DATE:       June 7, 2022
TO:         Potential Respondents
FROM:       Elaine Robbins – Construction Contract Coordinator II
SUBJECT:    Questions #1
            RFCSP769-22-11370ER
            UNT Eagle Landing Retail Space Buildout

*Please note that the UNTS webpage has changed – new link is:

This document is being issued to answer questions that have been submitted as follows:

1. Is the roof under current warranty? If so, please provide the contact information for
   the company that holds the warranty.

   **ANSWER:** Yes, roof is under warranty. UNTS to provide close out
   information to selected contractor.

2. Keyed Note 1 on sheet RP2.00 indicates retail space is mostly dirt, however,
   additional notes within underfloor plumbing enlarged plan indicate existing piping
   is installed and routed underneath slab foundation in shell space. Please clarify if
   the retail shell space has an existing concrete slab or if the floor finish is currently
   exposed dirt.

   **ANSWER:** Yes, retail space is mostly dirt, there is no concrete slab. It is
   exposed grade/dirt.

3. Sheet S2.00R provides new foundation plans for the retail space. Notes within the
   plumbing drawings indicate an existing slab foundation in the shell space. There
   are no demolition drawings indicating removal of an existing concrete slab. If there
   is an existing slab foundation within the shell space to be replaced with the new
   foundation shown on S2.00R, please provide demolition drawings indicating the
   extent of concrete removal required.

   **ANSWER:** There is no existing concrete slab that needs to be demolished.
   Demolition is not required as the slab was not poured/installed in phase one.
   The space was left with the existing grade/dirt.
4. On sheet A8.10R detail A2.1- it calls out for TA 4.1, however, nothing on the master schedule indicates on what TA 4.1 is supposed to be. Please provide product information for TA 4.1

**ANSWER:** *This is ConturaSeries® SURFACE-MOUNTED SEAT-COVER DISPENSER B-4221, see below:*
5. Please provide a signage schedule

ANSWER: UNTS will need signage for the toilet room HC RR, at door 16-C – emergency exit only on the door, IDF room, and refrigerator/freezer (this UNT dining will need to let UNTS know how they want this called out). See below for drawing:

6. On sheet A6.60R, is the interior partition type FB indicated to stop 4” from the structure? Please provide more information on the height of this partition.

ANSWER: This is not from structure. It is from the scheduled ceiling, refer to reflected ceiling plan (RCP) for the heights.
7. Spec Section 09 54 26 1.8-A indicates to build a mockup of typical ceiling area as shown on drawings, however, nothing is listed on plans. Please confirm a mockup is required. If so, please provide size of required mockup.

**ANSWER:** *This can be a built in place mock up in the initial space. Please include mock up pricing as an alternate.*

8. Specification Section 23 36 00 2.1-F and 2.3-A references controls spec section 23 09 00, however, this section is not included in bid documents. Please provide specification section 23 09 00.

**ANSWER:** *See attachment, Spec Section of Phase One – 230900-INSTRUMENTATION AND CONTROL FOR HVAC.*

9. Elevation D2/A8.10R indicates a digital monitor to be CFCI, however, in the RCP on A2.30R indicates that monitor to be OFCI. Please clarify if the digital monitor is to be furnished by the Contractor or Owner

**ANSWER:** *This should be contractor furnished, contractor installed CFCI.*

10. Are the food service equipment manufacturers open for “or-equal” substitutions? Hill Phoenix equipment is quoting 63 weeks on some equipment. Please advise.

**ANSWER:** *Yes, equal to or better than substitutions will be considered.*

11. The generator “design/build” service tie into existing concrete duct bank in the street has not been determined at this time. In order to correctly price the generator portion of the electrical scope the tie-in location will need to be determined. Has this been done by engineering or the city at this time? Please advise.

**ANSWER:** *As-builts to be provided to selected contractor. The generator portion is a connection for owner furnished full building generator. Contractor is not connecting building service to existing Dining Hall generator. Only life safety would be tied to that.*
12. There is tile (T-9) shown inside the millwork, which can be seen on sheet A9.24R. Is this correct? Please advise as to the section detail.

**ANSWER:** Yes, cross reference with the floor plan, finish plan and interior elevations. The section detail on A9.24R delineates where the tile 9 is going as well on the finish plan and interior elevations.

13. D2/A8.10R – MFR-1 hatching is similar to the T-9 hatching. Is this correct?

**ANSWER:** Yes, it has the same hatch but this is not Tile 9. This has been noted on the floor plan and interior elevations as OFOI (owner furnished owner installed) and it has the abbreviation MFR-1. Areas have been highlighted that are OFOI and do not include this as part of tile9. All the areas that are to receive tile have been called out on the plans and interior elevations. See below:

<table>
<thead>
<tr>
<th>TILE-9</th>
<th>T-9</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Colorbody Porcelain wall tile - field tile</td>
</tr>
<tr>
<td>Manufacturer</td>
<td>Dalite</td>
</tr>
<tr>
<td>Patterns</td>
<td>Saddle Brook</td>
</tr>
<tr>
<td>Color</td>
<td>Walnut Creek 5D15</td>
</tr>
<tr>
<td>Size</td>
<td>6&quot;x36&quot;</td>
</tr>
<tr>
<td>Finish</td>
<td>Matte</td>
</tr>
<tr>
<td>Thickness</td>
<td>5/16&quot;</td>
</tr>
<tr>
<td>Joining Pattern</td>
<td>Horizontal running bond</td>
</tr>
<tr>
<td>Joint Width</td>
<td>As Specified</td>
</tr>
<tr>
<td>Grout Type</td>
<td>High Performance at Walls and Epoxy at Floors</td>
</tr>
<tr>
<td>Grout Color</td>
<td>Select from Manufacturer’s color chart; architect to select two colors and GC to provide mock up</td>
</tr>
<tr>
<td>Floor Sealer</td>
<td>Not Required</td>
</tr>
<tr>
<td>Grout Sealer</td>
<td>Not Required</td>
</tr>
<tr>
<td>TCNA Installation</td>
<td>List tile installation from TCNA manual</td>
</tr>
<tr>
<td>Remarks</td>
<td>Wood wall tile at Walls, vertical face on counters where indicated on interior elevations and finish plans</td>
</tr>
</tbody>
</table>
14. Please confirm is the APC 2 in Retail 140 is to be installed above all LMC-1.

**ANSWER:** Yes, APC-2 goes above the LMC-1, refer to RCP on sheet A2.30R and especially the A9.21, A9.22, A9.23, A9.24.
15. Will additional sprinkler heads be required below the dropped linear metal ceilings in Retail 140?

**ANSWER:** No, because UNTS kept the LMC-1 ceiling close to the APC-2 ceiling. It is within the allowable range. These documents were reviewed by the UNTS Fire Marshall but the sprinkler sub will still need to have this reviewed by the Fire Marshall and comply with the code requirements.

16. The detail for partition type PA on sheet A6.60R indicates the steel within the wall to be mounted both vertically and horizontally. Please clarify the orientation and spacing of the required tube steel for partition type PA.

**ANSWER:** Do not see where it states it is a vertical and horizontal. This may be a mis-understanding, the detail shown has a plan view of the tube steel at the center of the detail. There are section cuts shown to delineate where the section occurs and where the plan view is. The note on the plan view details states the spacing of the steel and also read the precautionary notes. This is a detail for a vertical steel.
17. WD-9 is shown in detail C3/A8.10R, however WD-9 is not listed on the master schedule. Please provide product information for WD-9.

**ANSWER:** All the WD-9 was removed and changed to T-9. This tag was not updated. This is tile 9.

18. Please provide the existing deck height.

**ANSWER:** Refer to attached submittals – 052100-01-00 Steel Joists & 053100-01-00 Steel Deck.

19. Please indicate the size and spacing of the steel tube support requirements for sign FA-5 shown in detail A2/A9.21R.

**ANSWER:** This will need to be coordinated with Which Wich.

20. Sheet RMO.01 general note E indicated Contractor is to engage an independent air balancing company. This scope of work is typically provided by the Owner. Please confirm Contractor is to include test and balance in our scope of work.

**ANSWER:** UNTS will engage 3rd party for testing and balancing company.

21. The light fixture schedule on sheet A0.70R indicates in the description of illuminated signs FA1-6 that design is to be determined and the base bid is to only include infrastructure as noted on MEP drawings. However, the remarks on FA1-6 indicates the GC is to purchase and install the graphics. Please clarify if Contractor is to include purchase and installation of FA1-6 in our base bid, or if Contractor is to provide rough-in only. If Contractor is to purchase, please provide an allowance for Contractor to include.

**ANSWER:** Graphics FA-5 and FA-6 are Which Wich graphics. GC to purchase graphics from Which Wich, refer to MEP documents for the infrastructure. Also, refer to the graphics package shown on sheets SG2.10 and SG2.11. MEP documents call out the power requirements for these and as well for the infrastructure for future FA-1 through FA-4 graphics. The infrastructure will be above ceiling.
22. A9.25R indicates to coordinate with Owner if any cabinet doors need locks. Please advise which millwork doors will require locks and product information for desired lock type.

**ANSWER:** UNTS will confirm location of required millwork door locks prior to start of construction. For pricing purposes, assume all.

23. Where will parking be allotted for supervision, contractors, and vendors?

**ANSWER:** UNTS will coordinate with campus alongside selected GC in advance of construction start.

24. Where will we be allowed to set dumpsters during this project?

**ANSWER:** UNTS will coordinate with campus alongside selected GC in advance of construction start.

25. Please identify any allowed laydown area or storage area that we may use.

**ANSWER:** UNTS will coordinate with campus alongside selected GC in advance of construction start.

26. Can we place storage container on site anywhere?

**ANSWER:** UNTS will coordinate with campus alongside selected GC in advance of construction start.

27. What are the business hours for the building?

**ANSWER:** This is in front end of specs – UNTS will coordinate with campus alongside selected GC in advance of construction start.

28. What are business hours for the loading dock?

**ANSWER:** UNTS will coordinate with campus alongside selected GC in advance of construction start.

29. Please provide detail showing how the walkway/emergency drive by entry was constructed so we can determine if we can place pump truck and back concrete trucks on the drive in lieu of pumping/concrete buggy approx. 250 if from the street.

**ANSWER:** Pavers were removed by Rogers O’Brien when they built the dining hall; then reinstalled paver after the construction was complete. UNTS will coordinate with campus alongside selected GC in advance of construction start.
30. Please confirm that winning contractor is to purchase and provide all kitchen equipment shown on the F5 drawings and per spec 114000, including for Which Wich.

**ANSWER:** Yes, correct – contractor to provide and install all kitchen equipment.

31. Sheet S2.01R – Detail 2 – please clarify if this is to be included in scope of work for this project. This seems to be a detail for a concrete extension out in the loading dock, and details are not clear on dimensions, purpose, etc.

**ANSWER:** Yes, this is a concrete haunch that is the width of the gates to access the dumpster. Need to field verify the location of the dumpsters and gates. The concrete haunch can extend out 1'-6". The purpose of this is so the staff can walk out closer to the dumpster to drop off trash.

32. Sheet SG2.10 & SG2.11 – please confirm these are the entirety of the branding signage to be provided for this project.

**ANSWER:** No, there are two additional Which Wich signs where FA-5 and FA-6 are located
33. Sheets A8.11R renderings show other signs that are not shown on the SG sheets, but do not have the required details to provide pricing.

**ANSWER:** Correct, FA-1 through FA-4 are no longer to be provided, only the infrastructure for them and that is going above the ceiling, refer to MEP dwgs. Refer to Sheet A9.11% for the location of the two Which Wich signs FA-5 and FA-6; the rest of the signage/graphics shown on this sheet are replaced by the graphics shown on sheet SG2.11 Graphics-Interior. Also, provide the exterior graphics shown on SG2.10. During the phase 1 construction, the power for the exterior was stubbed out. UNTS know where the stub out is located. The exterior signage will need the power brought to it.

34. Confirm if there are any required contractors that must be used in this building (roof, sprinkler, data, firm alarm, security, etc.).

**ANSWER:** Specs provided by Kirksey should meet UNT campus standards. Fire Alarm is a Notifier system. Controls for Dining Hall project are Automated Logic. Specs for existing materials will be shared as needed.

35. In the specifications, there are some mentions of LEED. Please confirm if this is intended to be a LEED certified project, and if so, provide current points list and target certification.

**ANSWER:** Contractor will be using the same materials as phase 1, but do not need to track it.

36. Can we install temporary fencing outside entrance to space with working area along building during construction to protect from students/pedestrians?

**ANSWER:** UNTS will coordinate with campus alongside selected GC in advance of construction start.

37. Is there any existing signage on the canopy to receive new aluminum letters that will need to be removed?

**ANSWER:** No existing graphics, only new graphics as shown on SG2.10 Exterior.

38. Spec section 23 09 00 on sheet RM7.01 indicates to utilize equipment by the same manufacturer as currently exists, however does not give the existing manufacturer. Please provide the existing controls manufacturer.

**ANSWER:** Refer to attached submittal.
39. Is the CO2 line shown on FS5.03R to be provided by the Contractor? If so, please advise on the type of piping and insulation required for both interior and exterior application.

**ANSWER:** The existing CO2 tank will be used for the retail space. It is located on the south end of EL dock. A NUCO2 technician will install from above ceiling in dining hall to above ceiling in retail space. Contractor will need to install a 2 inch PVC in wall to allow CO2 line access from above ceiling to under drink station. No 90 degree fittings can be used on this conduit, preferably 22 or 45 degree only. UNTS will provide and coordinate this work with contractor.

40. Is there an existing soda line service port at the loading dock or is the Contractor to provide new?

**ANSWER:** There is an existing soda service line. GC does NOT have to provide.

41. Detail A3 on A8.10R indicated 4 digital monitors to be CFCI, however note #4 on TN4.04, indicates these to be future monitors. Please clarify if these monitors are to be CFCI or OFCI.

**ANSWER:** It is correct on Detail A3 on A8.10R that there are 4 digital monitors to be CFCI. Second part of question about “note #4 on TN4.04 indicates these to be future monitors” is incorrect, these will be going in and need to be contractor furnished and contractor installed. Monitors should be CFCI.

42. Security camera schedule on sheet TY2.04 references sheet TY5.01, however TY5.01 is not included in the construction documents. Please provide.

**ANSWER:** The TY5.01 detail is referring to this which was issued in the dining hall package, phase 1. File attached for reference below.
43. Project Overview-B on sheet TA1.00 indicates to update the existing installed control system, but does not indicate what the existing control system is. Is the Biamp DSP the existing control system or is there another control system attached? What is the control interface?

**ANSWER:** See Submittal #270500-01 & #270500-03 for more information.

44. What is the designed functionality for the added audiovisual control zone? Is a new user interface required in the retail space?

**ANSWER:** UNT Dining wanted to have the audio for this area separate from the dining hall. The homerun is not to go to the Audio Room 105B. UNTS to confirm location as needed.
SECTION 230900 - INSTRUMENTATION AND CONTROL FOR HVAC

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes control equipment for HVAC systems and components, including control components for terminal heating and cooling units not supplied with factory-wired controls.

B. Related Sections include the following:
   1. Division 23 Section "Meters and Gages for HVAC Piping" for measuring equipment that relates to this Section.
   2. Division 23 Section "Sequence of Operations for HVAC Controls" for requirements that relate to this Section.

C. Scope: This is a new Dining Hall in the middle of UNT’s Denton campus. The building should be connected to the campus BMS. Refer to this specification, UNT Design Guidelines, and the mechanical controls contract drawings.

1.3 DEFINITIONS

A. DDC: Direct digital control.

B. I/O: Input/output.

C. BACnet, Modbus: A control network technology platform for designing and implementing interoperable control devices and networks.

D. MS/TP: Master slave/token passing.

E. PID: Proportional plus integral plus derivative.

F. RTD: Resistance temperature detector.

1.4 SYSTEM PERFORMANCE

A. Comply with the following performance requirements:
   1. Graphic Display: Display graphic with current state of the art dynamic points and refresh speed.
   2. Object Command: Reaction time of less than two seconds between operator command of a binary object and device reaction.
   3. Object Scan: Transmit change of state and change of analog values to control units or workstation within six seconds.
   4. Alarm Response Time: Annunciate alarm at workstation within 45 seconds. Multiple workstations must receive alarms within five seconds of each other.
   5. Program Execution Frequency: Run capability of applications as often as five seconds, but selected consistent with mechanical process under control.
   6. Performance: Programmable controllers shall execute DDC PID control loops, and scan and update process values and outputs at least once per second.
   7. Reporting Accuracy and Stability of Control: Report values and maintain measured variables within tolerances as follows:
      a. Water Temperature: Plus or minus 1 deg F.
      b. Water Flow: Plus or minus 5 percent of full scale.
      c. Water Pressure: Plus or minus 2 percent of full scale.
d. Space Temperature: Plus or minus 1 deg F.
e. Ducted Air Temperature: Plus or minus 1 deg F.
f. Outside Air Temperature: Plus or minus 2 deg F.
g. Dew Point Temperature: Plus or minus 3 deg F.
h. Temperature Differential: Plus or minus 0.25 deg F.
i. Relative Humidity: Plus or minus 5 percent.
j. Airflow (Pressurized Spaces): Plus or minus 3 percent of full scale.
k. Airflow (Measuring Stations): Plus or minus 5 percent of full scale.
l. Airflow (Terminal): Plus or minus 10 percent of full scale.
m. Air Pressure (Space): Plus or minus 0.01-inch wg.
n. Air Pressure (Ducts): Plus or minus 0.1-inch wg.
o. Carbon Monoxide: Plus or minus 5 percent of reading.
p. Carbon Dioxide: Plus or minus 50 ppm.
q. Electrical: Plus or minus 5 percent of reading.

1.5 SUBMITTALS

A. Product Data: Include manufacturer’s technical literature for each control device. Indicate dimensions, capacities, performance characteristics, electrical characteristics, finishes for materials, and installation and startup instructions for each type of product indicated.
1. DDC System Hardware: Bill of materials of equipment indicating quantity, manufacturer, and model number. Include technical data for operator workstation equipment, interface equipment, control units, transducers/transmitters, sensors, actuators, valves, relays/switches, control panels, and operator interface equipment.
2. Control System Software: Include technical data for operating system software, operator interface, color graphics, and other third-party applications.
3. Controlled Systems: Instrumentation list with element name, type of device, manufacturer, model number, and product data. Include written description of sequence of operation including schematic diagram.

B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
1. Bill of materials of equipment indicating quantity, manufacturer, and model number.
2. Schematic flow diagrams showing fans, pumps, coils, dampers, valves, and control devices.
4. Details of control panel faces, including controls, instruments, and labeling.
5. Floor plans indicating control panel locations.
6. Written description of sequence of operation.
7. Schedule of dampers including size, leakage, and flow characteristics.
8. Schedule of valves including flow characteristics.
9. Panel and circuit number of any additional 120V power required.
10. DDC System Hardware:
a. Wiring diagrams for control units with termination numbers.
b. Schematic diagrams and floor plans for field sensors and control hardware.
c. Schematic diagrams for control, communication, and power wiring, showing trunk data conductors and wiring between operator workstation and control unit locations.
11. Control System Software: Graphics outline and “Print Page” examples of final product indicating monitored systems, data (connected and calculated) point addresses, output schedule, and operator notations.
12. Controlled Systems:
a. Schematic diagrams of each controlled system with control points labeled and control elements graphically shown, with wiring.
b. Scaled drawings showing mounting, routing, and wiring of elements including bases and special construction.
c. Written description of sequence of operation including schematic diagram.
d. Points list.

C. Operation and Maintenance Data: For HVAC instrumentation and control system to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 01 Section “Operation and Maintenance Data,” include the following:
1. Maintenance instructions and lists of spare parts for each type of control device and compressed-air station.
2. Interconnection wiring diagrams with identified and numbered system components and devices.
4. Inspection period, cleaning methods, cleaning materials recommended, and calibration tolerances.
5. Calibration records and list of set points.
6. Software and Firmware Operational Documentation: Include the following:
   a. Software operating and upgrade manuals.
   b. Program Software Backup: On a magnetic media or compact disc, complete with data files.
   c. Device address list.
   d. Printout of software application and graphic screens.
   e. Software license required by and installed for DDC workstations and control systems.
7. Software Upgrade Kit: For Owner to use in modifying software to suit future systems revisions or monitoring and control revisions.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Automatic control system manufacturer's authorized representative who is trained and approved for installation of system components required for this Project.
B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
C. Comply with ASHRAE 135 for DDC system components.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Factory-Mounted Components: Where control devices specified in this Section are indicated to be factory mounted on equipment, arrange for shipping of control devices to equipment manufacturer.
B. System Software: Update to latest version of software at Project completion.

1.8 COORDINATION

A. Coordinate location of temperature sensors, humidistats, and other exposed control sensors with plans and room details before installation.
B. Coordinate equipment with Division 28 Section "Intrusion Detection" to achieve compatibility with equipment that interfaces with that system and with building master clock.
C. Coordinate equipment with Division 28 Section "Access Control" to achieve compatibility with equipment that interfaces with that system.
D. Coordinate equipment with Division 28 Section "PLC Electronic Detention Monitoring and Control Systems" to achieve compatibility with equipment that interfaces with that system.
E. Coordinate equipment with Division 26 Section "Network Lighting Controls" to achieve compatibility with equipment that interfaces with that system.
F. Coordinate equipment with Division 28 Section "Fire Detection and Alarm" to achieve compatibility with equipment that interfaces with that system.
G. Coordinate supply of conditioned electrical branch circuits for control units and operator workstation.
H. Coordinate equipment with Division 26 Section "Electrical Power Monitoring and Control" to achieve compatibility of communication interfaces.
I. Coordinate equipment with Division 26 Section "Panelboards" to achieve compatibility with starter coils and annunciation devices.
J. Coordinate equipment with Division 26 Section "Motor-Control Centers" to achieve compatibility with motor starters and annunciation devices.

K. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 03 Section "Cast-in-Place Concrete."

1.9 WORK BY OTHERS

A. Automatic control valves shall be furnished by the EMS contractor and installed by the Mechanical Contractor. All reducers and fittings necessary to install smaller than pipe size valves shall be furnished and installed by the Mechanical Contractor.

B. Automatic dampers and actuators shall be furnished by the EMS contractor and installed by the Mechanical Contractor.

C. Piping: Water pressure and differential sensors, valve manifolds, flow switches, thermal sensors shall be furnished and installed by the EMS contractor. All piping taps and wells shall be provided by the mechanical contractor in locations shown on plans and/or locations directed by the EMS contractor for optimal performance.

D. Duct air flow monitors shall be furnished by the EMS contractor and installed by the Mechanical Contractor.

E. Smoke Detectors: All smoke detectors, including duct mounted smoke detectors, will be provided and wired to the Fire Alarm Panel by the Fire Alarm Contractor. Duct smoke detectors will be installed by the Mechanical Contractor. Shutdown interlock wiring between starters/variable frequency drives and the Fire Alarm system shutdown contacts shall be installed by the EMS Contractor.

F. Terminal Box DDC controllers will be furnished by the EMS Contractor to the Terminal Box Manufacturer for installation.

G. Transformer shall be oversized to serve three (3) adjacent VAV cooling only or heating water box controllers.

PART 2 - PRODUCTS

2.1 CONTROL SYSTEM

A. Allowable EMS Vendors/Manufacturers:
   1. Schneider Electrical
   2. Automated Logic Systems

B. All requirements from the UNT Design Guidelines shall be included in the scope of work. Those are as follows:
   1. The University of North Texas Denton Campus Facilities utilizes the Schneider Electric building automation control and monitoring system StruxureWare, Vista™ 5 and I/NET Seven with the associated interface hardware. Schneider Electric StruxureWare is a software suite of building management tools that control and monitor our building systems. It is based on open systems technology based on the LONWORKS® technology and NL220 protocol. New installations and construction shall be specified with Schneider Electric StruxureWare or Automated Logic equivalent.
   2. All end devices must be compatible with the Schneider Electric StruxureWare software front end and subsequent releases. All UNT programming or adjustments of any end device after installation shall be done through the Schneider Electric StruxureWare program and not require a secondary program.
   3. The programmable network devices, control panels, controllers will be provided and specified by Schneider Electric building controls or Automated Logic Systems.
   4. Full functionality and seamless interface to the controlled equipment through Schneider Electric StruxureWare/Automated Logic Controls is expected especially fume and laboratory hood controls & valves, chillers, boilers, fans, VFDs, AHUs, VAVs, lighting, metering, etc.
5. Each VAV air-handling unit will have a Dedicated Control Unit as per current UNT Spec. Only points associated with that unit will be terminated in the DCU plus I/O unless for lighting, exhaust, or other not associated with another unit.

6. Each VAV air handling unit will have 1 or more DCU controllers which will perform the data management functions for the VAV for a specific unit that the terminal units are associated to. If an air handler serves more than one floor, it will have a DCU on each floor with only that floors VAV terminals connected to it. Max of 10 terminal units per 401:B. Each VAV terminal will have a supply air sensor if the terminal unit has any heating stages.

7. Each single zone air-handling unit will have their own controller but some of the multi zone air-handling unit may require multiple controllers. No more than 1 unit will be terminated to a base controller.

8. Each single zone CAV, VAV or face and bypass unit will have a supply air sensor.

9. Each air-handling unit will have a return air if the ductwork is continuous from the space back to the unit. Multi-zone units will have cold deck and hot deck sensors installed in associated decks. Return Air Temperature Sensors will be installed as a standard. Mixed air temperature sensors will not be used as a standard, unless the unit is being served by another unit (an example of this would be a dedicated outside air unit [1] serving another unit [2] – then the mixed air of 2 is really the supply air of 1).

10. If safety device feedback is standard, the different devices (i.e.: smoke detector, freeze stat, high pressure cutout, etc.) will be a common safety circuit input to the controller. When a safety goes into alarm, only that safety’s feedback will be in alarm in the controller (safeties will be wired in series to pull in a relay for status to the controller). Each AHU control panel will have a service input switch to reset any safeties and allow local personnel to disable the control of the unit. Hardwire safeties will go to the motor controller and maintenance feedback from safeties to DCU. This switch must have a label indicating that this switch is only a means of EMS shut-down/reset, not intended as a service disconnect.
   a. Every VFD will have a LON interface and alarm in the DCU, or the following hardwired points as a minimum:
      1) VFD Run Indication
      2) VFD Speed Feedback
      3) VFD Speed Control
      4) VFD Start/Stop
   b. Standard VFD manufacturers acceptable for UNT are ABB and Square D. Exceptions have to be approved.

11. Each chiller, boiler plant, heating system and condenser water system will have its own dedicated DCU plus I/O controller. The Chiller and heating system controller will have a cooling or heating required LED and a plant reset pushbutton mounted on the cabinet door.

12. Each secondary pumping system will have its own dedicated controller.

13. A Zone Override pushbutton station will be provided at the direction of UNT, the purpose of this station will be to enable the local operator to override the scheduling of each unit or grouped zone in a building from 1 location through software. The override duration will be a timed for a default set at 2 hours.

14. An override momentary pushbutton will be installed on the front of the panel for each major zone. See #10 for details.

15. UNT will provide IP addresses.

16. The university standard sequence of operations will be followed and provided by UNT. Refer to controls drawings.

17. The university standard wiring termination will be followed.

18. Point names in the software will include the equipment name. This must be coordinated with UNT Facilities and generally is limited to 12 characters.

19. Each controller will be labeled (controller name and equipment name) on the front of the panel door.

20. Each controller will have a graphic printout showing wire termination by point name and wire number. The power source location will also be shown on the drawing (panel and breaker number and IP addresses). The drawing will be mounted inside the panel door in a clear plastic sleeve. There will be a separate Electronic Format file of drawings and bound reference copy.

21. All relays, transducers and other controls which are separated from the controlled device will be mounted in a control cabinet or electrical trough that is accessible without a ladder. This does not include sensors or transmitters which must be installed in a pipe.

22. Each controller panel will have a light switch/110v outlet combination installed. The switch will power down all the transformers in the panel. The 110v outlet will remain powered up with the switch off.
23. The following wire types will be used for the shown functions:

<table>
<thead>
<tr>
<th>Cable Function</th>
<th>CSI Part #</th>
<th>Jacket</th>
<th>Color Description</th>
</tr>
</thead>
</table>

24. All wiring in control panels will be installed in open slot wiring duct with snap on covers (Panduit or equal). The panels will be large enough to accommodate all of the hardware without over-crowding.
25. Each controller will have separate controller power and output power transformers.
26. A copy of the controls as-built (record) will be furnished in Visio format on CD or DVD.
27. Two hard copies of the controls as-built (record) will also be furnished.
28. Space temperature sensor shall be determined and approved by UNT for color and type- Submit samples. Non-Occupant Controlled and No Display.
29. Wireless pages to follow Vista/NSP standards version 5.x or higher.
30. Space temperature sensor shall be determined and approved by UNT for color and type- Submit samples. Non-Occupant Controlled and No Display.
31. Each controller will have separate controller power and output power transformers.
32. A copy of the controls as-built (record) will be furnished in Visio format on CD or DVD.
33. Two hard copies of the controls as-built (record) will also be furnished.
34. Space temperature sensor shall be determined and approved by UNT for color and type- Submit samples. Non-Occupant Controlled and No Display.
35. Graphic pages to follow Vista/NSP standards version 5.x or higher.
36. Wireless networks shall not be used. All networks shall be hardwired and a static IP address will be required by UNT.
37. Five year plan and system design required for approval.
38. Programming logic to be approved by UNT personnel. Generally, logic will be designed with as few calculations as necessary to accomplish tasks. Prefer use of modules over calculations.
39. Equipment network gateway to be fully functional. Contractor will be responsible for this complete functionality.
40. Hand held device set up will be standardized with Graphics compatible and resolution for devices such as laptops, net books, smart phones, etc.
41. A standard controller cabinet, mounting, color, labeling, lighting and location design and instructions will be provided by UNT or designated representative.

C. Control system shall consist of sensors, indicators, actuators, final control elements, interface equipment, other apparatus, accessories, and software connected to distributed controllers operating in multiuser, multitasking environment on token-passing network and programmed to control systems. An operator workstation permits interface with the network via dynamic color graphics with each system, building floor plan, and control device depicted by point-and-click graphics.

D. Power for control panels have been shown on the electrical drawings. The electrical contractor will provide the power to the junction box as indicated. The controls contractor shall furnish and install from the junction box to control panel or device as needed. If additional power is needed for any controls device then the controls contractor shall provide power (wire, conduit, etc.) from an available spare breaker to the controls device requiring 120V. Refer to division 26 for product and installation requirements. The circuit number used shall be submitted along with the required shop drawings to the engineer.

E. Data for control panels have been shown on the electrical drawings. If additional data drops are needed for any control device than the controls contractor shall provide the remaining devices and cabling to complete the required BAS Ethernet network. Refer to Division 28 for product and installation requirements.

F. Control system shall include the following:
1. Building lighting control system specified in Division 26 Section "Network Lighting Controls."
2. Fire alarm system specified in Division 28 Section "Fire Detection and Alarm."

2.2 DDC EQUIPMENT

A. Operator Workstation: One desktop with configuration commercially available three months before substantial completion:
1. Motherboard with 8 integrated USB 2.0 ports, integrated Intel Ethernet, integrated audio, bios, and hardware monitoring.
2. Intel Processor:
4. Graphics Video Adapter
5. Monitor 19" LCD color.
8. CD-ROM Read/Write Drive.
10. 2 kVA UPS.
11. Operating System: Microsoft Windows or Vista with high-speed Internet access.
a. Protocol Compliance: Control units shall use BACnet or Modbus protocol.

12. Printer: Color, ink-jet type commercial printer with print speed of 12 color pages per minute.

13. Application Software:
   a. I/O capability from operator station.
   b. System security for each operator via software password and access levels.
   c. Automatic system diagnostics; monitor system and report failures.
   d. Database creation and support.
   e. Automatic and manual database save and restore.
   f. Dynamic color graphic displays with up to 10 screen displays at once.
   g. Custom graphics generation and graphics library of HVAC equipment and symbols.
   h. Alarm processing, messages, and reactions.
   i. Trend logs retrievable in spreadsheets and database programs.
   j. Alarm and event processing.
   k. Object and property status and control.
   l. Automatic restart of field equipment on restoration of power.
   m. Data collection, reports, and logs. Include standard reports for the following:
      1) Current values of all objects.
      2) Current alarm summary.
      3) Disabled objects.
      4) Alarm lockout objects.
      5) Logs.
   n. Custom report development.
   o. Utility and weather reports.
   p. Workstation application editors for controllers and schedules.
   q. Maintenance management.

14. Custom Application Software:
   a. English language oriented.
   b. Full-screen character editor/programming environment.
   c. Allow development of independently executing program modules with debugging/simulation capability.
   d. Support conditional statements.
   e. Support floating-point arithmetic with mathematic functions.
   f. Contains predefined time variables.

B. One Diagnostic Terminal Unit: Portable notebook-style, PC-based microcomputer terminal capable of accessing system data by connecting to system network with state of the art configuration, commercially available three months before substantial completion.
   1. System: With one integrated USB 2.0 port, integrated Intel Ethernet, integrated audio, bios, and hardware monitoring.
   8. CD-ROM Read/Write Drive.

C. Control Units: Modular, comprising processor board with programmable, nonvolatile, random-access memory; local operator access and display panel; integral interface equipment; and backup power source.
   1. Units monitor or control each I/O point; process information; execute commands from other control units, devices, and operator stations; and download from or upload to operator workstation or diagnostic terminal unit.
   2. Stand-alone mode control functions operate regardless of network status. Functions include the following:
      a. Global communications.
      b. Discrete/digital, analog, and pulse I/O.
      c. Monitoring, controlling, or addressing data points.
      d. Software applications, scheduling, and alarm processing.
      e. Testing and developing control algorithms without disrupting field hardware and controlled environment.
   3. Standard Application Programs:
a. Electric Control Programs: Demand limiting, duty cycling, automatic time scheduling, start/stop time optimization, night setback/setup, on-off control with differential sequencing, staggered start, antishort cycling, PID control, DDC with fine tuning, and trend logging.
b. HVAC Control Programs: Optimal run time, supply-air reset, and enthalpy switchover.
c. Chiller Control Programs: Control function of condenser-water reset, chilled-water reset, and equipment sequencing.
d. Programming Application Features: Include trend point; alarm processing and messaging; weekly, monthly, and annual scheduling; energy calculations; run-time totalization; and security access.
e. Remote communications.
f. Maintenance management.
g. Units of Measure: Inch-pound and SI (metric).

4. Local operator interface provides for download from or upload to operator workstation or diagnostic terminal unit.

5. Protocol Compliance: Control units shall use BACnet or Modbus protocol.

D. Local Control Units: Modular, comprising processor board with electronically programmable, nonvolatile, read-only memory; and backup power source.

1. Units monitor or control each I/O point, process information, and download from or upload to operator workstation or diagnostic terminal unit.

2. Stand-alone mode control functions operate regardless of network status. Functions include the following:
   a. Global communications.
   b. Discrete/digital, analog, and pulse I/O.
   c. Monitoring, controlling, or addressing data points.

3. Local operator interface provides for download from or upload to operator workstation or diagnostic terminal unit.

E. I/O Interface: Hardwired inputs and outputs may tie into system through controllers. Protect points so that shorting will cause no damage to controllers.

1. Binary Inputs: Allow monitoring of on-off signals without external power.

2. Pulse Accumulation Inputs: Accept up to 10 pulses per second.

3. Analog Inputs: Allow monitoring of low-voltage (0- to 10-V dc), current (4 to 20 mA), or resistance signals.

4. Binary Outputs: Provide on-off or pulsed low-voltage signal, selectable for normally open or normally closed operation.

5. Analog Outputs: Provide modulating signal, either low voltage (0- to 10-V dc) or current (4 to 20 mA).


7. Universal I/Os: Provide software selectable binary or analog outputs.

F. Power Supplies: Transformers with Class 2 current-limiting type or overcurrent protection; limit connected loads to 80 percent of rated capacity. DC power supply shall match output current and voltage requirements and be full-wave rectifier type with the following:

1. Output ripple of 5.0 mV maximum peak to peak.

2. Combined 1 percent line and load regulation with 100-mic.sec. response time for 50 percent load changes.

3. Built-in overvoltage and overcurrent protection and be able to withstand 150 percent overload for at least 3 seconds without failure.

G. Power Line Filtering: Internal or external transient voltage and surge suppression for workstations or controllers with the following:

1. Minimum dielectric strength of 1000 V.


3. Minimum transverse-mode noise attenuation of 65 dB.

4. Minimum common-mode noise attenuation of 150 dB at 40 to 100 Hz.
2.3 UNITARY CONTROLLERS

A. Unitized, capable of stand-alone operation with sufficient memory to support its operating system, database, and programming requirements, and with sufficient I/O capacity for the application.
   1. Configuration: Local keypad and display; diagnostic LEDs for power, communication, and processor; wiring termination to terminal strip or card connected with ribbon cable; memory with bios; and 72-hour battery backup.
   2. Operating System: Manage I/O communication to allow distributed controllers to share real and virtual object information and allow central monitoring and alarms. Perform automatic system diagnostics; monitor system and report failures.
   3. ASHRAE 135 Compliance: Communicate using read (execute and initiate) and write (execute and initiate) property services defined in ASHRAE 135. Reside on network using MS/TP datalink/physical layer protocol and have service communication port for connection to diagnostic terminal unit.
   5. Enclosure: Dustproof rated for operation at 32 to 120 deg F.
   6. Enclosure: If outdoors or in wet ambient conditions, waterproof rated for operation at 40 to 150 deg F.

2.4 ELECTRONIC SENSORS

A. Description: Vibration and corrosion resistant; for wall, immersion, or duct mounting as required.

B. Thermistor Temperature Sensors and Transmitters:
   1. Accuracy: Plus or minus 0.5 deg F at calibration point.
   2. Wire: Twisted, shielded-pair cable.
   3. Insertion Elements in Ducts: Single point, use where not affected by temperature stratification or where ducts are smaller than 9 sq. ft.
   4. Averaging Elements in Ducts: Use where prone to temperature stratification or where ducts are larger than 10 sq. ft.
   5. Insertion Elements for Liquids: Brass or stainless-steel socket with minimum insertion length of 2-1/2 inches.
   6. Room Sensor Cover Construction: Manufacturer's standard locking covers.
      a. Set-Point Adjustment: Exposed.
      b. Set-Point Indication: Exposed.
      c. Temperature: LED.
   7. Outside-Air Sensors: Watertight inlet fitting, shielded from direct sunlight.

C. RTDs and Transmitters:
   1. Accuracy: Plus or minus 0.2 percent at calibration point.
   2. Wire: Twisted, shielded-pair cable.
   3. Insertion Elements in Ducts: Single point; use where not affected by temperature stratification or where ducts are smaller than 9 sq. ft.
   4. Averaging Elements in Ducts: Use where prone to temperature stratification or where ducts are larger than 9 sq. ft.; length as required.
   5. Insertion Elements for Liquids: Brass socket with minimum insertion length of 2-1/2 inches.
   6. Room Sensor Cover Construction: Manufacturer's standard locking covers.

D. Humidity Sensors: Bulk polymer sensor element.
   1. Accuracy: 2 percent full range with linear output.
   2. Room Sensor Range: 20 to 80 percent relative humidity.
   3. Room Sensor Cover Construction: Manufacturer's standard locking covers.
   4. Duct Sensor: 20 to 80 percent relative humidity range with element guard and mounting plate.
   5. Outside-Air Sensor: 20 to 80 percent relative humidity range with mounting enclosure, suitable for operation at outdoor temperatures of 32 to 120 deg F.
   6. Duct and Sensors: With element guard and mounting plate, range of 0 to 100 percent relative humidity.

E. Pressure Transmitters/Transducers:
1. Static-Pressure Transmitter: Nondirectional sensor with suitable range for expected input, and temperature compensated.
   a. Accuracy: 2 percent of full scale with repeatability of 0.5 percent.
   b. Output: 4 to 20 mA.
   c. Building Static-Pressure Range: plus/minus 0- to 0.25-inch wg. Building static sensor shall be bi-directional.
   d. Duct Static-Pressure Range: 0- to 5-inch wg.
2. Water Pressure Transducers: Stainless-steel diaphragm construction, suitable for service; minimum 150-psig operating pressure; linear output 4 to 20 mA.
3. Water Differential-Pressure Transducers: Stainless-steel diaphragm construction, suitable for service; minimum 150-psig operating pressure and tested to 300-psig; linear output 4 to 20 mA.
4. Differential-Pressure Switch (Air or Water): Snap acting, with pilot-duty rating and with suitable scale range and differential.
5. Pressure Transmitters: Direct acting for gas, liquid, or steam service; range suitable for system; linear output 4 to 20 mA.

2.5 STATUS SENSORS

A. Status Inputs for Fans: Differential-pressure switch with pilot-duty rating and with adjustable range of 0- to 5-inch wg.
B. Status Inputs for Pumps: Differential-pressure switch with pilot-duty rating and with adjustable pressure-differential range of 8 to 60 psig, piped across pump.
C. Status Inputs for Electric Motors: Comply with ISA 50.00.01, current-sensing fixed- or split-core transformers with self-powered transmitter, adjustable and suitable for 175 percent of rated motor current.
D. Voltage Transmitter (100- to 600-V ac): Comply with ISA 50.00.01, single-loop, self-powered transmitter, adjustable, with suitable range and 1 percent full-scale accuracy.
E. Power Monitor: 3-phase type with disconnect/shorting switch assembly, listed voltage and current transformers, with pulse kilowatt hour output and 4- to 20-mA kW output, with maximum 2 percent error at 1.0 power factor and 2.5 percent error at 0.5 power factor.
F. Current Switches: Self-powered, solid-state with adjustable trip current, selected to match current and system output requirements.
G. Electronic Valve/Damper Position Indicator: Visual scale indicating percent of travel and 2- to 10-V dc, feedback signal.
H. Water-Flow Switches: Bellows-actuated mercury or snap-acting type with pilot-duty rating, stainless-steel or bronze paddle, with appropriate range and differential adjustment, in NEMA 250, Type 1 enclosure.

2.6 GAS DETECTION EQUIPMENT

A. Carbon Monoxide Detectors: Single or multichannel, dual-level detectors using solid-state plug-in sensors with a 3-year minimum life; suitable over a temperature range of 32 to 104 deg F; with 2 factory-calibrated alarm levels at 50 and 100 ppm.
B. Carbon Dioxide Sensor and Transmitter: Single detectors using solid-state infrared sensors; suitable over a temperature range of 23 to 130 deg F and calibrated for 0 to 2 percent, with continuous or averaged reading, 4- to 20-mA output; for wall mounting.
C. Oxygen Sensor and Transmitter: Single detectors using solid-state zircon cell sensing; suitable over a temperature range of minus 32 to plus 1100 deg F and calibrated for 0 to 5 percent, with continuous or averaged reading, 4- to 20-mA output; for wall mounting.

2.7 FLOW MEASURING STATIONS

A. Duct Airflow Station: Combination of air straightener and multiport, self-averaging pitot tube station.
3. Sensing Manifold: Copper manifold with bullet-nosed static pressure sensors positioned on equal area basis.

2.8 ACTUATORS

A. Electric Motors: Size to operate with sufficient reserve power to provide smooth modulating action or two-position action.
1. Comply with requirements in Division 23 Section "Common Motor Requirements for HVAC Equipment."
2. Permanent Split-Capacitor or Shaded-Pole Type: Gear trains completely oil immersed and sealed. Equip spring-return motors with integral spiral-spring mechanism in housings designed for easy removal for service or adjustment of limit switches, auxiliary switches, or feedback potentiometer.
3. Nonspring-Return Motors for Valves Larger Than NPS 2-1/2: Size for running torque of 150 in. x lbf and breakaway torque of 300 in. x lbf.
4. Spring-Return Motors for Valves Larger Than NPS 2-1/2: Size for running and breakaway torque of 150 in. x lbf.
5. Nonspring-Return Motors for Dampers Larger Than 25 Sq. Ft.: Size for running torque of 150 in. x lbf and breakaway torque of 300 in. x lbf.
6. Spring-Return Motors for Dampers Larger Than 25 Sq. Ft.: Size for running and breakaway torque of 150 in. x lbf.

B. Electronic Actuators: Direct-coupled type designed for minimum 60,000 full-stroke cycles at rated torque.
1. Valves: Size for torque required for valve close off at maximum pump differential pressure.
2. Dampers: Size for running torque calculated as follows:
   b. Opposed-Blade Damper without Edge Seals: 3 inch-lb/sq. ft. of damper.
   c. Dampers with 2- to 3-Inch wg of Pressure Drop or Face Velocities of 1000 to 2500 fpm: Increase running torque by 1.5.
   d. Dampers with 3- to 4-Inch wg of Pressure Drop or Face Velocities of 2500 to 3000 fpm: Increase running torque by 2.0.
4. Overload Protection: Electronic overload or digital rotation-sensing circuitry.
5. Fail-Safe Operation: Mechanical, spring-return mechanism. Provide external, manual gear release on nonspring-return actuators.

2.9 CONTROL VALVES

A. Control Valves: Factory fabricated, of type, body material, and pressure class based on maximum pressure and temperature rating of piping system, unless otherwise indicated.

B. Hydronic system globe valves shall have the following characteristics:
1. NPS 2 and Smaller: Class 125 bronze body, bronze trim, rising stem, renewable composition disc, and screwed ends with backseating capacity repackable under pressure.
2. NPS 2-1/2 and Larger: Class 125 iron body, bronze trim, rising stem, plug-type disc, flanged ends, and renewable seat and disc.
3. Internal Construction: Replaceable plugs and stainless-steel or brass seats.
   a. Single-Seated Valves: Cage trim provides seating and guiding surfaces for plug on top and bottom.
   b. Double-Seated Valves: Balanced plug; cage trim provides seating and guiding surfaces for plugs on top and bottom.
4. Sizing: 5-psig Insert value maximum pressure drop at design flow rate or the following:
   b. Two-Way Modulating: Either the value specified above or twice the load pressure drop, whichever is more.
2.10 DAMPERS

A. Dampers: AMCA-rated, opposed-blade design; 0.108-inch- minimum thick, galvanized-steel or 0.125-inch- minimum thick, extruded-aluminum frames with holes for duct mounting; damper blades shall not be less than 0.064-inch- thick galvanized steel with maximum blade width of 8 inches and length of 48 inches.
   1. Secure blades to 1/2-inch- diameter, zinc-plated axles using zinc-plated hardware, with oil-impregnated sintered bronze blade bearings, blade-linkage hardware of zinc-plated steel and brass, ends sealed against spring-stainless-steel blade bearings, and thrust bearings at each end of every blade.
   2. Operating Temperature Range: From minus 40 to plus 200 deg F.
   3. Edge Seals, Low-Leakage Applications: Use inflatable blade edging or replaceable rubber blade seals and spring-loaded stainless-steel side seals, rated for leakage at less than 10 cfm per sq. ft. of damper area, at differential pressure of 4-inch wg when damper is held by torque of 50 in. x lbf; when tested according to AMCA 500D.
   4. Dampers shall be Ruskin CD-50 or approved equal.

2.11 CONTROL CABLE

A. Electronic and fiber-optic cables for control wiring are specified in Division 27 Section "Communications Horizontal Cabling."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that power supply is available to control units and operator workstation.

3.2 INSTALLATION

A. Install software in control units and operator workstation(s). Implement all features of programs to specified requirements and as appropriate to sequence of operation.

B. Connect and configure equipment and software to achieve sequence of operation specified.

C. Verify location of thermostats, humidistats, and other exposed control sensors with Drawings and room details before installation. Install devices 48 inches above the floor.
   1. Install averaging elements in ducts and plenums in crossing or zigzag pattern.
D. Install automatic dampers according to Division 23 Section "Air Duct Accessories."

E. Install damper motors on outside of duct in warm areas, not in locations exposed to outdoor temperatures.

F. Install labels and nameplates to identify control components according to Division 23 Section "Identification for HVAC Piping and Equipment."

G. Install hydronic instrument wells, valves, and other accessories according to Division 23 Section "Hydronic Piping."

H. Install refrigerant instrument wells, valves, and other accessories according to Division 23 Section "Refrigerant Piping."

I. Install duct volume-control dampers according to Division 23 Sections specifying air ducts.

J. Install electronic and fiber-optic cables according to Division 27 Section "Communications Horizontal Cabling."

3.3 ELECTRICAL WIRING AND CONNECTION INSTALLATION

A. Install raceways, boxes, and cabinets according to Division 26 Section "Raceway and Boxes for Electrical Systems."

B. Install building wire and cable according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

C. Install signal and communication cable according to Division 27 Section "Communications Horizontal Cabling."
   1. Conceal cable, except in mechanical rooms and areas where other conduit and piping are exposed.
   2. Install exposed cable in raceway.
   3. Install concealed cable in raceway.
   4. Bundle and harness multiconductor instrument cable in place of single cables where several cables follow a common path.
   5. Fasten flexible conductors, bridging cabinets and doors, along hinge side; protect against abrasion.
   6. Tie and support conductors.
   7. Install wire and cable with sufficient slack and flexible connections to allow for vibration of piping and equipment.

D. Connect manual-reset limit controls independent of manual-control switch positions. Automatic duct heater resets may be connected in interlock circuit of power controllers.

E. Connect hand-off-auto selector switches to override automatic interlock controls when switch is in hand position.

3.4 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including connections.

B. Perform the following field tests and inspections and prepare test reports:
   1. Operational Test: After electrical circuitry has been energized, start units to confirm proper unit operation. Remove and replace malfunctioning units and retest.
   2. Test and adjust controls and safeties.
   3. Test each point through its full operating range to verify that safety and operating control set points are as required.
   4. Test each control loop to verify stable mode of operation and compliance with sequence of operation. Adjust PID actions.
5. Test each system for compliance with sequence of operation.
6. Test software and hardware interlocks.

C. DDC Verification:
1. Verify that instruments are installed before calibration, testing, and loop checks.
2. Check instruments for proper location and accessibility.
3. Check instrument installation for direction of flow, elevation, orientation, insertion depth, and other applicable considerations.
4. Check flow instruments. Inspect tag number and line and bore size, and verify that inlet side is identified and that meters are installed correctly.
5. Check pressure instruments, piping slope, installation of valve manifold, and self-contained pressure regulators.
6. Check temperature instruments and material and length of sensing elements.
7. Check control valves. Verify that they are in correct direction.
8. Check air-operated dampers. Verify that pressure gages are provided and that proper blade alignment, either parallel or opposed, has been provided.
9. Check DDC system as follows:
   a. Verify that DDC controller power supply is from emergency power supply, if applicable.
   b. Verify that wires at control panels are tagged with their service designation and approved tagging system.
   c. Verify that spare I/O capacity has been provided.
   d. Verify that DDC controllers are protected from power supply surges.

D. Replace damaged or malfunctioning controls and equipment and repeat testing procedures.

E. Compile and maintain all field quality control reports and make available to the AHJ, owner, architect and engineer as needed.

3.5 ADJUSTING

A. Calibrating and Adjusting:
1. Calibrate instruments.
2. Make three-point calibration test for both linearity and accuracy for each analog instrument.
3. Calibrate equipment and procedures using manufacturer's written recommendations and instruction manuals. Use test equipment with accuracy at least double that of instrument being calibrated.
4. Control System Inputs and Outputs:
   a. Check digital inputs using jumper wire.
   b. Check digital outputs using ohmmeter to test for contact making or breaking.
   c. Check resistance temperature inputs at 0, 50, and 100 percent of span using a precision-resistant source.
5. Flow:
   a. Set differential pressure flow transmitters for 0 and 100 percent values with 3-point calibration accomplished at 50, 90, and 100 percent of span.
   b. Manually operate flow switches to verify that they make or break contact.
6. Pressure:
   a. Calibrate pressure transmitters at 0, 50, and 100 percent of span.
   b. Calibrate pressure switches to make or break contacts, with adjustable differential set at minimum.
7. Temperature:
   a. Calibrate resistance temperature transmitters at 0, 50, and 100 percent of span using a precision-resistant source.
   b. Calibrate temperature switches to make or break contacts.
8. Stroke and adjust control valves and dampers without positioners, following the manufacturer's recommended procedure, so that valve or damper is 100 percent open and closed.
9. Stroke and adjust control valves and dampers with positioners, following manufacturer's recommended procedure, so that valve and damper is 0, 50, and 100 percent closed.
10. Provide diagnostic and test instruments for calibration and adjustment of system.
11. Provide written description of procedures and equipment for calibrating each type of instrument. Submit procedures review and approval before initiating startup procedures.

B. Adjust initial temperature and humidity set points.
3.6 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner’s maintenance personnel to adjust, operate, and maintain HVAC instrumentation and controls. Refer to Division 01 Section “Demonstration and Training.”

B. Provide a minimum of 40 hours instruction to owner’s personnel in the operation and maintenance of the control system. Training sessions shall be video taped by the EMS contractor and tapes/digital files turned over to owner at completion of training.

END OF SECTION
This page intentionally left blank.
SUBMITTAL TRANSMITTAL & REVIEW SHEET

191604. - UNT Dining Hall

To: Linda Camacho
Kirksey Architecture

From: Kevin Copher
Rogers-O'Brien Construction

For: SteelFab Texas, Inc.

Submittal #: 052100-01
Submittal Title: STEEL JOISTS
Revision #: 0
Submital Detail: Shop Drawings
Due Date: 08/07/2019
Status: Submitted for Approval

Rogers-O'Brien Construction

SHOP DRAWING REVIEW

ENGINEER'S REVIEW RESPONSE REQUIRED OF CONTRACTOR

- No exceptions taken
- Comments Attached
- Note Markings
- Resubmit
- Rejected
- Confirm

Submittal No. 052100-01
Engineer's review is for general conformance with the design concept and contract documents. Modifications or comments made on the shop drawings during this review do not relieve contractor from compliance with the project plans and specifications nor departures therefrom. The Contractor remains responsible for details and accuracy, for confirming and correlating all quantities and dimensions, for selecting fabrication processes, for techniques of assembly and for performing his work in a safe manner.

By jdeliwala Date 7/24/2019
JQ INFRASTRUCTURE, LLC

Consultants

Other

Architect please confirm all edge of slab and deck dimensions. Dimensions are lacking to validate structural v architectural.

KIRKSEY COMMENTS NOTED IN MAGENTA.

LINDA CAMACHO & NADIA HASSAN
AUGUST 6, 2019

GC TO PROVIDE THE CANOPY SUBMITTAL TO STEEL MFR FOR COORDINATION

See all pages for PMI comments in blue box with red text:
Note that PMI does not dimension the locations of the penetrations. Mechanical contractor is BIM modeling the ductwork and units; they shall approve the final unit locations.
NMBS JOIST ERECTION NOTES

REFER TO THE STEEL JOIST INSTITUTE'S (SJI) SPECIFICATIONS AND ITS TECHNICAL DIGEST (TD) 9

GC / ERECTOR NOTE:

JQ: 1/4" ON 3/S5.04.

KIRKSEY AGREES WITH JQ RESPONSE TO REFER TO ALL DECK EDGE MARKUPS IN DECK SUBMITTAL & COORDINATE.

JQ: MIN 4" BEARING REQUIRED. STAGGERED JOISTS MAY BE REQUIRED. REFER 3/S5.04. TYP FOR KSERIES BUTTING LH SERIES.

JQ: REFER COMMENTS ON J2.0 REGARDING EXTENSION OF JOISTS ALONG PERIMETER.

JQ: REFER PLAN FOR EXTENSIONS.

JQ: INCORRECT DIMENSIONS. REFER MARKS ON J2.0. ALSO, REFER TO ALL DECK EDGE MARKS ON DECK SUBMITTAL JQ COMMENTS AND RESPONSE.

JQ: JOIST EXTENSIONS NOT CORRECT, THROUGH OUT.

JOIST EXTENSION SHALL BE EXTENDED ONLY 1/2" SHORT OF DECK EDGE DIMENSIONS ALL AROUND PERIMETER PER 7/S5.01.TYP.

REFER TO DECK SUBMITTAL FOR ALL DECK EDGE DIMENSION MARKS. TYP.
DOUBLE PITCHED JOIST PROFILE #
SEE PLAN FOR LOCATIONS
N.T.S

DOUBLE PITCHED JOIST PROFILE #
SEE PLAN FOR LOCATIONS
N.T.S

SPECIAL JOIST EXCEEDING 1/2:12" PITCH
1'-10 1/4"

SPECIAL JOIST EXCEEDING 1/2:12" PITCH
2'-2 1/4"

JOIST DESIGN IS BY MFR. SIZES SHOWN ON STRUCTURAL PLANS ARE
SMALLEST AT THE ENDS OF THE JOIST AND INCREASE AS NECESSARY.

TYP. HOWEVER, IF JOIST MFR WANTS TO USE
2'-4"

JQ: USE 2.5K2 OR 2.5K3 OR EQUIVALENT AND EXTEND BY 4'-3 1/2" SOUTH PAST GRID B. REFER 7/S5.01. AND 2/S5.05.

46'-4"

PMI Comment: Missing penetration for EF-3. Duct size on mechanical plans is 6"x6" ARCH'L/MEP TO PROVIDE EXACT SIZE AND LOCATION OF THIS OPENING TO FIT WITHIN JOIST SPACING.

Section 2/S2.03 shows 3 1/2" Max Joist Seat Depth. Adjacent grid B & D Joist Seat Depth is 2 1/2". Please verify.

Sheet S2.03 calls for beam to be W10x19. AE please confirm.

ALL JOISTS SHALL BE EXTENDED PAST PERIMETER GRIDS BY DECK EDGE DIMENSION MINUS 1/2" PAST THE PERIMETER GRID. REFER STRUCTURAL PLANS AND 7/S5.0.1 AND 2/S5.05 TYP. ALL AROUND PERIMETER. ARCH'L TO VERIFY ALL SLAB EXTENSIONS.

THIS IS A 3' X 3' ROOF HATCH. REFER TO NEXT PAGE FOR LOCATION AND THE STEEL DECK SUBMITTAL.

This submittal is reviewed only for joist information.

For Approval Only
NOT FOR CONSTRUCTION

This submittal is reviewed only for joist information.

PMI Comment: Roofs hatch is not in MEP's scope of work

SECTION 2/S2.03 SHOWS 3 1/2" MAX JOIST SEAT DEPTH. ADJACENT GRID B & D JOIST SEAT DEPTH IS STANDARD 2 1/2" JOIST SEAT DEPTH ACCEPTABLE.

3565 Highway 32 North
New Millennium Building Systems, LLC
Hope, Arkansas 71801  www.newmill.com
Phone: (870) 722-4100  Fax: (870) 722-4245

JQ: REFER TO DECK SUBMITTAL COMMENTS FOR ALL DECK EDGES. TYP.

3' X 3' ROOF HATCH. REFER TO NEXT PAGE FOR LOCATION AND THE STEEL DECK SUBMITTAL.

JQ: OK.

THIS SUBMITTAL IS REVIEWED ONLY FOR JOIST INFORMATION.

JQ: OK.

JQ: USE 2.5K2 OR 2.5K3 OR EQUIVALENT AND EXTEND BY 4'-3 1/2" SOUTH PAST GRID B. REFER 7/S5.01. AND 2/S5.05.

JQ: TOP OF STEEL ELEVATIONS PER CALLED OUT ON STRUCTURAL PLANS.

AE please confirm.

AE please verify all clouded areas on details.

JQ: REFER COMMENTS ON OTHER DETAIL.

JQ: VERTICAL ROD TO JOIST CONN. PER 12/S5.06.

JQ: OK.

JQ: REFER TO ALL COMMENTS NOTED THROUGHOUT SUBMITTAL FOR KIRKSEY'S REVIEW

JQ: MISSED OPENING, OPENING TO BE WITHIN JOIST SPACING.

JQ: ALL JOISTS SHALL BE EXTENDED PAST PERIMETER GRIDS BY DECK EDGE DIMENSION MINUS 1/2" PAST THE PERIMETER GRID. REFER STRUCTURAL PLANS AND 7/S5.0.1 AND 2/S5.05 TYP. ALL AROUND PERIMETER. ARCH'L TO VERIFY ALL SLAB EXTENSIONS.

JQ: VERIFIED.

JQ: OK.

JQ: SPACINGS CAN BE ADJUSTED A LITTLE BIT FROM WHAT SHOWN ON STRUCTURAL PLANS TO ALLOW FOR A MINIMUM JOIST BEARING.

JQ: OK.

JQ: REFER COMMENT ON OTHER DETAIL.

JQ: OK.

JQ: OK.

JQ: OK.

JQ: OK.

JQ: OK.

JQ: OK.

JQ: OK.

JQ: OK.
RESPONSE TO QUESTION 18

SUBMITTAL TRANSMITTAL & REVIEW SHEET

To: Linda Camacho
Kirksey Architecture

From: Kevin Copher
Rogers-O'Brien Construction

For: SteelFab Texas, Inc.

Submittal #: 053100-01
Submittal Title: STEEL DECK
Revision #: 0
Submittal Detail: Shop Drawings
Due Date: 08/07/2019
Status: Submitted for Approval

Rogers-O'Brien Construction

SUBMITTAL REVIEW

Submittal Number: 053100-01 - 0

This submittal is reviewed for conformance with the design intent of the project and requirements of the contract documents. This does not relieve the supplier of the responsibility of furnishing work and materials of the quantity and quality required by the contract nor authorizes any changes herein. The supplier shall be responsible for the accuracy of dimensions and conditions at the job site.

This submittal: Conforms as Noted
Reviewed by:
Kevin Copher on 07/10/2019

SHOP DRAWING REVIEW

Engineer's review is for general conformance with the design concept and contract documents. Markings or comments shall not be construed as relieving the contractor from compliance with the project plans and specifications nor departures therefrom. The Contractor is responsible for details and accuracy, for confirming and correlating all quantities and dimensions, for selecting fabrication processes, for techniques of assembly and for performing his work in a safe manner.

By: JQ INFRASTRUCTURE, LLC
Date: 7/23/2019

KIRKSEY COMMENTS NOTED IN MAGENTA.
LINDA CAMACHO & NADIA HASSAN
JULY 31, 2019

AUGUST 6, 2019
COMMITS HAVE BEEN ADDED PER THE AUGUST 2, 2019 DISCUSSION AT OAC MEETING WITH UNT. FM APPROVAL IS USED FOR CONFORMANCE/COMPLIANCE/BASIS OF DESIGN/BASE LINE STANDARD. THE UNT DESIGN STANDARD FOR THE ROOF HAS BEEN INCORPORATED.

PER DISCUSSIONS TODAY WITH RO, AUGUST 6, 2019, THE EDGE ANGLE AT THE PERIMETER OF THE LOWER ROOF HAS BEEN REVISED TO COMPLY WITH STRUCTURES COMMENTS. THE 12 1/2" WAS TO THE CENTER LINE OF COLUMN. PROCEED AS INDICATED BY STRUCTURE.
REFER TO THE UNIVERSITY ROOFING STANDARDS ON THE NEXT PAGE.

UNT WILL NEED TO INFORM THE TEAM IF THEIR INSURANCE REQUIRES THEM TO HAVE THIS.

UNT RESPONDED AT OAC MEETING AUG. 2, 2019.

KO SUBMIT THIS AS AN RFI QUESTION FOR UNT TO RESPOND.

PER OUR DISCUSSION AT THE AUGUST 2, 2019 OAC MEETING, UNT MENTIONED TO PROCEED PER THE UNIT STANDARDS LISTED FOR ROOFING.
Roofing

- UNT has a standard specification for roofs that should be incorporated into the construction documents. Generally, the specification calls for four-ply modified bitumen roofing system to include a base sheet, two intermediate fiberglass felt plies, and a granule surfaced polymer reinforced modified bitumen cap sheet applied to an unperforated asphalt or roof insulation board. The insulation system should be a two-layered system over a steel deck consisting of a base layer of rigid insulation board mechanically fastened to the deck in compliance with FM-1-06 wind uplift resistance requirements. A 1/2-inch (13mm) thick insulation board set in a grooves of 1/2-inch thickness should be used.
- No flat roofs. Must have a minimum slope of one-half inch per foot on new structures. Less than one-quarter (1/4) inch per foot is acceptable on existing structures provided the roofing manufacturer offers a 10-year warranty (depending on roofing system chosen). Facilities Maintenance will make all final decisions in these instances.
- The 4-ply specification is to be used in new construction where LEED certification points are not relevant to the project.
- Building evaluation and consideration should be given to provide infrastructure for future solar panels.

From the pre-approved systems, the consultant will select roof systems which are suitable for the facility. To evaluate possible systems, the consultant will consider the following design parameters:

1. Life of the roof system. Preferred systems and associated useful lives include:
   - Single Ply 60 mil Modified Bitumen (SBM): 29 years
   - Composition Shingles: 25 years
   - Metal: Preferred architectural
   - Structural standing seam
     - Architectural: custom tab

2. If other systems, such as PVC, TPO, CSPE, Hypalon, mechanically attached EPDM, APP, or modified bitumen are, in the opinion of the consultant, the most appropriate system, it will be evaluated by the project team.
3. Initial (first) cost of the roof system and additional building costs required for recommended roof system.
4. Maintenance costs and requirements.
5. Energy costs associated with recommended roof system.
7. Present and future uses of the building, including specific uses in the building that could affect the roof system.
8. Local environmental issues, contaminants and pollutants.
9. Life expectancy of building.
10. Structural properties of the roof superstructure.
11. Type of roof deck.
12. Slope/Drainage
13. Vapor retarder requirements.
14. Roof traffic/Access and penetrations.
15. Code/Insurance requirements and restrictions.
17. HVAC/Inferential pressures.
18. Application issues, such as staging, access, building use and occupancy, etc.
19. New roofs shall have safety lines installed for future maintenance and repairs. Safety lines shall be installed in cases where there is an upper “flat” roof that provides access to a sloped roof.

After establishing design parameters, Systems should be evaluated by the consultant based upon:

1. Minimum established UNT standards.
2. A choice of roof systems with properties that, considering all factors, are best suited to the project.
3. Requirements for a total system warranty.

The consultant will follow these roofing guidelines when designing the roofing system:

1. Single-ply balanced roof and coal tar roofs will not be installed.
2. Light weight concrete will not be used as a means to create slopes on new buildings. On re-roofs, it may be used to repair existing decks and create slope.
3. New buildings should have a 1/2” roof slope; this should be accomplished by sloping the structure.
4. If an existing roof has less than 1/2” roof slope a serious evaluation will be done to determine if achieving 1/2” roof is feasible.
5. Due to health hazards and indoor air quality issues, coal tar pitch shall not be used. The only exception is to patch an existing coal tar pitch roof, and then it may only be used during a night shut down.
6. Use cricket, saddles, and edging strips to direct water flow away from paraputs and penetrations. Back slope is to be confirmed during detailing.
7. Overflows are required by code. Overflows shall not be piped into the primary roof drain system.
8. Provide roof walkways to aid around roof equipment and other areas as directed by the owner.
9. In the design development phase, a review should be undertaken by the consultant to include proper penetrations, equipment data, expansion joint locations and details, significant ability of existing roof insulation, drainage, roof access, roof penetrations, fire rating, and wind uplift factors, and all other applicable parameters.
10. Existing roof decks will be checked by a registered structural engineer if roof loads are in question.
11. On re-roof projects, where a consultant is utilized, an evaluation will be done by the consultant and the owner. Core samples and other testing results will be reported and evaluated.
12. Roof access will be evaluated, and roof access hatches, ladders and other components will be installed as required by the owner.
13. Avoid complex flashing details. Minimize use of pitch pans or sealant pockets.
14. Minimize roof penetrations. If structural penetrations are unavoidable, use round or square structural steel shapes to facilitate flashing. Equipment supports for rooftop mounted equipment shall be a minimum 14” height. Use prefabricated equipment supports where possible. Equipment support frames or stands shall provide following working clearances:

<table>
<thead>
<tr>
<th>Width of Equipment</th>
<th>Height of Legs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Up to 25&quot;</td>
<td>14”</td>
</tr>
<tr>
<td>25-33”</td>
<td>18”</td>
</tr>
<tr>
<td>37-49”</td>
<td>24”</td>
</tr>
<tr>
<td>49-61”</td>
<td>30”</td>
</tr>
<tr>
<td>Over 61”</td>
<td>48”</td>
</tr>
</tbody>
</table>
1.4 PERFORMANCE REQUIREMENTS

A. General Performance: Installed membrane roofing and base flashings shall withstand specified uplift pressures, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Membrane roofing and base flashings shall remain watertight.

B. Material Compatibility: Provide roofing materials that are compatible with one another under conditions of service and application required, as demonstrated by membrane roofing manufacturer based on testing and field experience.

C. Roofing System Design: Provide membrane roofing system that is identical to systems that have been successfully tested by a qualified testing and inspecting agency to resist uplift pressure calculated according to ASCE/SEI 7.

1. Corner Uplift Pressure: Refer to structural drawings.

2. Perimeter Uplift Pressure: Refer to structural drawings.

3. Field-of-Roof Uplift Pressure: Refer to structural drawings.

D. FM Approvals Listing: Provide membrane roofing, base flashings, and component materials that comply with requirements in FM Approvals 4450 and FM Approvals 4470 as part of a membrane roofing system. Roofsing system must meet the design intent and wind uplift capabilities associated with the uplift rating requirements listed in this specification and that are listed in FM Approvals' "RoofNav" for Class 1 or noncombustible construction, as applicable. Identify materials with FM Approvals markings.

1. Fire/Windstorm Classification: Class 1A-120

2. Hail Resistance Rating: SH.

E. Energy Performance: Provide roofing system with initial Solar Reflectance Index of 0.74 when determined in accordance with the Solar Reflectance Index method in ASTM E1980 using a connection coefficient of 2.1 Btu/h ft² °F, based on three-year-aged solar reflectance and three-year-aged thermal emittance test in accordance with CRRC-1 Standard.

F. Insulation R-Value: Insulation R Value: Insulation system shall maintain a minimum R-25 (continuous) Long Term Thermal Resistance (LTIR) as determined in accordance with CAN/ULC-S770.

---

KIRKSEY COMMENTS PER SPEC 075216.19
THIS IS TO COMPLY WITH FM APPROVALS AS A BASIS OF STANDARD. DO NOT NEED TO SEEK FM APPROVAL. THIS IS THE BASE LINE.

---

AUGUST 6, 2019
KIRKSEY RESPONSE

---

B. Metal Roof Deck

1. Metal Roof Deck Schedule:

<table>
<thead>
<tr>
<th>Location</th>
<th>Gauge</th>
<th>SDI Deck Type</th>
<th>Deck Depth (in)</th>
<th>Sheet Width (in)</th>
<th>Min Ix (in⁴)</th>
<th>Min Sp (in⁴)</th>
<th>Min Sn (in⁴)</th>
</tr>
</thead>
<tbody>
<tr>
<td>High Roof</td>
<td>20 WR</td>
<td>1.5</td>
<td>36</td>
<td>0.201</td>
<td>0.234</td>
<td>0.247</td>
<td></td>
</tr>
<tr>
<td>Low Roof</td>
<td>22 WR</td>
<td>1.5</td>
<td>36</td>
<td>0.155</td>
<td>0.186</td>
<td>0.192</td>
<td></td>
</tr>
</tbody>
</table>

Sp = positive section modulus in³

I = moment of inertia in⁴

2. Roof deck shall be galvanized as indicated on the Structural Drawings.

3. Sheet steel for galvanized roof deck and accessories shall conform to ASTM A653, Structural Quality, with a minimum yield strength of 53 ksi. Galvanizing shall conform to ASTM A653 with a minimum coating of G60 as defined in A653.

4. Roof deck shall be continuous over four or more supports.

5. Place deck panels on structural supports and adjust to final position with ends lapped 2 inches over structural supports. Provide minimum end bearing of 2 inches.

6. Roof deck connections shall be as follows:

<table>
<thead>
<tr>
<th>Location</th>
<th>Pattern</th>
<th>Support Fastener</th>
<th>Side/Top Fastener</th>
</tr>
</thead>
<tbody>
<tr>
<td>Typical Building</td>
<td>36/4</td>
<td>5/8 PW</td>
<td>#10 Tek 3</td>
</tr>
<tr>
<td>Perimeter Band</td>
<td>36/7</td>
<td>5/8 PW</td>
<td>#10 Tek 4</td>
</tr>
</tbody>
</table>

Corner Zones: 36/7 | 5/8 PW | #10 Tek 4

See Design Wind Load information or plans for "x" dimension and Interior Fields, Perimeter Band, Ridge Band, and Corner Zones wind loads.

PVD = Puddle Weld

7. Field deck connections shall conform to the requirements of Factory Mutual Class 1-90 (Data Sheet 1-28, January 2012). For connection purposes, the width of the roof corners and perimeter, including ridges, is defined as the smaller of:

a. 0.1 times the building lesser plan dimension.

b. 0.4 times the eave height

c. Minimum width of 4 feet

8. Power driven fasteners shall be selected by the Contractor for the combinations of dock gauge and dock support member thickness. Submit proposed fasteners with complete manufacturer's information, including diaphragm shear values for the Engineer to review.

9. Puddle welds shall be 5/8" minimum diameter and shall be made through weld washers for decking tighter than 22 gauge.

10. Mechanical, electrical, and plumbing systems shall not be supported by the metal roof deck.

---

STRUCT COMMENTS PER S1.02
THIS IS TO CONFORM WITH FM CLASSIFICATION AS A BASIS OF STANDARD. THIS IS THE BASE LINE.
JQ: ARCH'L TO VERIFY ALL DECK EDGES AROUND THE PERIMETER AND JOGS.

REFER TO COMMENTS THROUGHOUT SUBMITTAL.

JQ: 1'-5" OR 1'-4 1/2" BOTH ACCEPTABLE.

STRUCUTRAL PREFER TO KEEP STRUCTURAL DIMENSIONS. ARCH'L TO CONFIRM.

1' 5" IS OK

JQ: GRID L TO STAY AS IS.

JQ: C4 VERTICAL CHANNEL CENETERED BELOW BRICK.

JQ: VERTICAL C4 CHANNEL IS CENTERED WITH BRICK VENEER. (IN-FILLED WITH METAL STUDS).

DECK EDGE ANGLE IS BACK TO BACK (WELDED TOP AND BOTTOM) WITH VERTICAL C4 CHANNEL, SO 2" FROM CENTELRINE OF BEAM BELOW.

DECK EDGE IS MAX. 1/2" SHORT OF EXTERIOR FACE OF DECK EDGE ANGLE.

JQ: VERTICLE CHANNEL CENTERED BELOW BRICK.

JQ: CENTELRINE OF BEAM IS ALLOWED TO MOVE OVER A LITTLE BIT, PER ARCH'L.

STRUCTRAL PREFER TO KEEP DIMENSIONS PER STRUCTURAL PLANS, THOUGH. ARCH'L CONFIRM.

1' 5" IS OK

JQ: ARCH'L TO VERIFY ALL DECK EDGES AROUND THE PERIMETER AND JOGS.

REFER TO COMMENTS THROUGHOUT SUBMITTAL.

JQ: REF. 6/S5.05.

AUGUST 6, 2019
KIRKSEY DISCUSSED THIS WITH RO AND WHAT HAS BEEN INDICATED BY STRUCTURE IS FINE.

There is 1/2" discrepancy, please verify which is correct.

1' 5" IS OK

AE please advise where deck should stop in coordination with the C Channel.
JQ: 9 1/4" TO EDGE OF METAL DECK.

VERIFIED

CONFIRM.

JQ: 5 3/4" TO EDGE OF METAL DECK.

VERIFIED

JQ: 1 1/2" TO EDGE OF METAL DECK.

VERIFIED

ARCH'L TO CONFIRM.

JQ: 12'-1 7/8" TO EDGE OF METAL DECK.

VERIFIED

12'-2 3/8" TO EDGE OF THE ANGLE, ARCH'L TO CONFIRM.

VERIFIED

JQ: 24'-0" IS CORRECT. GRID TO GRID DIMENSIONS SHALL BE PER STRUCTURAL PLANS. ENTIRE DECK SHALL ACT LIKE A UNIFORM DIAPHRAGM WITHOUT ANY GAPS ETC. HOW THESE DECKS ARE CUT AND PLACED ON THE AREA DECKS ARE NOT PROVIDED ANYWHERE PER STRUCTURAL NOTES AND ALLOTHER STRUCTURAL NOTES AND PLANS AND DETAILS ARE FOLLOWED. TYP.

PROCEED AS INDICATED IN STRUCTURAL DRAWINGS

5 3/4" TO EDGE OF METAL DECK.

6 1/4" TO EDGE OF THE ANGLE, ARCH'L TO CONFIRM.

9 1/4" TO EDGE OF METAL DECK. 9 3/4" TO EDGE OF THE ANGLE.

VERIFIED

ARCH'L TO CONFIRM IF OPENING THRU DECK IS NEEDED.

4" TO EDGE OF DECK ANGLE

1" TO EDGE OF DECK ANGLE

1' 5" IS CORRECT

OVERALL DIMENSION IS 17'-11 1/4". AE PLEASE CONFIRM.

LANDING DIMENSION IS 18' 5 3/4"

COMPOSITE DECK ERECTION PLAN

SCALE: 1/8" = 1'-0"

JQ: ARCH'L TO VERIFY ALL DECK EDGES AROUND THE PERIMETER AND JOGS.

JQ REVIEWED PERIMETER DECKEDGES AND DECK CONNECTIONS ONLY.

JQ: JQ REVIEWED PERIMETER DECKEDGES AND DECK CONNECTIONS ONLY.

ARCH'L TO PROVIDE IF REQUIRED.

JQ: REFER TO RFI 28 RESPONSE.

REFER TO MEP M2.02 & COORDINATE W/ MECH. SUB.

ARCH'L TO VERIFY ALL DECK EDGES TO BE 12 1/2" & EDGE OF ANGLE TO BE 12".

JQ: SEE MARKS ON SKETCH.

9 1/4" TO EDGE OF METAL DECK.

6 1/4" TO EDGE OF THE ANGLE, ARCH'L TO CONFIRM.

ARCH'L TO CONFIRM.

JQ: 4 1/8" TO EDGE OF THE ANGLE, ARCH'L TO CONFIRM.

VERIFIED

JQ: ARCH'L TO VERIFY ALL DECK EDGES SHOWN ON STRUCTURAL DRAWINGS.

ARCHITECT PLEASE CONFIRM ALL EDGE OF SLAB DIMENSIONS SHOWN ON STRUCTURAL DRAWINGS. NONE SHOWN ON ARCHITECTURAL PLANS TO VALIDATE STRUCTURE WITH.
SUBMITTAL TRANSMITTAL & REVIEW SHEET
191604. - UNT Dining Hall

To: Linda Camacho
Kirksey Architecture

From: Brandon Young
Rogers-O'Brien Construction
For: Miinc, LP

Submittal #: 230900-01
Revision #: 0
Due Date: 01/20/2020

Submittal Title: INSTRUMENTATION AND CONTROL FOR HVAC
Submittal Detail: Product Data/Shop Drawings
Status: Submitted for Approval

Rogers-O'Brien Construction

SUBMITTAL REVIEW

Submittal Number: 230900-01 - 0

This submittal is reviewed for conformance with the design intent of the project and requirements of the contract documents. This does not relieve the supplier of the responsibility of furnishing work and materials of the quantity and quality required by the contract nor authorizes any changes herein. The supplier shall be responsible for the accuracy of dimensions and conditions at the job site.

This submittal: Conforms as Noted

Reviewed by:
Brandon Young on 01/06/2020

A/E

[ ] No Exception Taken [ ] Furnish As Corrected
[ ] Rejected [ ] Revise And Submit
[ ] Submit Specific Item [ ] See Attached Review Docs
[ ] Reviewed For Compliance With Performance Spec Only

This review was performed, only for general conformance design concept of the project, and general compliance with information given in the contract documents. Modifications or comments made on the shop drawings during this review do not relieve contractor from compliance with the requirements of the plans and specifications. Contractor is responsible for; Dimensions to be confirmed and correlated at the jobsite, information that pertains solely to fabrication processes or to the means, methods, techniques, sequences and procedures of Construction; coordination of the work of all trade; and performing all work in a safe and satisfactory manner.

PURDY-MCGUIRE, INC. ENGINEERS
17300 N. Dallas Parkway, Suite 3000, Dallas, Texas 75248
Phone No.: (972) 239-5357 Fax No.: (972) 239-5231

Date: 01/13/2020 By: Brandon Jarrett

Consultants

Other

See the following page for PMI comments. All items were discussed during 01-09-2020 on site controls meeting.
-Brandon Jarrett, PMI, 01/13/2020
Shop Drawings
Page 15 - BTU Meter noted as pending, but meter in updated submittal discussed in meeting is acceptable.
Page 20 - The controls contractor to provide the integration to the Schneider system. Any auxiliary outputs can be connected to Dining BMS but not required.
Page 30 Miscellaneous Metering. The following required items were not included:
  ○ Interior & exterior lighting controls
  ○ Electrical Meters (need to be connected to the PME system).
  ○ Gas Meter (need to be connected to the PME system).
  ○ Domestic Water Meter (need to be connected to the PME system).
  ○ Domestic Water Temperature
  ○ Kitchen Controls system
  ○ DHW leak detection
Page 33 - We now have relief fans, not return fans. Schematic/SOO needs to be revised.
Bill of materials just notes 2 duct probe style AFMS are included. These are required for all AHUs and AHUs have louvered outside air openings.
Page 38 - There are various sequences missing from sheet M7-07.
Page 45 - need VAV control of MAU to hoods to modulate proportionally to EFs (this sequence was added on M-703).
Page 50 - motorized damper downstream of exhaust fans are not required, just BDD.
Control Panel locations -
  ○ Mechanical Room - The two locations shown on the submittal need to be adjusted, they are currently conflicting with the water softener.
  ○ Gas Detection needs to be located in the boiler room, not the fire pump room as shown.
  ○ Level 2 control panel can not be located in the MDF room. This can be located in the Janitor's closet, mounted high on wall.
Generator controls shall be located in the electrical room.
Product Data
  • Not all product data has been included in submittal. Provide product data for the following and any other missing components.
    ○ AFMS (options currently being discussed with client. PMI to coordinate with LSI).
    ○ Control valves (other than Energy Valves at AHUs).
    ○ Motorized isolation valves.
    ○ Control dampers
    ○ Thermostats/Combination Sensors
    ○ Flowmeters
    ○ Boiler CO/gas detection system strobe and alarm.
There are owner requested dishmachine changes impacting controls that have not been issued yet. These were noted on the duct shop drawings, but an RFI should be issued to formally document.
UNT - Dining Hall
1416 Maple Street
Denton, Tx  76201

As Prepared By:

407 International Pkwy, Suite 406
Richardson, Tx  75081
T: 972-437-5500

PROJECT TEAM

LSi Design Engineer:  Scott Hunter
LSi Project Manager:  Brad Brundrett
Project Number:  A2797
Drawing Designation:  Submittal
Drawing Date:  8/8/2019
<table>
<thead>
<tr>
<th>TAG DESCRIPTION</th>
<th>P</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>AA</td>
<td></td>
<td>Remote Annunciator Module &amp; Auto Dialer</td>
</tr>
<tr>
<td>ALC</td>
<td></td>
<td>Automated Logic Controller</td>
</tr>
<tr>
<td>ASA</td>
<td></td>
<td>Smoke Detector</td>
</tr>
<tr>
<td>CR</td>
<td></td>
<td>Control Relay</td>
</tr>
<tr>
<td>ENC</td>
<td></td>
<td>Enclosure</td>
</tr>
<tr>
<td>ES</td>
<td></td>
<td>Direct Current Power Supply</td>
</tr>
<tr>
<td>FCV</td>
<td></td>
<td>Flow Control Valve / Damper Actuator</td>
</tr>
<tr>
<td>FE</td>
<td></td>
<td>Flow Element</td>
</tr>
<tr>
<td>FS</td>
<td></td>
<td>Flow Switch</td>
</tr>
<tr>
<td>FT</td>
<td></td>
<td>Flow Transmitter</td>
</tr>
<tr>
<td>G</td>
<td></td>
<td>Generic Device</td>
</tr>
<tr>
<td>IP</td>
<td></td>
<td>Electro-Pneumatic Transducer</td>
</tr>
<tr>
<td>IS</td>
<td></td>
<td>Current Switch</td>
</tr>
<tr>
<td>ISE</td>
<td></td>
<td>Circuit Breaker</td>
</tr>
<tr>
<td>IT</td>
<td></td>
<td>Current Transducer</td>
</tr>
<tr>
<td>JT</td>
<td></td>
<td>BTU Meter</td>
</tr>
<tr>
<td>JY</td>
<td></td>
<td>Power Meter</td>
</tr>
<tr>
<td>KS</td>
<td></td>
<td>Electronic Timeclock</td>
</tr>
<tr>
<td>LS</td>
<td></td>
<td>Level Switch</td>
</tr>
<tr>
<td>LT</td>
<td></td>
<td>Level Transmitter</td>
</tr>
<tr>
<td>MS</td>
<td></td>
<td>Humidistat</td>
</tr>
<tr>
<td>MT</td>
<td></td>
<td>Humidity Transmitter</td>
</tr>
<tr>
<td>MTE</td>
<td></td>
<td>Humidity Transmitter w/ Temperature Element</td>
</tr>
<tr>
<td>MTT</td>
<td></td>
<td>Humidity Transmitter w/ Temperature Transmitter</td>
</tr>
<tr>
<td>N</td>
<td></td>
<td>Accessories</td>
</tr>
<tr>
<td>NY</td>
<td></td>
<td>Network Device</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>LEGEND</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>FIELD MOUNTED INSTRUMENT</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>PNEUMATIC TUBING</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>LINE VOLTAGE WIRE</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>ETHERNET CAT 5E CABLE</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>FIBER OPTIC CABLE</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>MODBUS</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>DVI</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>DIAGRAM W/ TP</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>SHIELD</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>CABLE TO CONTROLER</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>CABLE TO FIELD DEVICE</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>FMB</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>WHT</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>BLK</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>C-2</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Miscellaneous Notations**
- FLP = Fail At Last Position
- FC = Fail Closed
- FO = Fail Open
### 2 PAIR - 2 CONDUCTOR SHIELDED - RNET

**Wind City Wire Part Number:** 160100-5  
**Cable Specifications:**
- **Jacket Color:** White/Yellow  
- **Color Code:** 18 AWG 2 Pair Bare Copper, Individually Shielded Plenum, UL Subject 444, Type CMP, (UL) or FPLP UL  
- **Insulation:** Low-Smoke PVC .008"  
- **Overall Diameter:** 0.195" Nom.  
- **Capacitance:** 68 pF/ft.  
- **Impedance:** 28 Ohms/Mft.  
- **Temperature and Voltage Rating:** 75 C / 300 Volt  
- **Conductor DCR:** 6.66 Ohms/Mft.  
- **Marking:** Temperature Control System, 22 AWG CMP (UL) C(UL).  
- **Agency Approvals:** NEC Article 800; 725, UL CMP, C(UL) or FPLP UL  
- **Weight:** 35 Lbs/Mft.

### 3 CONDUCTOR SHIELDED - I/O Points

**Wind City Wire Part Number:** 0023350-5  
**Cable Specifications:**
- **Jacket Color:** Purple/White/Red  
- **Color Code:** 18 AWG 3 Conductor Bare Copper, Shielded Plenum, UL Subject 444, Type CMP, C(UL) or FPLP UL  
- **Insulation:** Low-Smoke PVC .008"  
- **Overall Diameter:** 0.168" Nom.  
- **Capacitance:** 68 pf/ft.  
- **Impedance:** 28 Ohms/Mft.  
- **Temperature and Voltage Rating:** 75 C / 300 Volt  
- **Conductor DCR:** 6.66 Ohms/Mft.  
- **Marking:** Temperature Control System, 22 AWG CMP (UL) C(UL).  
- **Agency Approvals:** NEC Article 800; 725, UL CMP, C(UL) or FPLP UL  
- **Weight:** 26 Lbs/Mft.

---

### ETHERNET - CAT 6

**Wind City Wire Part Number:** 0023350-5  
**Cable Specifications:**
- **Jacket Color:** Purple/White/Red  
- **Color Code:** 18 AWG 3 Conductor Bare Copper, Shielded Plenum, UL Subject 444, Type CMP, C(UL) or FPLP UL  
- **Insulation:** Low-Smoke PVC .008"  
- **Overall Diameter:** 0.168" Nom.  
- **Capacitance:** 68 pf/ft.  
- **Impedance:** 28 Ohms/Mft.  
- **Temperature and Voltage Rating:** 75 C / 300 Volt  
- **Conductor DCR:** 6.66 Ohms/Mft.  
- **Marking:** Temperature Control System, 22 AWG CMP (UL) C(UL).  
- **Agency Approvals:** NEC Article 800; 725, UL CMP, C(UL) or FPLP UL  
- **Weight:** 26 Lbs/Mft.
<table>
<thead>
<tr>
<th>DRAWING#</th>
<th>DRAWING NAME</th>
<th>DRAWING#</th>
<th>DRAWING NAME</th>
</tr>
</thead>
<tbody>
<tr>
<td>SYM.1</td>
<td>Symbol Legend</td>
<td>4.2</td>
<td>VAV AHU SF &amp; RF VFD Wiring</td>
</tr>
<tr>
<td>WIRE.1</td>
<td>Wire Specification</td>
<td>4.3</td>
<td>VAV AHU Module Layout</td>
</tr>
<tr>
<td>TOC.1</td>
<td>Table of Contents</td>
<td>4.4</td>
<td>AHU Enclosure Layout</td>
</tr>
<tr>
<td>1.1</td>
<td>1st Floor Network Riser</td>
<td>4.5</td>
<td>AHU CHW &amp; HW Belimo Energy Valve Interface</td>
</tr>
<tr>
<td>1.2</td>
<td>2nd Floor Network Riser</td>
<td>4.6</td>
<td>VAV AHU Sequence of Operations Page 1</td>
</tr>
<tr>
<td>1.3</td>
<td>1st Floor North Side Field Notes</td>
<td>4.7</td>
<td>VAV AHU Sequence of Operations Page 2</td>
</tr>
<tr>
<td>1.4</td>
<td>1st Floor South Side Field Notes</td>
<td>5.1</td>
<td>MAU-1K Schematics</td>
</tr>
<tr>
<td>1.5</td>
<td>2nd Floor Field Notes</td>
<td>5.2</td>
<td>MAU &amp; KEF Module Layout</td>
</tr>
<tr>
<td>1.6</td>
<td>CHW &amp; HW Plant Enclosure</td>
<td>5.3</td>
<td>KEF Schematic and Interface Control</td>
</tr>
<tr>
<td>1.7</td>
<td>1st Floor Network Enclosure</td>
<td>5.4</td>
<td>Captive Air DCV Kitchen Interface Points</td>
</tr>
<tr>
<td>1.8</td>
<td>2nd Floor Network Enclosure</td>
<td>5.5</td>
<td>MAU &amp; KEF Enclosure Layout</td>
</tr>
<tr>
<td>2.1</td>
<td>CHW System Control Schematics</td>
<td>5.6</td>
<td>MAU Sequence of Operations</td>
</tr>
<tr>
<td>2.2</td>
<td>CHW Pump VFD and Interface Points</td>
<td>6.1</td>
<td>VAV w/CO2 Schematics</td>
</tr>
<tr>
<td>2.3</td>
<td>CHW System Module &amp; BOM</td>
<td>6.2</td>
<td>VAV w/CO2 Sequence of Operations</td>
</tr>
<tr>
<td>2.4</td>
<td>CHW Pump Interface Points</td>
<td>6.3</td>
<td>VAV w/HW &amp; CO2 Schematics</td>
</tr>
<tr>
<td>2.5</td>
<td>CHW System Panel Layout</td>
<td>6.4</td>
<td>VAV w/HW &amp; CO2 Sequence of Operations</td>
</tr>
<tr>
<td>2.6</td>
<td>CHW System BTU Meter &amp; Interface Points</td>
<td>7.1</td>
<td>Exhaust Fan Schematics</td>
</tr>
<tr>
<td>2.7</td>
<td>CHW System Sequence of Operations</td>
<td>8.1</td>
<td>FCU Schematics</td>
</tr>
<tr>
<td>3.1</td>
<td>HW System Schematics</td>
<td>8.2</td>
<td>FCU Sequence of Operations</td>
</tr>
<tr>
<td>3.2</td>
<td>HW Pump VFD Wiring</td>
<td>9.1</td>
<td>Split System Schematics</td>
</tr>
<tr>
<td>3.3</td>
<td>Boiler Interface Points</td>
<td>9.2</td>
<td>Split System Sequence of Operations</td>
</tr>
<tr>
<td>3.4</td>
<td>HWP Interface Points</td>
<td>10.1</td>
<td>Bill of Materials</td>
</tr>
<tr>
<td>3.5</td>
<td>DWBP-1 Interface Points</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.6</td>
<td>HW System Module Layout</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.7</td>
<td>HW BTU Meter Interface Points</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.8</td>
<td>HW System Panel Layout</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.9</td>
<td>Plant Misc. Points</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.10</td>
<td>CO and Gas Dectection System</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.11</td>
<td>Heating Water System Sequence of Operations</td>
<td>10.1</td>
<td></td>
</tr>
<tr>
<td>4.1</td>
<td>VAV AHU Schematics</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

DRAWING NO.: TOC.1
1st Floor Network Riser

Interface Network Comm. Riser

Mechanical Room

Bill of Material w/ Tags

<table>
<thead>
<tr>
<th>Tag</th>
<th>Vendor</th>
<th>Part Number</th>
<th>Product Description</th>
<th>Manufacturer</th>
<th>Panel/Field</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>NY-1</td>
<td>ALPS</td>
<td>EISRS-1001</td>
<td>Five-port 10BASE-T/100BASE-TX switch</td>
<td>Contemporary Controls</td>
<td>P</td>
<td>1</td>
</tr>
</tbody>
</table>

Notes:
1. The BMS Riser is intended only to provide an overview of the system architecture. DDC devices are not intended to be wired in exactly the order shown. Optimal wiring runs to be determined in field.
2. All devices are to be wired in a daisy chain configuration.
Plant Panel Layout
36"x48"x8" Enclosure

A

OFBBC-NR
Chilled Water
System Module
CM-3

B

OFBBC-NR
Boiler Module
CM-4

C

Plant Control Relays
Track Mounted

OFBBC-NR-Chilled Water System Module CM-3
FIO812U Chilled Water System Module Expander 1
FIO48U Chilled Water System Module Expander 2
OFBBC-NR-Boiler Module CM-4
FIO812U Boiler Expander 1
FIO48U Boiler Expander 2

1st Floor Plant Enclosure
Located in Mechanical Room 160CA
**Bill of Material w/ Tags**

<table>
<thead>
<tr>
<th>Tag</th>
<th>Vendor</th>
<th>Part Number</th>
<th>Product Description</th>
<th>Manufacturer</th>
<th>Panel/Field</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALC-10</td>
<td>Automated Logic</td>
<td>REP485</td>
<td>ARCNET156 Repeater Board</td>
<td>Automated Logic</td>
<td>P</td>
<td>1</td>
</tr>
<tr>
<td>ALC-14</td>
<td>Automated Logic</td>
<td>AAR</td>
<td>ARCNET to ARCNET Router</td>
<td>Automated Logic</td>
<td>P</td>
<td>1</td>
</tr>
<tr>
<td>ALC-16</td>
<td>Automated Logic</td>
<td>G5CE</td>
<td>BACnet Integrator, ARCnet and MS/TP, Gigabit Ethernet</td>
<td>Automated Logic</td>
<td>P</td>
<td>1</td>
</tr>
<tr>
<td>ALC-9</td>
<td>Automated Logic</td>
<td>DIAG485</td>
<td>ARCNET156 Diagnostic Board, w/ 2 termination res. (2 pk)</td>
<td>Automated Logic</td>
<td>P</td>
<td>1</td>
</tr>
<tr>
<td>G-3</td>
<td>Unity</td>
<td>SOL24248RBC</td>
<td>24&quot;x24&quot;x8&quot; NEMA 1 Enclosure, Blue</td>
<td>Unity</td>
<td>P</td>
<td>1</td>
</tr>
</tbody>
</table>

**24"x24"x8" Enclosure**

**BACnet MS/TP Comm. DIAG485**

*Diagnostic Board Control Wiring Details*

```
**Note: Leave DIAG485**
Bus jumper in place and
use TERM485 in ARCNET
communications trunk.
```

**BACnet MS/TP Communications Bus Repeater Control Wiring Details**

```
Use Copper Conductors Only
24 Vac, 50- 60 Hz
20VA, 0.83A
24Vdc, 0.2A, 5W
```

---

**Caution:**

This product was designed to be mounted inside the building envelope. Warranty voided if mounted outside.
### Bill of Material w/ Tags

<table>
<thead>
<tr>
<th>Tag</th>
<th>Vendor</th>
<th>Part Number</th>
<th>Product Description</th>
<th>Manufacturer</th>
<th>Panel/Field</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>XF-8</td>
<td>ALPS</td>
<td>PSB100AB10</td>
<td>Panel Mount 100VA Pwr Supply, 120 to 24 Vac</td>
<td>Functional Devices</td>
<td>P</td>
<td>1</td>
</tr>
<tr>
<td>ALC-18</td>
<td>Automated Logic</td>
<td>PROT485</td>
<td>ARCNET156 Protection Board</td>
<td>Automated Logic</td>
<td>P</td>
<td>1</td>
</tr>
<tr>
<td>ALC-20</td>
<td>Automated Logic</td>
<td>GSCE</td>
<td>BACnet Integrator, ARCnet and MS/TP, Gigabit Ethernet</td>
<td>Automated Logic</td>
<td>P</td>
<td>1</td>
</tr>
<tr>
<td>ALC-21</td>
<td>Automated Logic</td>
<td>PROT485</td>
<td>ARCNET156 Protection Board</td>
<td>Automated Logic</td>
<td>P</td>
<td>1</td>
</tr>
<tr>
<td>G-6</td>
<td>Unity</td>
<td>SCL18188RC</td>
<td>18&quot;x18&quot;x8&quot; NEMA 1 Enclosure, Blue</td>
<td>Unity</td>
<td>P</td>
<td>1</td>
</tr>
</tbody>
</table>

### 2nd Floor Network Enclosure

**Network Router**

240VAC Power Supply in Panel

To Connecting network

**Automated Logic**

G5CE

MAC:99

**ARCNET Comm. PROT485**

Surge Protection Board Control Wiring Details

(Typ. Of 1: Refer to Riser for Location Details)

**ARC156 MS/TP**

Wiring In From Previous Device

Wiring Out to Next Device

**24VAC to Modules**

**End of Net?**

NO YES

**NO YES**

**End of Net?**

**2nd Floor Network Enclosure**

**Power Supply**

**ARC156 MS/TP**

Existing 120VAC

**Note: The PROT485 has two earth ground spade connectors for grounding however both do not need to be grounded. Utilize #12 wire no longer than 12" to ground plane. Use external port for RTU run.**
# UNT - Dining Hall Valve Schedule

<table>
<thead>
<tr>
<th>Valve Name</th>
<th>Qty</th>
<th>Valve Size</th>
<th>Fluid Type</th>
<th>GPM</th>
<th>CV</th>
<th>Control</th>
<th>Pattern</th>
<th>Valve Part Number</th>
<th>Actuator Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHW Isolation - MV1</td>
<td>1</td>
<td>6&quot;</td>
<td>CHW</td>
<td>-</td>
<td>-</td>
<td>Open/Close</td>
<td>2 Way</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CHW Isolation - MV2</td>
<td>1</td>
<td>6&quot;</td>
<td>CHW</td>
<td>-</td>
<td>-</td>
<td>Open/Close</td>
<td>2 Way</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CHW Isolation - MV3</td>
<td>1</td>
<td>6&quot;</td>
<td>CHW</td>
<td>-</td>
<td>-</td>
<td>Open/Close</td>
<td>2 Way</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CHW Bypass - MV4</td>
<td>1</td>
<td>6&quot;</td>
<td>CHW</td>
<td>900</td>
<td>605</td>
<td>Modulating</td>
<td>2 Way</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

CHW System Control Schematics

- **Campus Supply and Return from the Central Utility Plant**
- **CHW DP Sensor**

Pending RFI
CHW Pump VFD and Interface Points

Bill of Material w/ Tags

<table>
<thead>
<tr>
<th>Tag</th>
<th>Vendor</th>
<th>Part Number</th>
<th>Product Description</th>
<th>Manufacturer</th>
<th>Panel/Field</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>CR-3</td>
<td>ALPS</td>
<td>RHB-ULDC24V+SH2B-05</td>
<td>Control Relay, DPDT, 24DC, LED, w/ Socket</td>
<td>Idec</td>
<td>P</td>
<td>1</td>
</tr>
<tr>
<td>CR-4</td>
<td>ALPS</td>
<td>RHB-ULDC24V+SH2B-05</td>
<td>Control Relay, DPDT, 24DC, LED, w/ Socket</td>
<td>Idec</td>
<td>P</td>
<td>1</td>
</tr>
<tr>
<td>IS-1</td>
<td>Veris</td>
<td>H608</td>
<td>Current Switch, Adjustable Trip, Split Core</td>
<td>Veris</td>
<td>F</td>
<td>1</td>
</tr>
<tr>
<td>IS-2</td>
<td>Veris</td>
<td>H608</td>
<td>Current Switch, Adjustable Trip, Split Core</td>
<td>Veris</td>
<td>F</td>
<td>1</td>
</tr>
</tbody>
</table>
## CHW System Module & BOM

### Bill of Material w/ Tags

<table>
<thead>
<tr>
<th>Tag</th>
<th>Vendor</th>
<th>Part Number</th>
<th>Product Description</th>
<th>Manufacturer</th>
<th>Panel/Field</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>JT-10</td>
<td>Accuspec Inc</td>
<td>System-10-BAC-MS/TP+F1200+INSTL2</td>
<td>BTU Meter, Flow Xmt, Temp Sensors/Wells, Hot Tap, BACnet MSTP</td>
<td>Onicon</td>
<td>F</td>
<td>1</td>
</tr>
<tr>
<td>CR-3</td>
<td>ALPS</td>
<td>RH2B-ULDC24V+SH2B-05</td>
<td>Control Relay, DPDT,24VDC,LED,w/Socket</td>
<td>Idec</td>
<td>P</td>
<td>1</td>
</tr>
<tr>
<td>CR-4</td>
<td>ALPS</td>
<td>RH2B-ULDC24V+SH2B-05</td>
<td>Control Relay, DPDT,24VDC,LED,w/Socket</td>
<td>Idec</td>
<td>P</td>
<td>1</td>
</tr>
<tr>
<td>ALC-2</td>
<td>Automated Logic</td>
<td>OFBBC-NR</td>
<td>BACnet Building Controller, supports up to nine expanders</td>
<td>Automated Logic</td>
<td>P</td>
<td>1</td>
</tr>
<tr>
<td>ALC-3</td>
<td>Automated Logic</td>
<td>FIO812U</td>
<td>I/O Expander, 4 UO, 12 UI</td>
<td>Automated Logic</td>
<td>P</td>
<td>1</td>
</tr>
<tr>
<td>ALC-4</td>
<td>Automated Logic</td>
<td>FIO48U</td>
<td>I/O Expander, 4 UO, 8 UI</td>
<td>Automated Logic</td>
<td>P</td>
<td>1</td>
</tr>
<tr>
<td>TE-5</td>
<td>BAPI</td>
<td>ALC/10K-2-1-2&quot;-BB-MB</td>
<td>Immersion 2&quot; Insertion in BAPI BOX NEMA 4X, w/Brass Thermowell</td>
<td>BAPI</td>
<td>F</td>
<td>1</td>
</tr>
<tr>
<td>TE-6</td>
<td>BAPI</td>
<td>ALC/10K-2-1-2&quot;-BB-MB</td>
<td>Immersion 2&quot; Insertion in BAPI BOX NEMA 4X, w/Brass Thermowell</td>
<td>BAPI</td>
<td>F</td>
<td>1</td>
</tr>
<tr>
<td>IS-1</td>
<td>Veris</td>
<td>H608</td>
<td>Current Switch, Adjustable Trip, Split Core</td>
<td>Veris</td>
<td>F</td>
<td>1</td>
</tr>
<tr>
<td>IS-2</td>
<td>Veris</td>
<td>H608</td>
<td>Current Switch, Adjustable Trip, Split Core</td>
<td>Veris</td>
<td>F</td>
<td>1</td>
</tr>
<tr>
<td>PT-1</td>
<td>Veris</td>
<td>PWLX04S+AA16A</td>
<td>Wet Media Diff. Press., LCD, 0-10/20/50/100 PSI Diff, 4-20mA/0-5V/0-10V Output</td>
<td>Veris</td>
<td>F</td>
<td>1</td>
</tr>
<tr>
<td>PT-2</td>
<td>Veris</td>
<td>PWLX04S+AA16A</td>
<td>Wet Media Diff. Press., LCD, 0-10/20/50/100 PSI Diff, 4-20mA/0-5V/0-10V Output</td>
<td>Veris</td>
<td>F</td>
<td>1</td>
</tr>
<tr>
<td>PT-3</td>
<td>Veris</td>
<td>PG08AM</td>
<td>Gauge Press Sensor, 0-250psig, 4-20mA</td>
<td>Veris</td>
<td>F</td>
<td>1</td>
</tr>
<tr>
<td>PT-4</td>
<td>Veris</td>
<td>PG08AM</td>
<td>Gauge Press Sensor, 0-250psig, 4-20mA</td>
<td>Veris</td>
<td>F</td>
<td>1</td>
</tr>
<tr>
<td>PT-5</td>
<td>Veris</td>
<td>PG08AM</td>
<td>Gauge Press Sensor, 0-250psig, 4-20mA</td>
<td>Veris</td>
<td>F</td>
<td>1</td>
</tr>
<tr>
<td>PT-6</td>
<td>Veris</td>
<td>PG08AM</td>
<td>Gauge Press Sensor, 0-250psig, 4-20mA</td>
<td>Veris</td>
<td>F</td>
<td>1</td>
</tr>
</tbody>
</table>

**Diagram:**

- Ethernet Connection: As per Riser Diagram
- I/O Com. Bus IN: As per Riser Diagram
- I/O Com. Bus OUT: As per Riser Diagram
Plant Panel Layout
36"x48"x8" Enclosure

1st Floor Plant Enclosure
Located in Mechanical Room 160CA

- OFBBC-NR Chilled Water System Module CM-3
- FIO812U Chilled Water System Module Expander 1
- FIO48U Chilled Water System Module Expander 2
- OFBBC-NR Boiler Module CM-4
- FIO812U Boiler Expander 1
- FIO48U Boiler Expander 2

150VA 150VA 100VA
- We are to supply the BTU Meter to be connected by Others to existing Campus Monitoring System.

### Equipment Address Table

<table>
<thead>
<tr>
<th>Equipment</th>
<th>STP#</th>
<th>Address Table</th>
</tr>
</thead>
<tbody>
<tr>
<td>BTU Meter</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1. BMS will read the following points:
   1. Energy Rate (BTUs/hr)
   2. Energy Rate (kW)
   3. Energy Rate (Tons)
   4. Volume Rate (GPM)
   5. Volume Rate (GPH)
   6. Supply Temp
   7. Return Temp
   8. Energy Total (BTU)
   9. Energy Total (Ton/Hr)
   10. Energy Total (kWh)

1. BMS will write the following points:
   1. Energy Total Reset
   2. Volume Total Reset
**Chilled Water System Sequence of Operations**

**Chilled Water System Activation**
The chilled water pump system will be activated by a request for cooling from any air handler supplied with chilled water. The chilled water pumps will rotate lead based on runtime or day of the week and time (operator selectable).

**Chilled Water System DP Sequence**
The B.A.S. will monitor the master water differential pressure sensor mounted across the building Chilled supply and return lines. The B.A.S. will modulate the VFD on the Chilled Water pump as required to maintain a building Chilled Water differential pressure initial setpoint of 16 psi (adjustable). The B.A.S. will monitor the remote DP sensor and reset the master to maintain the loop remote DP setpoint of 16 psi (adj.)

**Chilled Water System Control**
The BAS will energize the chilled water pump Isolation Valves (MV-1 & MV-3), and modulate MV-4 100% open to flow. MV-2 shall be closed and energize water pump. Once the chilled water pump isolation valves prove status to the BAS, a run command will be sent to the lead chilled water pump. A current switch mounted in the pump’s starter will prove status to the BAS, and will alarm at the central site if the switches are not made within 40 seconds (adj.). There will also be a 20 second (adj.) de-bounce time to prevent nuisance alarms from the current switches. If the lead CHW pump fails to start after 60 seconds (adjustable), the lag CHW pump will be started in the same manner and alarm the central site.

**Chilled Water Sequence Control**
If the lead pump goes into an alarm condition or the lead pump cannot maintain system DP setpoint the second (lag) pump will start. The lag pump and run request will be canceled after a 15 minute (adj.) time delay if the chilled water pump speed is less than 80% of one pump. To prevent short cycling, the chilled water pumps shall run for a minimum of 5 min (adj.) and be off for a minimum of 5 min (adj.). If manually commanded through the B.A.S or both pumps fail, the B.A.S. shall cancel the run commands to the pumps, close the MV-1 & MV-3, open MV-2 and Modulate MV-4 to maintain system DP Setpoint.

**Chilled Water Pump Alarms**
Alarms shall be provided as follows:
- CHWP 1 Failure: Commanded on, but the status is off.
- CHWP 1 in Hand: Commanded off, but the status is on.
- CHWP 1 Runtime Exceeded: Status runtime exceeds a 10,000 hour (adj.).
- CHWP 1 VFD Fault
- CHWP 2 Failure: Commanded on, but the status is off.
- CHWP 2 in Hand: Commanded off, but the status is on.
- CHWP 2 Runtime Exceeded: Status runtime exceeds a 10,000 hour (adj.).
- CHWP 2 VFD Fault

**Chilled Water System Shutdown Sequence**
After all requests for cooling have been satisfied or halted by the B.A.S. the chilled water pumps will cycle to their off status, and then close all valves.
HW System Schematics

UNT - Dining Hall

Valve Schedule

<table>
<thead>
<tr>
<th>Valve Name</th>
<th>Qty</th>
<th>Valve Size</th>
<th>Fluid Type</th>
<th>GPM</th>
<th>CV</th>
<th>Control</th>
<th>Pattern</th>
<th>Valve Part Number</th>
<th>Actuator Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>HW Bypass - Downstream</td>
<td>1</td>
<td>2.5&quot;</td>
<td>HW</td>
<td>150</td>
<td>100</td>
<td>Modulating</td>
<td>2 Way</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Drawing Notes:
Mount Outside Air Temperature, Humidity and CO2 sensor on a North facing wall, in the shade where possible, as indicated on mechanical plans or field verify location with Owners Rep. Document installed location for as-built control drawings.

Outside Air Temperature, Humidity and CO2 Conditions will be displayed at central site.

Outside Air Temperature, Humidity and CO2 Control Wiring Details

Drawing No.: 3.1
**Boiler Interface Points**

### CREST BOILER INTERFACE POINTS

<table>
<thead>
<tr>
<th>Point</th>
<th>Read/Write</th>
<th>Address</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>INPUTS</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Binary Inputs 16-31</td>
<td>Read</td>
<td>Al:1</td>
</tr>
<tr>
<td>Binary Inputs 32-47</td>
<td>Read</td>
<td>Al:2</td>
</tr>
<tr>
<td>System / Cascade Setpoint</td>
<td>Read</td>
<td>Al:3</td>
</tr>
<tr>
<td>System Pump Speed</td>
<td>Read</td>
<td>Al:4</td>
</tr>
<tr>
<td>Cascade Total Power</td>
<td>Read</td>
<td>Al:5</td>
</tr>
<tr>
<td>Outlet Setpoint</td>
<td>Read</td>
<td>Al:7</td>
</tr>
<tr>
<td>Outlet Temperature</td>
<td>Read</td>
<td>Al:8</td>
</tr>
<tr>
<td>Inlet Temperature</td>
<td>Read</td>
<td>Al:9</td>
</tr>
<tr>
<td>Flue Temperature</td>
<td>Read</td>
<td>Al:10</td>
</tr>
<tr>
<td>Firing Rate</td>
<td>Read</td>
<td>Al:11</td>
</tr>
<tr>
<td>Boiler Pump Speed</td>
<td>Read</td>
<td>Al:12</td>
</tr>
<tr>
<td>Boiler Status Code</td>
<td>Read</td>
<td>Al:13</td>
</tr>
<tr>
<td>Boiler Blocking Code</td>
<td>Read</td>
<td>Al:14</td>
</tr>
<tr>
<td>Boiler Lockout Code</td>
<td>Read</td>
<td>Al:15</td>
</tr>
<tr>
<td>Binary Inputs 48-63</td>
<td>Read</td>
<td>Al:25</td>
</tr>
<tr>
<td>Lock-Out Error Leader</td>
<td>Read</td>
<td>Al:26</td>
</tr>
<tr>
<td>Lock-Out Error Member 1</td>
<td>Read</td>
<td>Al:27</td>
</tr>
<tr>
<td>Lock-Out Error Member 2</td>
<td>Read</td>
<td>Al:28</td>
</tr>
<tr>
<td>Lock-Out Error Member 3</td>
<td>Read</td>
<td>Al:29</td>
</tr>
<tr>
<td>Lock-Out Error Member 4</td>
<td>Read</td>
<td>Al:30</td>
</tr>
<tr>
<td>Lock-Out Error Member 5</td>
<td>Read</td>
<td>Al:31</td>
</tr>
<tr>
<td>Lock-Out Error Member 6</td>
<td>Read</td>
<td>Al:32</td>
</tr>
<tr>
<td>Lock-Out Error Member 7</td>
<td>Read</td>
<td>Al:33</td>
</tr>
<tr>
<td><strong>ANALOG Values</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Configuration</td>
<td>Read</td>
<td>Al:0</td>
</tr>
<tr>
<td>Coils</td>
<td>Read</td>
<td>Al:1</td>
</tr>
<tr>
<td>Setpoint Command</td>
<td>Read</td>
<td>Al:2</td>
</tr>
<tr>
<td>Tank Setpoint</td>
<td>Read</td>
<td>Al:3</td>
</tr>
<tr>
<td>Tank Temperature</td>
<td>Read</td>
<td>Al:4</td>
</tr>
<tr>
<td>Outdoor Temperature</td>
<td>Read</td>
<td>Al:5</td>
</tr>
<tr>
<td>System Supply Temperature</td>
<td>Read</td>
<td>Al:6</td>
</tr>
<tr>
<td>System Return Temperature</td>
<td>Read</td>
<td>Al:7</td>
</tr>
</tbody>
</table>

### CREST BOILER INTERFACE POINTS

<table>
<thead>
<tr>
<th>Point</th>
<th>Read/Write</th>
<th>Address</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>BINARY Values</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boiler Enable</td>
<td>Read</td>
<td>BV:0</td>
</tr>
<tr>
<td>Tank Thermostat</td>
<td>Read</td>
<td>BV:4</td>
</tr>
<tr>
<td><strong>BINARY INPUTS</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Manual Reset High Limit</td>
<td>Read</td>
<td>Bi:0</td>
</tr>
<tr>
<td>Flow Switch</td>
<td>Read</td>
<td>Bi:1</td>
</tr>
<tr>
<td>Gas Pressure Switch</td>
<td>Read</td>
<td>Bi:2</td>
</tr>
<tr>
<td>Louver Proving Switch</td>
<td>Read</td>
<td>Bi:3</td>
</tr>
<tr>
<td>Air Pressure Switch</td>
<td>Read</td>
<td>Bi:4</td>
</tr>
<tr>
<td>Blocked Drain Switch</td>
<td>Read</td>
<td>Bi:5</td>
</tr>
<tr>
<td>Flame 1</td>
<td>Read</td>
<td>Bi:6</td>
</tr>
<tr>
<td>Enable</td>
<td>Read</td>
<td>Bi:7</td>
</tr>
<tr>
<td>Tank Thermostat</td>
<td>Read</td>
<td>Bi:8</td>
</tr>
<tr>
<td>Fan 1 Proving Switch</td>
<td>Read</td>
<td>Bi:9</td>
</tr>
<tr>
<td>Fan 2 Proving Switch</td>
<td>Read</td>
<td>Bi:10</td>
</tr>
<tr>
<td>Flue Damper Switch</td>
<td>Read</td>
<td>Bi:11</td>
</tr>
<tr>
<td>Flame 2</td>
<td>Read</td>
<td>Bi:12</td>
</tr>
<tr>
<td>Run Time Contacts</td>
<td>Read</td>
<td>Bi:20</td>
</tr>
<tr>
<td>Alarm Contacts</td>
<td>Read</td>
<td>Bi:22</td>
</tr>
<tr>
<td>Boiler Pump</td>
<td>Read</td>
<td>Bi:32</td>
</tr>
<tr>
<td>DHW Pump</td>
<td>Read</td>
<td>Bi:33</td>
</tr>
<tr>
<td>Louver Relay</td>
<td>Read</td>
<td>Bi:34</td>
</tr>
<tr>
<td>Gas Valve 1</td>
<td>Read</td>
<td>Bi:35</td>
</tr>
<tr>
<td>System Pump</td>
<td>Read</td>
<td>Bi:36</td>
</tr>
<tr>
<td>Flue Damper Output</td>
<td>Read</td>
<td>Bi:37</td>
</tr>
<tr>
<td>Gas Valve 2</td>
<td>Read</td>
<td>Bi:38</td>
</tr>
</tbody>
</table>

---

**Example:** BACNET://66100:x/AI:01

<table>
<thead>
<tr>
<th>Equipment</th>
<th>MSTP#</th>
<th>Address Table</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boiler 1</td>
<td>66100</td>
<td>6</td>
</tr>
<tr>
<td>Boiler 2</td>
<td>66100</td>
<td>7</td>
</tr>
</tbody>
</table>
YASKAWA DRIVE Z1000 INTERFACE POINTS

<table>
<thead>
<tr>
<th>Point</th>
<th>Read/Write</th>
<th>Address</th>
</tr>
</thead>
<tbody>
<tr>
<td>ANALOG VALUES</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Frequency Reference In</td>
<td>Read</td>
<td>bacnet://14100/X/AV:9</td>
</tr>
<tr>
<td>Output Frequency In</td>
<td>Read</td>
<td>bacnet://14100/X/AV:10</td>
</tr>
<tr>
<td>Output Voltage In</td>
<td>Read</td>
<td>bacnet://14100/X/AV:11</td>
</tr>
<tr>
<td>Output Current In</td>
<td>Read</td>
<td>bacnet://14100/X/AV:12</td>
</tr>
<tr>
<td>Output Power In</td>
<td>Read</td>
<td>bacnet://14100/X/AV:13</td>
</tr>
<tr>
<td>Torque Reference In</td>
<td>Read</td>
<td>bacnet://14100/X/AV:14</td>
</tr>
<tr>
<td>DC Bus Voltage In</td>
<td>Read</td>
<td>bacnet://14100/X/AV:18</td>
</tr>
<tr>
<td>Accel Time In</td>
<td>Read</td>
<td>bacnet://14100/X/AV:27</td>
</tr>
<tr>
<td>Decel Time In</td>
<td>Read</td>
<td>bacnet://14100/X/AV:28</td>
</tr>
<tr>
<td>BVNARY INPUTS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Run FWD Cmd In</td>
<td>Read</td>
<td>bacnet://14100/X/BV:1</td>
</tr>
<tr>
<td>Run REV Cmd In</td>
<td>Read</td>
<td>bacnet://14100/X/BV:2</td>
</tr>
<tr>
<td>Ext Fault Cmd In</td>
<td>Read</td>
<td>bacnet://14100/X/BV:3</td>
</tr>
<tr>
<td>Fault Reset Cmd In</td>
<td>Read</td>
<td>bacnet://14100/X/BV:4</td>
</tr>
<tr>
<td>RUN-STOP In</td>
<td>Read</td>
<td>bacnet://14100/X/BV:13</td>
</tr>
<tr>
<td>REV-FWD In</td>
<td>Read</td>
<td>bacnet://14100/X/BV:14</td>
</tr>
<tr>
<td>READY In</td>
<td>Read</td>
<td>bacnet://14100/X/BV:15</td>
</tr>
<tr>
<td>FAULT In</td>
<td>Read</td>
<td>bacnet://14100/X/BV:16</td>
</tr>
<tr>
<td>Overcurrent – Ground Fault In</td>
<td>Read</td>
<td>bacnet://14100/X/BV:18</td>
</tr>
<tr>
<td>Main Circuit – Overvoltage In</td>
<td>Read</td>
<td>bacnet://14100/X/BV:19</td>
</tr>
<tr>
<td>Drive Overload In</td>
<td>Read</td>
<td>bacnet://14100/X/BV:20</td>
</tr>
<tr>
<td>Drive Overheat In</td>
<td>Read</td>
<td>bacnet://14100/X/BV:21</td>
</tr>
<tr>
<td>Fuse Blown In</td>
<td>Read</td>
<td>bacnet://14100/X/BV:22</td>
</tr>
<tr>
<td>External Fault In</td>
<td>Read</td>
<td>bacnet://14100/X/BV:24</td>
</tr>
<tr>
<td>Hardware Error In</td>
<td>Read</td>
<td>bacnet://14100/X/BV:25</td>
</tr>
<tr>
<td>Motor Overload - Overtorque In</td>
<td>Read</td>
<td>bacnet://14100/X/BV:26</td>
</tr>
<tr>
<td>Overspeed In</td>
<td>Read</td>
<td>bacnet://14100/X/BV:27</td>
</tr>
<tr>
<td>Communication Error In</td>
<td>Read</td>
<td>bacnet://14100/X/BV:31</td>
</tr>
<tr>
<td>Low Voltage Detect In</td>
<td>Read</td>
<td>bacnet://14100/X/BV:40</td>
</tr>
<tr>
<td>Run Command Mode In</td>
<td>Read</td>
<td>bacnet://14100/X/BV:43</td>
</tr>
<tr>
<td>Overtorque Detect In</td>
<td>Read</td>
<td>bacnet://14100/X/BV:44</td>
</tr>
<tr>
<td>Timeout Error In</td>
<td>Read</td>
<td>bacnet://14100/X/BV:54</td>
</tr>
<tr>
<td>Drive Comm Error In</td>
<td>Read</td>
<td>bacnet://14100/X/BV:57</td>
</tr>
<tr>
<td>Emerg Shutdown</td>
<td>Read</td>
<td>bacnet://14100/X/BV:58</td>
</tr>
</tbody>
</table>
1. BMS will monitor/trend the following points:
   1. Output Frequency
   2. Output Current
   3. Output Voltage
   4. Running Speed
   5. Converter Output Voltage
   6. Output Power
   7. Load Meter
   8. Cumulative Energization Time
   9. Actual Operation Time

Example: BACNET://8200:9/Al:01

<table>
<thead>
<tr>
<th>Equipment</th>
<th>MSTP#</th>
<th>Address Table</th>
</tr>
</thead>
<tbody>
<tr>
<td>DWBP-1</td>
<td>8200</td>
<td>9</td>
</tr>
</tbody>
</table>

**Interface Points**

<table>
<thead>
<tr>
<th>Point</th>
<th>Read/Write</th>
<th>Object I/O</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output Frequency</td>
<td>Read</td>
<td>AV:1</td>
</tr>
<tr>
<td>Output Current</td>
<td>Read</td>
<td>AV:2</td>
</tr>
<tr>
<td>Output Voltage</td>
<td>Read</td>
<td>AV:3</td>
</tr>
<tr>
<td>Running Speed</td>
<td>Read</td>
<td>AV:6</td>
</tr>
<tr>
<td>Converter Output Voltage</td>
<td>Read</td>
<td>AV:8</td>
</tr>
<tr>
<td>Output Power</td>
<td>Read</td>
<td>AV:14</td>
</tr>
<tr>
<td>Load Meter</td>
<td>Read</td>
<td>AV:17</td>
</tr>
<tr>
<td>Cumulative Energization Time</td>
<td>Read</td>
<td>AV:20</td>
</tr>
<tr>
<td>Actual Operation Time</td>
<td>Read</td>
<td>AV:23</td>
</tr>
</tbody>
</table>
## Bill of Material

<table>
<thead>
<tr>
<th>Vendor</th>
<th>Part Number</th>
<th>Product Description</th>
<th>Manufacturer</th>
<th>Panel Or Field</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>BAPI</td>
<td>ALC/10K-2-I-2&quot;-BB-MB</td>
<td>Immersion 2&quot; Insertion in BAPI BOX NEMA 4X, w/Brass Thermowell</td>
<td>BAPI</td>
<td>F</td>
<td>4</td>
</tr>
<tr>
<td>Senva</td>
<td>CHTOL-E</td>
<td>Outdoor CO2/RH Temp Transmitter with 10k type 2 thermistor</td>
<td>Senva</td>
<td>F</td>
<td>1</td>
</tr>
<tr>
<td>Accuspec Inc</td>
<td>F-1210+INSTL2</td>
<td>Flow Xmtr, Insertion, 2.5-36&quot;, hot tap w/4-20mA</td>
<td>Onicon</td>
<td>F</td>
<td>1</td>
</tr>
<tr>
<td>Automated Logic</td>
<td>FIO48U</td>
<td>I/O Expander, 4 UO, 8 UI</td>
<td>Automated Logic</td>
<td>P</td>
<td>1</td>
</tr>
<tr>
<td>Automated Logic</td>
<td>FIO812U</td>
<td>I/O Expander, 4 UO, 12 UI</td>
<td>Automated Logic</td>
<td>P</td>
<td>1</td>
</tr>
<tr>
<td>Automated Logic</td>
<td>OF890C-NC</td>
<td>BACnet Building Controller</td>
<td>Automated Logic</td>
<td>P</td>
<td>1</td>
</tr>
<tr>
<td>Veris</td>
<td>PWLX04S+AA16A</td>
<td>Wet Media Diff. Press., LCD, 0-10/20/50/100 PSI Diff, 4-20mA/0-5V/0-10V Output</td>
<td>Veris</td>
<td>F</td>
<td>2</td>
</tr>
</tbody>
</table>

## Diagram

The diagram shows a network layout with various components connected via Ethernet cables. The labels indicate connections and data flow as per the riser diagram.
- We are to supply the BTU Meter to be connected by Others to existing Campus Monitoring System.

- The listed points will be extracted from the Existing Campus Monitoring System and will be displayed at the Central Site.

1. BMS will monitor the following points:
   1. Energy Rate (BTUs/Hr)
   2. Energy Rate (kW)
   3. Energy Rate (Tons)
   4. Volume Rate (GPM)
   5. Volume Rate (GPH)
   6. Supply Temp
   7. Return Temp
   8. Energy Total (BTU)
   9. Energy Total (Ton/Hr)
   10. Energy Total (kWh)

1. BMS will write the following points:
   1. Energy Total Reset
   2. Volume Total Reset

### Interface Points

<table>
<thead>
<tr>
<th>Point</th>
<th>Read/Write</th>
<th>Address</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy Rate (BTUs/hr)</td>
<td>Read</td>
<td>modbus://FLOAT/41003/?</td>
</tr>
<tr>
<td>Energy Rate (kW)</td>
<td>Read</td>
<td>modbus://FLOAT/41005/?</td>
</tr>
<tr>
<td>Energy Rate (Tons)</td>
<td>Read</td>
<td>modbus://FLOAT/41007/?</td>
</tr>
<tr>
<td>Volume Rate (GPM)</td>
<td>Read</td>
<td>modbus://FLOAT/41009/?</td>
</tr>
<tr>
<td>Volume Rate (GPH)</td>
<td>Read</td>
<td>modbus://FLOAT/41011/?</td>
</tr>
<tr>
<td>Supply Temp</td>
<td>Read</td>
<td>modbus://FLOAT/41027/?</td>
</tr>
<tr>
<td>Return Temp</td>
<td>Read</td>
<td>modbus://FLOAT/41029/?</td>
</tr>
<tr>
<td>Energy Total (BTU)</td>
<td>Read</td>
<td>modbus://FLOAT/41035/?</td>
</tr>
<tr>
<td>Energy Total (Ton/Hr)</td>
<td>Read</td>
<td>modbus://FLOAT/41039/?</td>
</tr>
<tr>
<td>Energy Total (kWH)</td>
<td>Read</td>
<td>modbus://FLOAT/41043/?</td>
</tr>
<tr>
<td>Energy Total Reset</td>
<td>Write</td>
<td>modbus://UINT/41065/?</td>
</tr>
<tr>
<td>Volume Total Reset</td>
<td>Write</td>
<td>modbus://UINT/41066/?</td>
</tr>
</tbody>
</table>
1st Floor Plant Enclosure
Located in Mechanical Room 160
The B.A.S. shall monitor the Fire Alarm points and display status at central site.

Module is Located in Plant Enclosure

The B.A.S. shall monitor the Gas and Domestic Meter input and display value at central site.

Space Temp Monitoring for IDF Room 140A
Space Temp Monitoring for Fire Pump Room 160C

The B.A.S. shall monitor the TVSS Status points and display status at central site.

The B.A.S. shall monitor the Heat Trace points and display status at central site.

Sequence of Operations

Freezer, Cooler Temperature
The B.A.S. shall monitor freezers and cooler temperatures for display at the central site. Trending and History Data will be recorded for the Day, Month, and Year.

Freezer Alarming
The B.A.S. will monitor the freezer temperature and if the temperature rises above 28°F (adjustable) an alarm will be sent to the central site. If the input falls below ~20°F (adjustable) an alarm will be sent to the central site.

Cooler Alarming
The B.A.S. will monitor the freezer temperature and if the temperature rises above 50°F (adjustable) an alarm will be sent to the central site. If the input falls below 33°F (adjustable) an alarm will be sent to the central site.
CO and Gas Detection System for Review

Built in horn alarming***
- Factory wired, 24 VDC
- Fault (fail-safe) alarming
- Stage-level control & alarming

*** Factory pre-configured horn and fault (fail-safe), can be re-assigned/converted for remote control, stage-level #4 and/or #5

Normal condition (factory default)

\( \square = \text{Relay status LEDs D1 to D5 located below terminal connection of sensor inputs (X10)} \)
Heating Water System Sequence of Operations

Heating Water System Activation
The heating water system will be activated by request from any unit supplied by the system and if the outside air temperature is 65°F (adjustable) or below.

Heating Water Pump Control
When a request for heating is received the B.A.S. will send a 24 VAC signal to a relay mounted at the starter for the lead building heating water pump, which will complete the auto side of the control circuit and start the lead pump. A current switch will prove pump status to the B.A.S. control module and will alarm at the central site if the switch is not made within 20 seconds (adjustable). There will also be a 10 second (adjustable) de bounce time to prevent nuisance alarms from a bouncing switch. If the lead pump goes into an alarm condition or the lead pump cannot maintain system DP setpoint the second (lag) pump will start. The lag pump and run request will be canceled after a 15 minute (adj.) time delay if the heating water pump speed is less than 80% of one pump. To prevent short cycling, the heating water pumps shall run for a minimum of 5 min (adj.) and be off for a minimum of 5 min (adj.). The B.A.S. will monitor the master water differential pressure sensor mounted across the building HW supply and return lines. The B.A.S. will modulate the VFD on the HW pump as required to maintain a building HW differential pressure initial setpoint of 16 psi (adjustable). The B.A.S. will monitor the remote DP sensor and reset the master to maintain the loop remote DP setpoint of 16 psi. (adj.) For initial startup pump HWP-1 will be the lead pump.

Heating Water Boiler Control
When the system is activated and the lead pump has proven status, the B.A.S. will send a 24 VAC signal to a relay mounted at the isolation valve of the lead boiler. Once a set of dry contacts has proven an open status to the B.A.S. control module, and will alarm at the central site if the switch is not made within 20 seconds (adjustable). The B.A.S. will then send a 2-10 VDC signal to the boilers control panel (2-10 scaling from low fire to high fire), which will enable the boiler to fire. If the lead boiler fails to start within 2 minutes (adjustable), the B.A.S. will de-energize by sending a 0 VDC signal, shut off its isolation valve, alarm the central site, and automatically rotate start to the lag boiler.

A Lead/Lag program shall alternate the lead Boiler based on Runtime, Weekly or Daily (adjustable). For initial startup Boiler-1 will be the lead boiler.

When the boiler is deactivated, the heating water pump will continue to run for 15 minutes (adjustable) to avoid excessive pressure build-up in the boiler and prevent condensation.

Heating Water Temperature Control
The B.A.S. control module will receive temperature inputs from sensors located in the building’s hot water supply and return piping and each boiler’s supply. The hot water supply set point shall be reset between 120°F and 180°F based on an outdoor air temperature of 70°F to 20°F respectively (all values adjustable). When incoming requests are cancelled, the boiler/boilers will be de-energized pump/pumps will continue to run until cool down is complete. If no heat requests are received during this period, the B.A.S. shall disable the hot water pump/pumps and close the isolation valves.

Freeze Protection
When the outdoor air temperature drops to 35°F (adjustable) or below and the building is unoccupied, the B.A.S. will open all hot water valves on the hot water system and enable the heating water lead pump until the low ambient temperature no longer exists.

Equipment Off Conditions
When the heating water system is inactive, boilers and pumps will be de-energized.
### Bill of Material

<table>
<thead>
<tr>
<th>Vendor</th>
<th>Part Number</th>
<th>Product Description</th>
<th>Manufacturer</th>
<th>Panel Or Field</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Siemens</td>
<td>134-1504</td>
<td>Low-Limit Temp Sw, DPDT, Man Rst, 15-55F, 20&quot;</td>
<td>Siemens</td>
<td>F</td>
<td>2</td>
</tr>
<tr>
<td>Veris</td>
<td>AA06</td>
<td>Duct Static Pressure Pickup 4&quot;</td>
<td>Veris</td>
<td>F</td>
<td>28</td>
</tr>
<tr>
<td>Dwyer</td>
<td>ADPS-08-1-N</td>
<td>Filter Differential Pressure Switch, 0.08-1.20&quot;WC</td>
<td>Dwyer</td>
<td>F</td>
<td>10</td>
</tr>
<tr>
<td>Kele</td>
<td>AFS-460-DSS</td>
<td>Differential Pressure Switch, 2-12 in. WC, 2-SPST, Man. Reset (NC, NC)</td>
<td>Cleveland</td>
<td>F</td>
<td>8</td>
</tr>
<tr>
<td>BAPI</td>
<td>ALC/HE20-D-BB</td>
<td>Humidity 2%, Duct, BAPI BOX NEMA 4X</td>
<td>BAPI</td>
<td>F</td>
<td>2</td>
</tr>
<tr>
<td>BAPI</td>
<td>BA/10K-2-A-12-BBX</td>
<td>Continuous Averaging, 12' Length, 10K-2 and BAPI BOX Enclosure</td>
<td>BAPI</td>
<td>F</td>
<td>10</td>
</tr>
<tr>
<td>BAPI</td>
<td>BA/2PM-LR-ST-D</td>
<td>ZPM Standard Range Unit, with Static Pressure Tube, with Display</td>
<td>BAPI</td>
<td>F</td>
<td>2</td>
</tr>
<tr>
<td>BAPI</td>
<td>BA/2PM-SR-ST-D</td>
<td>ZPM Standard Range Unit, with Static Pressure Tube, with Display</td>
<td>BAPI</td>
<td>F</td>
<td>2</td>
</tr>
<tr>
<td>Veris</td>
<td>CDE</td>
<td>Economy Duct CC0, Field Selectable Output</td>
<td>Veris</td>
<td>F</td>
<td>2</td>
</tr>
<tr>
<td>Technical Air Systems</td>
<td>GTC116Px</td>
<td>Gold Series AFMS, Analog/RS485, Duct Probe, Density based on field conditions</td>
<td>Ebtron</td>
<td>F</td>
<td>2</td>
</tr>
<tr>
<td>Belimo</td>
<td>NFB24-SR-S</td>
<td>Dmpr. Act. 90 in-lbs, Spring Return, 2-10 V, 24 VAC, 2 Aux Switch</td>
<td>Belimo</td>
<td>F</td>
<td>6</td>
</tr>
</tbody>
</table>

### Diagram

The diagram shows various components and connections, including Ethernet connections as per riser diagram.
**Bill of Material w/ Tags**

<table>
<thead>
<tr>
<th>Tag</th>
<th>Vendor</th>
<th>Part Number</th>
<th>Product Description</th>
<th>Manufacturer</th>
<th>Panel/Field</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>XF-3</td>
<td>ALPS</td>
<td>PSB100AB10</td>
<td>Enclosed Single Pwr Supply, 100VA</td>
<td>Functional Devices</td>
<td>P</td>
<td>2</td>
</tr>
<tr>
<td>XF-4</td>
<td>ALPS</td>
<td>TR150VA001</td>
<td>150VA 120:24, Ckt Brkr, UL</td>
<td>Functional Devices</td>
<td>P</td>
<td>2</td>
</tr>
<tr>
<td>ENC-3</td>
<td>Kele</td>
<td>SCE30X246LP</td>
<td>30&quot;x24&quot;x6&quot; Enclosure, NEMA 4</td>
<td>Saginaw</td>
<td>P</td>
<td>2</td>
</tr>
<tr>
<td>ENC-4</td>
<td>Kele</td>
<td>SCE30P24</td>
<td>30&quot;x24&quot;x6&quot; Enclosure Back Plate</td>
<td>Saginaw</td>
<td>P</td>
<td>2</td>
</tr>
</tbody>
</table>

**30"x24"x8" Enclosure**

- **Tag Vendor Part Number Product Description Manufacturer Panel/Field Quantity**
  - XF-3 ALPS PSB100AB10 Enclosed Single Pwr Supply, 100VA Functional Devices P 2
  - XF-4 ALPS TR150VA001 150VA 120:24, Ckt Brkr, UL Functional Devices P 2
  - ENC-3 Kele SCE30X246LP 30"x24"x6" Enclosure, NEMA 4 Saginaw P 2
  - ENC-4 Kele SCE30P24 30"x24"x6" Enclosure Back Plate Saginaw P 2

**Bond Secondary Neutrals**

- **Tag Vendor Part Number Product Description Manufacturer Panel/Field Quantity**
  - XF-3 ALPS PSB100AB10 Enclosed Single Pwr Supply, 100VA Functional Devices P 2
  - XF-4 ALPS TR150VA001 150VA 120:24, Ckt Brkr, UL Functional Devices P 2
  - ENC-3 Kele SCE30X246LP 30"x24"x6" Enclosure, NEMA 4 Saginaw P 2
  - ENC-4 Kele SCE30P24 30"x24"x6" Enclosure Back Plate Saginaw P 2
1. BMS will monitor/trend the following points:
   1. Relative Position in %
   2. Absolute Position in Degrees
   3. Setpoint Analog in Volt
   4. Relative Flow in %
   5. Absolute Flow in GPM
   6. Temperature 1 (Remote) in F
   7. Temperature 2 (Remote) in F
   8. Power in kW
   9. Cooling Energy in kWh
   10. Error State
   11. Setpoint Absolute Flow in GPM
   12. Setpoint Position Reached
   13. Reset Error Count
   14. Delta T Manager Status

2. BMS will read/report the following alarms:
   1. Error State

Example: BACNET://42300:1/AI:01

<table>
<thead>
<tr>
<th>Equipment</th>
<th>MST#</th>
<th>Address Table</th>
</tr>
</thead>
<tbody>
<tr>
<td>AHU 1D CHW Belimo Energy Valve</td>
<td>42300</td>
<td>25</td>
</tr>
<tr>
<td>AHU 1K CHW Belimo Energy Valve</td>
<td>42300</td>
<td>16</td>
</tr>
<tr>
<td>MAU 1K CHW Belimo Energy Valve</td>
<td>42300</td>
<td>11</td>
</tr>
</tbody>
</table>

Belimo CHWV Interface Points

<table>
<thead>
<tr>
<th>Point URL</th>
<th>Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>BACnet://42300:X/AI:1</td>
<td>Relative Position in %</td>
</tr>
<tr>
<td>BACnet://42300:X/AI:2</td>
<td>Absolute Position in Degrees</td>
</tr>
<tr>
<td>BACnet://42300:X/AI:5</td>
<td>Setpoint Analog in Volt</td>
</tr>
<tr>
<td>BACnet://42300:X/AI:10</td>
<td>Relative Flow in %</td>
</tr>
<tr>
<td>BACnet://42300:X/AI:13</td>
<td>Absolute Flow in GPM</td>
</tr>
<tr>
<td>BACnet://42300:X/AI:25</td>
<td>Temperature 1 (Remote) in F</td>
</tr>
<tr>
<td>BACnet://42300:X/AI:26</td>
<td>Temperature 2 (Remote) in F</td>
</tr>
<tr>
<td>BACnet://42300:X/AI:30</td>
<td>Power in kW</td>
</tr>
<tr>
<td>BACnet://42300:X/AI:31</td>
<td>Cooling Energy in kWh</td>
</tr>
<tr>
<td>BACnet://42300:X/AI:100</td>
<td>Error State</td>
</tr>
<tr>
<td>BACnet://42300:X/BI:1</td>
<td>Setpoint Position Reached</td>
</tr>
<tr>
<td>BACnet://42300:X/BV:100</td>
<td>Reset Error Count</td>
</tr>
<tr>
<td>BACnet://42300:X/MSI:102</td>
<td>Delta T Manager Status</td>
</tr>
</tbody>
</table>
Supply Air Temperature Setpoint - Optimized:
The controller shall monitor the supply air temperature and shall maintain a supply air temperature setpoint reset based on zone cooling and heating requirements.
The supply air temperature setpoint shall be reset for cooling based on zone cooling requirements as follows:
The initial supply air temperature setpoint shall be 55°F (adj.).
As cooling demand increases, the setpoint shall incrementally reset down to a minimum of 53°F (adj.).
As cooling demand decreases, the setpoint shall incrementally reset up to a maximum of 72°F (adj.).
If more zones need heating than cooling, then the supply air temperature setpoint shall be reset for heating as follows:
The initial supply air temperature setpoint shall be 82°F (adj.).
As heating demand increases, the setpoint shall incrementally reset up to a maximum of 85°F (adj.).
As heating demand decreases, the setpoint shall incrementally reset down to a minimum of 72°F (adj.).

Cooling Coil Valve:
The controller shall measure the supply air temperature and modulate the cooling coil valve to maintain its cooling setpoint. When cooling is required, an outgoing request will be sent to Bldg. Chilled water pump system.

Heating Coil Valve:
The controller shall measure the supply air temperature and modulate the heating coil valve to maintain its heating setpoint. When heating is required, an outgoing request will be sent to Bldg. Hot Water System.

 Relief Damper Control:
The Relief Damper will open during Economizer Mode. All other times it will be closed.

Smoke Detector:
The B.A.S. will monitor the smoke detector. If the contacts of the smoke detector close, an alarm will be sent to the central site.
Supply Air Temperature:
The controller will monitor the supply air temperature.

Alarms will be provided as follows:
- High Supply Air Temp: If the supply air temperature is greater than 120°F (adj.) for 5 minutes (adj.).
- Low Supply Air Temp: If the supply air temperature is less than 40°F (adj.) for 5 minutes (adj.).

Mixed Air Temperature:
The controller will monitor the mixed air temperature.

Alarms will be provided as follows:
- Mixed Air Temp: If the mixed air temperature is greater than 90°F (adj.) for 5 minutes (adj.).
- Mixed Air Temp: If the mixed air temperature is less than 45°F (adj.) for 5 minutes (adj.).

Return Air Temperature:
The controller will monitor the return air temperature.

Alarms will be provided as follows:
- Return Air Temp: If the return air temperature is greater than 90°F (adj.) for 5 minutes (adj.).
- Return Air Temp: If the return air temperature is less than 45°F (adj.) for 5 minutes (adj.).

Return Humidity:
The controller will monitor the Return Humidity.

Alarms will be provided as follows:
- High Zone Humidity: If the zone humidity is greater than 70%rh (adj.) for 5 minutes (adj.).
- Low Zone Humidity: If the zone humidity is less than 35%rh (adj.) for 5 minutes (adj.).

Economizer:
The controller will measure the zone temperature and modulate the economizer dampers in sequence to maintain a setpoint 2°F less than the zone cooling setpoint. The outside air dampers will maintain a minimum adjustable position of 20% (adj.) open whenever occupied.

The economizer will be enabled whenever:
- Outside air temperature is less than 65°F (adj.).
- AND the outside air enthalpy is less than 228Btu/lb (adj.).
- AND the outside air temperature is less than the return air temperature.
- AND the outside air enthalpy is less than the return air enthalpy.
- AND the supply fan status is on.
- AND the unit is occupied.

The economizer will close whenever:
- Mixed air temperature drops from 45°F to 40°F (adj.),
- OR on loss of supply fan status,
- OR freeze condition,
- OR unit is unoccupied.

The outside air dampers will close and the return air damper will open when the unit is off. If Optimal Start Up is available outside air damper will remain fully closed.

Alarms will be provided as follows:
- Economizer Hunting.
### MAU & KEF Module Layout

#### Bill of Material

<table>
<thead>
<tr>
<th>Vendor</th>
<th>Part Number</th>
<th>Product Description</th>
<th>Manufacturer</th>
<th>Panel Or Field</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Siemens</td>
<td>134-1504</td>
<td>Low-Limit Temp Sw, DPDT, Man Rst, 15-55F, 20'</td>
<td>Siemens</td>
<td>F</td>
<td>1</td>
</tr>
<tr>
<td>Veris</td>
<td>AA06</td>
<td>Duct Static Pressure Pickup 4&quot;</td>
<td>Veris</td>
<td>F</td>
<td>4</td>
</tr>
<tr>
<td>Dwyer</td>
<td>ADPS-08-1-N</td>
<td>Filter Differential Pressure Switch, 0.08-1.20'WC</td>
<td>Dwyer</td>
<td>F</td>
<td>1</td>
</tr>
<tr>
<td>Kele</td>
<td>AFS-460-DSS</td>
<td>Differential Pressure Switch, 2-12 in. WC, 2-SPST, Manu. Reset (NC, NC)</td>
<td>Cleveland</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BAPI</td>
<td>BA/10K-2-A-12-BSX</td>
<td>Continuous Averaging, 12' Length, 10K-2 and BAPI BOX Enclosure</td>
<td>BAPI</td>
<td>F</td>
<td>4</td>
</tr>
<tr>
<td>BAPI</td>
<td>BA/ZPM-ST-ST-D</td>
<td>ZPM Standard Range Unit, with Static Pressure Tube, with Display</td>
<td>BAPI</td>
<td>F</td>
<td>1</td>
</tr>
<tr>
<td>Automated Logic</td>
<td>FIO812U</td>
<td>I/O Expander, 4 UO, 12 Ul</td>
<td>Automated Logic</td>
<td>P</td>
<td>1</td>
</tr>
<tr>
<td>Automated Logic</td>
<td>FIO012u</td>
<td>I/O Expander, 12 Ul</td>
<td>Automated Logic</td>
<td>P</td>
<td>2</td>
</tr>
<tr>
<td>Belimo</td>
<td>H608</td>
<td>Current Switch, Adjustable Trip, Split Core</td>
<td>Belimo</td>
<td>F</td>
<td>1</td>
</tr>
<tr>
<td>Automated Logic</td>
<td>OFBBC</td>
<td>BACnet Building Controller</td>
<td>Automated Logic</td>
<td>P</td>
<td>1</td>
</tr>
<tr>
<td>ALPS</td>
<td>RH2B-ULAC24V+SH2B-05</td>
<td>Control Relay, DPDT,24VAC,LED,w/ Socket</td>
<td>Idac</td>
<td>P</td>
<td>3</td>
</tr>
<tr>
<td>ALPS</td>
<td>RH2B-ULDC24V+SH2B-05</td>
<td>Control Relay, DPDT,24VDC,LED,w/ Socket</td>
<td>Idac</td>
<td>P</td>
<td>1</td>
</tr>
</tbody>
</table>

---

![Diagram of MAU & KEF Module Layout](image-url)
**KEF Run Conditions:**

The KEF will run when energized by local switch.

The B.A.S. will monitor the exhaust fan status and the B.A.S. will send a run request to the MAU when any exhaust fan proves status.

Alarms shall be provided as follows:
- KEF Runtime Exceeded: Status runtime exceeds 10,000 hours (adj.).

**Bill of Material w/ Tags**

<table>
<thead>
<tr>
<th>Tag</th>
<th>Vendor</th>
<th>Part Number</th>
<th>Product Description</th>
<th>Manufacturer</th>
<th>Panel/Field</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>IS-S</td>
<td>Veris</td>
<td>H608</td>
<td>Current Switch, Adjustable Trip, Split Core</td>
<td>Veris</td>
<td>F</td>
<td>18</td>
</tr>
</tbody>
</table>

**Example:** BACNET://14100:X/AI:01

**MSTP# Address Table**

<table>
<thead>
<tr>
<th>Equipment</th>
<th>MSTP#</th>
<th>Address Table</th>
</tr>
</thead>
<tbody>
<tr>
<td>KEF-1</td>
<td>14100</td>
<td></td>
</tr>
<tr>
<td>KEF-2</td>
<td>14100</td>
<td>3</td>
</tr>
<tr>
<td>KEF-3</td>
<td>14100</td>
<td>4</td>
</tr>
<tr>
<td>KEF-4</td>
<td>14100</td>
<td>5</td>
</tr>
<tr>
<td>KEF-5</td>
<td>14100</td>
<td>6</td>
</tr>
<tr>
<td>KEF-6</td>
<td>14100</td>
<td>7</td>
</tr>
<tr>
<td>KEF-7</td>
<td>14100</td>
<td>8</td>
</tr>
<tr>
<td>KEF-8</td>
<td>14100</td>
<td>9</td>
</tr>
<tr>
<td>KEF-9</td>
<td>14100</td>
<td>10</td>
</tr>
<tr>
<td>KEF-10</td>
<td>14100</td>
<td>11</td>
</tr>
<tr>
<td>KEF-11</td>
<td>14100</td>
<td>12</td>
</tr>
<tr>
<td>KEF-12</td>
<td>14100</td>
<td>13</td>
</tr>
<tr>
<td>KEF-13</td>
<td>14100</td>
<td>14</td>
</tr>
<tr>
<td>KEF-14</td>
<td>14100</td>
<td>15</td>
</tr>
<tr>
<td>KEF-15</td>
<td>14100</td>
<td>16</td>
</tr>
<tr>
<td>KEF-16</td>
<td>14100</td>
<td>17</td>
</tr>
<tr>
<td>KEF-17</td>
<td>14100</td>
<td>18</td>
</tr>
<tr>
<td>KEF-18</td>
<td>14100</td>
<td>19</td>
</tr>
</tbody>
</table>
Example: BACNET://XXXX-X/AI:01

<table>
<thead>
<tr>
<th>Equipment</th>
<th>MSTP#</th>
<th>Address Table</th>
</tr>
</thead>
<tbody>
<tr>
<td>Captive Air Kitchen Unit</td>
<td></td>
<td>X</td>
</tr>
</tbody>
</table>

1. BMS will monitor/trend the following points:
   1. 

2. BMS will provide the following commands:
   1. 

Pending RFI #3
Bill of Material

<table>
<thead>
<tr>
<th>Vendor</th>
<th>Part Number</th>
<th>Product Description</th>
<th>Manufacturer</th>
<th>Panel Or Field</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALPS</td>
<td>PSB100AB10</td>
<td>Enclosed Single Pwr Supply, 100VA</td>
<td>Functional Devices</td>
<td>P</td>
<td>1</td>
</tr>
<tr>
<td>Kele</td>
<td>SCE362406LP</td>
<td>30&quot;x24&quot;x8&quot; Enclosure, NEMA 4</td>
<td>Saginaw</td>
<td>P</td>
<td>1</td>
</tr>
<tr>
<td>Kele</td>
<td>SCE362P54</td>
<td>30&quot;x24&quot;x8&quot; Enclosure Back Plate</td>
<td>Saginaw</td>
<td>P</td>
<td>1</td>
</tr>
<tr>
<td>ALPS</td>
<td>TR150VA001</td>
<td>Xfmr 150VA,120:24,Utc Brkr, UL</td>
<td>Functional Devices</td>
<td>P</td>
<td>1</td>
</tr>
</tbody>
</table>

30"x24"x8" Enclosure

- OFBBC-NC
- Expander 1
- Expander 2
- Expander 3
- 150VA
- 150VA
- 100VA

Bond Secondary Neutrals
Zone Occupancy:
The unit will run whenever:
- The controller receives more than 0 cooling/heating requests or any time a Kitchen Exhaust Fan turns on.

Supply Fan Command
The supply fan will run anytime the unit is commanded to run, unless shutdown on safeties. To prevent short cycling, the supply fan will have a 1:00 minute (adj.) minimum runtime.

Supply Fan Status
The controller will monitor the status of the fan thru a current switch.
Alarms will be provided as follows:
- Supply Fan Failure: Fan is commanded on, but the status is off.
- Supply Fan in Hand: Fan is commanded off, but the status is on.
- Supply Fan Runtime Exceeded: Status runtime exceeds 10,000 hours (adj.)

Supply Fan Static Pressure Control
The controller will measure duct static pressure and will modulate the supply fan VSD speed to maintain a duct static pressure setpoint of .75in H2O (adj.).

The supply fan VSD speed will not drop below 20Hz (adj.) during Operation.

Supply Air Temperature Setpoint
The controller shall monitor the supply air temperature and shall maintain a supply air temperature setpoint.
The supply air temperature setpoint shall be 55°F (adj.).

Cooling Coil Valve:
The controller shall measure the supply air temperature and modulate the cooling coil valve to maintain its cooling setpoint. When cooling is required, an outgoing request will be sent to Bldg. Chilled water pump system.

The cooling shall be enabled whenever:
- Outside air temperature is greater than 60°F (adj.).
- AND the economizer is disabled or fully open.
- AND the supply fan status is on.
- AND the heating is not active.

The cooling coil valve shall open whenever the freezestat is on.
Alarms shall be provided as follows:
- High Supply Air Temp: If the supply air temperature is 5°F (adj.) greater than setpoint when active.

High Static Limit:
The unit will shut down and generate an alarm upon receiving an alarm from the high static pressure switch. The High Static Switch will have a manual reset.
Alarms will be provided as follows:
- High Static Pressure Switch: If the input becomes active

Supply Air Temperature Setpoint
The controller shall monitor the supply air temperature and shall maintain a supply air temperature setpoint.
The supply air temperature setpoint shall be 55°F (adj.).

Cooling Coil Valve:
The controller shall measure the supply air temperature and modulate the cooling coil valve to maintain its cooling setpoint. When cooling is required, an outgoing request will be sent to Bldg. Chilled water pump system.

The cooling shall be enabled whenever:
- Outside air temperature is greater than 60°F (adj.).
- AND the economizer is disabled or fully open.
- AND the supply fan status is on.
- AND the heating is not active.

The cooling coil valve shall open whenever the freezestat is on.
Alarms shall be provided as follows:
- High Supply Air Temp: If the supply air temperature is 5°F (adj.) greater than setpoint when active.

Heat exchanger Coolant Valve:
The controller shall measure the supply air temperature and modulate the heat exchanger coolant valve to maintain its heating setpoint of 55°F (adj.). When heating is required, an outgoing request will be sent to bldg. hot water system.

The heating shall be enabled whenever:
- Outside air temperature is less than 65°F (adj.).
- AND the supply fan status is on.
- AND the cooling is not active.

The heating coil valve shall open whenever:
- Supply air temperature drops from 40°F to 35°F (adj.).
- OR the freezestat is on.
Alarms shall be provided as follows:
- Low Supply Air Temp: If the supply air temperature is 5°F (adj.) less than setpoint.
- High Supply Air Temp: If the supply air temperature is greater than 120°F (adj.).

Return Damper Control:
The Return Damper will open when unit is active. All other times it will be closed.

Freeze Protection:
The unit shall shut down and generate an alarm upon receiving a freezestat status & open CHW Valve 100%.

Smoke Detector:
The B.A.S. will monitor the smoke detector. If the contacts of the smoke detector close, an alarm will be sent to the central site.
Bill of Material w/ Tags

<table>
<thead>
<tr>
<th>Tag</th>
<th>Vendor</th>
<th>Part Number</th>
<th>Product Description</th>
<th>Manufacturer</th>
<th>Panel/Field</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALC-1</td>
<td>Automated Logic</td>
<td>ZN341A</td>
<td>Zone Controller for VAV w/ Actuator, 3DO, 4UI, 1AO</td>
<td>Automated Logic</td>
<td>F</td>
<td>17</td>
</tr>
<tr>
<td>TE-1</td>
<td>Automated Logic</td>
<td>ZS2P-C-ALC</td>
<td>Zone Sensor - ZS2 Pro-Temp, SP Adj. CO2</td>
<td>Automated Logic</td>
<td>F</td>
<td>17</td>
</tr>
<tr>
<td>TE-2</td>
<td>BAPI</td>
<td>BA-10K-2-D-4&quot;-BBX</td>
<td>Duct, 4&quot; Insertion, BAPI Box</td>
<td>BAPI</td>
<td>F</td>
<td>17</td>
</tr>
</tbody>
</table>

Actuator Note:
Prior to linking damper, depress clutch release button and rotate actuator collar fully clockwise. Link Damper open. Motor turns counter clockwise to close.

Note: Cable shields not shown on panel end.

Points List with Spares

<table>
<thead>
<tr>
<th>Controller</th>
<th>MAC</th>
<th>Point Number</th>
<th>Point Name</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>ZN341A</td>
<td>1</td>
<td>AO-01</td>
<td>Spare</td>
<td>0-10V</td>
</tr>
<tr>
<td>ZN341A</td>
<td>1</td>
<td>BO-01</td>
<td>Spare</td>
<td>NO</td>
</tr>
<tr>
<td>ZN341A</td>
<td>1</td>
<td>BO-02</td>
<td>Spare</td>
<td>NO</td>
</tr>
<tr>
<td>ZN341A</td>
<td>1</td>
<td>BO-03</td>
<td>Spare</td>
<td>NO</td>
</tr>
<tr>
<td>ZN341A</td>
<td>1</td>
<td>IN-01</td>
<td>Supply Air Temp Th/DC</td>
<td></td>
</tr>
<tr>
<td>ZN341A</td>
<td>1</td>
<td>IN-02</td>
<td>Occupancy Sensor Th/DC</td>
<td></td>
</tr>
<tr>
<td>ZN341A</td>
<td>1</td>
<td>IN-03</td>
<td>Spare</td>
<td>Th/DC</td>
</tr>
<tr>
<td>ZN341A</td>
<td>1</td>
<td>IN-04</td>
<td>Spare</td>
<td>Th/DC</td>
</tr>
<tr>
<td>ZN341A</td>
<td>1</td>
<td>RNET</td>
<td>Zone Temperature RN</td>
<td></td>
</tr>
</tbody>
</table>

Drawing Notes:
- Refer to Mechanical drawings for space temperature sensor locations. Space temperature sensor will be field mounted at 48" AFF or as specified.
Variable Air Volume - Terminal Unit Sequence of Operation

Zone Occupancy:
The unit will have an occupancy schedule and will run according to a user definable schedule.

Run Conditions - Scheduled:
The unit shall run according to a user definable time schedule in the following modes:

Occupied Mode: The unit shall maintain
A 75°F (adj.) cooling setpoint
A 70°F (adj.) heating setpoint.

Unoccupied Mode (night setback): The unit shall maintain
A 85°F (adj.) cooling setpoint.
A 55°F (adj.) heating setpoint.

Alarms shall be provided as follows:
High Zone Temp: If the zone temperature is greater than the cooling setpoint by a user definable amount (adj.).
Low Zone Temp: If the zone temperature is less than the heating setpoint by a user definable amount (adj.).

Timed Local Override (TLO) Control:
A momentary push button, at zone sensor will energize the unit for after hour operation (Non-Schedule). Each time the momentary button is pushed the unit will be energized for 30 minutes (adj.), up to a maximum of an 1 1/2 hours (adj.). If the switch is pushed continuously for 3 seconds (adj.), the override will be canceled.

Zone Setpoint Adjust:
The occupant will be able to adjust the zone temperature +/-2 degrees from the heating and cooling setpoints at the zone sensor.

Alarms shall be provided as follows:
High Zone Temp: If the zone temperature is greater than the cooling setpoint by 2°F (adj.).
Low Zone Temp: If the zone temperature is less than the heating setpoint by 2°F (adj.).

Zone Sensor CO2: (If Applicable)
The BAS will monitor the CO2 reading from the Zone Temperature Sensor and will display this reading at the central site.

When CO2 Reading is 700ppm (adj.) or greater the B.A.S will modulate from minimum to maximum CFM Setpoint unit reading is less than setpoint. If Zone CO2 reading reaches 1200 ppm. Or B.A.S. determines a sensor failure condition, the B.A.S. will alarm the central site.

Alarms shall be provided as follows:
High CO2 Reading Alarm: If the CO2 reading is greater than 700 ppm (adj.).

Reversing Variable Volume Terminal Unit - Flow Control:
The unit shall maintain zone setpoints by controlling the airflow through one of the following:

Occupied:
When zone temperature is greater than its cooling setpoint, the zone damper shall modulate between the minimum occupied airflow (adj.) and the maximum cooling airflow (adj.) until the zone is satisfied.
When the zone temperature is between the cooling setpoint and the heating setpoint, the zone damper shall maintain the minimum required zone ventilation (adj.).
When zone temperature is less than its heating setpoint, the controller shall modulate to maintain minimum airflow.

Unoccupied:
When the zone is unoccupied the zone damper shall control to its minimum unoccupied airflow (adj.).
When the zone temperature is greater than its cooling setpoint, the zone damper shall modulate between the minimum unoccupied airflow (adj.) and the maximum cooling airflow (adj.) until the zone is satisfied.
When zone temperature is less than its unoccupied heating setpoint, the controller shall enable heating to maintain the zone temperature at the setpoint.

Trends:
Trends can be enabled on the VAV graphic to provide information about the Terminal Unit. These Trends can track an array of points such as Zone Temp, Supply Air Temp, Airflow and Demand Level.

Supply Air Temperature:
The controller shall monitor the discharge air temperature.
Alarms shall be provided as follows:
High Discharge Air Temp: If the discharge air temperature is greater than 120°F (adj.).
Low Discharge Air Temp: If the discharge air temperature is less than 40°F (adj.).
Bill of Material w/ Tags

<table>
<thead>
<tr>
<th>Tag</th>
<th>Vendor</th>
<th>Part Number</th>
<th>Product Description</th>
<th>Manufacturer</th>
<th>Panel/Field</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALC-2</td>
<td>Automated Logic</td>
<td>ZNH41A</td>
<td>Zone Controller for VAV w/ Actuator, 3DO, 4UI, 1AO</td>
<td>Automated Logic</td>
<td>F</td>
<td>41</td>
</tr>
<tr>
<td>TE-3</td>
<td>Automated Logic</td>
<td>ZS2P-C-ALC</td>
<td>Zone Sensor - ZS2 Pro-Temp, SP Adj, CO2</td>
<td>Automated Logic</td>
<td>F</td>
<td>41</td>
</tr>
<tr>
<td>TE-4</td>
<td>BAPI</td>
<td>BA/10K-2-D-4&quot;-BBX</td>
<td>Duct, 4&quot; Insertion, BAPI Box</td>
<td>BAPI</td>
<td>F</td>
<td>41</td>
</tr>
</tbody>
</table>

Drawing Notes:
- Refer to Mechanical drawings for space temperature sensor locations. Space temperature sensor will be field mounted at 48" A/F or as specified.
- Note: Cable shields not shown on panel end.
Variable Air Volume - Terminal Unit Sequence of Operation

Zone Occupancy:
The unit will have an occupancy schedule and will run according to a user definable schedule.

Run Conditions - Scheduled:
The unit shall run according to a user definable schedule in the following modes:
- Occupied Mode: The unit shall maintain
  - A 75°F (adj.) cooling setpoint
  - A 70°F (adj.) heating setpoint.
- Unoccupied Mode (night setback): The unit shall maintain
  - A 85°F (adj.) cooling setpoint.
  - A 55°F (adj.) heating setpoint.

Alarms shall be provided as follows:
- High Zone Temp: If the zone temperature is greater than the cooling setpoint by a user definable amount (adj.).
- Low Zone Temp: If the zone temperature is less than the heating setpoint by a user definable amount (adj.).

Timed Local Override (TLO) Control:
A momentary push button, at zone sensor will energize the unit for after hour operation (Non-Schedule). Each time the momentary button is pushed the unit will be energized for 30 minutes (adj.), up to a maximum of an 1 1/2 hours (adj.). If the switch is pushed continuously for 3 seconds (adj.), the override will be canceled.

Zone Setpoint Adjust:
The occupant will be able to adjust the zone temperature +/- 2 degrees from the heating and cooling setpoints at the zone sensor.

Alarms shall be provided as follows:
- High Zone Temp: If the zone temperature is greater than the cooling setpoint by 2°F (adj.).
- Low Zone Temp: If the zone temperature is less than the heating setpoint by 2°F (adj.).

Zone Sensor CO2: (If Applicable)
The BAS will monitor the CO2 reading from the Zone Temperature Sensor and will display this reading at the central site.

When CO2 Reading is 700ppm (adj.) or greater the BAS will modulate from minimum to maximum CFM setpoint. If Zone CO2 reading reaches 1200 ppm. Or BAS determines a sensor failure condition, the BAS will alarm the central site.

Alarms shall be provided as follows:
- High CO2 Reading Alarm: If the CO2 reading is greater than 700 ppm (adj.).

Reversing Variable Volume Terminal Unit - Flow Control:
The unit shall maintain zone setpoints by controlling the airflow through one of the following:

Occupied:
- When zone temperature is greater than its cooling setpoint, the zone damper shall modulate between the minimum occupied airflow (adj.) and the maximum cooling airflow (adj.) until the zone is satisfied.
- When the zone temperature is between the cooling setpoint and the heating setpoint, the zone damper shall maintain the minimum required zone ventilation (adj.).
- When zone temperature is less than its heating setpoint, the controller shall modulate to maintain minimum airflow.

Unoccupied:
- When the zone is unoccupied the zone damper shall control to its minimum unoccupied airflow (adj.).
- When the zone temperature is greater than its cooling setpoint, the zone damper shall modulate between the minimum unoccupied airflow (adj.) and the maximum cooling airflow (adj.) until the zone is satisfied.
- When zone temperature is less than its unoccupied heating setpoint, the controller shall enable heating to maintain the zone temperature at the setpoint.

Trends:
Trends can be enabled on the VAV graphic to provide information about the Terminal Unit. These Trends can track an array of points such as Zone Temp, Supply Air Temp, Airflow and Demand Level.

Heating Coil Valve:
The controller shall measure the supply air temperature and modulate the heating coil valve to maintain its heating setpoint.
- If the space temperature drops, the hot water valve is increased from a minimum hot water valve position to a maximum position. If the space temperature still continues to drop, the heating minimum airflow setpoint will be increased to a heating maximum airflow.
- The heating shall be enabled whenever:
  - Outside air temperature is less than 65°F (adj.).
  - AND the cooling is not active.
- Alarms shall be provided as follows:
  - Low Supply Air Temp: If the supply air temperature is 5°F (adj.) less than setpoint.

Supply Air Temperature:
The controller shall monitor the discharge air temperature.
- Alarms shall be provided as follows:
  - High Discharge Air Temp: If the discharge air temperature is greater than 120°F (adj.).
  - Low Discharge Air Temp: If the discharge air temperature is less than 40°F (adj.).
Sequence of Operations:

**Exhaust Fan Occupancy:**
The exhaust fan is occupied the per B.A.S. schedule. The B.A.S. will monitor fan status and will alarm at the central site if status is not made within 60 seconds (adjustable). There is a 10 second (adjustable) de-bounce time to prevent nuisance alarms. The exhaust fan will be off during unoccupied mode.

**Exhaust Fan Damper Interlock:**
The B.A.S. will energize the associated fans motorized damper and energize the fan through interlock. The Damper shall close when the fan is off and open when enabled. The fan shall be allow to run when the motorized damper is proven open by the end position switches. The exhaust fan shall shut down on a fire or smoke alarm.

**Exhaust Fan Alarms:**
Alarms shall be provided as follows:
- Exhaust Fan Failure: Commanded on, but the status is off.
- Exhaust Fan in Hand: Commanded off, but the status is on.
- Damper Failure: Commanded on, but the status is closed after a time delay matching actuator stroke time.
- Damper in Hand: Commanded closed, but the status is open after a time delay matching actuator spring return time.
Run Conditions - Scheduled:
The unit shall run according to a user definable time schedule in the following modes:

Occupied Mode: The unit shall maintain
A 74°F (adj.) cooling setpoint
A 70°F (adj.) heating setpoint.
Unoccupied Mode (night setback): The unit shall maintain
A 85°F (adj.) cooling setpoint.
A 55°F (adj.) heating setpoint.

Alarms shall be provided as follows:
High Zone Temp: If the zone temperature is greater than the cooling setpoint by a user definable amount (adj.).
Low Zone Temp: If the zone temperature is less than the heating setpoint by a user definable amount (adj.).

Zone Optimal Start:
The unit shall use an optimal start algorithm for morning start-up. This algorithm shall minimize the unoccupied warm-up or cool-down period while still achieving comfort conditions by the start of scheduled occupied period.

Supply Fan:
The supply fan shall run anytime the unit is commanded to run, unless shutdown on safeties. To prevent short cycling, the supply fan shall have a 3 min (adj.) minimum runtime.

Alarms shall be provided as follows:
Supply Fan Failure: Commanded on, but the status is off.
Supply Fan In Hand: Commanded off, but the status is on.
Supply Fan Runtime Exceeded: Status runtime exceeds a user definable limit (adj.).

Cooling Coil Valve:
The controller shall measure the supply air temperature and modulate the cooling coil valve to maintain its cooling setpoint. When cooling is required, an outgoing request will be sent to CHW plant.

The cooling shall be enabled whenever:
Outside air temperature is greater than 60°F (adj.).
AND the economizer is disabled or fully open.
AND the supply fan status is on.
AND the heating is not active.

The cooling coil valve shall open to 50% (adj.) whenever the freezestat is on.

Alarms shall be provided as follows:
High Supply Air Temp: If the supply air temperature is greater than 120°F (adj.).
Low Supply Air Temp: If the supply air temperature is less than 45°F (adj.).

Freeze Protection:
The unit shall shut down, open the Chilled Water Valve and generate an alarm upon receiving a freezestat status.

Smoke Detector:
The B.A.S. will monitor the smoke detector. If the contacts of the smoke detector close, an alarm will be sent to the central site. Interlock wiring to the starter will be done by others.

Filter Status:
The controller shall monitor the pre-filter status.
Alarms shall be provided as follows:
Filter Change Required: Filter differential pressure exceeds 1.25” S.P. (Adj.) will energize an Alarm to the BAS.

Supply Air Temperature:
The controller shall monitor the supply air temperature.
Alarms shall be provided as follows:
High Supply Air Temp: If the supply air temperature is greater than 120°F (adj.).
Low Supply Air Temp: If the supply air temperature is less than 45°F (adj.).

Environmental Index:
When the zone is occupied, the controller will monitor the deviation of the zone temperature from the heating or cooling setpoint and calculate a 0 - 100% Environmental Index which gives an indication of how well the zone is maintaining comfort. The controller will also calculate the percentage of time since occupancy began that the Environmental Index is 70% or higher. Optionally, a weighting factor can be configured to adjust the contribution of the zone to the rollup average index based upon the floor area of the zone, importance of the zone, or other static criteria.

Smoke Detector
The B.A.S. will monitor the smoke detector. If the contacts of the smoke detector close, an alarm will be sent to the central site. Interlock wiring to the starter will be done by others.

Filter Status:
The controller shall monitor the pre-filter status.
Alarms shall be provided as follows:
Filter Change Required: Filter differential pressure exceeds 1.25” S.P. (Adj.) will energize an Alarm to the BAS.

Supply Air Temperature:
The controller shall monitor the supply air temperature.
Alarms shall be provided as follows:
High Supply Air Temp: If the supply air temperature is greater than 120°F (adj.).
Low Supply Air Temp: If the supply air temperature is less than 45°F (adj.).

Environmental Index:
When the zone is occupied, the controller will monitor the deviation of the zone temperature from the heating or cooling setpoint and calculate a 0 - 100% Environmental Index which gives an indication of how well the zone is maintaining comfort. The controller will also calculate the percentage of time since occupancy began that the Environmental Index is 70% or higher. Optionally, a weighting factor can be configured to adjust the contribution of the zone to the rollup average index based upon the floor area of the zone, importance of the zone, or other static criteria.
Split System AC Schedule

<table>
<thead>
<tr>
<th>Split System</th>
<th>Location</th>
<th>CFM</th>
</tr>
</thead>
<tbody>
<tr>
<td>AC-1</td>
<td>IDF</td>
<td>300</td>
</tr>
<tr>
<td>AC-2</td>
<td>IDF</td>
<td>300</td>
</tr>
</tbody>
</table>

Bill of Material w/ Tags

<table>
<thead>
<tr>
<th>Tag</th>
<th>Vendor</th>
<th>Part Number</th>
<th>Product Description</th>
<th>Manufacturer</th>
<th>Panel/Field</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>SUB-1</td>
<td>ALPS</td>
<td>CSE-992</td>
<td>Dust Can</td>
<td>Veris</td>
<td>P</td>
<td>2</td>
</tr>
<tr>
<td>ALC-1</td>
<td>Automated Logic</td>
<td>ZN551</td>
<td>Zone Controller, SDO, 5, 1DO</td>
<td>Automated Logic</td>
<td>P</td>
<td>2</td>
</tr>
<tr>
<td>TE-1</td>
<td>Automated Logic</td>
<td>ZS2P-ALC</td>
<td>25 Pro Space Temp Sensor, Indoor, LCD, SP Adj, Duct</td>
<td>Automated Logic</td>
<td>P</td>
<td>2</td>
</tr>
<tr>
<td>TE-2</td>
<td>BAPI BA10K-3 D-2'-88X</td>
<td>Duct, 4&quot; Insertion in BAPI BOX</td>
<td>BAPI</td>
<td>P</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>PS-2</td>
<td>Dwyer</td>
<td>ADPS-08-1-N</td>
<td>Filter Differential Pressure Switch, 0.08-1.20&quot;WC</td>
<td>Dwyer</td>
<td>F</td>
<td>2</td>
</tr>
<tr>
<td>IS-1</td>
<td>Veris</td>
<td>H600</td>
<td>Current Switch, Split Core, Setpoint to 0.5A, Mini</td>
<td>Veris</td>
<td>F</td>
<td>2</td>
</tr>
<tr>
<td>P-3</td>
<td>Veris</td>
<td>AA06</td>
<td>Duct Static Pressure Pickup 4&quot;</td>
<td>Veris</td>
<td>F</td>
<td>2</td>
</tr>
<tr>
<td>P-4</td>
<td>Veris</td>
<td>AA06</td>
<td>Duct Static Pressure Pickup 4&quot;</td>
<td>Veris</td>
<td>F</td>
<td>2</td>
</tr>
<tr>
<td>YS-1</td>
<td>Veris</td>
<td>ACS-3</td>
<td>Auxiliary In-Line Condensate Overflow Safety Switch</td>
<td>Veris</td>
<td>F</td>
<td>2</td>
</tr>
</tbody>
</table>
Run Conditions - Scheduled:
The unit shall run 24/7 to maintain 72°F (adj.)

Alarms shall be provided as follows:
High Zone Temp: If the zone temperature is greater than the cooling setpoint by 5°F (adj.).
Low Zone Temp: If the zone temperature is less than the cooling setpoint by 5°F (adj.).

Supply Fan:
The supply fan shall run anytime the unit is commanded to run, unless shutdown on safeties. To prevent short cycling, the supply fan shall have a 3 min (adj.) minimum runtime.

Alarms shall be provided as follows:
Supply Fan Failure: Commanded on, but the status is off.
Supply Fan in Hand: Commanded off, but the status is on.
Supply Fan Runtime Exceeded: Status runtime exceeds a user definable limit (adj.).

Cooling Stages:
The controller shall measure the zone temperature and stage the cooling to maintain its cooling setpoint. To prevent short cycling, there shall be a 5 min (adj.) delay between stages, and each stage shall have a 5 min (adj.) minimum runtime.
The cooling shall be enabled whenever:
The zone temperature is above cooling setpoint.
AND the supply fan status is on.

Filter Status:
The controller shall monitor the pre-filter status.
Alarms shall be provided as follows:
Filter Change Required: Filter differential pressure exceeds 1.25" S.P. (Adj.) will energize an Alarm to the BAS.

Condensate Overflow:
The B.A.S. will monitor a condensate switch in the auxiliary drain pan. When the contacts of the switch open, an alarm will be sent to the central site. All fans associated with the unit will be stopped and the cooling will be locked out.

Supply Air Temperature:
The controller shall monitor the supply air temperature.
Alarms shall be provided as follows:
High Supply Air Temp: If the supply air temperature is greater than 120°F (adj.).
Low Supply Air Temp: If the supply air temperature is less than 45°F (adj.).

Environmental Index:
When the zone is occupied, the controller will monitor the deviation of the zone temperature from the heating or cooling setpoint and calculate a 0 - 100% Environmental Index which gives an indication of how well the zone is maintaining comfort. The controller will also calculate the percentage of time since occupancy began that the Environmental Index is 70% or higher. Optionally, a weighting factor can be configured to adjust the contribution of the zone to the rollup average index based upon the floor area of the zone, importance of the zone, or other static criteria.
## Bill of Materials

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Product Description</th>
<th>Manufacturer</th>
<th>Panel Or Field</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>13A-1510</td>
<td>Low-Limit Temp Swi,SPDT,Auto Rst,RS-45-25W</td>
<td>Siemens</td>
<td>F</td>
<td>4</td>
</tr>
<tr>
<td>AAR</td>
<td>Duct Static Pressure Pickup 4’</td>
<td>Varia</td>
<td>F</td>
<td>44</td>
</tr>
<tr>
<td>AAR</td>
<td>ARChnet/ARChnet Router</td>
<td>Automated</td>
<td>Logic</td>
<td>P 1</td>
</tr>
<tr>
<td>ACS-3</td>
<td>Auxiliary In-Line Condensate Overflow Safety Switch</td>
<td>Varia</td>
<td>F</td>
<td>6</td>
</tr>
<tr>
<td>ADF-68-1-T</td>
<td>Filter Differential Pressure Switch, 0.08-1.25 SWC</td>
<td>Dwyer</td>
<td>F</td>
<td>13</td>
</tr>
<tr>
<td>AFS-222</td>
<td>Differential Pressure Switch, 0-12 in, WC, SPDT, Auto Reset</td>
<td>Cleveland</td>
<td>F</td>
<td>4</td>
</tr>
<tr>
<td>AFS-460-DES</td>
<td>Differential Pressure Switch, 2-12 in, WC, SPST, Man. Reset (NC, NC)</td>
<td>Cleveland</td>
<td>F</td>
<td>10</td>
</tr>
<tr>
<td>AFS-240</td>
<td>Alarm Indication Station - light, horn, silence button - 24VDC</td>
<td>Kele</td>
<td>F</td>
<td>1</td>
</tr>
<tr>
<td>ALC/10K-2-1”-BB-VB</td>
<td>Immersion 2” Insertion in BAP BOX NEMA 4X, wireless Thermowell</td>
<td>BAPI</td>
<td>F</td>
<td>6</td>
</tr>
<tr>
<td>ALC/10K-2-C-BB</td>
<td>Humidity 2%, Duct 1, BAP BOX NEMA 4X</td>
<td>BAPI</td>
<td>F</td>
<td>2</td>
</tr>
<tr>
<td>ASD-922</td>
<td>Outdoor CO/CO2 Temp Transmitter with 10K Type 2 Thermistor</td>
<td>Sensa</td>
<td>F</td>
<td>1</td>
</tr>
<tr>
<td>AWX</td>
<td>ARChnet to MS/TP Router</td>
<td>Automated</td>
<td>Logic</td>
<td>P 19</td>
</tr>
<tr>
<td>BA/10K-2-2”-BBX</td>
<td>Continuous Averaging, 12 Length, 10K-2 and BAP BOX Enclosure</td>
<td>BAPI</td>
<td>F</td>
<td>14</td>
</tr>
<tr>
<td>BA/10K-2-2”-VBX</td>
<td>Duct, 4” Insertion, BAP Box</td>
<td>BAPI</td>
<td>F</td>
<td>64</td>
</tr>
<tr>
<td>BA/10K-2-FFP-5-BB</td>
<td>Strap On 10K-2 THMS Remote 5 Leads Weatherproof</td>
<td>BAPI</td>
<td>F</td>
<td>2</td>
</tr>
<tr>
<td>BA/PM5SR-ST-D</td>
<td>2PM Standard Range Unit, with Static Pressure Tube, with Display</td>
<td>BAPI</td>
<td>F</td>
<td>2</td>
</tr>
<tr>
<td>BA/PM5SR-ST-D</td>
<td>2PM Standard Range Unit, with Static Pressure Tube, with Display</td>
<td>BAPI</td>
<td>F</td>
<td>3</td>
</tr>
<tr>
<td>BT485</td>
<td>ARChnet156 Terminating and Busing plug in board (16 P)</td>
<td>Automated</td>
<td>Logic</td>
<td>P 1</td>
</tr>
<tr>
<td>B106</td>
<td>Economy Duct CO2, Field Selectable Output</td>
<td>Varia</td>
<td>F</td>
<td>3</td>
</tr>
<tr>
<td>C-932-927</td>
<td>9.25” x 24” x 2” 5” Duct Can</td>
<td>Versa</td>
<td>P</td>
<td>6</td>
</tr>
<tr>
<td>DIAG485</td>
<td>ARChnet156 Diagnostic Board, w/ 2 termination res. (2 pk)</td>
<td>Automated</td>
<td>Logic</td>
<td>P 3</td>
</tr>
<tr>
<td>F1040U</td>
<td>1/0 Expander, 4 LO, 8 UI</td>
<td>Automated</td>
<td>Logic</td>
<td>P 2</td>
</tr>
<tr>
<td>F10612U</td>
<td>1/0 Expander, 4 XI, 12 UI</td>
<td>Automated</td>
<td>Logic</td>
<td>P 5</td>
</tr>
<tr>
<td>F10012u</td>
<td>1/0 Expander, 12 XI</td>
<td>Automated</td>
<td>Logic</td>
<td>P 3</td>
</tr>
<tr>
<td>GC5CE</td>
<td>BACnet Integrator, ARChnet and MS/TP, Gigabit Ethernet</td>
<td>Automated</td>
<td>Logic</td>
<td>P 5</td>
</tr>
<tr>
<td>GTC116P</td>
<td>Gold Series AFMS, Analog/R485, Duct, Probe, Density based on field conditions</td>
<td>Eltron</td>
<td>F</td>
<td>2</td>
</tr>
<tr>
<td>H600</td>
<td>Current Switch, Spill Core, Setpoint 0.5A, Mini</td>
<td>Varia</td>
<td>F</td>
<td>6</td>
</tr>
<tr>
<td>H608</td>
<td>Current Switch, Adjustable Trip, Spill Core</td>
<td>Varia</td>
<td>F</td>
<td>27</td>
</tr>
<tr>
<td>H8ECM</td>
<td>Current Switch for EAD, Spill Core, 0.5A - 175A</td>
<td>Varia</td>
<td>F</td>
<td>4</td>
</tr>
<tr>
<td>NFB24-5</td>
<td>Dmprr. Act. 90 in. Spring Return, On/Off, 24 VAC, 2 Aux Switch</td>
<td>Balimo</td>
<td>F</td>
<td>8</td>
</tr>
<tr>
<td>NFB24-5L</td>
<td>Dmprr. Act. 90 in. Spring Return, 3, 10 V, 24 VAC, 2 Aux Switch</td>
<td>Balimo</td>
<td>F</td>
<td>7</td>
</tr>
<tr>
<td>OFBEC-MR</td>
<td>BACnet Building Controller</td>
<td>Automated</td>
<td>Logic</td>
<td>P 4</td>
</tr>
<tr>
<td>P00648</td>
<td>Gauge Pressure Sensor, 0.25 psi/deg., 4-20mA</td>
<td>Varia</td>
<td>F</td>
<td>4</td>
</tr>
<tr>
<td>P01485</td>
<td>ARChnet156 Protection Board</td>
<td>Automated</td>
<td>Logic</td>
<td>P 3</td>
</tr>
<tr>
<td>PS810000A10</td>
<td>Panel Mount 1000V Per Supply, 120 to 24 Vac</td>
<td>Functional</td>
<td>Devices</td>
<td>P 6</td>
</tr>
<tr>
<td>PWSLE5XHXA10A</td>
<td>Wet Media Diff. Press., LCD, 0-10/20/30/50/100 PSI, 4-20mA, 5V/12V Output</td>
<td>Functional</td>
<td>Devices</td>
<td>P 6</td>
</tr>
<tr>
<td>P80485</td>
<td>ARChnet156 Repeater Board</td>
<td>Automated</td>
<td>Logic</td>
<td>P 1</td>
</tr>
<tr>
<td>RHAB-ULDC1V+DHSV-05</td>
<td>Control Relay, 24/30 VDC, LED, w/ Socket</td>
<td>Idec</td>
<td>P 18</td>
<td></td>
</tr>
<tr>
<td>SE10200C00</td>
<td>Remote Sensor for VAV/10EM, Carbon Monoxide</td>
<td>Vulcan (Honeywell)</td>
<td>F</td>
<td>1</td>
</tr>
<tr>
<td>SI110</td>
<td>Alarm Horn, 120VAC, Panel Mount, 68-80 dB</td>
<td>Mallory</td>
<td>F</td>
<td>2</td>
</tr>
<tr>
<td>SC3032404L</td>
<td>30”x4”x12” Enclosure Back Plate</td>
<td>Sagnag</td>
<td>P</td>
<td>4</td>
</tr>
<tr>
<td>SCD500404</td>
<td>30”x4”x12” Enclosure</td>
<td>Sagnag</td>
<td>P</td>
<td>4</td>
</tr>
<tr>
<td>SE1044a</td>
<td>Control Module, DDQ, 10V, 4AO</td>
<td>Automated</td>
<td>Logic</td>
<td>P 4</td>
</tr>
<tr>
<td>SE1666</td>
<td>Control Module, DDQ, 16V, 6AO</td>
<td>Automated</td>
<td>Logic</td>
<td>P 1</td>
</tr>
<tr>
<td>SOL11B8RRC</td>
<td>18”x18”x8” NEMA 1 Enclosure, Blue</td>
<td>Unity</td>
<td>P</td>
<td>1</td>
</tr>
<tr>
<td>SOL12A44RCC</td>
<td>24”x4”x12” NEMA 1 Enclosure, Blue</td>
<td>Unity</td>
<td>P</td>
<td>2</td>
</tr>
<tr>
<td>STB-H</td>
<td>Wall Mounted Strobe w/horn, 24VDC</td>
<td>Gentex</td>
<td>P</td>
<td>1</td>
</tr>
<tr>
<td>TR1150X001</td>
<td>10’x150VA, 120-240V, Di/Brkr, UL</td>
<td>Functional</td>
<td>Devices</td>
<td>P 8</td>
</tr>
<tr>
<td>TR200X1A5</td>
<td>Transformer 200VA, 480/277/240V/480/208/240, 1 HUB</td>
<td>Functional</td>
<td>Devices</td>
<td>P 4</td>
</tr>
<tr>
<td>V100</td>
<td>1/0 Exp. Relay, 10-30 VAC/VDC &amp; 120VAC Coil, 15A</td>
<td>BAPI</td>
<td>F</td>
<td>12</td>
</tr>
<tr>
<td>ZN250</td>
<td>Zone Controller, 2DO, 2UI</td>
<td>Automated</td>
<td>Logic</td>
<td>P 4</td>
</tr>
<tr>
<td>ZN240A</td>
<td>Zone Controller for VAV w/ Actuator, 300, 48V, 1AO</td>
<td>Automated</td>
<td>Logic</td>
<td>P 58</td>
</tr>
<tr>
<td>ZN551</td>
<td>Zone Controller, DDQ, 5, 1AO</td>
<td>Automated</td>
<td>Logic</td>
<td>P 2</td>
</tr>
<tr>
<td>ZPS-ACC10</td>
<td>Outside Pressure Pickup Port</td>
<td>BAPI</td>
<td>F</td>
<td>2</td>
</tr>
<tr>
<td>ZPS-ACC30</td>
<td>Low Profile Room Pressure Pickup Port</td>
<td>BAPI</td>
<td>F</td>
<td>2</td>
</tr>
<tr>
<td>ZS2-A2C</td>
<td>Zone Sensor - ZS2 Temp, 5P Adj</td>
<td>Automated</td>
<td>Logic</td>
<td>P 2</td>
</tr>
<tr>
<td>ZS2P-A2C</td>
<td>Zone Sensor - ZS2 Pro-Temp, 5P Adj</td>
<td>Automated</td>
<td>Logic</td>
<td>P 6</td>
</tr>
<tr>
<td>ZS2P-C-2C</td>
<td>Zone Sensor - ZS2 Pro-Temp, 5P Adj, CO2</td>
<td>Automated</td>
<td>Logic</td>
<td>P 56</td>
</tr>
</tbody>
</table>
Attachment: LSI Product Cut Sheets
Line Number: 2
Item: Product Data
Copies: 1
Date: 10/23/2019
Reference No: 23 09 00
Description: Product Cut Sheets
UNT - Dining Hall
Project Cutsheets

Project Name:       UNT - Dining Hall
Project Number:    A2797
Drawing Designation: Submittal
Drawing Date:       7/25/2019
BACK PANEL FLAT LAYOUT

22.28
19.50
1.39

0.50 DIA. THRU 8 PLC'S

0.68 TYP.

14.5

46.28

14.5

14.5

BACK PANEL FORM DWG

27.00
25.50

45.00
43.50

0.75 TYP.

0.75

1/23/07 NM A INITIAL PRINT

10 GAUGE COLD ROLLED STEEL

HIGH REFLECTIVE WHITE

UNITY

LOGICAL SOLUTIONS 30X48X6 RC WITH SOLID BACK PANEL

P/N SOL30486RC

GARLAND, TEXAS 75040 U.S.A.

= ±0.062
Joxx = ±0.031
ANGLES = ± 2

REVISIONS
Overview

The BA/ (H200, H300) is a humidity transmitter which comes in 2% or 3% accuracies and an optional temperature sensor. The temperature sensor can be either a Thermistor or RTD. It can be ordered for either Duct or Outside Air applications with Weatherproof (WP), Weather Tight (EU), BAPI-Box (BB), or BAPI-Box 2 (BB2) Enclosures. The transmitter can be wired for either a 0 to 5VDC output or a loop powered 4 to 20mA output.

Duct Unit Mounting

Mount at least 3 duct diameters from humidifiers in the center of the duct wall. Drill a 1 inch hole for the probe in the duct and use two number 8 sheet metal screws to attach the sensor to the duct. Center the probe in its mounting hole. Be sure that the foam seals the hole, do not over tighten the screws.

Outside Air Mounting

Mount in a permanently shaded area away from windows and doors. Do not mount in direct sunlight. Mount with the sensor probe pointed down. Drill a hole large enough for your sensor cable through your mounting surface. Mount the unit to the surface with the wiring knock out centered over the wiring hole. Pull the wiring into the unit and terminate using sealant filled connectors. Best practice is to seal the wiring hole with caulk after the wiring is installed. Be sure that the foam on the back of the unit makes a good weather tight seal.
Wiring and Termination

BAPI recommends using twisted pair of at least 22AWG and sealant filled connectors for all wire connections. Larger gauge wire may be required for long runs. All wiring must comply with the National Electric Code (NEC) and local codes.

Do NOT run this device’s wiring in the same conduit as AC power wiring of NEC class 1, NEC class 2, NEC class 3 or with wiring used to supply highly inductive loads such as motors, contactors and relays. BAPI’s tests show that fluctuating and inaccurate signal levels are possible when AC power wiring is present in the same conduit as the signal lines. If you are experiencing any of these difficulties, please contact your BAPI representative.

**Table 1: Humidity Transmitter with 4 to 20mA Output**

<table>
<thead>
<tr>
<th>Wire Color</th>
<th>Purpose</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>White</td>
<td>Not Used</td>
<td>Not Used (Cap Wires)</td>
</tr>
<tr>
<td>Black</td>
<td>Humidity Output</td>
<td>4 to 20 mA, To Analog Input of Controller</td>
</tr>
<tr>
<td>Red</td>
<td>Power</td>
<td>10 to 35VDC</td>
</tr>
</tbody>
</table>

**Table 2: Humidity Transmitter with 0 to 5VDC Output**

<table>
<thead>
<tr>
<th>Wire Color</th>
<th>Purpose</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>White</td>
<td>Humidity Output</td>
<td>0 to 5VDC, To Analog Input of Controller</td>
</tr>
<tr>
<td>Black</td>
<td>GND (Common)</td>
<td>Ground for Power and Humidity Output</td>
</tr>
<tr>
<td>Red</td>
<td>Power</td>
<td>10 to 35VDC or 12 to 27 VAC</td>
</tr>
</tbody>
</table>

**Table 3: Temperature Sensor Lead Wire Colors**

<table>
<thead>
<tr>
<th>Temperature Sensor Type</th>
<th>Platinum RTDs - 2 Wire</th>
<th>Nickel RTD</th>
<th>Silicon RTD</th>
<th>Platinum RTDs - 3 Wire</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thermistors</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.8KΩ</td>
<td>Orange/Red</td>
<td>100Ω</td>
<td>Orange/Red</td>
<td></td>
</tr>
<tr>
<td>2.2KΩ</td>
<td>Brown/White</td>
<td>1KΩ</td>
<td>Green/Green</td>
<td></td>
</tr>
<tr>
<td>3KΩ</td>
<td>Yellow/Black</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.25KΩ</td>
<td>Brown/Green</td>
<td>1KΩ</td>
<td>Green/Green</td>
<td></td>
</tr>
<tr>
<td>3.3KΩ</td>
<td>Yellow/Brown</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10K-2Ω</td>
<td>Yellow/Yellow</td>
<td>2KΩ</td>
<td>Brown/Blue</td>
<td></td>
</tr>
<tr>
<td>10K-3Ω</td>
<td>Yellow/Red</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10K-3(11K)Ω</td>
<td>Yellow/Orange</td>
<td>100Ω</td>
<td>Red/Red/Black*</td>
<td></td>
</tr>
<tr>
<td>20KΩ</td>
<td>White/White</td>
<td>1KΩ</td>
<td>Orange/Orange/Black*</td>
<td></td>
</tr>
<tr>
<td>47KΩ</td>
<td>Yellow/Orange</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>50KΩ</td>
<td>White/Blue</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>100KΩ</td>
<td>Yellow/White</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*In the 3-Wire RTD sensors listed above, the two wires of similar color are connected together.

Additional sensors are available so your sensor may not be listed on this table.

Specifications subject to change without notice.
### Specifications

**Power:**
- 10 to 35 VDC
- 12 to 27 VAC

**Power Consumption:**
- 22 mA max. DC
- 0.53 VA max. AC

**Sensor:**
- Factory corrected @17 RH points (10 to 90% RH)
- Capacitive Polymer
- RH Accuracy: ±2% @ 73°F (23°C) from 10 to 90%
- Drift: 0.5% per year
- Response time: < 5 seconds in moving air
- RH Linearity: Negligible, factory corrected linear from 10 to 90%
- RH Hysteresis: Factory corrected to <1%
- Opt. Temp.: Passive RTD or Thermistor

**Filter:**
- 80 micron sintered stainless steel filter

**Calibrated Accuracy:**
- Calibration @17 RH points, (10% to 90%)
- RH 2%: 2% from 10 to 90% @ 73°F (23°C), Non-condensing
- RH 3%: 3% from 10 to 95% @ 73°F (23°C), Non-condensing
- Thermistor: ±0.36°F (0.2ºC) from 32 to 158°F (0 to 70°C) - High accuracy units are available
- RTD: ±0.55°F (0.31ºC) @ 32°F (0ºC) - High accuracy units are available

**Output:**
- Selectable via wiring detail
- Humidity: 0 to 5VDC or 4 to 20mA at 0 to 100% RH
- Opt. Temp.: Resistance RTD or Thermistor

**Humidity Output Impedance:**
- Current: 700Ω @ 24VDC, Voltage drop is 10VDC
  - (Supply Voltage DC – Transmitter voltage drop 10VDC) / 0.02 Amps = Max load Impedance
- Voltage: 10KΩ

**Probe Length:**
- Duct: 5.3” (13.5cm) Duct Insertion, 1” diameter
- Outside Air: 2.4” (6.1cm) Below Enclosure, 1” diameter

**Dimensions:**
- Weatherproof (WP): 2.75” x 4.5” x 2.2”, (70 x 114 x 55 mm)
- Weather Tight (EU): 4.1” x 3.8” x 2.1”, (105 x 97 x 54 mm)
- BAPI-Box (BB): 4.15” x 5” x 2.5”, (105.4 x 127 x 63.5mm)
- BAPI-Box 2 (BB2): 4.9” x 2.8” x 2.35”, (124.8 x 71.6 x 59.7mm)

**Termination:**
- Open wire
- Crimp: 18 to 26 AWG with Sealant Filled Crimp Connector (BA/SFC1000-x00)
- Wire Nut: 26 to 16 AWG with Sealant Filled Wire Nut (BA/SFC2000-x00)

**Enclosure Material:**
- Weatherproof (WP): Cast Aluminum
- Weather Tight (EU): ABS plastic, UV resistant
- BAPI-Boxes (BB, BB2): Polycarbonate, UV resistant

**Enclosures Ratings:**
- Weatherproof (WP): NEMA-3R
- Weather Tight (EU): IP66, UL94V-0
- BAPI-Boxes (BB, BB2): NEMA-4, IP66, UL94V-0

**Environmental Operation Range:** -40º to 158ºF (-40º to 70°C) • 0% to 100% RH

**Approvals:** RoHs
**Filter Care**
A sintered filter protects the humidity sensor from various airborne particles and may need periodic cleaning. To do this, gently unscrew the filter from the probe. Rinse the filter in warm soapy water and rinse until clean. A nylon brush may be used if necessary. Gently replace the filter by screwing it back into the probe. The filter should screw all the way into the probe. Hand tighten only. If a replacement filter is needed, call BAPI.

**BA/HDOFS3**  Stainless Steel Sintered Filter Replacement for Outside Air Units

---

**Humidity Diagnostics**

**Possible Problems:**

- Unit will not operate
- Humidity output is at its maximum value of 5V or 20mA
- Humidity output is at its minimum value of 0V or 4mA
- Humidity reading in controller’s software appears to be off by more than the specified accuracy

**Possible Solutions:**

- Check for proper supply power. (See page 2 for wiring diagram and power specifications)
- Make sure the humidity sensor is wired properly.
- Check all software parameters
- Determine if the sensor is exposed to an external air source different from the intended measured environment or reference device.
- Check the Humidity transmitter output against a calibrated reference such as a 2% accurate hygrometer. Measure the humidity at the sensor’s location using the reference meter, then calculate the humidity transmitter output using the humidity formula at left. Compare the calculated output to the actual humidity transmitter output (see the wiring diagram on page 2 for the humidity transmitter output wire colors). If the calculated output differs from the humidity transmitter output by more than 5%, contact BAPI technical support.

**Output Humidity Formula**

<table>
<thead>
<tr>
<th>Output</th>
<th>Humidity Formula</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 to 20mA</td>
<td>%RH = (mA-4)/0.16</td>
</tr>
<tr>
<td>0 to 5VDC</td>
<td>%RH = V/0.05</td>
</tr>
</tbody>
</table>

---

**Temperature Diagnostics**

**Possible Problems:**

- Controller reports Incorrect temperature

**Possible Solutions:**

- Confirm the input is set up correctly in the controller’s software
- Verify that the sensor wires are not physically shorted or open
- Check wiring for proper termination
- Measure the temperature at the temperature sensor’s location using an accurate temperature standard. Disconnect the temperature sensor wires and measure the temperature sensor’s resistance with an ohmmeter. Compare the temperature sensor’s resistance to the appropriate temperature sensor table on the BAPI website. If the measured resistance is different from the temperature table by more than 5%, call BAPI technical support. BAPI’s web site is found at www.bapihvac.com; click on “Resource Library” and “Sensor Specs” then click on the type of sensor you have.

---

Specifications subject to change without notice.
Static Pressure Pickup Accessories

Unobtrusive Housing for Pressure Sensing Devices

DESCRIPTION
The AA05 Room Static Pickup Device is a compact, easy-to-install, low-profile device used to minimize the aesthetic impact of pressure monitoring in spaces. Just drill a 1 3/8” (1” conduit electrical trade size) hole at a convenient place in a wall or ceiling of the space. Run tubing to connect between the sensor port and the hose barb on the back of the AA05 pickup, then just push the pickup into the surface to finish the installation.

FEATURES
AA05 Room Static Pickup
- Compact, attractive appearance
- Barb brass fitting accommodates popular tubing
- Easy to install

AA07 8”, AA06 4” Duct Static Pickup
- Rugged, all-metal construction
- Gasket and hardware provided
- Easy to install

DIMENSIONAL DRAWINGS

APPLICATION DIAGRAMS

ORDERING INFORMATION

<table>
<thead>
<tr>
<th>MODEL</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>AA05</td>
<td>Room Static Pressure Pickup</td>
</tr>
<tr>
<td>AA06</td>
<td>Duct Static Pressure Pickup Tube, 4”</td>
</tr>
<tr>
<td>AA07</td>
<td>Duct Static Pressure Pickup Tube, 8”</td>
</tr>
</tbody>
</table>

5 Year Warranty
The Series ADPS Adjustable Differential Pressure Switch is designed for pressure, vacuum, and differential pressures. The dual scaled adjustment knob in inches water column and pascals allows changes to the switching pressure to be made without a pressure gage. The ADPS is available with settings from 0.08 in w.c. (20 Pa) up to 20 in w.c. (5000 Pa). The silicone diaphragm and PA 6.6 body make the series ADPS ideal for use with air and other noncombustible gases. The compact size, adjustment knob and low cost make the ADPS the perfect choice for HVAC applications.

**APPLICATIONS**
- Monitoring air filters and ventilators
- Monitoring industrial cooling-air circuits
- Overheating protection for fan heaters
- Monitoring flows in ventilation ducts
- Controlling air and fire-protection dampers
- Frost protection for heat exchanges

**SPECIFICATIONS**

- **Service:** Air and non-combustible, compatible gases.
- **Wetted Materials:** Diaphragm material: silicone; Housing material: POM switch body: PA 6.6; Cover: Polystyrene.
- **Temperature Limits:** Process and ambient temperature from -4 to 185˚F (-20 to 85˚C).
- **Pressure Limits:** Max. operating pressure: 40˝ w.c. (10 kPa) for all pressure ranges.
- **Switch Type:** Single-pole double-throw (SPDT).
- **Electrical Rating:** Max. 1.5 A res./0.4 A ind./250 VAC, 50/60 Hz; Max. switching rate: 6 cycles/min.
- **Electrical Connections:** Push-on screw terminals. M20x1.5 with cable strain relief or optional 1/2˝ NPT connection.
- **Process Connections:** 5/16˝ (7.94 mm) outside diameter tubing, 1/4˝ (6.0 mm) inside diameter tubing.
- **Enclosure Rating:** NEMA 13, IP54.
- **Mounting Orientation:** Vertically, with pressure connections pointing downwards.
- **Mechanical Working Life:** Over 10⁶ switching operations.
- **Weight:** 5.6 oz (160 g).
- **Agency Approvals:** CE, RoHS.

**APPLICAtions**

- Monitoring air filters and ventilators
- Monitoring industrial cooling-air circuits
- Overheating protection for fan heaters
- Monitoring flows in ventilation ducts
- Controlling air and fire-protection dampers
- Frost protection for heat exchanges

**Accessories**

- A-288, "L" type metal mounting bracket with screws $3.50
- A-289, "S" type metal mounting bracket with screws $3.50
- A-480, Plastic static pressure tip $0.80
- A-481, Installer kit. Includes 2 plastic static pressure tips and 7` (2.1 m) of PVC tubing $4.25
- A-489, 4" Straight Static Pressure Tip with Flange $6.67

**Note:** For optional 1/2˝ NPT conduit connection, change -2-N to -1-N. Models that include installer kit add -C to the end of the model number (-2-N cable gland models only). Installer kit includes two static tips and 7 ft of PVC tubing. Order installer kit separately with 1/2˝ NPT conduit connection models. See A-481 below.

**Price**

<table>
<thead>
<tr>
<th>Model</th>
<th>Set Point Range in w.c. (Pa)</th>
<th>Approx. Dead Band @ Min Set Point in w.c. (Pa)</th>
<th>Approx. Deadband @ Max Set Point in w.c. (Pa)</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>ADPS-08-2-N</td>
<td>0.08 to 1.20 (20-300)</td>
<td>0.04 (10)</td>
<td>0.05 (12)</td>
<td>$21.25</td>
</tr>
<tr>
<td>ADPS-04-2-N</td>
<td>0.12 to 1.60 (30-400)</td>
<td>0.06 (15)</td>
<td>0.09 (22)</td>
<td>$21.25</td>
</tr>
<tr>
<td>ADPS-03-2-N</td>
<td>0.20 to 2.00 (50-500)</td>
<td>0.08 (20)</td>
<td>0.09 (23)</td>
<td>$21.25</td>
</tr>
<tr>
<td>ADPS-05-2-N</td>
<td>0.80 to 4.00 (200-1000)</td>
<td>0.4 (100)</td>
<td>0.5 (130)</td>
<td>$21.25</td>
</tr>
<tr>
<td>ADPS-06-2-N</td>
<td>2.00 to 10.00 (500-2500)</td>
<td>0.8 (150)</td>
<td>0.8 (200)</td>
<td>$21.25</td>
</tr>
<tr>
<td>ADPS-07-2-N</td>
<td>4.00 to 20.00 (1000-5000)</td>
<td>1.0 (250)</td>
<td>1.4 (350)</td>
<td>$21.25</td>
</tr>
</tbody>
</table>

**Price**

- Approx. Dead Band @ Min Set Point in w.c. (Pa)
- Approx. Deadband @ Max Set Point in w.c. (Pa)
- Price

See page 587 for process tubing options.
# Technical Data

<table>
<thead>
<tr>
<th>Power Supply</th>
<th>24 VAC±20%, 50/60Hz, 24 VDC+20%/-10%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power Consumption Running</td>
<td>5.5 W</td>
</tr>
<tr>
<td>Power Consumption Holding</td>
<td>3 W</td>
</tr>
<tr>
<td>Transformer Sizing</td>
<td>8.5 VA (class 2 power source)</td>
</tr>
<tr>
<td>Shaft Diameter</td>
<td>1/2&quot; to 1.05&quot; round, centers on 1/2&quot; and 3/4&quot; with insert, 1.05&quot; without insert</td>
</tr>
<tr>
<td>Electrical Connection</td>
<td>(2) 3 ft [1 m], 18 GA appliance cables with 1/2&quot; conduit connectors</td>
</tr>
<tr>
<td>Overload Protection</td>
<td>electronic throughout 0° to 95° rotation</td>
</tr>
<tr>
<td>Electrical Protection</td>
<td>actuators are double insulated</td>
</tr>
<tr>
<td>Operating Range Y</td>
<td>2 to 10 VDC, 4 to 20 mA w/ ZG-R01 (500 Ω, 1/4 W resistor)</td>
</tr>
<tr>
<td>Input Impedance Y</td>
<td>100 k Ω for 2 to 10 VDC (0.1 mA), 500 Ω for 4 to 20 mA</td>
</tr>
<tr>
<td>Feedback Output U</td>
<td>2 to 10 VDC, 0.5 mA max</td>
</tr>
<tr>
<td>Angle of Rotation</td>
<td>95° (adjustable with mechanical end stop, 35° to 95°)</td>
</tr>
<tr>
<td>Torque</td>
<td>180 in-lb (20 Nm) minimum</td>
</tr>
<tr>
<td>Direction of Rotation (Motor)</td>
<td>reversible with built-in switch</td>
</tr>
<tr>
<td>Direction of Rotation (Fail-Safe)</td>
<td>reversible with CW/CCW mounting</td>
</tr>
<tr>
<td>Position Indication</td>
<td>visual indicator, 0° to 95° (0° is full spring return position)</td>
</tr>
<tr>
<td>Manual Override</td>
<td>5 mm hex crank (3/16&quot; Allen), supplied</td>
</tr>
<tr>
<td>Running Time (Motor)</td>
<td>95 sec</td>
</tr>
<tr>
<td>Running Time (Fail-Safe)</td>
<td>&lt;20 sec @ -4°F to 122°F [-20°C to 50°C], &lt;60 sec @ -22°F [-30°C]</td>
</tr>
<tr>
<td>Humidity</td>
<td>max. 95% RH non-condensing</td>
</tr>
<tr>
<td>Ambient Temperature Range</td>
<td>-22°F to +122°F [-30°C to +50°C]</td>
</tr>
<tr>
<td>Storage Temperature Range</td>
<td>-40°F to +176°F [-40°C to +80°C]</td>
</tr>
<tr>
<td>Housing</td>
<td>NEMA 2, IP54, UL enclosure type 2</td>
</tr>
<tr>
<td>Housing Material</td>
<td>zinc coated metal and plastic casing</td>
</tr>
<tr>
<td>Agency Listings†</td>
<td>cULus acc. to UL60730-1A/2-14, CAN/CSA E60730-1:02, CE acc. to 2004/108/EC and 2006/95/EC</td>
</tr>
<tr>
<td>Noise Level (Motor)</td>
<td>≤40 dB (A)</td>
</tr>
<tr>
<td>Noise Level (Fail-Safe)</td>
<td>≤62 dB (A)</td>
</tr>
<tr>
<td>Servicing</td>
<td>maintenance free</td>
</tr>
<tr>
<td>Quality Standard</td>
<td>ISO 9001</td>
</tr>
<tr>
<td>Weight</td>
<td>5.1 lb [2.3 kg]</td>
</tr>
<tr>
<td>Auxiliary Switch</td>
<td>2 x SPDT, 3A resistive (0.5A inductive) @ 250 VAC, one set at +10°, one adjustable 10° to 90°</td>
</tr>
</tbody>
</table>

---

**Application**

For fail-safe, modulating control of dampers in HVAC systems. Actuator sizing should be done in accordance with the damper manufacturer’s specifications. The actuator is mounted directly to a damper shaft up to 1.05” in diameter by means of its universal clamp. A crank arm and several mounting brackets are available for applications where the actuator cannot be direct coupled to the damper shaft. The actuator operates in response to a 2 to 10 VDC or, with the addition of a 500Ω resistor, a 4 to 20 mA control input from an electronic controller or positioner. A 2 to 10 VDC feedback signal is provided for position indication. Not to be used for a master-slave application.

**Operation**

The AF..24-SR-S series actuators provide true spring return operation for reliable fail-safe application and positive close off on air tight dampers. The spring return system provides constant torque to the damper with, and without, power applied to the actuator. The AF..24-SR-S series provides 95° of rotation and is provided with a graduated position indicator showing 0° to 95°. The AF..24-SR-S uses a brushless DC motor which is controlled by an Application Specific Integrated Circuit (ASIC) and a microprocessor. The microprocessor provides the intelligence to the ASIC to provide a constant rotation rate and to know the actuator’s exact fail-safe position. The ASIC monitors and controls the brushless DC motor’s rotation and provides a digital rotation sensing function to prevent damage to the actuator in a stall condition. The actuator may be stalled anywhere in its normal rotation without the need of mechanical end switches. The AF..24-SR-S versions are provided with two built-in auxiliary switches. These SPDT switches provide safety interfacing or signaling, for example, for fan start-up. The switching function at the fail-safe position is fixed at +10°, the other switch function is adjustable between +10° to +90°. The AF..SR-S actuator is shipped at +5° (5° from full fail-safe) to provide automatic compression against damper gaskets for tight shut-off.

ATTENTION: AF..24-SR-S cannot be tandem mounted on the same damper or valve shaft. Only On/Off and MFT AF.. models can be used for tandem mount applications.

---

**Dimensions (Inches [mm])**

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Y</td>
<td>2.31&quot; [58.78]</td>
</tr>
<tr>
<td>Z</td>
<td>1.25&quot; [31.79]</td>
</tr>
<tr>
<td>U</td>
<td>0.38&quot; [9.7]</td>
</tr>
</tbody>
</table>

---

†Rated Impulse Voltage 800V, Type of Action 1.AA.B, Control Pollution Degree 3.
Spring return control damper actuators shall be direct coupled type which require no crank arm and linkage and be capable of direct mounting to a jackshaft up to a 1.05” diameter. The actuator must provide modulating damper control in response to a 2 to 10 VDC or, with the addition of a 500Ω resistor, a 4 to 20 mA control input from an electronic controller or positioner. The actuators must be designed so that they may be used for either clockwise or counter clockwise fail-safe operation. Actuators shall use a brushless DC motor controlled by a microprocessor and be protected from overload at all angles of rotation. Run time shall be constant, and independent of torque. A 2 to 10 VDC feedback signal shall be provided for position feedback. Actuators with auxiliary switches must be constructed to meet the requirements for Double Insulation so an electrical ground is not required to meet agency listings. Actuators shall be cULus listed and have a 5 year warranty, and be manufactured under ISO 9001 International Quality Control Standards. Actuators shall be as manufactured by Belimo.
WARNING! LIVE ELECTRICAL COMPONENTS!

During installation, testing, servicing and troubleshooting of this product, it may be necessary to work with live electrical components. Have a qualified licensed electrician or other individual who has been properly trained in handling live electrical components perform these tasks. Failure to follow all electrical safety precautions when exposed to live electrical components could result in death or serious injury.

Meets cULus requirements without the need of an electrical ground connection.

Apply only AC line voltage or only UL-Class 2 voltage to the terminals of auxiliary switches. Mixed or combined operation of line voltage/safety extra low voltage is not allowed.

Actuators with appliance cables are numbered.

Provide overload protection and disconnect as required.

Actuators may also be powered by 24 VDC.

Two built-in auxiliary switches (2x SPDT), for end position indication, interlock control, fan startup, etc.

Only connect common to negative (-) leg of control circuits.

A 500 ohm resistor (ZG-R01) converts the 4 to 20 mA control signal to 2 to 10 VDC.

Actuators may be connected in parallel if not mechanically linked. Power consumption and input impedance must be observed.
AFB24-S N4 - Damper Actuator
NEMA 4, On/Off, Spring Return, 24 V

Technical Data

<table>
<thead>
<tr>
<th>Feature</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power Supply</td>
<td>24 VAC, ±20%, 50/60 Hz, 24 VDC, -10% / +20%</td>
</tr>
<tr>
<td>Power consumption in operation</td>
<td>5 W</td>
</tr>
<tr>
<td>Power consumption in rest position</td>
<td>2.5 W</td>
</tr>
<tr>
<td>Transformer sizing</td>
<td>7.5 VA (class 2 power source)</td>
</tr>
<tr>
<td>Shaft Diameter</td>
<td>1/2&quot; to 1.05&quot; round, centers on 3/4&quot; with insert, 1.05&quot; without insert</td>
</tr>
<tr>
<td>Electrical Connection</td>
<td>(2) 3ft [1m], 18 GA appliance cables with 1/2&quot; conduit connectors</td>
</tr>
<tr>
<td>Overload Protection</td>
<td>electronic throughout 0° to 95° rotation</td>
</tr>
<tr>
<td>Electrical Protection</td>
<td>actuators are double insulated</td>
</tr>
<tr>
<td>Angle of rotation</td>
<td>95°, adjustable with mechanical end stop, 35° to 95°</td>
</tr>
<tr>
<td>Torque motor</td>
<td>180 in-lbs [20 Nm]</td>
</tr>
<tr>
<td>direction of rotation motor</td>
<td>reversible with CW/CCW mounting</td>
</tr>
<tr>
<td>direction of rotation spring-return</td>
<td>reversible with CW/CCW mounting</td>
</tr>
<tr>
<td>Position indication</td>
<td>dial</td>
</tr>
<tr>
<td>Manual override</td>
<td>5 mm hex crank (3/16&quot; Allen), supplied</td>
</tr>
<tr>
<td>Running time motor</td>
<td>&lt;75 sec</td>
</tr>
<tr>
<td>Running time emergency control position</td>
<td>&lt;20 sec @ -4°F to 122°F [-20°C to 50°C], &lt;60 sec @ -22°F [-30°C]</td>
</tr>
<tr>
<td>Ambient humidity</td>
<td>5 to 95% RH non-condensing</td>
</tr>
<tr>
<td>Ambient temperature</td>
<td>-22...122°F [-30...50°C]</td>
</tr>
<tr>
<td>Non-operating temperature</td>
<td>-40...176°F [-40...80 °C]</td>
</tr>
<tr>
<td>Degree of Protection</td>
<td>IP66, NEMA 4X, UL Enclosure Type 4X</td>
</tr>
<tr>
<td>Housing material</td>
<td>polycarbonate</td>
</tr>
<tr>
<td>Agency Listing</td>
<td>cULus acc. to UL60730-1A/-2-14, CAN/CSA E60730-1:02, CE acc. to 2004/108/EC and 2006/95/EC</td>
</tr>
<tr>
<td>Noise level, motor</td>
<td>≤50 dB (A)</td>
</tr>
<tr>
<td>Noise Level (Fail-Safe)</td>
<td>≤62 dB (A)</td>
</tr>
<tr>
<td>Maintenance</td>
<td>maintenance free</td>
</tr>
<tr>
<td>Quality Standard</td>
<td>ISO 9001</td>
</tr>
<tr>
<td>Weight</td>
<td>9.7 lbs (4.4 kg); 10 lbs (4.5 kg) with switches</td>
</tr>
<tr>
<td>Auxiliary switch</td>
<td>2 x SPDT, 3A resistive (0.5A inductive) @ 250 VAC, one set at 10°, one adjustable 10° to 90°</td>
</tr>
</tbody>
</table>

Torque min. 180 in-lb, for control of air dampers.

Application
For On/Off, fail-safe control of dampers in HVAC systems. Actuator sizing should be done in accordance with the damper manufacturer’s specifications. Control is On/Off from an auxiliary contact or a manual switch. The actuator is mounted directly to a damper shaft up to 1.05" in diameter by means of its universal clamp. Maximum of two AF’s can be piggybacked for torque loads of up to 266 in-lbs. Minimum 3/4" diameter shaft and parallel wiring.

Operation
The AF..24-S N4 series actuators provide true spring return operation for reliable fail-safe application and positive close off on air tight dampers. The spring return system provides constant torque to the damper with, and without, power applied to the actuator. The AF..24-S N4 series provides 95° of rotation and is provided with a graduated position indicator showing 0° to 95°. The actuator may be stalled anywhere in its normal rotation without the need of mechanical end switches. The AF..24-S N4 version are provided with two built-in auxiliary switches. These SPDT switches are provided for safety interfacing or signaling, for example, for fan start-up. The switching function at the fail-safe position is fixed at 10°; the other switch function is adjustable between 10° to 90°. The AF..24-S N4 actuator is shipped at 5° (5° from full fail-safe) to provide automatic compression against damper gaskets for tight shut-off.

Installation Note: Use suitable flexible metallic conduit or its equivalent with the conduit fitting. Not suitable for plenum applications.

Dimensions (Inches[mm])

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length</td>
<td>12.99” [330]</td>
</tr>
<tr>
<td>Width</td>
<td>3.62” [92.1]</td>
</tr>
<tr>
<td>Height</td>
<td>3.45” [88.2]</td>
</tr>
<tr>
<td>Housing Material</td>
<td>polycarbonate</td>
</tr>
<tr>
<td>Agency Listing</td>
<td>cULus acc. to UL60730-1A/-2-14, CAN/CSA E60730-1:02, CE acc. to 2004/108/EC and 2006/95/EC</td>
</tr>
<tr>
<td>Noise level, motor</td>
<td>≤50 dB (A)</td>
</tr>
<tr>
<td>Noise Level (Fail-Safe)</td>
<td>≤62 dB (A)</td>
</tr>
<tr>
<td>Maintenance</td>
<td>maintenance free</td>
</tr>
<tr>
<td>Quality Standard</td>
<td>ISO 9001</td>
</tr>
<tr>
<td>Weight</td>
<td>9.7 lbs (4.4 kg); 10 lbs (4.5 kg) with switches</td>
</tr>
<tr>
<td>Auxiliary switch</td>
<td>2 x SPDT, 3A resistive (0.5A inductive) @ 250 VAC, one set at 10°, one adjustable 10° to 90°</td>
</tr>
</tbody>
</table>

†Rated Impulse Voltage 800V, Type of action 1.AA.B, Control Pollution Degree 4.
Accessories

<table>
<thead>
<tr>
<th>Accessory Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AF-P</td>
<td>Anti-rotation bracket AF/NF.</td>
</tr>
<tr>
<td>KG10A</td>
<td>Straight ball joint with M8</td>
</tr>
<tr>
<td>KH10</td>
<td>Damper lever</td>
</tr>
<tr>
<td>SH10</td>
<td>Push rod for KG10A ball joint (36” L, 3/8” diameter).</td>
</tr>
<tr>
<td>TOOL-06</td>
<td>8 mm and 10 mm wrench.</td>
</tr>
<tr>
<td>TOOL-07</td>
<td>13 mm wrench.</td>
</tr>
<tr>
<td>ZG-DC1</td>
<td>Damper clip for damper blade, 3.5” width.</td>
</tr>
<tr>
<td>ZG-DC2</td>
<td>Damper clip for damper blade, 6” width.</td>
</tr>
<tr>
<td>ZG-JSA-1</td>
<td>1” diameter jackshaft adaptor (11” L).</td>
</tr>
<tr>
<td>ZG-JSA-2</td>
<td>1-5/16” diameter jackshaft adaptor (12” L).</td>
</tr>
<tr>
<td>ZG-JSA-3</td>
<td>1.05” diameter jackshaft adaptor (12” L).</td>
</tr>
<tr>
<td>11097-00001</td>
<td>Gasket for cable gland (for NEMA 4 models).</td>
</tr>
<tr>
<td>43442-00001</td>
<td>Cable gland (for NEMA 4 models).</td>
</tr>
<tr>
<td>P475</td>
<td>Shaft mount, non-Mercury aux. switch for 1/2” dia. shafts.</td>
</tr>
<tr>
<td>P475-1</td>
<td>Shaft mount, non-Mercury aux. switch for 1” dia. shafts.</td>
</tr>
<tr>
<td>PS-100</td>
<td>Actuator power supply and control simulator.</td>
</tr>
<tr>
<td>ZG-X40</td>
<td>120 to 24 VAC, 40 VA transformer.</td>
</tr>
</tbody>
</table>

Typical Specification

On/Off spring return damper actuators shall be direct coupled type which require no crank arm and linkage and be capable of direct mounting to a jackshaft up to a 1.05” diameter. The actuators must be designed so that they may be used for either clockwise or counter clockwise fail-safe operation. Actuators shall be protected from overload at all angles of rotation. If required, two SPDT auxiliary switch shall be provided having the capability of one being adjustable. Actuators with auxiliary switches must be constructed to meet the requirements for Double Insulation so an electrical ground is not required to meet agency listings. Actuators shall be cULus listed and have a 5 year warranty, and be manufactured under ISO 9001 International Quality Control Standards. Actuators shall be as manufactured by Belimo.

Wiring Diagrams

**WARNING! LIVE ELECTRICAL COMPONENTS!**

During installation, testing, servicing and troubleshooting of this product, it may be necessary to work with live electrical components. Have a qualified licensed electrician or other individual who has been properly trained in handling live electrical components perform these tasks. Failure to follow all electrical safety precautions when exposed to live electrical components could result in death or serious injury.

- Meets cULus requirements without the need of an electrical ground connection.
- Apply only AC line voltage or only UL-Class 2 voltage to the terminals of auxiliary switches. Mixed or combined operation of line voltage/safety extra low voltage is not allowed.
- Actuators with appliance cables are numbered.
- Provide overload protection and disconnect as required.
- Actuators may also be powered by 24 VDC.
- Two built-in auxiliary switches (2x SPDT), for end position indication, interlock control, fan startup, etc.
- Actuators may be powered in parallel. Power consumption must be observed.
- Parallel wiring required for piggy-back applications.
APPLICATION

Model AFS-222 Air Pressure Sensing Switch is a general purpose proving switch designed for HVAC and Energy Management applications. It may be used to sense positive, negative, or differential air pressure.

GENERAL DESCRIPTION & OPERATION

The plated housing contains a diaphragm, a calibration spring and a snap-acting SPDT switch. The sample connections located on each side of the diaphragm accept ¼" OD metallic tubing via the integral compression ferrule and nut.

An enclosure cover guards against accidental contact with the live switch terminal screws and the set point adjusting screw. The enclosure cover will accept a ½" conduit connection.

MOUNTING (SEE FIGURE 1)

Select a mounting location which is free from vibration. The AFS-222 must be mounted with the diaphragm in any vertical plane in order to obtain the lowest specified operating set point. Avoid mounting with the sample line connections in the "up" position. Surface mount via the two ⅜" diameter holes in the integral mounting bracket. The mounting holes are 3-⅜" apart.

POSITIVE PRESSURE ONLY: Connect the sample line to inlet H; inlet L remains open to the atmosphere.

NEGATIVE PRESSURE ONLY: Connect the sample line to inlet L; inlet H remains open to the atmosphere.

TWO NEGATIVE SAMPLES: Connect the higher negative sample to inlet L. Connect the lower negative sample to inlet H.

TWO POSITIVE SAMPLES: Connect the higher positive sample to inlet H. Connect the lower positive sample to inlet L.

ONE POSITIVE AND ONE NEGATIVE SAMPLE: Connect the positive sample to inlet H. Connect the negative sample to inlet L.

AIR SAMPLING CONNECTION (SEE FIGURE 2)

The AFS-222 is designed to accept firm-wall sample lines of ¼" OD tubing by means of ferrule and nut compression connections. For sample lines of up to 10 feet, ¼" OD tubing is acceptable. For lines up to 20 feet, use ¼" ID tubing. For lines up to 60 feet, use ⅜" ID tubing. A ¼" OD adapter, suitable for slip-on flexible tubing is available: order part number 18311.

Locate the sampling probe a minimum of 1.5 duct diameters downstream from the air source. Install the sampling probe as close to the center of the airstream as possible. Refer to Figure 2 to identify the high pressure inlet (H) and the low pressure inlet (L). Select one of the following five application options, and connect the sample lines as recommended.
ELECTRICAL CONNECTIONS
(SEE FIGURE 3)

Before pressure is applied to the dia-
phragm, the switch contacts will be in the
normally closed (NC) position. The snap
switch has screw top terminals with cup
washers. Wire alarm and control applica-
tions as shown in Figure 4.

FIELD ADJUSTMENT

The adjustment range of an AFS-222 Air
Switch is 0.05 ± 0.02" w.c. to 12.0" w.c. To
adjust the set point, turn the adjusting
screw counterclockwise until motion has
stopped. Next, turn the adjusting screw
4 complete turns in a clockwise direction
to engage the spring. From this point, the
next ten turns will be used for the actual
calibration. Each full turn represents
approximately 1.2" w.c.

Please note: To properly calibrate an air
switch, a digital manometer or other mea-
suring device should be used to confirm
the actual set point.

SPECIFICATIONS
MODEL AFS-222 AIR
PRESSURE SENSING
SWITCH WITH ADJUSTABLE
SET POINT RANGE

Mounting Position:
Mount with the diaphragm in any ver-
tical plane.

Set Point Range:
0.05 ± 0.02" w.c. to 12.0" w.c.

Field Adjustable “Operate Range”:
0.07" w.c. to 12.0" w.c.

Field Adjustable “Release Range”:
0.04" w.c. to 11.2" w.c.

Approximate Switching Differential:
Progressive, increasing from 0.02
± 0.01" w.c. at minimum set point to
approximately 0.8" w.c. at maximum
set point.

Measured Media:
Air, or combustion by-products that will
not degrade silicone.

Maximum Pressure:
½ psi (0.03 bar).

Operating Temperature Range:
-40F to 180F (-40 to 82C).

Life:
100,000 cycles minimum at ½ psi
maximum pressure each cycle and at
maximum rated electrical load.

Electrical Rating:
300 VA pilot duty at 115 to 277 VAC,
15 amps noninductive to 277 VAC,
60Hz.

Contact Arrangement: SPDT.

Electrical Connections:
Screw-type terminals with cup
washers.

Conduit Opening:
¾" diameter opening accepts ½"
conduit.

Sample Line Connectors:
Male, externally threaded ¾" -24 UNS
2A thread, complete with nuts and self-
aligning ferrules.

Sample Line Connections:
Connectors will accept ¼" OD rigid or
semi-rigid tubing.

Approvals: UL, FM, CSA.

Shipping Weight: 1.2 lbs.

Accessories:
• P/N 18311 Slip-on ¼" OD Tubing
Adapter, suitable for slipping on flex-
ible plastic tubing.
• Sample line probes.
• Orifice plugs (pulsation dampers).
APPLICATION

The Model AFS-460-DSS is a general purpose airflow proving switch designed for 120 VAC HVAC and Energy Management applications where dual manual reset switches with SPST contacts are needed. It may be used to sense positive, negative, or differential air pressure.

GENERAL DESCRIPTION & OPERATION

The plated housing contains a diaphragm, a calibration spring, and 2 snap-acting switches with a single manual reset button. The sample connections located on each side of the diaphragm accept ½” (6.35 mm) OD tubing via the integral compression ferrule and nut. An enclosure cover guards against accidental contact with the live switch terminal screws and the set point adjusting screw. The enclosure cover accepts two 0.5” (12.7 mm) conduit connections. The manual reset button is located on the top surface of the enclosure cover.

MOUNTING (SEE FIGURE 1)

Select a mounting location which is free from vibration. The AFS-460-DSS must be mounted with the diaphragm in any vertical plane in order to obtain the lowest specified operating set point. Avoid mounting with the sample line connections in the “up” position. Surface mount via the two 3/16” (4.75 mm) diameter holes in the integral mounting bracket. The mounting holes are 3-7/8” (98.4 mm) apart.

AIR SAMPLING CONNECTION (SEE FIGURE 2)

The AFS-460-DSS is designed to accept firm-wall sample lines of ¼” (6.35 mm) OD tubing by means of ferrule and nut compression connections. An optional ¼” (6.35 mm) adapter, suitable for slip-on flexible tubing is available. For sample lines of up to 10 feet (3.05 metres), ¼” (6.35 mm) OD tubing is acceptable. For lines up to 20 feet (6.1 metres), use ¼” (6.35 mm) ID tubing. For lines up to 60 feet (18.3 metres), use ½” (12.7 mm) ID tubing. Locate the sampling probe a minimum of 1.5 duct diameters downstream from the air source. Install the sampling probe as close to the center of the airstream as possible. Refer to Figure 2 to identify the high pressure inlet (H), and the low pressure inlet (L). Select one of the five application options listed below, and connect the sample lines as recommended.

POSITIVE PRESSURE ONLY: Connect the sample line to inlet H; inlet L remains open to the atmosphere.

NEGATIVE PRESSURE ONLY: Connect the sample line to inlet L; inlet H remains open to the atmosphere.

TWO NEGATIVE SAMPLES: Connect the higher negative sample to inlet L. Connect the lower negative sample to inlet H.

TWO POSITIVE SAMPLES: Connect the higher positive sample to inlet H. Connect the lower positive sample to inlet L.

ONE POSITIVE AND ONE NEGATIVE SAMPLE: Connect the positive sample to inlet H. Connect the negative sample to inlet L.
ELECTRICAL CONNECTIONS
(SEE FIG. 3)
Before pressure is applied to the diaphragm, the snap switch contacts will be in the normally closed (NC) position as shown in Fig. 3.
The snap switches have screw top terminals with cup washers. Wire alarm and control applications as shown in Fig. 4.

FIELD ADJUSTMENT:
LEAD & LAG SNAP SWITCHES
(SEE FIG. 4)
The AFS-460-DSS Manual Reset Air Switch has a lead snap switch adjustment of 1.25" w.c. to 12.0" w.c. (31.8 mm w.c. to 305 mm w.c.) The set point adjusting screw is used to adjust the set point of the lead snap switch (Switch A in Fig. 4). The lag snap switch (Switch B in Fig. 4) operates after the lead snap switch at progressively increasing set point increments as indicated in Table 1, below. Note: if simultaneous operation of Switch A and Switch B is required, use Model AFS-460-136 or AFS-460-137.

To adjust the set point of Switch A: Turn the adjusting screw counterclockwise until motion has stopped. Next, turn the adjusting screw four complete turns in a clockwise direction to engage the spring. From this point, the next ten turns will be used for the actual calibration. Each full turn represents approximately 1.0" w.c. (25.4 mm w.c.). Please note: To properly calibrate an air switch, a digital manometer or other measuring device should be used to confirm the actual set point.

Table 1

<table>
<thead>
<tr>
<th>Lead Switch A Set Point</th>
<th>Lag Switch B Set Point</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.25&quot; - 3.00&quot; w.c. (31.8 - 76.2 mm w.c.)</td>
<td>up to 5% after Switch A</td>
</tr>
<tr>
<td>3.00&quot; - 6.00&quot; w.c. (76.2 - 152.4 mm w.c.)</td>
<td>up to 10% after Switch A</td>
</tr>
<tr>
<td>6.00&quot; - 9.00&quot; w.c. (152.4 - 229 mm w.c.)</td>
<td>up to 15% after Switch A</td>
</tr>
<tr>
<td>9.00 - 12.00&quot; w.c. (229 - 305 mm w.c.)</td>
<td>up to 35% after Switch A</td>
</tr>
</tbody>
</table>
Duct Averaging Units

Temperature Sensors

**Features & Options**

- Averaging Lengths: 8’, 12’ and 24’
- Three Enclosure Styles
- Limited Lifetime Warranty

BAPI Duct Averaging Units feature closed cell foam to seal the probe insertion hole and absorb vibration. Mounting tabs allow for easy installation to the duct. All units have etched Teflon leadwires and encapsulated sensors to create a watertight package that can perform under real world conditions.

Averaging probes should be used wherever there is a chance for stratified layers of hot and cold air. Averaging probes are made of bendable aluminum tubing and measure temperature along their entire length. Nylon tie straps are provided for mounting.

Duct Averaging Units come standard with a 2”x4” steel J-Box but are also available with no box or the new BAPI-Box Crossover enclosure.

---

**The New BAPI-Box Crossover Enclosure**

The new BAPI-Box Crossover features a hinged cover with thumb latch for easy termination. A pierceable knockout plug is available for the open port. See the Accessories section for more info.

*(Units shown with knockplug plug sold separately.)*

---

**Specifications**

**Environmental Operation Range:**

- Temperature:
  - BAPI-Box Crossover: -40 to 85 °C
  - Other Enclosures: -40 to 100 °C
- Humidity: 0 to 95%, non-condensing

**Sensing Element:**

- Thermistor or RTD (See Sensors Section for Specs.)

**Probe Material:**

- Bendable Aluminum, 3/16” diameter

**Enclosure Material:**

- Junction Box: Galvanized Steel
- BAPI-Box Crossover: UV-resistant polycarbonate, UL94, V-0

**Enclosure Rating:**

- Junction Box: IP20, NEMA 1
- BAPI-Box Crossover (BBX):
  - IP10, NEMA 1
  - IP44 with knockout plug in open port

**Encl. Dimensions: H x W x D**

- BAPI-Box Crossover:
  - 3.1 x 2.2 x 1.9” (79 x 56 x 49mm)
- Junction Box
  - 4.2 x 3.9 x 1.94” (106 x 98.4 x 49mm)

*(For enclosure dimension drawings, see the end of the section.)*
Use the Option Selection Guide below to create your custom part number. Replace the number and parenthesis with the designator for each selection. Skip the designator and dashes for optional selections that are not required in your configuration.

**Duct Averaging Sensor Option Selection Guide**

<table>
<thead>
<tr>
<th>BA/ ( #1 ) - ( #2 ) - ( #3 ) - ( #4 )</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>#1: Temperature Sensor</strong> (required)</td>
</tr>
<tr>
<td>1.8K ......... 1.8K Thermistor</td>
</tr>
<tr>
<td>3K ......... 3K Thermistor</td>
</tr>
<tr>
<td>10K-2 ......... 10K-2 Thermistor</td>
</tr>
<tr>
<td>10K-3 ......... 10K-3 Thermistor</td>
</tr>
<tr>
<td>20K ......... 20K Thermistor</td>
</tr>
<tr>
<td>1K[375] ......... 1K Platinum RTD (375 curve)</td>
</tr>
<tr>
<td>1K[NI] ......... 1K Ω Nickel RTD</td>
</tr>
<tr>
<td>1K ......... 1K Platinum RTD (385 curve)</td>
</tr>
</tbody>
</table>

Transmitters below require a BAPI-Box Crossover Enclosure

| T1K[32 TO 212F] ......... 1K Plat. RTD Transmitter, 4 to 20 mA Output, 32 to 212°F Range |
| T1K[20 TO 120F] ......... 1K Plat. RTD Transmitter, 4 to 20 mA Output, 20 to 120°F Range |
| T1K[0 TO 100F] ......... 1K Plat. RTD Transmitter, 4 to 20 mA Output, 0 to 100°F Range |
| T1K[0 TO 100C] ......... 1K Plat. RTD Transmitter, 4 to 20 mA Output, 0 to 100°C Range |
| T1K[-7 TO 49C] ......... 1K Plat. RTD Transmitter, 4 to 20 mA Output, -7 to 49°C Range |
| T1K[-18 TO 38C] ......... 1K Plat. RTD Transmitter, 4 to 20 mA Output, -18 to 38°C Range |

**Matched Transmitters are also available. Contact your BAPI representative for ordering.**

| **#2: Probe Type and Length** (required) |
| A-8' ......... Flexible Averaging, 8’ (2.4m) length |
| A-12' ......... Flexible Averaging 12’ (3.7m) length |
| A-24' ......... Flexible Averaging 24’ (7.3m) length |

**#3: Enclosure and Lead Length** (optional, J-Box comes standard)

| BBX ......... BAPI-Box Crossover (IP10, NEMA 1) |
| NB ......... No Box (comes with 6” Etched Teflon Leads) |

**#4: Test & Balance or Terminal Strip** (optional, requires a BAPI-Box Crossover Enclosure)

| TB ......... Test & Balance Switch |
| TS ......... Terminal Strip Connection |

Additional options are available for these units but not shown in the configurator above. Contact your BAPI representative for the complete list of options.

**Example Number:** BA/ ( 10K-2 ) - ( A-8' ) - ( BBX ) - (    )

**Actual Number (with parenthesis removed):** BA/10K-2-A-8'-BBX

**Description:** 10K-2 Thermistor, Duct Averaging Sensor, BAPI-Box Crossover Enclosure

**Your Number:** BA/
**PRODUCT IDENTIFICATION**

**DELUXE MODEL:**

<table>
<thead>
<tr>
<th>RH Option</th>
<th>Temp</th>
<th>Sensor Type</th>
<th>Optional Cal Cert.</th>
</tr>
</thead>
<tbody>
<tr>
<td>H = RH2%</td>
<td>T = Temp</td>
<td>A = Transmitter</td>
<td>Blank = None</td>
</tr>
<tr>
<td>X = NO RH</td>
<td>X = No Temp</td>
<td>B = 100R Platinum, RTD</td>
<td>1 = 1 pt Temp Cert</td>
</tr>
<tr>
<td></td>
<td>(Stop Here)</td>
<td>C = 1k Platinum, RTD</td>
<td>2 = 2 pt Temp Cert</td>
</tr>
<tr>
<td></td>
<td></td>
<td>D = 10k T2, RTD, Thermistor</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>E = 2.2k, Thermistor</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>F = 3k, Thermistor</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>G = 10k CPC, Thermistor</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>H = 10k T3, Thermistor</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>J = 10k Dale, Thermistor</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>K = 10k w/11k shunt, Thermistor</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>M = 20k NTC, Thermistor</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>N = 1800 ohm, Thermistor</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>R = 10k US, Thermistor</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>S = 10k 3A221, Thermistor</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>T = 100k, Thermistor</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>U = 20k “D”, Thermistor</td>
<td></td>
</tr>
</tbody>
</table>

**ECONOMY MODEL:**

**CDE** (no options)

**DIMENSIONS**

- 6.7" (170 mm) x 3.1" (78 mm) x 7.8" (97 mm)
- 10.2" (258 mm)
- 2.4" (61 mm)

**NOTICE**

- This product is not intended for life or safety applications.
- Do not install this product in hazardous or classified locations.
- Read and understand the instructions before installing this product.
- Turn off all power supplying equipment before working on it.
- The installer is responsible for conformance to all applicable codes.

**EMC Conformance:**

- EN 61000-6-1:2001
- EMC Special Note: Connect this product to a DC distribution network or an AC/DC power adaptor with proper Surge protection (EN 61000-6-1:2001 specification requirements).
  * Measured at NTP
  ** Not available on CDE

**Specified accuracy with 24VDC supplied power with rising humidity. RTD/Thermistors in wall packages are not compensated for internal heating of product.**

- **EMC Conformance:**
  - EN 61000-6-1:2001

- **EMC Test Methods:**
  - CISPR 22:2006
  - IEC 61000-4-2:2001
  - IEC 61000-4-3:2006
  - IEC 61000-4-4:2004
  - IEC 61000-4-6:2006
  - IEC 61000-4-8:2001
  - IEC 61000-4-11:2004

- **EMC Special Note:** Connect this product to a DC distribution network or an AC/DC power adaptor with proper Surge protection (EN 61000-6-1:2001 specification requirements).
  * Measured at NTP

**QUICK INSTALL**

1. Using the mounting diagram on page 2, or using the housing as a template, mark and drill the four mounting holes on the duct. The centerline through the housing must be parallel to the air flow through the duct.
2. Rotate the duct probe so that its widest surface is perpendicular to the air flow in the duct.
3. Insert the probe and secure the sensor to the duct with the sheet metal screws provided, making sure that the provided gasket material is compressed between the sensor housing and the air duct.
4. Wiring. See wiring diagrams on next page.
OPERATION

CD series duct mount CO₂ sensors measure the levels of CO₂, RH (if equipped), and temperature (if equipped) of air inside a duct. The CO₂ sensor operates within accuracy specifications for an interval of 5 years and can be field calibrated. The temperature element is warranted to meet accuracy specifications for a period of 5 years. RH equipped models feature a replaceable HS Series humidity element that is warranted to meet accuracy specifications for a period of 1 year. To maintain accuracy, all vents must remain clear and free of dust, debris, etc.

INSTALLATION

Observe handling precautions for static sensitive devices to avoid damage to the circuitry which would not be covered under the factory warranty.

1. Choose a location to mount the sensor. The centerline of the housing must be parallel to the direction of air flow in the duct.

2. Use the mounting diagram to drill the four holes in the duct for securing the sensor.

3. Insert the probe into the hole. Rotate the housing so that the widest surface is perpendicular to the air flow.

4. Attach the sensor to the duct using the sheet metal screws provided. Make sure that the gasket on the back of the housing is compressed between the housing and the duct for a secure fit.

5. Wire the device. See Wiring section.

6. Configure the system using the menu (CDL only; see Configuration section).

7. Calibrate using 0 ppm CO₂ gas (see Calibration section).

WIRING

1. Feed control wire through conduit adapter and grommeted compression fitting on the bottom of the housing.

2. Remove terminal blocks by pulling straight up on the green assemblies.

3. Connect wires as shown and push terminal blocks back in to black receptacles.

4. Tighten compression fitting around control wire until sealed.

5. Snap conduit adapter onto compression fitting.

6. Refer to specifications for power requirements and relay rating.

7. Select mA or Volt output using selector switch.
## INSTALLATION GUIDE

### CONFIGURATION: CDL MODES

#### CONFIGURATION MODE:
Press [ENTER] for CONFIGURATION MODE. Press plus or minus to change setting.

**Set Point**
```
<table>
<thead>
<tr>
<th>CO2</th>
<th>02</th>
</tr>
</thead>
</table>
```

Range: 500 to 1500

**50PPM Increment**

**Dead Band**
```
<table>
<thead>
<tr>
<th>CO2</th>
<th>02</th>
</tr>
</thead>
</table>
```

Range: 10 to 500

**5 PPM Increment**

**Ranges**
```
<table>
<thead>
<tr>
<th>CO2</th>
<th>XXX</th>
</tr>
</thead>
</table>
```

Options: 2000 or 5000

**Units**
```
<table>
<thead>
<tr>
<th>CO2</th>
<th>CAL?</th>
</tr>
</thead>
</table>
```

Options: °F or ºC

**Options**
- ON, LOW, OFF
- None, 0, 400

**Output**
```
<table>
<thead>
<tr>
<th>0 - 10V</th>
</tr>
</thead>
</table>
```

Options: 0-10V or 0-5V

**Options**
- Default is 0-10V

**Output**
```
<table>
<thead>
<tr>
<th>4 - 20mA</th>
</tr>
</thead>
</table>
```

(mA Mode Only)

---

**NOTE:** This product is factory calibrated. The typical CO₂ sensor calibration interval is 5 years, depending on specific site installation factors. As of the date of this document, compliance with ANSI/ASHRAE 62-2001 requires minimum on-site accuracy verification intervals of 6 months or per the building operation and maintenance manual. Verify accuracy using a comparison to a known reference or the CO₂ gas calibration kit available from Veris Industries as AA01.

**WARNING:** CO₂ sensor calibration requires gas calibration kit. Performing calibration without gas kit or at an incorrect gas flow rate will cause erroneous readings.

---

**DISPLAYS SERIAL NUMBER**
```
| XXXXXXX |
```

**DISPLAYS MODEL NUMBER**
```
| XXXXXX |
```

---

**Serial Number**
```
| XXXXXXX |
```

**Model Number**
```
| CO2 |
```

---

**Ranges**
```
<table>
<thead>
<tr>
<th>CO2</th>
<th>XXX</th>
</tr>
</thead>
</table>
```

Options are -5 to 5ºC

0.1ºC Increment

(CO₂/temp combo models)

---

**Ranges**
```
<table>
<thead>
<tr>
<th>CO2</th>
<th>XXX</th>
</tr>
</thead>
</table>
```

Options are -10 to 10%

0.1% Increment

(CO₂/RH combo models)

---

**Ranges**
```
<table>
<thead>
<tr>
<th>CO2</th>
<th>XXX</th>
</tr>
</thead>
</table>
```

Options are None, 0, 400

---

**Working**
```
<table>
<thead>
<tr>
<th>5:00</th>
</tr>
</thead>
</table>
```

Unit will automatically return to run mode when calibration is complete.
**ABC CALIBRATION ALGORITHM**

ABC (Automatic Baseline Calibration) is a patented self-calibration feature that automatically adjusts the CO₂ sensor to compensate for drift. When ABC is enabled, the sensor records the lowest reading within every 24-hour interval and compares these values over a running 7-day or 28-day period. If a statistically significant amount of drift is detected, the ABC applies an automatic correction factor. This enables the sensor to operate within specifications for the 5-year calibration interval.

**ON POSITION.** Recommended Setting. Use the ON setting for applications where the building is unoccupied within a 24-hour timeframe.

**LOW POSITION.** Use the LOW setting for buildings occupied 24 hours a day.

**OFF POSITION.** Not Recommended.

*NOTE: After changing the ABC settings, power cycle the unit for changes to take effect.*

To set the ABC mode for CDL models, refer to the Configuration section on page 3. To set the ABC mode for CDE models, position the ABC jumper as shown:

**CDL MODELS ONLY**

CDL versions have optional RH and temperature sensors.

To Replace Humidity Sensor:
1. Power down unit
2. Remove CDL from duct to access probe tip.
3. Open tip of duct probe
4. Slide old RH sensor off pins
5. Slide new RH sensor onto pins.
6. Re-install CDL in duct and re-secure with screws provided.
7. Power unit back on

**OUTPUT SCALING**

Output scaling: 0-2000 ppm

<table>
<thead>
<tr>
<th>CO₂ ppm</th>
<th>0-5 Volt Output</th>
<th>0-10 Volt Output</th>
<th>mA Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>Outside</td>
<td>300-500</td>
<td>0.75 to 1.25</td>
<td>1.5 to 2.5</td>
</tr>
<tr>
<td>Over Ventilated</td>
<td>Under 600</td>
<td>under 1.5</td>
<td>Under 3</td>
</tr>
<tr>
<td>Ideal Ventilation</td>
<td>600-900</td>
<td>1.5 to 2.25</td>
<td>3 to 4.5</td>
</tr>
<tr>
<td>Under Ventilated</td>
<td>Over 900</td>
<td>over 2.25</td>
<td>Over 4.5</td>
</tr>
</tbody>
</table>

Observe handling precautions for static sensitive devices to avoid damage to the circuitry which would not be covered under the factory warranty.
**CALIBRATION PROCESS: CDL MODELS**

1. Remove cover and connect gas cylinder hose to the plastic port located on sensing module. Note: only connect one sensor to the calibration gas cylinder at a time.

2. Start flowing nitrogen gas (0 ppm CO₂). Use a flow rate of 0.3 to 0.5 liter/minute.

3. Calibrate for 5 min. Unit will return to working display when finished.

4. When unit returns to working display, remove hose from calibration port and enter Calibration mode as described on page 3.

**CALIBRATION PROCESS: CDE MODELS**

1. Remove cover and connect gas cylinder hose to the plastic port located on sensing module. Note: only connect one sensor to the calibration gas cylinder at a time.

2. Start flowing nitrogen gas (0 ppm CO₂). Use a flow rate of 0.3 to 0.5 liter/minute.

3. Push and hold down calibration button until the LED illuminates.

4. Continue flowing gas through the sensor until the LED is off. Estimated calibration time is 5 minutes. Remove hose from calibration port when complete.

For more complete calibration instructions using the AA01 Calibration Kit, see the AA01 Installation Guide.
Verify that you have the most current version of this document. Go to https://accounts.automatedlogic.com, then select Support > Download > Documents. Important changes are listed in Document revision history at the end of this document.

© 2018 Automated Logic Corporation. All rights reserved throughout the world. Automated Logic, WebCTRL, EIKON, Eco-Screen, and BACview are registered trademarks of Automated Logic Corporation. EnergyReports, Environmental Index, OptiFlex, and OptiPoint are trademarks of Automated Logic Corporation. All other trademarks are the property of their respective owners.
What is a DIAG485?

A DIAG485 is a diagnostic board that shows the communication signal levels on a network segment. The DIAG485 can also add bias to reduce the effects of noise on the network, but this usage depends on which of the following methods you use to terminate each end of the network segment.

- If you use BT485s or the OptiFlex™ controller's **End of Net** switch to terminate and add bias, you can optionally install one or more DIAG485's for diagnostic purposes only. You must put the DIAG485's **Bias** jumper in the **OFF** position to prevent it from adding bias.

- If you use the 120 Ohm terminators included with the DIAG485, you must add at least one DIAG485 near the center of the network segment to add bias. Put this DIAG485's **Bias** jumper in the **ON** position. If you add other DIAG485's on the network segment for diagnostics, put their **Bias** jumpers in the **OFF** position.

To attach a 120 Ohm terminator, turn off the controller’s power, then attach the terminator to the controller’s **Net +** and **Net –** terminals.
Sample network configuration

Sample daisy-chain configuration using DIAG485s for bias and diagnostics:

Specifications

<table>
<thead>
<tr>
<th>Specification</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power</td>
<td>24 Vac ±10%, 0.3 A, 50–60 Hz, 7.2 VA (Single Class 2 Source Only, 100 VA or less)</td>
</tr>
<tr>
<td>Environmental operating range</td>
<td>0 to 130°F (-17.8 to 54.4°C), 10–90% relative humidity, non-condensing</td>
</tr>
<tr>
<td>Protection</td>
<td>Built-in solid-state polyswitch surge and transient protection for communications. Polyswitch is not replaceable; it will reset itself if the condition that caused a fault returns to normal.</td>
</tr>
<tr>
<td>Overall dimensions</td>
<td>Width: 2.5 in. (6.35 cm) Height: 4 in. (10.16 cm)</td>
</tr>
<tr>
<td>Listed by</td>
<td>UL-916 (PAZX), cUL-916 (PAZX7), CE</td>
</tr>
</tbody>
</table>

To mount a DIAG485

⚠️ CAUTION  If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

Provide at least 1.5 in. (3.8 cm) clearance from each edge of the DIAG485 for wiring.

1 Remove DIAG485 from the snap track.
2 Mount the snap track using self-drilling screws. Drill directly into the plastic near the edges of the snap track so that the screws will be visible when you install the DIAG485. This prevents loose screws from shorting out the back of the board.
3 Mount the DIAG485 on the snap track by pushing it firmly into the grooves.
Wiring for power

**WARNING** Do not apply line voltage (mains voltage) to this device's ports or terminals.

**CAUTIONS**
- The DIAG485 is powered by a Class 2 power source. Take appropriate isolation measures when mounting it in a control panel where non-Class 2 circuits are present.
- Automated Logic® controllers can share a power supply as long as you:
  - Maintain the same polarity.
  - Use the power supply only for Automated Logic® controllers.

To wire for power

1. Remove power from the 24 Vac transformer.
2. Pull the screw terminal connector from the DIAG485's power connector.
3. Connect the transformer wires to the screw terminal connector.
4. Apply power to the transformer.
5. Measure the voltage at the DIAG485's power input terminals to verify that the voltage is within the operating range of 21.6–26.4 Vac.
6. Insert the screw terminal connector into the DIAG485's power connector. The **Power** LED lights when the DIAG485 has power.

To wire for communications

**WARNING** Do not apply line voltage (mains voltage) to this device's ports or terminals.

1. Pull the screw terminal connector from the DIAG485's power connector.
2. Check the communications wiring for shorts and grounds.
3. Connect the communications wiring to the DIAG485's **Net +**, **Net −**, and **Shield** screw terminals.
   - **NOTE** Use the same polarity throughout the network segment.
4. Insert the screw terminal connector into the DIAG485's power connector.
5. Verify communication with the network by viewing Module Status reports (Modstats) in the WebCTRL® interface for controllers beyond the DIAG485.
## Diagnosing network problems

Factors such as network length or the DIAG485’s position on the network affect how many of its LED’s are lit when communication is good or when network problems exist. To use the LED’s to diagnose problems, you must understand how the LED’s react to various network problems. Use the LED diagrams below as a reference.

<table>
<thead>
<tr>
<th></th>
<th>Short network (Less than 200 feet)</th>
<th>Medium network (201 to 999 feet)</th>
<th>Long network (1000 to 2000 feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Good communication</strong></td>
<td>Net- Off to Net+ On</td>
<td>Net- On</td>
<td>Net- On</td>
</tr>
</tbody>
</table>

### Network problems

<table>
<thead>
<tr>
<th><strong>Missing bias</strong></th>
<th>Number of lit Net- LED's is higher than Good communication (shown above), almost as many as Net +</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Missing terminators</strong></td>
<td>Most LED's are lit.</td>
</tr>
<tr>
<td><strong>Missing bias and terminators</strong></td>
<td>Almost all LED's are lit.</td>
</tr>
</tbody>
</table>

**Possible causes:**

- Shorted Net- to Net+ (most likely cause)
- A defective controller on network is constantly transmitting
- A defective BT485 is putting +5 volts directly onto Net+


**NOTE** If all lit LED's quickly turn off then on, this indicates an ARC156 network reconfiguration.

Good network communication viewed through an oscilloscope looks similar to the following figure. The DIAG485's **Net-** LED's represent the signal below the 0-volt line, and the **Net+** LED's represent the signal above the 0-volt line.

**CE Compliance**

⚠️ **WARNING** This is a Class A product. In a domestic environment, this product may cause radio interference in which case the user may be required to take adequate measures.
# Document revision history

Important changes to this document are listed below. Minor changes such as typographical or formatting errors are not listed.

<table>
<thead>
<tr>
<th>Date</th>
<th>Topic</th>
<th>Change description</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>11/9/18</td>
<td>Specifications</td>
<td>Changed Overall dimensions width to 2.5.</td>
<td>X-TS-JC-E</td>
</tr>
<tr>
<td>1/27/17</td>
<td>What is a DIAG485?</td>
<td>Added OptiFlex's End of Net switch to first bullet.</td>
<td>A-D</td>
</tr>
<tr>
<td>4/27/15</td>
<td>Entire document</td>
<td>New look, no content changes.</td>
<td>A-D</td>
</tr>
</tbody>
</table>

* For internal use only
Duct Units

Temperature Sensors

Features & Options

- Series 304 Stainless Steel Probes: 2, 4, 8, 12 and 18”
- Three Enclosure Styles
- Double Encapsulated Sensors & Etched Teflon Leads
- Limited Lifetime Warranty
- Wide Selection of Temperature Sensing Elements

Single Point Duct Units feature closed cell foam to seal the probe insertion hole and to absorb vibration. Mounting tabs allow for easy installation directly to the wall of the duct.

All Duct Units have etched Teflon leadwires and double encapsulated sensors to create a watertight package that can withstand high humidity and condensation and perform under real world conditions. Duct Units have probe lengths from 2” to 18” to accommodate most duct shapes and sizes. Custom probe lengths are also available.

Duct Units come standard with a 2”x4” steel J-Box but are also available with no box or the new BAPI-Box Crossover enclosure.

The New BAPI-Box Crossover Enclosure

The new BAPI-Box Crossover features a hinged cover with thumb latch for easy termination. A pierceable knockout plug is available for the open port. See the Accessories section for more info.

(Units shown with knockplug plug sold separately.)

Specifications

Environmental Operation Range:
Temperature:
BAPI-Box Crossover: -40 to 85 °C
Other Enclosures: -40 to 105 °C
Humidity: 0 to 100%, non-condensing

Sensing Element:
Thermistor or RTD (See Sensors Section for Specs.)

Probe Material:
Stainless Steel, 1/4” diameter

Enclosure Material:
Junction Box: Galvanized Steel
BAPI-Box Crossover:
UV-resistant polycarbonate, UL94, V-0

Enclosure Rating:
Junction Box: IP20, NEMA 1
BAPI-Box Crossover (BBX):
IP10, NEMA 1
IP44 with knockout plug in open port

Enclosure Dimensions: H x W x D
BAPI-Box Crossover:
3.1 x 2.2 x 1.9” (79 x 56 x 49mm)
Junction Box
4.2 x 3.9 x 1.94” (106 x 98.4 x 49mm)

(For enclosure dimension drawings, see the end of the section.)
Use the Option Selection Guide below to create your custom part number. Replace the number and parenthesis with the designator for each selection. Skip the designator and dashes for optional selections that are not required in your configuration.

**Duct Temperature Option Selection Guide**

<table>
<thead>
<tr>
<th>#1: Temperature Sensor (required)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.8K .................................. 1.8K Thermistor</td>
</tr>
<tr>
<td>3K .................................... 3K Thermistor</td>
</tr>
<tr>
<td>10K-2 .................................. 10K-2 Thermistor</td>
</tr>
<tr>
<td>10K-3 .................................. 10K-3 Thermistor</td>
</tr>
<tr>
<td>20K .................................... 20K Thermistor</td>
</tr>
</tbody>
</table>

Transmitters below require a BAPI-Box Crossover Enclosure
- T1K[32 TO 212°F] .... 1K Plat. RTD Transmitter, 4 to 20 mA Output, 32 to 212°F Range
- T1K[20 TO 120°F] .... 1K Plat. RTD Transmitter, 4 to 20 mA Output, 20 to 120°F Range
- T1K[0 TO 100°F] .... 1K Plat. RTD Transmitter, 4 to 20 mA Output, 0 to 100°F Range
- T1K[-7 TO 49°C] .... 1K Plat. RTD Transmitter, 4 to 20 mA Output, -7 to 49°C Range
- T1K[-18 TO 38°C] .... 1K Plat. RTD Transmitter, 4 to 20 mA Output, -18 to 38°C Range

*Matched Transmitters are also available. Contact your BAPI representative for ordering.*

<table>
<thead>
<tr>
<th>#2: Probe Type and Length (required)</th>
</tr>
</thead>
<tbody>
<tr>
<td>D-2&quot; .... Duct, 2” (51mm) length</td>
</tr>
<tr>
<td>D-4&quot; .... Duct, 4” (102mm) length</td>
</tr>
<tr>
<td>D-8&quot; .... Duct, 8” (203mm) length</td>
</tr>
<tr>
<td>D-12&quot; .... Duct, 12” (305mm) length</td>
</tr>
<tr>
<td>D-18&quot; .... Duct, 18” (457mm) length</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>#3: Enclosure and Lead Length (optional, J-Box comes standard)</th>
</tr>
</thead>
<tbody>
<tr>
<td>BBX .................................... BAPI-Box Crossover (IP10, NEMA 1)</td>
</tr>
<tr>
<td>NB-18” .............. No Box, 18’ Leads</td>
</tr>
<tr>
<td>NB-5’ .............. No Box, 5’ Leads</td>
</tr>
<tr>
<td>NB-10’ .............. No Box, 10’ Leads</td>
</tr>
<tr>
<td>NB-15’ .............. No Box, 15’ Leads</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>#4: Test &amp; Balance or Terminal Strip (optional, requires a BAPI-Box Crossover Enclosure)</th>
</tr>
</thead>
<tbody>
<tr>
<td>TB ..................................... Test &amp; Balance Switch</td>
</tr>
<tr>
<td>TS ..................................... Terminal Strip Connection</td>
</tr>
</tbody>
</table>

*Additional options are available for these units but not shown in this Selection Guide. Contact your BAPI representative for the complete list of options.*

**Example Number:** BA/ (#1) - (#2) - (#3) - (#4)

**Actual Number (with parenthesis removed):** BA/10K-2-D-8”-NB-5’

**Description:** 10K-2 Thermistor, Duct Temperature Sensor, No Box Enclosure with 5’ Leads.

**Your Number:** BA/
OptiFlex™ I/O Expanders

I/O Modules for the OptiFlex™ BACnet Building Controller

The Automated Logic® OptiFlex I/O expanders are an integral component of the WebCTRL® building automation system.

The OptiFlex I/O expanders deliver input and output capacity to the powerful OptiFlex BACnet Building Controller (OFBBC). Flexible and versatile, the OFBBC supports multiple I/O configurations for both common and custom HVAC control strategies. Up to nine OptiFlex I/O expanders can be added to an OptiFlex controller.

OptiFlex I/O expanders are designed for flexible panel configurations. They are DIN rail or screw-tab mountable and can be mixed and matched to meet the I/O requirements of the equipment being controlled. The expanders can be mounted directly to the OFBBC controller or remotely mounted up to 500’ away.

<table>
<thead>
<tr>
<th>Part#</th>
<th>FIO48u</th>
<th>FIO88u</th>
<th>FIO812u</th>
<th>FIO012u</th>
</tr>
</thead>
<tbody>
<tr>
<td>Universal Outputs</td>
<td>4</td>
<td>8</td>
<td>8</td>
<td>0</td>
</tr>
<tr>
<td>Universal Inputs</td>
<td>8</td>
<td>8</td>
<td>12</td>
<td>12</td>
</tr>
</tbody>
</table>

The WebCTRL® building automation system gives you the ability to understand your building operations and analyze the results. The WebCTRL system integrates environmental, energy, security and safety systems into one powerful management tool that allows you to reduce energy consumption, increase occupant comfort, and achieve sustainable building operations. Our web-based platform allows building managers to control and access information about their HVAC, lighting, central plant and critical processes on premises or remotely at any time of day.
# OptiFlex™ I/O Expanders

## Specifications

<table>
<thead>
<tr>
<th>Feature</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power Requirements</td>
<td>24 Vac ± 10%, 50–60 Hz, 50 VA or 26 Vdc ± 10%, 12W</td>
</tr>
<tr>
<td>I/O Bus port</td>
<td>Provides communication for wired FIO expanders that are powered by external power supplies.</td>
</tr>
<tr>
<td>I/O bus edge connector</td>
<td>6-pin connector that provides communication and power to a directly-connected OptiFlex I/O expander.</td>
</tr>
<tr>
<td>Configurable Inputs</td>
<td>Configurable in the control program for 0–5 Vdc, 0–10 Vdc, 0–20 mA, RTD, thermistor, dry contact, or pulse counter</td>
</tr>
<tr>
<td>Input resolution</td>
<td>16 bit A/D</td>
</tr>
<tr>
<td>Input pulse frequency</td>
<td>40 pulses per second, Max. Minimum pulse width (on or off time) required for each pulse is 12.5 msec.</td>
</tr>
<tr>
<td>Configurable Outputs</td>
<td>Outputs can be set as analog or binary outputs and feature</td>
</tr>
<tr>
<td>Hand-Auto-Off (HAO) switches</td>
<td>A 2A fuse for the FIO expander's power</td>
</tr>
<tr>
<td>Analog outputs</td>
<td>A 4A fuse for the I/O bus edge connector</td>
</tr>
<tr>
<td>Binary outputs</td>
<td>The power and network ports comply with the EMC requirements EN50491-5-2.</td>
</tr>
<tr>
<td>Output resolution</td>
<td>12 bit D/A</td>
</tr>
<tr>
<td>Microprocessor</td>
<td>32-bit microprocessor with 256 kB Flash memory and 64 kB SRAM</td>
</tr>
<tr>
<td>Protection</td>
<td>The OptiFlex I/O expander has two fast acting, 5mm x 20mm glass fuses:</td>
</tr>
<tr>
<td></td>
<td>A 2A fuse for the FIO expander's power</td>
</tr>
<tr>
<td></td>
<td>A 4A fuse for the I/O bus edge connector</td>
</tr>
<tr>
<td>Environmental Operating Range:</td>
<td>NOTE: Install in a UL Listed enclosure only.</td>
</tr>
<tr>
<td>Terminal connectors</td>
<td>Screw-type terminal blocks. 0.2 in (5.08 mm) pitch connectors</td>
</tr>
<tr>
<td>Dimensions</td>
<td><strong>Overall</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Screw mounting</strong></td>
</tr>
<tr>
<td>A</td>
<td>6.9 in. (17.53 cm)</td>
</tr>
<tr>
<td>B</td>
<td>6.95 in. (17.65 cm)</td>
</tr>
<tr>
<td>Depth</td>
<td>2.09 in. (5.31 cm)</td>
</tr>
<tr>
<td>Recommended panel depth</td>
<td>2 3/4 in. (7 cm)</td>
</tr>
<tr>
<td>Weight</td>
<td>1.1 lb. (0.49 kg)</td>
</tr>
<tr>
<td>Status Indicators</td>
<td>LED status indicators for Power, Run, Error, Xnet TX and Xnet Rx</td>
</tr>
<tr>
<td>Compliance</td>
<td><strong>United States of America:</strong> FCC compliant to Title CFR47, Chapter 1, Subchapter A, Part 15, Subpart B, Class A; UL Listed to UL 916, PAZX, Energy Management Equipment</td>
</tr>
<tr>
<td></td>
<td><strong>Canada:</strong> Industry Canada Compliant, ICES-003, Class A  cUL Listed UL 916, PAZX7, Energy Management Equipment</td>
</tr>
<tr>
<td></td>
<td><strong>Europe:</strong> CE Mark ENS0491-5:2009, Part 5-2: EMC requirements for HBES/BACS used in residential, commercial and light industry environment</td>
</tr>
<tr>
<td></td>
<td>ENS0491-3:2009, Part 3: Electrical safety requirements for Home and Building Electronic Systems (HBES) and Building Automation and Control Systems (BACS)</td>
</tr>
<tr>
<td></td>
<td>Low Voltage Directive: 2014/35/EU</td>
</tr>
<tr>
<td></td>
<td>RoHS Compliant: 2011/65/EU</td>
</tr>
<tr>
<td></td>
<td><strong>Australia and New Zealand:</strong> C-Tick Mark, AS/NZS 61000-6-3</td>
</tr>
</tbody>
</table>

All trademarks used herein are the property of their respective owners.
Humidity & Combination
Temp./Humidity Sensors

**Features & Options**
- Etched Teflon Leadwires & Double Encapsulated Sensors
- Watertight BAPI-Box or BAPI-Box 2 Enclosure
- Humidity Only or Temp./Humidity Combination
- 2% and 3% RH Accuracies with Replaceable Filter

Humidity control is an important aspect of any climate control system. Therefore, humidity sensors must be both accurate and dependable. BAPI’s humidity sensors are prescreened for accuracy, eliminating the need for field calibration. The Outside Air Units are also extremely dependable with a watertight (IP66) BAPI-Box or BAPI-Box 2 UV-resistant polycarbonate enclosure.

All Outside Air Units have etched Teflon leadwires and are built to withstand high humidity and condensation and perform under real world conditions. This is especially important in an Outside Air Unit which can be exposed to rain, snow and large temperature swings.

**Ordering Information/Part Numbers**

**Humidity Only Units in a BAPI-Box, interchangeable 0 to 5 or 4 to 20 mA %RH Output**
- ALC/H200-O-BB .......... 2%RH Outside Air Humidity Sensor with a BAPI-Box Enclosure
- ALC/H300-O-BB .......... 3%RH Outside Air Humidity Sensor with a BAPI-Box Enclosure

**Combo Units, 10K-2 Thermistor in a BAPI-Box, interchangeable 0 to 5 or 4 to 20 mA %RH Output**
- ALC/10K-2-H200-O-BB ... 2%RH Outside Air Temp and Humidity Sensor with a BAPI-Box Enclosure
- ALC/10K-2-H300-O-BB ... 3%RH Outside Air Temp and Humidity Sensor with a BAPI-Box Enclosure

**Humidity Only Units in a BAPI-Box 2, interchangeable 0 to 5 or 4 to 20 mA %RH Output**
- ALC/H200-O-BB2 .......... 2%RH Outside Air Humidity Sensor with a BAPI-Box Enclosure
- ALC/H300-O-BB2 .......... 3%RH Outside Air Humidity Sensor with a BAPI-Box Enclosure

**Combo Units, 10K-2 Thermistor in a BAPI-Box 2, interchangeable 0 to 5 or 4 to 20 mA %RH Output**
- ALC/10K-2-H200-O-BB2 .. 2%RH Outside Air Temp & Humidity Sensor with a BAPI-Box 2 Enclosure
- ALC/10K-2-H300-O-BB2 .. 3%RH Outside Air Temp & Humidity Sensor with a BAPI-Box 2 Enclosure

**Specifications**

**Power:**
10 to 35 VDC or 12 to 27 VAC (0 to 5 VDC %RH Output)

**Power Consumption:**
22 mA max. DC or 0.53 VA max. AC

**Humidity Sensor:** Capacitive 2% or 3% RH
(10 to 90% RH @ 23°C)

**Encl. Material:** UV-res. polycarbonate, UL 94, V-0

**Enclosure Rating:** IP66, NEMA 4

**Environmental Operation Range:**
Temp: -40 to 70 °C • Humidity: 0 to 100% RH

**10K-2 Thermistor Sensor Specifications**
- **Resistance:** 10 kΩ @ 25°C, -55°C to 150°C range
- **Standard Accuracy:** 0.2°C (±0.36°F) at 0 to 70°C
- **Dissipation Constant:** 2.7 mW/°C
- **Stability(drift):** Less than ±0.1°C (0.18°F) drift over 10 years.
HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Follow safe electrical work practices. See NFPA 70E in the USA, or applicable local codes.
- This equipment must only be installed and serviced by qualified electrical personnel.
- Read, understand and follow the instructions before installing this product.
- Turn off all power supplying equipment before working on or inside the equipment.
- Use a properly rated voltage sensing device to confirm power is off.

DO NOT DEPEND ON THIS PRODUCT FOR VOLTAGE INDICATION

- Only install this product on insulated conductors.

Failure to follow these instructions will result in death or serious injury.

A qualified person is one who has skills and knowledge related to the construction and operation of this electrical equipment and the installation, and has received safety training to recognize and avoid the hazards involved. NEC2009 Article 100

No responsibility is assumed by Veris Industries for any consequences arising out of the use of this material.

NOTICE

- This product is not intended for life or safety applications.
- Do not install this product in hazardous or classified locations.
- The installer is responsible for conformance to all applicable codes.
- Mount this product inside a suitable fire and electrical enclosure.

INSTALLATION

Disconnect and lock out power to the enclosure containing the conductor to be monitored.

1. Locate a mounting surface for the removable mounting bracket that will allow the monitored conductor to pass through the center window when it is installed and that will keep the product at least ½” (13 mm) from any uninsulated conductors. Determine cable routing for the controller connection, allowing wiring to reach the mounting location.

2. Drill holes to mount the bracket to the chosen surface using the included screws.

3. Wire the output connections between the sensor and the controller (solid-state contact).

4. Snap the sensor over the wire to be monitored clip the assembly to the mounting bracket.

5. Secure the enclosure and reconnect power.

SPECIFICATIONS

<table>
<thead>
<tr>
<th>Sensor Power</th>
<th>Induced from monitored conductor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amperage Range</td>
<td>0.15 to 200A Continuous</td>
</tr>
<tr>
<td>Status Output Ratings</td>
<td>N.O. 1.0A@30VAC/DC, not polarity sensitive</td>
</tr>
<tr>
<td>Insulation Class</td>
<td>600VAC RMS (UL), 300VAC RMS (CE)</td>
</tr>
<tr>
<td>Setpoint</td>
<td>Fixed at 0.15 A max. (60 Hz)</td>
</tr>
<tr>
<td>Frequency</td>
<td>50/60 Hz</td>
</tr>
<tr>
<td>Temperature Range</td>
<td>-15° to 40°C (5° to 104°F)</td>
</tr>
<tr>
<td>Humidity Range</td>
<td>10-90% RH non-condensing</td>
</tr>
<tr>
<td>Off State Resistance</td>
<td>Open switch represents &gt;1 Ω</td>
</tr>
<tr>
<td>On State Resistance</td>
<td>Closed switch represents &lt;200 mΩ</td>
</tr>
<tr>
<td>Terminal Block Wire Size</td>
<td>14 to 24 AWG (2.1 to 0.2 mm²)</td>
</tr>
<tr>
<td>Terminal Block Torque</td>
<td>3.5 to 4.5 in-lb (0.4 to 0.5 N-m)</td>
</tr>
<tr>
<td>Agency Approvals</td>
<td>UL508, CE: EN61010-1</td>
</tr>
</tbody>
</table>

For CE compliance, conductor shall be insulated according to IEC 61010-1. The product design provides for functional insulation only. Listed for use with 75°C insulated conductors.

DIMENSIONS

- Insulated Conductor ONLY
- DDC CONTROLLER
- Fan
- Motor
- Removable Mounting Bracket

For RoHS Compliance, see manufacturer's website.
**OPERATION**

The H600 is a current-sensitive switching device that monitors current (amperage) in the conductor passing through it. A change in amperage in the monitored conductor that crosses the switch (setpoint) threshold plus the hysteresis value causes the resistance of the FET status output to change state, similar to the action of a mechanical switch. In this model, the setpoint is fixed at 150 mA AC max. (200 mA for 50 Hz operation). The status output is suitable for connection to building controllers or other appropriate data acquisition equipment operating at up to 30 volts. The H600 requires no external power supply to generate its output.

**TROUBLESHOOTING**

<table>
<thead>
<tr>
<th>Problem</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Reading at Controller</td>
<td>• Check for control voltage at sensor (&lt;30V)</td>
</tr>
<tr>
<td></td>
<td>• Check for amperage in monitored conductor (&gt; 0.15A @ 60Hz)</td>
</tr>
<tr>
<td></td>
<td>• Assure that sensor core mating surfaces are clean and that the core clamp is completely closed</td>
</tr>
</tbody>
</table>

**NOTES**

For load currents greater than sensor maximum rating:
Use a 5 Amp (H68xx series) current transformer (CT) as shown. This technique can be combined with wrapping (see below) when added range is desired for a low current load on a high current source.

![Diagram of current transformer and wrapping](image)

**CAUTION**

RISK OF EQUIPMENT DAMAGE

- Derate the product’s maximum current for the number of turns through the sensing window using the following formula.

  Rated Max. Amps ÷ Number of Turns = Max. monitored Amps

  e.g.: 100A ÷ 4 Turns = 25 Amps max. in monitored conductor

- Failure to follow these instructions can result in overheating and permanent equipment damage.

For load currents less than sensor minimum rating:
Wrap the monitored conductor through the center window and around the sensor body to produce multiple turns through the center window. This increases the current measured by the transducer.

Program the controller to account for the extra turns, e.g., if four turns pass through the sensor (as shown) divide the normal controller reading by 4.

![Diagram of wrapping and reduced current](image)
HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

• Follow safe electrical work practices. See NFPA 70E in the USA, or applicable local codes.
• This equipment must only be installed and serviced by qualified electrical personnel.
• Read, understand and follow the instructions before installing this product.
• Turn off all power supplying equipment before working on or inside the equipment.
• Use a properly rated voltage sensing device to confirm power is off.

DO NOT DEPEND ON THIS PRODUCT FOR VOLTAGE INDICATION

• Only install this product on insulated conductors.

Failure to follow these instructions will result in death or serious injury.

A qualified person is one who has skills and knowledge related to the construction and operation of this electrical equipment and the installation, and has received safety training to recognize and avoid the hazards involved. NEC2009 Article 100

No responsibility is assumed by Veris Industries for any consequences arising out of the use of this material.

DANGER

NOTICE

• This product is not intended for life or safety applications.
• Do not install this product in hazardous or classified locations.
• The installer is responsible for conformance to all applicable codes.
• Mount this product inside a suitable fire and electrical enclosure.

Product Overview

The H908 is a current-sensitive switching device that monitors current (amperage) in the conductor passing through it. A change in amperage in the monitored conductor that crosses the switch (setpoint) threshold plus the hysteresis value causes the resistance of the FET status output to change state, similar to the action of a mechanical switch. In this model, the setpoint is adjustable through the action of a twenty (20) turn potentiometer (see the CALIBRATION section). The status output is suitable for connection to building controllers or other appropriate data acquisition equipment operating at up to 30 volts. The H908 requires no external power supply to generate its output.

The H908 housing offers unprecedented mounting flexibility. The mounting bracket can be attached in three different places. Additionally, the bracket is compatible with the Veris AH01 DIN Rail clip, allowing DIN mounting.

Specifications

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sensor Power</td>
<td>Induced from the monitored conductor</td>
</tr>
<tr>
<td>Amperage Range</td>
<td>2.5 to 135 A continuous</td>
</tr>
<tr>
<td>Status Output Ratings</td>
<td>N.O. 1.0 A@30 VAC/DC, not polarity sensitive</td>
</tr>
<tr>
<td>Insulation Class</td>
<td>600 VAC RMS (UL); 300 VAC (CE)</td>
</tr>
<tr>
<td>Setpoint</td>
<td>Adjustable, 2.5 A or less</td>
</tr>
<tr>
<td>Frequency Range</td>
<td>50/60 Hz</td>
</tr>
<tr>
<td>Temperature Range</td>
<td>-15° to 60°C (5° to 140°F)</td>
</tr>
<tr>
<td>Humidity Range</td>
<td>10-90% RH non-condensing</td>
</tr>
<tr>
<td>Hysteresis</td>
<td>10% typical</td>
</tr>
<tr>
<td>Off State Resistance</td>
<td>Open switch represents &gt;1 MΩ</td>
</tr>
<tr>
<td>On State Resistance</td>
<td>Closed switch represents &lt; 200 mΩ</td>
</tr>
<tr>
<td>Terminal Block Wire Size</td>
<td>24 to 14 AWG (0.2 to 2.1 mm²)</td>
</tr>
<tr>
<td>Terminal Block Torque</td>
<td>3.5 to 4.4 in-lbs (0.4 to 0.5 N-m)</td>
</tr>
</tbody>
</table>

COMPLIANCE INFORMATION

Agency Approvals                  | UL508 open device listing, CE: EN61010-1            |
Installation Category             | Cat. III, pollution degree 2                        |

For applications requiring double or reinforced insulation, please contact the factory.
The product design provides basic insulation only.
Do not use the LED indicators as evidence of applied voltage.
Installation

**Dimensions**

- Removable Mounting Bracket
  - 1.0" (25 mm)
  - 1.1" (26 mm)
  - 3.1" (79 mm)
  - 2.5" (64 mm)
  - 0.8" (21 mm)
  - 0.3" (8 mm)
  - 1.4"* (36 mm)
  - Bracket can be mounted on three sides for added installation flexibility.
  - Self-gripping Iris

- Use DIN Rail Mounting clip (Veris part number AH01) to mount on standard DIN rail.

**Installation**

⚠️ **Disconnect and lock out power to the enclosure containing the conductor to be monitored.**

1. Locate a mounting surface for the removable mounting bracket that will allow the monitored conductor to pass through the center window when it is installed and that will keep the product at least ½" (13 mm) from any uninsulated conductors. Determine cable routing for the controller connection, allowing the wiring to reach the mounting location.

2. Drill holes to mount the bracket to the chosen surface using the included screws.

3. Wire the output connections from the sensor to the controller (solid-state contact).

4. Snap the sensor over the conductor and clip the assembly to the mounting bracket.

5. Secure the enclosure and reconnect power.

6. Calibrate the sensor with the load running normally.
For load currents greater than sensor maximum rating:

Use a 5 Amp (H68xx series) current transformer (CT) as shown. This technique can be combined with wrapping (see below) to add range for a low current load on a high current source.

![Diagram of a 5A CT installation](image)

**DANGER:** 5A CTs can present hazardous voltages. Install CTs in accordance with manufacturer’s instructions. Terminate the CT secondary before applying current.

For load currents less than sensor minimum rating:

Wrap the monitored conductor through the center window and around the sensor body to produce multiple turns. This increases the current measured by the transducer. Program the controller to account for the extra turns (e.g., if four turns pass through the sensor (as shown) divide the normal reading by 4).

![Diagram of a conductor wrap](image)

**CAUTION**

- Derate the product’s maximum current for the number of turns through the sensing window using the following formula.
  
  Rated Max. Amps ÷ Number of Turns = Max. monitored Amps

  e.g.: 100A ÷ 4 Turns = 25 Amps max. in monitored conductor

  - Failure to follow these instructions can result in overheating and permanent equipment damage.

### Notes

For load currents greater than sensor maximum rating:

Use a 5 Amp (H68xx series) current transformer (CT) as shown. This technique can be combined with wrapping (see below) to add range for a low current load on a high current source.

![Diagram of a 5A CT installation](image)

**DANGER:** 5A CTs can present hazardous voltages. Install CTs in accordance with manufacturer’s instructions. Terminate the CT secondary before applying current.

For load currents less than sensor minimum rating:

Wrap the monitored conductor through the center window and around the sensor body to produce multiple turns. This increases the current measured by the transducer. Program the controller to account for the extra turns (e.g., if four turns pass through the sensor (as shown) divide the normal reading by 4).

![Diagram of a conductor wrap](image)

**CAUTION**

- Derate the product’s maximum current for the number of turns through the sensing window using the following formula.
  
  Rated Max. Amps ÷ Number of Turns = Max. monitored Amps

  e.g.: 100A ÷ 4 Turns = 25 Amps max. in monitored conductor

  - Failure to follow these instructions can result in overheating and permanent equipment damage.
Before beginning calibration, establish normal load conditions. Then choose either A or B below.

A. To monitor under-current (belt loss, coupling shear, status)

1. Turn setpoint screw clockwise until Status Open LED turns on.

2. Slowly turn the screw counter clockwise until the Status Closed LED turns on.

3. Turn the screw an additional ¼ turn counter clockwise for operational margin.

B. To monitor over-current (mechanical problems, seized impeller)

1. Turn setpoint screw counter clockwise until Status Closed LED turns on.

2. Slowly turn the setpoint screw clockwise until the Status Open LED just turns on.

3. Turn the setpoint screw an additional ¼ turn clockwise for operational margin.

Troubleshooting

<table>
<thead>
<tr>
<th>Problem</th>
<th>Solution</th>
</tr>
</thead>
</table>
| No Reading at Controller | • Check sensor calibration (see above)  
                          | • Check for amperage in monitored conductor (> 2.5A)  
                          | • Assure that sensor core mating surfaces are clean and that the core clamp is completely closed |
| Setpoint screw has no stops | The setpoint screw has a slip-clutch at both ends of its travel to avoid damage. Twenty turns CCW will reset the sensor to be most sensitive. Repeat calibration above. |
| Both LEDs are lit | Setpoint screw is too far clockwise. See solution above. |
Immersion Temperature Sensors

Accessory for HVAC/R

Automated Logic’s Immersion Temperature Sensors are available in 2”, 4”, and 8” probe lengths. The sensor is potted inside a 1/4” stainless steel probe with thermally conductive epoxy. All Immersion Units have etched Teflon leadwires and double encapsulated sensors to create a watertight package that can withstand high humidity and condensation.

Immersion Units come standard with a 2”x4” steel J-Box or a nylon and ABS plastic BAPI-Box 4 enclosure. They are also available with a watertight BAPI-Box or BAPI-Box 2 enclosure.

**Features**
- 2”, 4” & 8” Probe Lengths: (fit our standard Thermowells)
- Series 304 SS Probes & Double Encapsulated Sensors
- Optional BAPI-Box or BAPI-Box 2 Enclosure

**Thermowells**
Probes are designed to be inserted into a Thermowell. Thermowells are available in lengths to match our Immersion Probe Lengths.

Manufactured by Building Automation Products, Inc., 750 N. Royal Ave., Gays Mills, WI 54631 USA

Ph:+1-608-735-4800 • Fax:+1-608-735-4804 • E-mail:sales@bapihvac.com • Web:www.bapihvac.com

1150 Roberts Boulevard, Kennesaw, Georgia 30144
770-429-3000 Fax 770-429-3001 | www.automatedlogic.com

© Automated Logic 2016

Next level building automation engineered to help you make smart decisions.
Immersion Temperature Sensors

Specifications

Environmental Operation Range:

Temperature Sensor:
- J-Box: -40 °C to 100 °C
- BAPI Box: -40 °C to 85 °C
- Humidity: 0 to 100%, non-condensing

10K-2 Thermistor Sensor:
- Resistance: 10 kΩ @ 25°C, -55 to 150°C range
- Standard Accuracy: 0.2°C (±0.36°F) at 0 to 70°C
- Dissipation Constant: 2.7 mW/°C
- Stability (drift): Less than ±0.1°C (0.18°F) drift over 10 years

Enclosure Material:
- BAPI-Box: Polycarbonate, UL94, V-0
- BAPI-Box 2: Polycarbonate, UL94, V-0
- BAPI-Box 4: Nylon & ABS Plastic, UL94, V-0
- J-Box Model: Galv. Steel

Enclosure Rating:
- BAPI-Box or BAPI-Box 2: IP66, NEMA 4
- BAPI-Box 4 Model: IP10 (IP44 with Knockout Plug)
- J-Box Model: IP20, NEMA 1

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>NSB-10K-2-I-2-A</td>
<td>IMMERSION TEMPERATURE SENSOR - J-BOX - 2 IN. PROBE NO LOGO - ALC</td>
</tr>
<tr>
<td>NSB-10K-2-I-2-BB2-A</td>
<td>IMMERSION TEMP SENSOR - BB2 ENCLOSURE - 2 IN. PROBE LOGO - ALC</td>
</tr>
<tr>
<td>NSB-10K-2-I-2-BB2-M304-A</td>
<td>IMMERSION TEMP SENSOR - BB2 ENC - 2 IN. - 304 SS WELL LOGO - ALC</td>
</tr>
<tr>
<td>NSB-10K-2-I-2-BB4-A</td>
<td>IMMERSION TEMP SENSOR - BB4 ENC - 2 IN. PROBE LOGO - ALC</td>
</tr>
<tr>
<td>NSB-10K-2-I-2-M304-A</td>
<td>IMMERSION TEMP SENSOR - J-BOX - 2 IN. - 304 SS WELL NO LOGO - ALC</td>
</tr>
<tr>
<td>NSB-10K-2-I-4-A</td>
<td>IMMERSION TEMP SENSOR - J-BOX ENC - 4 IN. - NO LOGO - ALC</td>
</tr>
<tr>
<td>NSB-10K-2-I-4-BB2-A</td>
<td>IMMERSION TEMP SENSOR - BB2 ENC - 4 IN. - C28 LOGO - ALC</td>
</tr>
<tr>
<td>NSB-10K-2-I-4-BB2-M304-A</td>
<td>IMMERSION TEMP SENSOR - BB2 ENC - 4 IN. - 304 SS WELL LOGO - ALC</td>
</tr>
<tr>
<td>NSB-10K-2-I-4-BB4-A</td>
<td>IMMERSION TEMP SENSOR - BB4 ENC - 4 IN. PROBE LOGO - ALC</td>
</tr>
<tr>
<td>NSB-10K-2-I-4-M304-A</td>
<td>IMMERSION TEMP SENSOR - J-BOX - 4 IN. 304 SS WELL NO LOGO - ALC</td>
</tr>
</tbody>
</table>
THERMOSTATS & CONTROLLERS

LOW LIMIT TEMPERATURE CONTROLLERS
L480 SERIES

DESCRIPTION
The Honeywell L480 Series low limit controllers operate electric dampers, valves and compressor or fan motors to provide temperature or limit control of air conditioning systems and refrigeration units. The L480B has an SPDT switch and automatically resets; the L480G has an SPST switch that opens on a fall in temperature and requires manual reset. The L482A has two SPST switches and manual reset; the main switch opens, and the auxiliary switch closes, on a fall in temperature.

FEATURES
- Dual temperature scale plate provides both Fahrenheit and Celsius readings
- No sensing bulb, the controller operates at the coldest point (1 foot section) of the 20 ft. element for complete coverage
- Dustproof and moisture proof enclosed switch for trouble-free operation
- Horizontal or vertical mounting for installation flexibility

APPLICATION
- Air handling unit coil freeze protection
- Freezer cabinets
- Display cases
- Beverage coolers
- Frost alarm for storehouses, orchards

SPECIFICATIONS

<table>
<thead>
<tr>
<th>Sensing Element</th>
<th>20' (6m) element, 1/8&quot; dia., no bulb, controller operates at coldest point</th>
</tr>
</thead>
<tbody>
<tr>
<td>Switch action</td>
<td>L480B: SPDT, automatic reset, makes R-B, breaks R-W on temperature fall</td>
</tr>
<tr>
<td></td>
<td>L480G: SPST, manual reset, breaks circuit on temperature fall</td>
</tr>
<tr>
<td></td>
<td>L482A: 2 SPST, manual reset, main switch (M2) opens, aux. switch (M1) closes on temperature fall</td>
</tr>
<tr>
<td>Conduit Connection</td>
<td>7/8&quot; (22mm) hole for 1/2&quot; conduit with 1-3/32&quot; (28mm) knockout ring for 3/4&quot; conduit</td>
</tr>
<tr>
<td>Setpoint Range</td>
<td>L480B, G: 20° to 60°F (-5° to 15°C)</td>
</tr>
<tr>
<td></td>
<td>L482A: 15° to 55°F (-9.4° to 13°C), with setpoint stops minimum 34°F</td>
</tr>
<tr>
<td>Setpoint Adjustment</td>
<td>L480B, G: Non-adjustable, additive, fixed at 10°F (6°C)</td>
</tr>
<tr>
<td></td>
<td>L482A: Non-adjustable, additive, fixed at 5°F (3°C)</td>
</tr>
<tr>
<td>Operating Temperature</td>
<td>L480B, G: -20° to 125°F (-11° to 52°C)</td>
</tr>
<tr>
<td></td>
<td>L482A: 20° to 140°F (-7° to 60°F)</td>
</tr>
<tr>
<td>Maximum Element Temperature</td>
<td>L480B, G: 225°F (107°C)</td>
</tr>
<tr>
<td></td>
<td>L482A: 250°F (121°C)</td>
</tr>
<tr>
<td>Dimensions</td>
<td>L480B, G: 3.3&quot;H x 3.7&quot;W x 2.3&quot;D (8.4 x 9.4 x 5.9 cm)</td>
</tr>
<tr>
<td></td>
<td>L482A: 4.7&quot;H x 3.9&quot;W x 2.1&quot;D (11.9 x 10.1 x 5.3 cm)</td>
</tr>
<tr>
<td>Weight</td>
<td>L480B: 1.5 lb (0.68 Kg)</td>
</tr>
<tr>
<td></td>
<td>L480G: 1.6 lb (0.73 Kg)</td>
</tr>
<tr>
<td></td>
<td>L482A: 2.3 lb (1.04 Kg)</td>
</tr>
<tr>
<td>Approvals</td>
<td>UL Listed file #E49725, Vol. No. 2, dated 02-09-66; Guide No. SDFY2</td>
</tr>
<tr>
<td></td>
<td>CSA Certified Listing G, File No. LR1620; Guide No. 400-E-0</td>
</tr>
<tr>
<td>Warranty</td>
<td>1 year</td>
</tr>
</tbody>
</table>

EASY RETURNS, LET KELE DO THE LEGWORK

 September 2016
**THERMOSTATS & CONTROLLERS**

**LOW LIMIT TEMPERATURE CONTROLLERS**

**L480 SERIES**

---

**WIRING**

![Wiring Diagram](Image)

**L480B**

**L480G**

**L482A**

---

**TABLE 1: AMPERE RATINGS L480B, G**

<table>
<thead>
<tr>
<th>120 VAC</th>
<th>240 VAC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Full Load</td>
<td>10.2</td>
</tr>
<tr>
<td>Locked Rotor</td>
<td>61.2</td>
</tr>
</tbody>
</table>

**DC Rating:** 0.2 A @ 120 VDC, 0.1 A @ 240 VDC

**Pilot Duty:** 125 VA

---

**TABLE 2: AMPERE RATINGS L482A**

<table>
<thead>
<tr>
<th>120 VAC</th>
<th>208 VAC</th>
<th>240 VAC</th>
<th>277 VAC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Switch M2 (Main)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Full Load</td>
<td>16.0</td>
<td>9.2</td>
<td>8.0</td>
</tr>
<tr>
<td>Locked Rotor</td>
<td>96.0</td>
<td>55.2</td>
<td>48.0</td>
</tr>
<tr>
<td>Non-inductive</td>
<td>16.0</td>
<td>9.2</td>
<td>8.0</td>
</tr>
</tbody>
</table>

| Switch M1 (Auxiliary) | | | |
| Full Load | 6.0 | 3.3 | 3.0 | - |
| Locked Rotor | 36.0 | 19.8 | 18.0 | - |
| Non-inductive | 6.0 | 6.0 | 6.0 | 6.0 |

**Pilot Duty (both poles):** 125 VA @ 24 to 600 VAC; 57.5 VA @ 120 to 300 VDC

---

**ORDERING INFORMATION**

**MODEL**

- **L480B1239**
  - Low limit thermostat with auto-reset, SPDT switch and 20' capillary

- **L480G1044**
  - Low limit thermostat with manual reset, SPST switch and 20' capillary

- **L482A1004**
  - Low limit thermostat with manual reset, 2 x SPST switches and 20' capillary

**RELATED PRODUCTS**

- **CC-1G-K**
  - Plastic capillary and sensor holder mounting clip

- **ES1051**
  - Freeze spray, 8 fl oz

- **M-648-K**
  - Copper-clad capillary mounting clip

---

September 2016

GROWING SELECTION AVAILABLE ON KELE.COM

kele.com | 877-826-9037 USA
Verify that you have the most current version of this document. Go to https://accounts.automatedlogic.com, then select Support > Download > Documents. Important changes are listed in Document revision history at the end of this document.

© 2018 Automated Logic Corporation. All rights reserved throughout the world. Automated Logic, WebCTRL, EIKON, Eco-Screen, and BACview are registered trademarks of Automated Logic Corporation. EnergyReports, Environmental Index, OptiFlex, and OptiPoint are trademarks of Automated Logic Corporation. All other trademarks are the property of their respective owners.
Contents

What is the LGR250? .......................................................................................................................... 1
  Driver and control program ................................................................................................................. 1
  Specifications ....................................................................................................................................... 1
  Zone sensors ......................................................................................................................................... 3
  Touchscreen devices ............................................................................................................................. 3
To mount the LGR250 ........................................................................................................................ 4
  To wire for power ................................................................................................................................. 4
Wiring for communications ............................................................................................................... 9
  Wiring specifications ........................................................................................................................... 9
  To connect the LGR250 to the Ethernet ............................................................................................. 10
  To wire to a BACnet/ARC156 network ............................................................................................. 10
  To wire to a BACnet MS/TP network ................................................................................................ 10
  To wire to a BACnet PTP network ..................................................................................................... 11
  To wire a third-party device ............................................................................................................... 11
  To wire a modem for half-router communications ......................................................................... 11
  To set a port’s baud rate using PuTTY ............................................................................................. 12
Wiring devices to the LGR250’s Rnet port ..................................................................................... 13
Downloading the LGR250 ................................................................................................................ 14
  To download from the WebCTRL® interface ..................................................................................... 14
To set up the driver .......................................................................................................................... 15
  Driver ............................................................................................................................................... 15
  Device .............................................................................................................................................. 17
  Notification Classes ......................................................................................................................... 17
  Calendars ......................................................................................................................................... 18
  Common and Specific Alarms ........................................................................................................... 18
  Custom Translation Tables ............................................................................................................... 19
  I/O Tuning ....................................................................................................................................... 19
  Pneumatic Lines ............................................................................................................................... 19
  BACnet router properties ................................................................................................................ 19
  BACnet half-router properties ......................................................................................................... 20
  Alarm Store/Forward ....................................................................................................................... 20
  BACnet firewall .............................................................................................................................. 21
  Protocols .......................................................................................................................................... 21
  Xnet .................................................................................................................................................. 21
  Expanders ........................................................................................................................................ 21
To communicate through the local access port ............................................................................... 21
  To set up a Local Access connection in the WebCTRL® interface .................................................. 22
Troubleshooting .............................................................................................................................. 23
  LEDs ............................................................................................................................................... 23
  Formatting the controller ................................................................................................................. 24
  To get the LGR250’s serial number ................................................................................................. 25
  Recovering from a power outage .................................................................................................... 25
  Replacing the LGR250’s battery ...................................................................................................... 26
  To take the LGR250 out of service .................................................................................................. 26
Compliance ........................................................................................................................................ 27
  FCC Compliance ............................................................................................................................. 27
  CE Compliance ............................................................................................................................... 27
  BACnet Compliance ........................................................................................................................ 27
What is the LGR250?

The LGR250 is a BACnet router and a protocol translator for integrating third-party points into your WebCTRL® system.

Driver and control program

<table>
<thead>
<tr>
<th>Driver 1</th>
<th>DRV_MELGR_VANILLA</th>
</tr>
</thead>
<tbody>
<tr>
<td>WARNING</td>
<td>You must use v2-06e-080 or later driver.</td>
</tr>
</tbody>
</table>

| Maximum number of control programs 2 | 999 |
| Maximum number of BACnet objects 2   | 12000 |

1 To integrate a third-party device into your WebCTRL® system, you must use the driver for the specific protocol or device. Go to http://accounts.automatedlogic.com/download, then select Third-party Integration > Third-party Interface (ME-LGR & LGR).

2 Depends on available memory.

Specifications

| Power                  | 24 Vac ±10%, 50–60 Hz, 24 VA |
|                       | 26 Vdc ±10%, 10 W             |

| Third-party integration points | 250 |

| 10/100 BaseT Ethernet Port | For communication on the Ethernet at 10 or 100 Mbps, half duplex |
| BACnet port               | For communication with the controller network using ARC156 |
| Port S1                   | For communication on EIA-232 or EIA-485. Communicates with the controller network using MS/TP (9600 bps–76.8 kbps) or a third-party device and protocol at various baud rates. |
| Port S2                   | For communication on EIA-232 or EIA-485. Communicates with the controller network using PTP (9600 bps–115.2 kbps) or a third-party device and protocol at various baud rates. |
**Rnet port**  
- Supports up to 15 wireless and/or ZS sensors, and one Equipment Touch or OptiPoint™ Interface  
- Supplies 12 Vdc/210 mA power to the Rnet at an ambient temperature of 77 °F (25 °C) with a 24 Vac nominal power source.  
  **NOTE** Ambient temperature and power source fluctuations may reduce the power supplied by the Rnet port.

**NOTE** If the total power required by the sensors on the Rnet exceeds the power supplied by the Rnet port, use an external power source. The Wireless Adapter, Equipment Touch, or OptiPoint™ Interface must be powered by an external power source. See the specifications in each device’s Technical Instructions to determine the power required.

**Rnet Local Access port**  
For system start-up and troubleshooting

<table>
<thead>
<tr>
<th><strong>Microprocessor</strong></th>
<th>32-bit Motorola Power PC microprocessor with cache memory, Fast Ethernet controller, high performance 32-bit communication co-processor, ARCNET communication co-processor, and I/O expansion CAN co-processor</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Memory</strong></td>
<td>16 MB non-volatile battery-backed RAM (with 12 MB available for use), 8 MB Flash memory, 32-bit memory bus</td>
</tr>
<tr>
<td><strong>Real-time clock</strong></td>
<td>Battery-backed real-time clock keeps track of time in event of power failure</td>
</tr>
<tr>
<td><strong>Battery</strong></td>
<td>10-year Lithium CR123A battery retains the following data for a maximum of 720 hours during power outages: time, control programs, editable properties, schedules, and trends. To conserve battery life, you can set the driver to turn off battery backup after a specified number of days and depend on the archive function to restore data when the power returns. A low battery is indicated by the <strong>Battery low LED</strong> or a low battery alarm in the WebCTRL® application.</td>
</tr>
<tr>
<td><strong>Data archive</strong></td>
<td>Control programs, editable properties, and schedules are archived to non-volatile Flash memory daily and after every power up or download. If a power outage occurs and the battery backup fails or is turned off, the data is automatically restored from this archive.</td>
</tr>
<tr>
<td><strong>Protection</strong></td>
<td>Built-in surge and transient protection for power and communications in compliance with EN61000-6-1. Incoming power and network connections are protected by non-replaceable internal solid-state polyswitches that reset themselves when the condition that causes a fault returns to normal. The power and network connections are also protected against transient excess voltage/surge events lasting no more than 10 msec.</td>
</tr>
<tr>
<td><strong>BT485 connector</strong></td>
<td>You attach a BT485 (not included) to a controller at the beginning and end of a network segment to add bias and to terminate a network segment.</td>
</tr>
<tr>
<td><strong>Status indicators</strong></td>
<td>LEDs indicate status of communications and low battery status. Seven segment display indicates running, error, and power status.</td>
</tr>
<tr>
<td><strong>Environmental operating range</strong></td>
<td>-20 to 140 °F (-29 to 60 °C), 10–90% relative humidity, non-condensing</td>
</tr>
<tr>
<td><strong>Physical</strong></td>
<td>Rugged aluminum cover, removable screw-type terminal blocks</td>
</tr>
</tbody>
</table>
Overall dimensions

<table>
<thead>
<tr>
<th>Width:</th>
<th>Height:</th>
</tr>
</thead>
<tbody>
<tr>
<td>11 5/16 in. (28.7 cm)</td>
<td>7 1/2 in. (19 cm)</td>
</tr>
</tbody>
</table>

Mounting dimensions

<table>
<thead>
<tr>
<th>Width:</th>
<th>Height:</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 13/16 in. (27.5 cm)</td>
<td>5 in. (12.7 cm)</td>
</tr>
</tbody>
</table>

Recommended panel depth

- 2 3/4 in. (7 cm)

Weight

- 1.4 lbs (0.64 kg)

BACnet support


Listed by

- UL-916 (PAZX), cUL-916 (PAZX7), FCC Part 15-Subpart B-Class A, CE

---

**Zone sensors**

You can wire ZS sensors and/or a Wireless Adapter that communicates with wireless sensors to the LGR250's Rnet port. You can have up to 15 ZS and/or wireless sensors.

**NOTES**

- A control program can use no more than 5 ZS sensors, so you must use multiple control programs if your Rnet network has more than 5 sensors.
- ZS and wireless sensors can share the Rnet with an Equipment Touch or OptiPoint™ Interface.
- An Rnet with the above devices cannot have RS sensors.

**Touchscreen devices**

You can wire an Equipment Touch or OptiPoint™ Interface to the LGR250's Rnet port to view or change the controller's property values, schedule equipment, view trends and alarms, and more, without having to access the system's server. The Rnet can have one Equipment Touch or OptiPoint™ Interface, plus ZS sensors and/or a Wireless Adapter that communicates with wireless sensors.

**NOTE** These touchscreen devices are not powered by the Rnet.

- The OptiPoint™ Interface requires a 24 Vdc external power source.
- The Equipment Touch requires a 24 Vac external power source.

**CAUTION** A touchscreen device can share a power supply with the Automated Logic® controller as long as:

- The power source shared by the controller and Equipment Touch is AC power.
- The power source shared by the controller and OptiPoint™ Interface is DC power.
- You maintain the same polarity.
- You use the power source only for Automated Logic® controllers.
To mount the LGR250

Screw the LGR250 into an enclosed panel using the mounting holes provided on the cover plate. Leave about 2 in. (5 cm) on each side of the controller for wiring.

Wiring for power

⚠️ **WARNING**  Do not apply line voltage (mains voltage) to the controller’s ports and terminals.

⚠️ **CAUTIONS**
- The LGR250 is powered by a Class 2 power source. Take appropriate isolation measures when mounting it in a control panel where non-Class 2 circuits are present.
- Automated Logic® controllers can share a power supply as long as you:
  - Maintain the same polarity.
  - Use the power supply only for Automated Logic® controllers.

To wire for power

1. Make sure the LGR250’s power switch is in the **OFF** position to prevent it from powering up before you can verify the correct voltage.
2. Remove power from the power supply.
3. Pull the screw terminal connector from the controller’s power terminals labeled **24V ac/dc** and **Ground**.
4. Connect the transformer wires to the screw terminal connector.
5. Apply power to the power supply.
6. Measure the voltage at the LGR250’s power input terminals to verify that the voltage is within the operating range of 21.6–26.4 Vac.
7. Insert the screw terminal connector into the LGR250’s power terminals.
8. Turn on the LGR250’s power.
9. Verify that the Run LED (a dot in the lower right corner of the **Module Status** LED) begins blinking. The **Module Status** LED will show a chase pattern when the controller is running with no errors.
Addressing the LGR250

The LGR250 needs two addresses, one for the controller network and one for the Ethernet.

<table>
<thead>
<tr>
<th>The LGR250 needs...</th>
<th>That is unique on the...</th>
<th>Notes</th>
<th>See...</th>
</tr>
</thead>
<tbody>
<tr>
<td>A MAC address</td>
<td>controller network</td>
<td>You set the MAC address on the controller's rotary switches.</td>
<td>To set the controller network MAC address (page 5)</td>
</tr>
<tr>
<td>An IP address</td>
<td>Ethernet</td>
<td>You can use one of the following:</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• The <strong>default</strong> IP address that your system creates:</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• IP address = 192.168.168.x, where x is the controller network MAC address.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Subnet mask = 255.255.255.0</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• A DHCP IP address</td>
<td>To use a DHCP IP address (page 6)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Assign a <strong>custom</strong> IP address</td>
<td>To use a custom IP address (page 7)</td>
</tr>
</tbody>
</table>

NOTES

• Carefully plan your addressing scheme to avoid duplicating addresses. If third-party devices are integrated into the system, make sure your addresses do not conflict with their addresses.

• The controller network MAC address and IP address are defined in SiteBuilder in the controller's properties dialog box.

• You can address the LGR250 before or after you wire it for power.

To set the controller network MAC address

⚠️ **CAUTIONS**

• The MAC address must be unique on the controller network.

• If you are using default IP addressing, the MAC address must match the last octet of the **Address** field in the controller's properties dialog box in SiteBuilder.

1 If wired for power, turn off the controller's power.

**NOTE** The controller only reads the rotary switch positions during power up or upon reset.

2 Use the rotary switches to set the address. Set the **Tens** (10's) switch to the tens digit of the address, and set the **Ones** (1's) switch to the ones digit.
EXAMPLE If the controller's address is 25, point the arrow on the **Tens (10's)** switch to 2 and the arrow on the **Ones (1's)** switch to 5.

To use a default IP address

⚠️ **CAUTION** The IP address must be unique on the Ethernet.

1. If wired for power, turn off the controller's power.
2. **NOTE** The controller only reads the rotary switch positions during power up or upon reset.
3. Set the **Default/Assigned** DIP switch to the **Default** position.
4. Set the **+100/0** DIP switch to **On** to add 100 to x in the IP address.

**EXAMPLE** If you turn on this DIP switch and the controller network MAC address is 25, the IP address is 192.168.168.125.

**NOTE** The default address is an intranet address. Data packets from this address are not routable to the Internet.

To use a DHCP IP address

**PREREQUISITE** v6.0 or later driver

1. Set the LGR250's **Enhanced Access** DIP switch to **ON**.
2. Set the **Default/Assigned** DIP switch to **Default**.
3. Turn the controller's power off, then on again.
4. Connect a laptop with the WebCTRL® Server to the LGR250's **Local Access** port. See To communicate through the local access port (page 21).
5 In SiteBuilder, set your Configure > Preferences > Connections tab settings.

<table>
<thead>
<tr>
<th>Field</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Port</td>
<td>The computer's port number that the USB cable is connected to. NOTE To find the port number, plug the USB cable into the computer's USB port, then select Start &gt; Control Panel &gt; System &gt; Device Manager &gt; Ports (Com &amp; LPT). The COM port number is beside Silicon Labs CP210x USB to UART Bridge.</td>
</tr>
<tr>
<td>Baud Rate</td>
<td>115200</td>
</tr>
<tr>
<td>Data Bits</td>
<td>8</td>
</tr>
<tr>
<td>Parity</td>
<td>None</td>
</tr>
<tr>
<td>Stop Bits</td>
<td>1</td>
</tr>
</tbody>
</table>

6 On the Network tree, double-click the LGR250.

7 On the Address tab, click Module Status.

8 Note the LGR250's Ethernet MAC address.

9 Give the Ethernet MAC address to your DHCP network administrator and request that he reserve an IP address for that MAC address.

10 Get from him the reserved IP address, subnet mask, and default gateway address for the LGR250.

11 Repeat steps 1–6.

12 On the Address tab, select Specify a custom or DHCP IP Address.

13 Type the IP Address, Subnet Mask, and Default Gateway Address that the DHCP network administrator gave you.

14 When finished, set the LGR250's Enhanced Access DIP switch to OFF to restore normal functionality to the Local Access port.

15 Turn the controller's power off, then on again.

To use a custom IP address

1 Obtain the IP address, subnet mask, and default gateway address for the controller from the facility network administrator.

2 Set the LGR250’s Enhanced Access DIP switch to ON.

3 Set the Default/Assigned DIP switch to Assigned.

4 Turn the controller's power off, then on again.

5 Connect a laptop with the WebCTRL® Server to the LGR250's Local Access port. See To communicate through the local access port (page 21).
6 In SiteBuilder, set your **Configure > Preferences > Connections** tab settings.

<table>
<thead>
<tr>
<th>Field</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Port</td>
<td>The computer's port number that the USB cable is connected to.</td>
</tr>
<tr>
<td></td>
<td><strong>NOTE</strong> To find the port number, plug the USB cable into the computer's USB port, then select <strong>Start &gt; Control Panel &gt; System &gt; Device Manager &gt; Ports (Com &amp; LPT)</strong>. The COM port number is beside <strong>Silicon Labs CP210x USB to UART Bridge</strong>.</td>
</tr>
<tr>
<td>Baud Rate</td>
<td>115200</td>
</tr>
<tr>
<td>Data Bits</td>
<td>8</td>
</tr>
<tr>
<td>Parity</td>
<td>None</td>
</tr>
<tr>
<td>Stop Bits</td>
<td>1</td>
</tr>
</tbody>
</table>

7 On the **Network** tree, double-click the controller.

8 On the **Address** tab, select **Specify a custom or DHCP IP Address**.

9 Type the **IP Address**, **Subnet Mask**, and **Default Gateway Address**.

10 Click **Download Address**.

11 When the download is complete, click **Module Status** in the same dialog box to verify the controller's address.

12 When finished, set the LGR250's **Enhanced Access** DIP switch to **OFF** to restore normal functionality to the **Local Access** port.

13 Turn the controller's power off, then on again.
Wiring for communications

The LGR250 communicates using BACnet and/or third-party protocols, and can connect to a variety of port types at multiple baud rates. See table below.

<table>
<thead>
<tr>
<th>Port</th>
<th>Protocol</th>
<th>Port type(s)</th>
<th>Baud rate(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ethernet Port E1</td>
<td>BACnet/IP</td>
<td>Ethernet</td>
<td>10 Mbps, 100 Mbps</td>
</tr>
<tr>
<td></td>
<td>BACnet/Ethernet</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Telnet Diagnostics</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Proprietary third-party over TCP/IP</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>NOTE</strong></td>
<td>All protocols can run simultaneously.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BACnet</td>
<td>BACnet/ARC156 1</td>
<td>EIA-485 (2-wire)</td>
<td>156 kbps</td>
</tr>
<tr>
<td>S1 2</td>
<td>BACnet MS/TP</td>
<td>EIA-485 (2-wire)</td>
<td>9600 bps, 19.2 kbps, 38.4 kbps, 76.8 kbps (default)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Third-party</td>
<td>EIA-232</td>
<td>EIA-485 (2-wire)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>EIA-422 (EIA-485 4-wire)</td>
<td></td>
</tr>
<tr>
<td><strong>S2</strong> 2</td>
<td>BACnet PTP</td>
<td>EIA-232</td>
<td>9600 bps, 19.2 kbps, 38.4 kbps (default), 57.6 kbps, 115.2 kbps</td>
</tr>
<tr>
<td></td>
<td></td>
<td>EIA-485 (2-wire)</td>
<td></td>
</tr>
<tr>
<td>Local Access</td>
<td>Enhanced Access</td>
<td>Rnet 3</td>
<td>115.2 kbps</td>
</tr>
</tbody>
</table>

1  ARC156 is a unique implementation of the industry standard ARCNET. For a summary of differences between ARCNET and ARC156, see the ARC156 Wiring Technical Instructions.

2  This port supports only one protocol and one wire type at a time.

3  See To communicate through the local access port (page 21).

Wiring specifications

<table>
<thead>
<tr>
<th>For...</th>
<th>Use...</th>
<th>Maximum Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ethernet</td>
<td>CAT5e or higher Ethernet cable</td>
<td>328 feet (100 meters)</td>
</tr>
<tr>
<td>ARC156 1 or MS/TP 2</td>
<td>22 AWG, low-capacitance, twisted, stranded, shielded copper wire</td>
<td>2000 feet (610 meters)</td>
</tr>
<tr>
<td>PTP</td>
<td>18–28 AWG; twisted pair preferable</td>
<td>50 feet (15.24 meters)</td>
</tr>
</tbody>
</table>

1  See the ARC156 Wiring Technical Instructions.

2  See the MS/TP Networking and Wiring Technical Instructions.
WARNING  Do not apply line voltage (mains voltage) to the controller's ports and terminals.

To connect the LGR250 to the Ethernet

Connect an Ethernet cable to the Ethernet port.

**NOTE**  If your system has controllers on different IP subnets separated by an IP router, you must configure one controller on each subnet as a BACnet Broadcast Management Device (BBMD). Do not configure more than one BBMD per subnet as this would cause circular routes. To avoid this problem:

- Let SiteBuilder automatically configure your BBMD tables. (SiteBuilder defines only one controller per IP subnet as a BBMD.)
- Use the BBMD Configuration Tool to make sure that a controller's BBMD table does not contain the IP addresses of other controllers on the same IP subnet.

To wire to a BACnet/ARC156 network

1. Turn off the LGR250's power.
2. Check the communications wiring for shorts and grounds.
3. Connect the communications wiring to the controller's screw terminals labeled **Net +**, **Net -**, and **Shield**.
   **NOTE**  Use the same polarity throughout the network segment.
4. If the LGR250 is at either end of a network segment, connect a BT485 to the LGR250.
5. Turn on the LGR250's power.
6. Verify communication with the network by viewing a Module Status report in the WebCTRL® interface.

To wire to a BACnet MS/TP network

1. Turn off the LGR250's power.
2. Check the communications wiring for shorts and grounds.
3. Connect the communications wiring to the controller's screw terminals labeled **Net+** and **Net-** on **Port S1**.
   **NOTE**  Use the same polarity throughout the network segment.
4. Set the **MSTP on S1** DIP switch to **Enable (ON)**.
5. If the LGR250 is at either end of a network segment, connect a BT485 to the LGR250.
6. Turn on the LGR250's power.
7. To change the port's baud rate, see *To set a port's baud rate using PuTTY* (page 12).
   **NOTE**  Use the same baud rate for all controllers on the network segment.
To wire to a BACnet PTP network

1. Turn off the LGR250's power.
2. Check the communications wiring for shorts and grounds.
3. Connect the communications wiring to the controller's screw terminals labeled **Tx**, **Rx**, and **Signal Ground** on Port S2, and jumper the **DTR** and **DCD** terminals.
   
   **NOTE** Use the same polarity throughout the network segment.
4. Set the **PTP on S2** DIP switch to **Enable (ON)**.
5. Turn on the LGR250's power.
6. To change the port's baud rate, see **To set a port's baud rate using PuTTY** (page 12).

**NOTE** Use the same baud rate for all controllers on the network segment.

To wire a third-party device

See the *Integration Guide* for the third-party device or protocol.

To wire a modem for half-router communications

If using the LGR250 as a BACnet half-router:

1. Turn off the LGR250's power.
2. Connect the modem to Port S2 using a standard modem cable connected to an S2-DB9 adapter (available from Automated Logic®) or a cable you create using the following wiring diagram:

   ![](image)

   * Wire connection usually not needed
   ** Needed only if hardware handshaking is used
   † DCD can be hooked up to the DTR signal for self-handshaking

3. Set the **PTP on S2** DIP switch to **Enable (ON)**.
4. Turn on the LGR250's power.
5. Set the port baud rate to 38400 using PuTTY. See **To set a port's baud rate using PuTTY** (page 12).
To set a port's baud rate using PuTTY

1. Download and install PuTTY from the PuTTY website (http://www.chiark.greenend.org.uk/~sgtatham/putty/download.html).
2. Connect a computer to the LGR250's Local Access port. See To communicate through the local access port (page 21).
3. Set the LGR250's Enhanced Access DIP switch to ON.
4. Turn the LGR250's power Off, then On.
5. Start PuTTY.
7. Under Options controlling local serial lines, enter the following settings:

<table>
<thead>
<tr>
<th>Field</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Serial line to connect to</td>
<td>Replace X with the computer's port number that the USB Link Kit cable is connected to.</td>
</tr>
<tr>
<td></td>
<td><strong>NOTE</strong> To find the port number, select Start &gt; Control Panel &gt; System &gt; Device Manager &gt; Ports (Com &amp; LPT). The COM port number is beside Silicon Labs CP210x USB to UART Bridge.</td>
</tr>
<tr>
<td>Speed (baud)</td>
<td>115200</td>
</tr>
<tr>
<td>Data Bits</td>
<td>8</td>
</tr>
<tr>
<td>Stop Bits</td>
<td>1</td>
</tr>
<tr>
<td>Parity</td>
<td>None</td>
</tr>
<tr>
<td>Flow Control</td>
<td>None</td>
</tr>
</tbody>
</table>
8 Click Open. A window similar to the one below appears.

```
BACnet Router. Ethernet MAC address = 00-E0-C9-00-0E-B8
1) Restart
2) Display Modstat
3) IP Address [192.168.160.1]
4) Subnet Mask [255.255.255.0]
5) Default Gateway [0.0.0.0]
6) BACnet/IP UDP Port [0xBAC0]
7) BACnet/IP Network [4824+]
8) BACnet/Ethernet Network [4829]
9) BACnet/BACNET Network [4825]
10) BACnet/MSIP Network [4834]
11) Display B/IP PAD Table
12) Add B/IP PAD Table Entry
13) Delete B/IP PAD Table Entry
14) Clear B/IP PAD Table
15) Set baud rate for MSIP [76800]
16) Set baud rate for PTP [38400]

+ The HOME network is updated each time a network number is changed (#7-10).
Enter selection: _
```

9 Type the number of the baud rate field, then press Enter.
10 Type the new baud rate, then press Enter.
11 Type 1, then press Enter to restart the controller.
12 When finished, set the LGR250's Enhanced Access DIP switch to OFF to restore normal functionality to the Local Access port.
13 Turn the LGR250's power Off, then On.

## Wiring devices to the LGR250's Rnet port

You can wire the following devices to the LGR250's Rnet port in a daisy-chain or star configuration:

- ZS sensors
- Wireless Adapter that communicates with wireless sensors
- Equipment Touch
- OptiPoint™ Interface

See the device's Technical Instructions for complete wiring instructions.

### NOTES

- ZS sensors, a Wireless Adapter, and an Equipment Touch can share the same Rnet, but not RS sensors.
- The Rnet communicates at a rate of 115 kbps.
### Downloading the LGR250

Download to send the following items to the LGR250:

<table>
<thead>
<tr>
<th>Item</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Up to 999 control programs, depending on available memory</td>
<td>Must be in <code>WebCTRL.x.webroot\&lt;system_name&gt;\programs</code>.</td>
</tr>
<tr>
<td>DRV_MELGR_VANILLA driver *</td>
<td>Must be in <code>WebCTRL.x.webroot\&lt;system_name&gt;\drivers</code>.</td>
</tr>
</tbody>
</table>

*NOTE* To verify that you have the driver's latest version, go to [http://accounts.automatedlogic.com/download](http://accounts.automatedlogic.com/download), then select **Drivers > ExecB**. Compare the latest version to the LGR250's driver in SiteBuilder.

**Editable properties**

**Schedules**

* To integrate a third-party device into your WebCTRL® system, you must use the driver for the specific protocol or device. Go to [http://accounts.automatedlogic.com/download](http://accounts.automatedlogic.com/download), then select **Third-party Integration > Third-party Interface (ME-LGR & LGR)**.

If you change any of the above items or the LGR250's address after the initial download, you must download again. The first download takes longer than subsequent downloads.

⚠️ **CAUTIONS**

- The LGR250 will lose stored data when you download.
- Equipment controlled by the LGR250 will shut down and restart when you download.
- After you download, the **Archive Valid** LED lights to indicate the downloaded items are stored in the LGR250's flash memory. This type of memory is not dependent on power or battery backup. If you need to remove power from the controller after downloading, make sure this LED is lit.

### To download from the WebCTRL® Interface

If your network is complete, you can download from any network browser. If not complete, connect a laptop with a local copy of the system database to the LGR250's local access port. See *To communicate through the local access port* (page 21).

1. On the WebCTRL® **Network** tree, select the controller.
2. Click **Downloads**.
3. Do one of the following:
   - If the controller is in the Downloads list, go to step 4.
   - If the controller is not in the list:
     a. Click **Add**.
     b. In the pop-up, select the controller.
     c. Select **All Content**.
     d. Click **Add**.
     e. Click **Close**.
4. Select the controller in the Downloads list.
5. Click **Start**.
NOTES
• If the download fails, locate and resolve the problem, then retry the download.
• You can also download a controller from the Devices page.

To set up the driver

After you download the driver and control program(s) to the LGR250, you may want to change the driver's properties in the WebCTRL® interface to suit your application.

1 On the WebCTRL® Network tree, click to the left of your LGR250.
2 Click to the left of Driver to see its children.
3 Make changes as needed on the Properties page for Driver and any of its children.

Driver

On the Driver page, you can change the following properties:
• Backup battery conservation settings. See table below.
• Module clock synchronization and failure. See table below.
• Network Input microblock communication properties.

Backup Battery

<table>
<thead>
<tr>
<th>Turn off internal backup battery after ___ days to conserve battery life (shutoff date/time)</th>
<th>How long backup battery should run after power loss.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>TIP</strong> Downloading activates the battery backup. To conserve battery life when you know the LGR250 will be without power for an extended period after downloading (for example, during shipment): 1 Verify the Archive Valid LED is lit, then set this field to 0. 2 After you install the LGR250 and apply power, enter a number greater than 0.</td>
<td></td>
</tr>
</tbody>
</table>

BACview Control

| Keypad Inactivity timeout (minutes) | Log out the user (if a user-level password is required), turn off the backlight, and display the standby screen after this period of inactivity. |
| Keypad user-level password | Numeric password user must enter to access system through a BACview® device. |

TouchScreen Control

| TouchScreen Schedule Edit Enable | Check this field to allow a user to edit this controller's schedules from an Equipment Touch's Schedules screen. **NOTE** Schedules edited on an Equipment Touch are not uploaded to the WebCTRL® application. This could result in the controller operating on a schedule that differs from the one you see in the WebCTRL® interface. |
**Module Clock**

<table>
<thead>
<tr>
<th><strong>Clock Fall Date and Time</strong></th>
<th>Date and time the control program uses when controller's real-time clock is invalid.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>TIP</strong> Use an occupied date and time (such as a Tuesday at 10 a.m.) so the equipment does not operate in unoccupied mode if the controller loses power during occupancy.</td>
</tr>
</tbody>
</table>

| **Time Synch Sensitivity (seconds)** | When the controller receives a time sync request, if the difference between the controller's time and the time sync's time is greater than this field's value, the controller's time is immediately changed. If the difference is less than this field's value, the controller's time is slowly adjusted until the time is correct. |

**Network Microblocks**

| **Number of poll retries before Network Input Microblocks indicate failure** | The maximum number of retries after the initial attempt that a Network microblock will attempt to communicate with its target device. If unsuccessful, the point will transition to an idle state for 30 seconds before attempting to communicate again. Change this field only if directed by Technical Support. |

| **Periodic rebinding interval** | If a microblock uses a wildcard in its address, this timer determines how often the microblock will attempt to find the nearest instance of its target. For example, if an outside air temperature address uses a wildcard, a VAV application will look for the outside air temperature on the same network segment or on the nearest device containing that object. |

**BACnet COV Throttling**

| **Enable COV Throttling** | Under normal circumstances, COV Throttling should be enabled to prevent excessive network traffic if an object's COV Increment is set too low. See EXCEPTION below. When enabled, if an object generates excessive COV broadcasts (5 updates in 3 seconds), the driver automatically throttles the broadcasts to 1 per second. Also, if the object's value updates excessively for 30 seconds, an alarm is sent to the WebCTRL® application listing all objects that are updating excessively. A Return-to-normal alarm is sent only after all objects have stopped updating excessively. **EXCEPTION**: In rare circumstances, such as process control, a subscribing object may require COV updates more frequently than once per second. For these situations, clear this checkbox, but make sure that your network can support the increased traffic. You will also need to disable the Excessive COV alarms under the driver's Common Alarms. |

**Trend Sampling**

| **Collect a daily midnight sample for all points in this controller that are sampling on COV** | For values that change infrequently, select to verify at midnight daily that the point is still able to communicate trend values. |
Device

On the **Device** page, you can change the following properties:

- BACnet device object properties for the LGR250
- LGR250 communication

<table>
<thead>
<tr>
<th>Configuration</th>
<th>NOTE The three APDU fields refer to all networks over which the LGR250 communicates.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max Masters and Max Info Frames</td>
<td>Apply only if the LGR250's MS/TP network is enabled.</td>
</tr>
</tbody>
</table>

Notification Classes

A BACnet alarm's Notification Class defines:

- Alarm priority for Alarm, Fault, and Return to Normal states
- Options for BACnet alarm acknowledgment
- Where alarms should be sent (recipients)

Alarms in the WebCTRL® application use Notification Class #1. The WebCTRL® application is automatically a recipient of these alarms.

<table>
<thead>
<tr>
<th>Priorities</th>
<th>NOTE BACnet defines the following Network message priorities for Alarms and Events.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Priority range</td>
<td>Network message priority</td>
</tr>
<tr>
<td>00–63</td>
<td>Life Safety</td>
</tr>
<tr>
<td>64–127</td>
<td>Critical Equipment</td>
</tr>
<tr>
<td>128–191</td>
<td>Urgent</td>
</tr>
<tr>
<td>192–255</td>
<td>Normal</td>
</tr>
<tr>
<td>Priority of Off-Normal</td>
<td>BACnet priority for Alarms.</td>
</tr>
<tr>
<td>Priority of Fault</td>
<td>BACnet priority for Fault messages.</td>
</tr>
<tr>
<td>Priority of Normal</td>
<td>BACnet priority for Return-to-normal messages.</td>
</tr>
<tr>
<td>Ack Required for Off-Normal, Fault, and Normal</td>
<td>Specifies whether alarms associated with this Notification Class require a BACnet Acknowledgment for Off-Normal, Fault, or Normal alarms.</td>
</tr>
</tbody>
</table>

**TIP** You can require operator acknowledgment for an Alarm or Return-to-normal message (stored in the WebCTRL® database). In the WebCTRL® interface on the **Alarm > Enable/Disable** tab, change the acknowledgment settings for an alarm source or an alarm category.

Recipient List

<table>
<thead>
<tr>
<th>Recipients</th>
<th>The first row in this list is from the WebCTRL® application. Do not delete this row. Click <strong>Add</strong> if you want other BACnet devices to receive alarms associated with this Notification Class.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recipient Description</td>
<td>Name that appears in the <strong>Recipients</strong> table.</td>
</tr>
</tbody>
</table>
Recipients:

Recipient Type
Use Address (static binding) for either of the following:
- Third-party BACnet device recipients that do not support dynamic binding
- When you want alarms to be broadcast (you must uncheck Issue Confirmed Notifications). This use is rare.

Days and times
The days and times during which the recipient will receive alarms.

Recipient Device Object Identifier
Type the Device Instance from SiteBuilder (or from the network administrator for third-party devices) in the # field.

Process Identifier
Change for third-party devices that use a BACnet Process Identifier other than 1. The WebCTRL® application processes alarms for any 32-bit Process Identifier.

Issue Confirmed Notifications
Select to have a device continue sending an alarm message until it receives delivery confirmation from the recipient.

Transitions to Send
Uncheck the types of alarms you do not want the recipient to get.

Calendars
Calendars are provided in the driver for BACnet compatibility only. Instead, use the Schedules feature in the WebCTRL® interface.

Common and Specific Alarms
On these pages, you can enable/disable, change BACnet alarm properties, or set delays for the following BACnet alarms:

Common alarms:
- Module Halted
- All Programs Stopped
- Duplicate Address
- Locked I/O
- Control Program
- Program Stopped
- Excessive COV

Specific alarm:
- Dead Module Timeout
- Low Battery Alarm
- Pneumatic Unstable Alarm
- Pneumatic Leak Alarm
- Low Main Air Alarm

NOTE To set up alarm actions for controller generated alarms, see Setting up alarm actions in WebCTRL® Help.
Module Generated Alarm

<table>
<thead>
<tr>
<th>Description</th>
<th>Short message shown on the Alarms page or in an alarm action when this type of alarm is generated.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Events</td>
<td></td>
</tr>
<tr>
<td>Alarm Category and Alarm Template</td>
<td>See Customizing alarms in WebCTRL® Help.</td>
</tr>
<tr>
<td>Enable</td>
<td>Clear these checkboxes to disable Alarm or Return to normal messages of this type from this controller.</td>
</tr>
<tr>
<td>Notification Class</td>
<td>Do not change this field.</td>
</tr>
</tbody>
</table>

Custom Translation Tables

Does not apply to the LGR250.

I/O Tuning

Does not apply to the LGR250.

Pneumatic Lines

Does not apply to the LGR250.

BACnet router properties

On the BACnet router properties page, you can change the following properties:

- IP address of the router in the controller and the system database
- BACnet routing settings
- Color and prime variable caching settings
### IP Configuration

| Allow remote management of IP configuration | For future use. |
| Enable IP configuration changeover | Select to remotely change the router’s **IP Address**, **Subnet Mask**, and **Default Gateway Address**. Type the new addresses and the **UDP Port** that your server is using to communicate to all controllers. In the **Changeover timeout** field, enter: |
| | • 0:00 to have the controller use the **Next** settings as soon as the controller can communicate with the **Next Default Gateway Address**.  |
| | • A specific length of time to have the controller use the **Next** settings as soon as the controller can communicate with the **Next Default Gateway Address**, or when the timeout expires, whichever occurs first. See “To remotely change a controller's IP address” in WebCTRL® Help for more information on using this feature. |

### BACnet Router Options

| Ignore all Reject-Message-to-Network, Reason=1 messages | Clear to delete and rediscover a router if a network's router indicates that the network is no longer present (reason=1). Select to continue routing messages to a network even if its router indicates that the network is no longer present. |

### Color/Prime Variable Caching

| Disable Color Cache | Clear (enable) to improve responsiveness in retrieving colors. Select (disable): |
| | • To reduce network traffic to third-party (non-color-supporting) devices |
| | • If using the LGR250 on the controller network, not as a router |
| | **NOTE** Selecting this checkbox also disables dead module alarms. |

| Dead Module Timeout | After this period (minutes:seconds) of non-response from an ExecB controller, the router sends an alarm to the server. |

### BACnet half-router properties

On the BACnet Half Router Properties page, you can change the communication settings for an LGR250 used as a BACnet half-router (dial-up connection) on a remote network. For more information, go to http://accounts.automatedlogic.com/findinfo and search for Setting up a remote network.

### Alarm Store/Forward

On the Alarm Store and Forward page, you can change alarm delivery settings for the LGR250 used to store and forward alarms from a remote dial-up site.
BACnet firewall

Requires v6-02 or later driver

If this IP controller is accessible from the Internet, you can increase security by enabling its BACnet firewall. When enabled, this feature prevents the controller from receiving BACnet messages from unidentified sources and allows communication only with IP addresses that you define. These can be all private IP addresses and/or a list of IP addresses. Follow the instructions in the WebCTRL® interface to set up the BACnet firewall.

Protocols

On the Protocols page, you can enable or disable Telnet diagnostics. This allows you to write to a text file the communication between the controller and a third party device. This file is used for troubleshooting.

Xnet

Does not apply to the LGR250.

Expanders

Does not apply to the LGR250.

To communicate through the local access port

Using a computer and a USB Link Kit, you can communicate locally with the LGR250 to download or to troubleshoot.

PREREQUISITES

• A computer with a USB port
• A USB Link Kit. See the USB Link Kit Technical Instructions.
  NOTE The USB Link Kit driver is installed with a WebCTRL® v5 or later system. But if needed, you can get the latest driver from http://www.silabs.com/products/mcu/Pages/USBtoUARTBridgeVCPDrivers.aspx. Install the driver before you connect the USB Link Kit to your computer.
• The controller driver drv_melgr_vanilla v1.73a.038 or later

CAUTION If multiple controllers share power but polarity was not maintained when they were wired, the difference between the controller's ground and the computer's AC power ground could damage the USB Link Kit and the controller. If you are not sure of the wiring polarity, use a USB isolator between the computer and the USB Link Kit. Purchase a USB isolator online from a third-party manufacturer.
1. Connect the USB Link Kit to the computer and to the controller's Local Access port.

![USB Link Kit Diagram]

**NOTE**: If using a USB isolator, plug the isolator into your computer's USB port, and then plug the USB Link Kit cable into the isolator.

2. Set the controller's Enhanced Access DIP switch.

<table>
<thead>
<tr>
<th>To communicate in...</th>
<th>Set switch to...</th>
</tr>
</thead>
<tbody>
<tr>
<td>The WebCTRL® application</td>
<td>Off</td>
</tr>
<tr>
<td>PuTTY or HyperTerminal</td>
<td>On</td>
</tr>
<tr>
<td>SiteBuilder to set a custom IP address</td>
<td>On</td>
</tr>
</tbody>
</table>

3. Turn the controller's power off, then on again.

### To set up a Local Access connection in the WebCTRL® interface

For the WebCTRL® application to communicate with the Local Access port, you must do the following:

1. On the System Configuration tree, select Connections.
2. On the Configure tab, click Add.
3. From the Type drop-down list, select BACnet Local Access.
4. Optional: Edit the Description.
5. Type the computer's Port number that the USB cable is connected to.

**NOTE**: To find the port number, plug the USB cable into the computer's USB port, then select Start > Control Panel > System > Device Manager > Ports (Com & LPT). The COM port number is beside Silicon Labs CP210x USB to UART Bridge.

6. Set the Baud rate to 115200.
7. Click Accept.
8. On the View tab, click the button next to the BACnet/IP network, then select BACnet Local Access.
9. Click Accept.
10. On the Configure tab, select BACnet Local Access, then click Start.

**NOTE**: If an error message appears, make sure the COM port you selected is not in use. For example, PuTTY may be open and is holding the port open.
11 On the Network tree, select the controller that you are connected to.

12 Click , then select Manual Command.

13 Type rnet here in the dialog box, then click OK.

14 On the Properties page, click Module Status. If a Modstat report appears, the WebCTRL® application is communicating with the controller.

**Troubleshooting**

If you have problems mounting, wiring, or addressing the LGR250, contact Automated Logic® Technical Support.

**LEDs**

The Module Status LED can display the following error codes.

<table>
<thead>
<tr>
<th>Error Code...</th>
<th>Indicates...</th>
<th>Possible solutions</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>The control program or driver has not been downloaded.</td>
<td>Download All Content to the LGR250. See Downloading the LGR250 (page 14).</td>
</tr>
<tr>
<td>1</td>
<td>A control program error</td>
<td>Obtain a Module Status Report (Modstat) and look for error conditions. See To get the controller's serial number (page 25) for instructions on obtaining a Modstat. If you cannot determine the error from the Modstat, send a screenshot of the Modstat to Technical Support.</td>
</tr>
<tr>
<td>2</td>
<td>The controller's memory is full</td>
<td>In the WebCTRL® interface, reduce the amount of trend data being stored in the controller. In SiteBuilder, reduce the amount of control programs.</td>
</tr>
</tbody>
</table>
| 3             | A setup error | Verify:  
  - The address has been set on the rotary switches. See Addressing the LGR250 (page 5).  
  - The address is unique on the network  
  - DIP switches are set correctly |
<p>| 4             | A system error | Obtain a Module Status Report (Modstat) and look for error messages. See To get the controller's serial number (page 25) for instructions on obtaining a Modstat. If you cannot determine the error from the Modstat, send a screenshot of the Modstat to Technical Support. |
| 7             | An abnormal restart | See solution above for #4. |</p>
<table>
<thead>
<tr>
<th>Error Code...</th>
<th>Indicates...</th>
<th>Possible solutions</th>
</tr>
</thead>
</table>
| 8            | The controller is formatting      | The number 8 should display only during the short formatting period. If this number displays continuously or flashes intermittently with another number, try each of the following:  
  - Turn the LGR250’s power off, then on.  
  - Format the LGR250. See To format the controller (page 24).  
  - Download the controller. See Downloading the LGR250 (page 14).  
  - Replace the LGR250. |

Other LED’s show the status of certain functions.

<table>
<thead>
<tr>
<th>If this LED is on...</th>
<th>Status is...</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power</td>
<td>The LGR250 has power.</td>
</tr>
<tr>
<td>Link</td>
<td>The controller is connected to the Ethernet.</td>
</tr>
<tr>
<td>LAN</td>
<td>The Ethernet port is transmitting or receiving data.</td>
</tr>
<tr>
<td>100</td>
<td>The connection speed is 100 Mbps. If LED is not lit, the connection speed is 10 Mbps.</td>
</tr>
<tr>
<td>CMnet transmit</td>
<td>The LGR250 is transmitting data over the controller network.</td>
</tr>
<tr>
<td>CMnet receive</td>
<td>The LGR250 is receiving data from the controller network.</td>
</tr>
<tr>
<td>Archive Valid</td>
<td>The controller’s memory backup is valid.</td>
</tr>
<tr>
<td>Port S1 transmit</td>
<td>The LGR250 is transmitting data from Port S1.</td>
</tr>
<tr>
<td>Port S1 receive</td>
<td>The LGR250 is receiving data on Port S1.</td>
</tr>
<tr>
<td>Battery low</td>
<td>The battery is low.</td>
</tr>
</tbody>
</table>

**Formatting the controller**

If you cannot communicate with a controller after downloading it, as a last resort, you can manually format the controller to erase its memory.

1. Turn off the LGR250’s power.
2. ![Warning](image) Make sure the address switches are not set to 0, 0.
3. Hold down the controller’s Format button while you turn its power on.
4. Continue to hold down the Format button until the controller displays 8 and then 0, then release the button.
5. Download the LGR250.
To get the LGR250's serial number

If you need the LGR250's serial number when troubleshooting, the number is on:

- a sticker on the back of the main controller board
- a Module Status report (Modstat) under Core (or Main) board hardware

To obtain a modstat in the WebCTRL® interface:

1. Select the LGR250 in the Network tree.
2. On the Properties page, click Module Status.

Recovering from a power outage

**Battery function**

The LGR250 has a 10-year Lithium CR123A battery that retains the following data for a maximum of 720 hours during power outages.

- Time
- Control programs
- Editable properties
- Schedules
- Trends

To conserve battery life, you can set the driver to turn off battery backup after a specified number of days and depend on the archive function to restore data when the power returns. See To set up the driver > Driver (page 15).

**Archive function**

The following items are archived to non-volatile Flash memory daily and after every power up or download.

- Control programs
- Editable properties
- Schedules

If a power outage occurs and the battery backup fails or is turned off after a specified number of days, the above data is automatically restored from the archive. If changes were made in the WebCTRL® interface since the last archive, you may need to download parameters after power returns to correct any mismatches.

You can see the status of the latest archive in the WebCTRL® interface on the controller’s Driver page under Flash Memory Archive.
Replacing the LGR250's battery

If the LGR250's Battery low LED is lit or if the LGR250 sends a Low Battery alarm to the WebCTRL® application, replace the battery.

1. Verify that the LGR250's power is on.
2. Using a small flathead screwdriver, pry up each side of the black battery clip until it is free and you can remove it.
3. Remove the battery from the controller, making note of the battery's polarity.
4. Insert the new battery into the controller, matching the polarity of the battery you removed.
5. Push the black clip back onto the battery until you hear both sides click in place.
6. Download the LGR250.

To take the LGR250 out of service

If needed for troubleshooting or start-up, you can stop communication between the WebCTRL® application and the LGR250.

1. On the WebCTRL® Network tree, select the LGR250.
2. On the Properties page, check Out of Service.
3. Click Accept.
Compliance

FCC Compliance

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

⚠️ CAUTION Changes or modifications not expressly approved by the responsible party for compliance could void the user’s authority to operate the equipment.

CE Compliance

⚠️ WARNING This is a Class A product. In a domestic environment, this product may cause radio interference in which case the user may be required to take adequate measures.

BACnet Compliance

Compliance of listed products to requirements of ASHRAE Standard 135 is the responsibility of BACnet International. BTL® is a registered trademark of BACnet International.
### Document revision history

Important changes to this document are listed below. Minor changes such as typographical or formatting errors are not listed.

<table>
<thead>
<tr>
<th>Date</th>
<th>Topic</th>
<th>Change description</th>
<th>Code*</th>
</tr>
</thead>
<tbody>
<tr>
<td>10/2/18</td>
<td>Specifications</td>
<td>Revised the Rnet port and Protection specs.</td>
<td>X-H-JS-O</td>
</tr>
<tr>
<td></td>
<td>Zone Sensors</td>
<td>Removed RS sensors and restructured topic</td>
<td>X-D</td>
</tr>
<tr>
<td></td>
<td>Touchscreen devices</td>
<td>Was called Equipment Touch devices. Added OptiPoint™ Interface, power requirements and Caution.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Wiring devices to the &lt;ALCProduct&gt;’s Rnet port</td>
<td>Removed subtopics and referred reader to each devices Technical Instructions.</td>
<td></td>
</tr>
<tr>
<td>2/6/17</td>
<td>Specifications</td>
<td>Added wireless sensors to the Rnet port specification.</td>
<td>X-D</td>
</tr>
<tr>
<td></td>
<td>Zone sensors</td>
<td>Added wireless sensors to this topic.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Equipment Touch</td>
<td>Added Wireless Adapter to this topic.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Wiring devices to the Rnet port</td>
<td>Added Wireless Adapter to this topic.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>To wire a Wireless Adapter to the LGR250</td>
<td>New topic.</td>
<td></td>
</tr>
<tr>
<td>10/3/16</td>
<td>To set up a Local Access connection in the WebCTRL interface</td>
<td>Updated WebCTRL menu button in step 12.</td>
<td>A-D</td>
</tr>
<tr>
<td></td>
<td>Appendix - LGR250 coverplate</td>
<td>Updated coverplate</td>
<td>A-D</td>
</tr>
<tr>
<td>8/12/16</td>
<td>LEDs</td>
<td>Added description of #7 LED to table.</td>
<td>X-TS-RB-F</td>
</tr>
<tr>
<td>3/1/16</td>
<td>BACnet firewall</td>
<td>New topic</td>
<td>A-D</td>
</tr>
<tr>
<td>4/16/15</td>
<td>Entire document</td>
<td>New look, no content changes</td>
<td>A-D</td>
</tr>
<tr>
<td>11/14/14</td>
<td>BACnet Compliance</td>
<td>Changed BACnet Manufacturers Association to BACnet International</td>
<td>X-D-CP-MW</td>
</tr>
<tr>
<td>10/7/14</td>
<td>Driver</td>
<td>Added the Network Microblock fields</td>
<td>A-TS-RB-F</td>
</tr>
<tr>
<td>7/22/14</td>
<td>Equipment Touch</td>
<td>Changed 5 ZS sensors to 15 ZS sensors</td>
<td>X-D</td>
</tr>
<tr>
<td>5/13/14</td>
<td>Specifications</td>
<td>Rnet Port: Added Equipment Touch and removed BACview® devices</td>
<td>A-D-CP-O-TC</td>
</tr>
<tr>
<td></td>
<td>Zone sensors</td>
<td>Removed references to BACview</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Equipment Touch</td>
<td>New topic</td>
<td></td>
</tr>
<tr>
<td></td>
<td>BACview devices</td>
<td>Removed topic</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Wiring zone sensors to the LGR250</td>
<td>Changed to &quot;Wiring devices to the LGR250's Rnet port&quot;</td>
<td></td>
</tr>
<tr>
<td></td>
<td>To wire an Equipment Touch to the LGR250</td>
<td>New topic</td>
<td></td>
</tr>
<tr>
<td></td>
<td>To set up the driver &gt; Driver</td>
<td>Added new driver property: TouchScreen Schedule Edit Enable</td>
<td></td>
</tr>
</tbody>
</table>

* For internal use only
ME812u Controller

Technical Instructions
Verify that you have the most current version of this document. Go to https://accounts.automatedlogic.com, then select Support > Download > Documents. Important changes are listed in Document revision history at the end of this document.

© 2018 Automated Logic Corporation. All rights reserved throughout the world. Automated Logic, WebCTRL, EIKON, Eco-Screen, and BACview are registered trademarks of Automated Logic Corporation. EnergyReports, Environmental Index, OptiFlex, and OptiPoint are trademarks of Automated Logic Corporation. All other trademarks are the property of their respective owners.
## Contents

What is the ME812u? .................................................................................................................. 1  
Using expanders ..................................................................................................................... 1  
Driver and control program .................................................................................................. 1  
Specifications ......................................................................................................................... 1  
Inputs ...................................................................................................................................... 3  
Outputs ..................................................................................................................................... 4  
Zone sensors ........................................................................................................................... 4  
Touchscreen devices .............................................................................................................. 5  
To mount the ME812u ............................................................................................................. 5  
To assign inputs or outputs to points ..................................................................................... 15  
Wiring for power .................................................................................................................... 6  
Wiring for communications .................................................................................................... 8  
Wiring specifications .............................................................................................................. 8  
To wire to a BACnet/ARC156 network ................................................................................. 8  
To wire to a BACnet MS/TP network .................................................................................... 9  
To set a port’s baud rate using PuTTY ................................................................................ 9  
Wiring inputs and outputs ...................................................................................................... 11  
Wiring specifications ............................................................................................................. 11  
To wire inputs and outputs ................................................................................................... 11  
Wiring devices to the ME812u’s Rnet port ......................................................................... 14  
Downloading the ME812u ....................................................................................................... 14  
To download from the WebCTRL® interface ..................................................................... 15  
To set up the driver ................................................................................................................ 19  
Driver ..................................................................................................................................... 19  
Device .................................................................................................................................... 21  
Notification Classes .............................................................................................................. 21  
Calendars ................................................................................................................................. 23  
Common and Specific Alarms ............................................................................................... 23  
Custom Translation Tables .................................................................................................... 23  
I/O Tuning ............................................................................................................................... 23  
Pneumatic Lines ....................................................................................................................... 24  
BACnet router properties ....................................................................................................... 24  
BACnet half-router properties .............................................................................................. 25  
Alarm Store/Forward ............................................................................................................ 25  
BACnet firewall ...................................................................................................................... 25  
Xnet ....................................................................................................................................... 25  
Expanders ............................................................................................................................... 25  
To communicate through the local access port ................................................................. 26  
To set up a Local Access connection in the WebCTRL® Interface .................................... 27  
Troubleshooting .................................................................................................................... 28  
LED’s ....................................................................................................................................... 28  
Formatting the controller ..................................................................................................... 29  
To get the ME812u’s serial number ..................................................................................... 29  
Recovering from a power outage ......................................................................................... 30  
Replacing the ME812u’s battery .......................................................................................... 30
What is the ME812u?

The ME812u is a general-purpose controller that you can use to control multiple pieces of equipment simultaneously. The ME812u can communicate BACnet/ARCNET at 156 kbps or BACnet MS/TP at 9600 bps, 19.2 kbps, 38.4 kbps, or 76.8 kbps.

**SOFTWARE REQUIREMENT** WebCTRL® v6.0 or later

Using expanders

To add inputs or outputs to the ME812u, you can attach up to 5 MEx, MX, or X expanders to the ME812u. Do not attach MEx expanders to a controller with MX/X expanders. See an expander's *Technical Instructions* for more information.

Driver and control program

<table>
<thead>
<tr>
<th>Driver</th>
<th>drv_melgr_vanilla</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>WARNING</strong></td>
<td>You must use v2-04-139 or later driver.</td>
</tr>
<tr>
<td>Maximum number of control programs*</td>
<td>999</td>
</tr>
<tr>
<td>Maximum number of BACnet objects*</td>
<td>12000</td>
</tr>
<tr>
<td>* Depends on available memory.</td>
<td></td>
</tr>
</tbody>
</table>

Specifications

| Power | 24 Vac ±10%, 50–60 Hz, 50 VA  
26 Vdc ±10%, 23 W |
| BACnet port | For communication with the controller network using ARC156 or MS/TP (9600 bps–76.8 kbps) |
| Rnet port |  
- Supports up to 15 wireless and/or ZS sensors, and one Equipment Touch or OptiPoint™ Interface  
- Supplies 12 Vdc/210 mA power to the Rnet at an ambient temperature of 77°F (25°C) with a 24 Vac nominal power source.  
**NOTE** Ambient temperature and power source fluctuations may reduce the power supplied by the Rnet port. |
<p>| <strong>NOTE</strong> If the total power required by the sensors on the Rnet exceeds the power supplied by the Rnet port, use an external power source. The Wireless Adapter, Equipment Touch, or OptiPoint™ Interface must be powered by an external power source. See the specifications in each device's <em>Technical Instructions</em> to determine the power required. |</p>
<table>
<thead>
<tr>
<th>Feature</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rnet Local Access port</td>
<td>For system start-up and troubleshooting</td>
</tr>
<tr>
<td>Expansion</td>
<td>Up to 5 expanders with a maximum of 192 points</td>
</tr>
<tr>
<td>Inputs</td>
<td>12 inputs, configurable for 0–5 Vdc, 0–10 Vdc, 0–20 mA, RTD, thermistor, or dry contact</td>
</tr>
<tr>
<td>Input resolution</td>
<td>14 bit A/D</td>
</tr>
<tr>
<td>Input pulse frequency</td>
<td>40 pulses per second. Minimum pulse width (on or off time) required for each pulse is 25 msec.</td>
</tr>
<tr>
<td>Outputs</td>
<td>8 outputs for 24 Vdc relay driver, 0–10 Vdc, or 0-20 mA</td>
</tr>
<tr>
<td>Output resolution</td>
<td>12 bit D/A</td>
</tr>
<tr>
<td>Microprocessor</td>
<td>32-bit Motorola Power PC microprocessor with cache memory, Fast Ethernet controller, high performance 32-bit communication co-processor, ARCNET communication co-processor, and I/O expansion CAN co-processor</td>
</tr>
<tr>
<td>Memory</td>
<td>16 MB non-volatile battery-backed RAM (with 12 MB available for use), 8 MB Flash memory, 32-bit memory bus</td>
</tr>
<tr>
<td>Real-time clock</td>
<td>Battery-backed real-time clock keeps track of time in event of power failure</td>
</tr>
<tr>
<td>Battery</td>
<td>10-year Lithium CR123A battery retains the following data for a maximum of 720 hours during power outages: time, control programs, editable properties, schedules, and trends. To conserve battery life, you can set the driver to turn off battery backup after a specified number of days and depend on the archive function to restore data when the power returns. A low battery is indicated by the <strong>Battery low</strong> LED or a low battery alarm in the WebCTRL® application.</td>
</tr>
<tr>
<td>Data archive</td>
<td>Control programs, editable properties, and schedules are archived to non-volatile Flash memory daily and after every power up or download. If a power outage occurs and the battery backup fails or is turned off, the data is automatically restored from this archive.</td>
</tr>
<tr>
<td>Protection</td>
<td>Built-in surge and transient protection for power and communications in compliance with EN61000-6-1. Incoming power is protected by a replaceable 3 Amp Pico® fuse. Network connections are protected by non-replaceable internal solid-state polyswitches that reset themselves when the condition that causes a fault returns to normal. The power, network, input, and output connections are also protected against transient excess voltage/surge events lasting no more than 10 msec.</td>
</tr>
<tr>
<td>BT485 connector</td>
<td>You attach a BT485 (not included) to a controller at the beginning and end of a network segment to add bias and to terminate a network segment.</td>
</tr>
<tr>
<td>Status indicators</td>
<td>LEDs indicate status of communications and low battery status. Seven segment display indicates running, error, and power status.</td>
</tr>
<tr>
<td>Environmental operating range</td>
<td>-20 to 140 °F (-29 to 60 °C), 10–90% relative humidity, non-condensing</td>
</tr>
<tr>
<td>Physical</td>
<td>Rugged aluminum cover, removable screw-type terminal blocks</td>
</tr>
</tbody>
</table>
**Inputs**

The ME812u has 12 inputs that accept the following signal types.

<table>
<thead>
<tr>
<th>Signal Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thermistor 1</td>
<td>Precon type 2 (10 kOhm at 77°F). Input voltages should be from 0.489 Vdc to 3.825 Vdc for thermistors.</td>
</tr>
<tr>
<td>Dry contact</td>
<td>A 5 Vdc wetting voltage detects contact position, resulting in a 1 mA maximum sense current when the contacts are closed.</td>
</tr>
<tr>
<td>0–5 Vdc</td>
<td>The output impedance of a 0–5 Vdc or a 0–10 Vdc source must not exceed 200 Ohms. The input impedance of the ME812u is approximately 20 kOhm.</td>
</tr>
<tr>
<td>0–10 Vdc</td>
<td>The input resistance on the positive (+) terminal is 250 Ohms. The <strong>Aux Power Out</strong> connector is capable of supplying 24 Vdc to multiple 4–20 mA transducers, but the total current demanded must not exceed 200 mA. If the voltage measured from the <strong>Aux Power Out</strong> connector to <strong>Gnd</strong> is less than 18 Vdc, you need to use an external power supply.</td>
</tr>
<tr>
<td>0–20 mA</td>
<td>The input resistance on the positive (+) terminal is 250 Ohms. The <strong>Aux Power Out</strong> connector is capable of supplying 24 Vdc to multiple 4–20 mA transducers, but the total current demanded must not exceed 200 mA. If the voltage measured from the <strong>Aux Power Out</strong> connector to <strong>Gnd</strong> is less than 18 Vdc, you need to use an external power supply.</td>
</tr>
</tbody>
</table>
| RTD 1       | Platinum - 1 kOhm at 32°F (0°C)  
Nickel/Iron - 1 kOhm at 70°F (21°C)  
Balco TS8000 - 1 kOhm at 70°F (21°C)  
Input voltages should be from 0.6–1.2 V  
**NOTE** Automated Logic® recommends use of an external current transducer between an RTD and the ME812u to improve accuracy and resolution. |
| Pulse counter 2 | Pulse counting up to 40 pulses per second.  
Minimum pulse width (on or off time) required for each pulse is 25 msec. |

1  To use a thermistor or RTD not listed above, you can set up a custom translation table (page 23) for your sensor.  
2  The ME812u can perform pulse counting for dry contact or voltage inputs if you assign the input to a Pulse to Analog Input microblock. See To assign inputs or outputs to points (page 15).
**NOTE** If you have one or more RTD's connected to the inputs, the total current draw of all Thermistor, RTD, and Dry contact devices wired to the inputs should not exceed 10 mA. Exceeding this limit will affect the accuracy of the RTD's. Use the following approximations as a reference:

- 10 kOhm Thermistor draws approximately 0.334 mA
- 1 kOhm RTD draws approximately 0.834 mA
- Dry contact draws approximately 1 mA

For example, if you connect 12 RTD's to the inputs, you cannot use the remaining 4 inputs for Thermistor, RTD, or Dry contact devices. This assumes negligible wiring impedance (<10 Ohms) for each RTD input with up to 100 feet of 22 AWG cable.

### Outputs

The ME812u has 8 universal outputs that you can use as digital outputs or analog outputs. The outputs support:

- driving external 24 Vdc relays
- 0-10 Vdc devices
- 0-20 mA devices

⚠️ **WARNING** Do not apply 24 Vac to these universal outputs.

<table>
<thead>
<tr>
<th>If output controls a...</th>
<th>Resistance to ground must be...</th>
</tr>
</thead>
<tbody>
<tr>
<td>0–10 Vdc device</td>
<td>500 Ohms minimum</td>
</tr>
<tr>
<td>0–20 mA device</td>
<td>800 Ohms maximum</td>
</tr>
</tbody>
</table>

**NOTES**

- The device must share the same ground as the controller.
- The total output current from all outputs and the **Aux Power Out** connector must not exceed:
  - 500 mA at 115°F
  - 300 mA at 140°F

  For temperatures above 115°F, use the following equation to calculate the total current at 8 mA per degree:

  \[
  500mA - ((\text{max. expected temp.} - 115°F) \times 8mA/F)
  \]

### Zone sensors

You can wire ZS sensors and/or a Wireless Adapter that communicates with wireless sensors to the ME812u's Rnet port. You can have up to 15 ZS and/or wireless sensors.

**NOTES**

- A control program can use no more than 5 ZS sensors, so you must use multiple control programs if your Rnet network has more than 5 sensors.
- ZS and wireless sensors can share the Rnet with an Equipment Touch or OptiPoint™ Interface.
- An Rnet with the above devices cannot have RS sensors.
**Touchscreen devices**

You can wire an Equipment Touch or OptiPoint™ Interface to the ME812u's Rnet port to view or change the controller's property values, schedule equipment, view trends and alarms, and more, without having to access the system's server. The Rnet can have one Equipment Touch or OptiPoint™ Interface, plus ZS sensors and/or a Wireless Adapter that communicates with wireless sensors.

**NOTE** These touchscreen devices are not powered by the Rnet.

- The OptiPoint™ Interface requires a 24 Vdc external power source.
- The Equipment Touch requires a 24 Vac external power source.

**CAUTION** A touchscreen device can share a power supply with the Automated Logic® controller as long as:

- The power source shared by the controller and Equipment Touch is AC power.
- The power source shared by the controller and OptiPoint™ Interface is DC power.
- You maintain the same polarity.
- You use the power source only for Automated Logic® controllers.

---

**To mount the ME812u**

Screw the ME812u into an enclosed panel using the mounting holes provided on the cover plate. Leave about 2 in. (5 cm) on each side of the controller for wiring.

If using expanders, see the following section(s) before mounting the controller.

---

**To attach MEx expanders**

See the MEx expander's *Technical Instructions* for mounting options.

Use ARC156 wiring to wire the MEx expander to the controller. Do not exceed 100 feet total wire length. See *Wiring for Communications* in the expander's *Technical Instructions* for complete wiring specifications.

1. Wire the ME812u's *Xnet Remote Expansion* port to the same port on the MEx expander.

   **NOTE** To use more than one expander, wire their *Xnet Remote Expansion* ports together in a daisy-chain configuration. The ME812u must be the first device on the expander network.

2. Set the ME812u's *Xnet/Mx* DIP switch to *Xnet*.

   **NOTE** You must set the Xnet baud rate to 500 kbps in the WebCTRL® interface on the driver's *Xnet* page. See *To set up the driver* (page 19).
To attach MX or X expanders

Arrange the ME812u and expanders in one or two columns, placing the ME812u at the top of a column.

1. Connect the devices’ Expansion connectors.

   **NOTES**
   - To mount the expander, place spacers behind its mounting holes so that its Expansion connector will align with the connector on the ME812u. See table below to purchase the appropriate spacers.
   - If you use 2 columns, use an MX expander cable to connect an Expansion connector in the first column to an Expansion connector in the second column. See the expander’s Technical Instructions for more information.

2. Set the ME812u’s Xnet/Mx DIP switch to Mx.

<table>
<thead>
<tr>
<th>Expander...</th>
<th>Requires 2 spacers...</th>
<th>ALC part number</th>
</tr>
</thead>
<tbody>
<tr>
<td>MX040, MX400, MX440</td>
<td>Small</td>
<td>254901</td>
</tr>
<tr>
<td>MX080, MX4106, MX4106p, MX800, MX8102, MX880</td>
<td>Medium</td>
<td>254900</td>
</tr>
<tr>
<td>MX0160, MX0320, MX1600, MX16160</td>
<td>Large</td>
<td>254902</td>
</tr>
</tbody>
</table>

Wiring for power

**WARNING**  Do not apply line voltage (mains voltage) to the controller’s ports and terminals.

**CAUTIONS**
- The ME812u is powered by a Class 2 power source. Take appropriate isolation measures when mounting it in a control panel where non-Class 2 circuits are present.
- Automated Logic® controllers can share a power supply as long as you:
  - Maintain the same polarity.
  - Use the power supply only for Automated Logic® controllers.

**NOTE**  For the controller to recognize an attached expander, you must turn on the expander before you turn on the controller.
To wire for power

1. Make sure the ME812u's power switch is in the **OFF** position to prevent it from powering up before you can verify the correct voltage.
2. Remove power from the power supply.
3. Pull the screw terminal connector from the controller's power terminals labeled **24ac/26dc** and **Return** (Ground).
4. Connect the transformer wires to the screw terminal connector.
5. Apply power to the power supply.
6. Measure the voltage at the ME812u's power input terminals to verify that the voltage is within the operating range of 21.6–26.4 Vac.
7. Insert the screw terminal connector into the ME812u's power terminals.
8. Turn **on** the ME812u's power.
9. Verify that the Run LED (a dot in the lower right corner of the **Module Status** LED) begins blinking. The **Module Status** LED will show a chase pattern when the controller is running with no errors.

To address the ME812u

You must give the ME812u an address that is unique on the network. You can address the ME812u before or after you wire it for power.

1. If wired for power, turn off the controller's power.
2. **NOTE** The controller only reads the rotary switch positions during power up or upon reset.
3. Using the rotary switches, set the controller's address to match the **Address** in the controller's properties dialog box in SiteBuilder. Set the **Tens** (**10's**) switch to the tens digit of the address, and set the **Ones** (**1's**) switch to the ones digit.

**EXAMPLE** If the controller's address is 25, point the arrow on the **Tens** (**10's**) switch to 2 and the arrow on the **Ones** (**1's**) switch to 5.
Wiring for communications

The ME812u communicates on the following ports.

<table>
<thead>
<tr>
<th>Port</th>
<th>Protocol</th>
<th>Port type(s)</th>
<th>Baud rate(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>BACnet</td>
<td>BACnet/ARC156 ¹</td>
<td>EIA-485 (2-wire)</td>
<td>156 kbps</td>
</tr>
<tr>
<td></td>
<td>BACnet MS/TP</td>
<td>EIA-485 (2-wire)</td>
<td>9600 bps</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>19.2 kbps, 38.4 kbps,</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>76.8 kbps (default)</td>
</tr>
<tr>
<td>Local Access</td>
<td>Enhanced Access</td>
<td>Rnet ²</td>
<td>115.2 kbps</td>
</tr>
</tbody>
</table>

¹ ARC156 is a unique implementation of the industry standard ARCNET. For a summary of differences between ARCNET and ARC156, see the ARC156 Wiring Technical Instructions.

² See To communicate through the local access port (page 26).

Wiring specifications

<table>
<thead>
<tr>
<th>For...</th>
<th>Use...</th>
<th>Maximum Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>ARC156 ¹ and</td>
<td>22 AWG, low-capacitance, twisted, stranded,</td>
<td>2000 feet (610</td>
</tr>
<tr>
<td>MS/TP ²</td>
<td>shielded copper wire</td>
<td>meters)</td>
</tr>
</tbody>
</table>

¹ See the ARC156 Wiring Technical Instructions.

² See the MS/TP Networking and Wiring Technical Instructions.

⚠️ WARNING Do not apply line voltage (mains voltage) to the controller’s ports and terminals.

To wire to a BACnet/ARC156 network

1. Turn off the ME812u's power.
2. Check the communications wiring for shorts and grounds.
3. Connect the communications wiring to the BACnet port’s screw terminals labeled Net +, Net -, and Shield.
   **NOTE** Use the same polarity throughout the network segment.
4. Set the BACnet Mode jumper to ARC156.
5. If the ME812u is at either end of a network segment, connect a BT485 to the ME812u.
6. Turn on the ME812u's power.
7. Verify communication with the network by viewing a Module Status report in the WebCTRL® interface.
To wire to a BACnet MS/TP network

1. Turn off the ME812u's power.
2. Check the communications wiring for shorts and grounds.
3. Connect the communications wiring to the BACnet port’s screw terminals labeled **Net +**, **Net -**, and **Shield**.
   
   **NOTE** Use the same polarity throughout the network segment.
4. Set the **BACnet Mode** jumper to MSTP.
5. If the ME812u is at either end of a network segment, connect a BT485 to the ME812u.
6. Turn on the ME812u's power.
7. To change the port's baud rate, see *To set a port's baud rate using PuTTY* (page 9).
   
   **NOTE** Use the same baud rate for all controllers on the network segment.

To set a port's baud rate using PuTTY

1. Download and install PuTTY from the PuTTY website (http://www.chiark.greenend.org.uk/~sgtatham/putty/download.html).
2. Connect a computer to the ME812u's **Local Access** port. See *To communicate through the local access port* (page 26).
3. Set the ME812u's **Enhanced Access** DIP switch to **ON**.
4. Turn the ME812u's power **Off**, then **On**.
5. Start PuTTY.
6. Under **Category > Connection**, select **Serial**.
7. Under **Options controlling local serial lines**, enter the following settings:

<table>
<thead>
<tr>
<th>Field</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Serial line to connect to</td>
<td>Replace X with the computer's port number that the USB Link Kit cable is connected to.</td>
</tr>
<tr>
<td></td>
<td><strong>NOTE</strong> To find the port number, select Start &gt; Control Panel &gt; System &gt; Device Manager &gt; Ports (Com &amp; LPT). The COM port number is beside Silicon Labs CP210x USB to UART Bridge.</td>
</tr>
<tr>
<td>Speed (baud)</td>
<td>115200</td>
</tr>
<tr>
<td>Data Bits</td>
<td>8</td>
</tr>
<tr>
<td>Stop Bits</td>
<td>1</td>
</tr>
<tr>
<td>Parity</td>
<td>None</td>
</tr>
<tr>
<td>Flow Control</td>
<td>None</td>
</tr>
</tbody>
</table>
8 Click **Open**. A window similar to the one below appears.

```
BACnet Router. Ethernet MAC address = 00-E0-C9-00-4E-B8

1) Restart
2) Display Modstat
3) IP Address [192.168.160.1]
4) Subnet Mask [255.255.255.0]
5) Default Gateway [0.0.0.0]
6) BACnet/IP UDP Port [0x89C0]
7) BACnet/IP Network [4824]
8) BACnet/Ethernet Network [4829]
9) BACnet/ARCNET Network [4825]
10) BACnet/MSTP Network [4834]
11) Display B/IP PAD Table
12) Add B/IP PAD Table Entry
13) Delete B/IP PAD Table Entry
14) Clear B/IP PAD Table
15) Set baud rate for MSTP [76800]
16) Set baud rate for PTP [38400]

* The HOME network is updated each time a network number is changed (#7-10).

Enter selection: _
```

9 Type the number of the baud rate field, then press **Enter**.

10 Type the new baud rate, then press **Enter**.

11 Type 1, then press **Enter** to restart the controller.

12 When finished, set the ME812u's **Enhanced Access** DIP switch to **OFF** to restore normal functionality to the **Local Access** port.

13 Turn the ME812u's power **Off**, then **On**.
Wiring inputs and outputs

Wiring specifications

Input wiring

<table>
<thead>
<tr>
<th>Input</th>
<th>Maximum length</th>
<th>Minimum gauge</th>
<th>Shielding</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thermistor</td>
<td>1000 feet</td>
<td>22 AWG</td>
<td>Shielded</td>
</tr>
<tr>
<td>Dry contact</td>
<td>(305 meters)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0–5 Vdc</td>
<td>1000 feet</td>
<td>26 AWG</td>
<td>Shielded</td>
</tr>
<tr>
<td>0–10 Vdc</td>
<td>(305 meters)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0–20 mA</td>
<td>3000 feet</td>
<td>26 AWG</td>
<td>Shielded or unshielded</td>
</tr>
<tr>
<td>RTD</td>
<td>100 feet</td>
<td>22 AWG</td>
<td>Shielded</td>
</tr>
<tr>
<td>(30 meters)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

ZS sensor
Wireless Adapter for wireless sensors
Equipment Touch
OptiPoint™ Interface

See Wiring devices to the ME812u's Rnet port (page 14).

**NOTE** Automated Logic® recommends use of an external current transducer between an RTD and the ME812u to improve accuracy and resolution.

Output wiring

To size output wiring, consider the following:

- Total loop distance from the power supply to the controller, and then to the controlled device
  **NOTE** Include the total distance of actual wire. For 2-conductor wires, this is twice the cable length.
- Acceptable voltage drop in the wire from the controller to the controlled device
- Resistance (Ohms) of the chosen wire gauge
- Maximum current (Amps) the controlled device requires to operate

To wire inputs and outputs

**WARNING** Do not apply line voltage (mains voltage) to the controller's ports and terminals.

**NOTE** If the ME812u has an expander mounted to its coverplate, see ME812u coverplate (page 33) for the location of connectors, switches, and jumpers.

1. Verify that the ME812u's power and communications connections work properly.
2. Turn off the ME812u's power.
3 Connect the input wiring to the screw terminals on the ME812u. See figure below.

**NOTES**
- Connect the shield wire to the **GND** terminal with the ground wire.
- For a loop-powered 4-20 mA sensor, wire the sensor's positive terminal to the + terminal on the ME812u's **Aux Power Out** connector. Wire the sensor's negative terminal to an input's + terminal.

4 Set each input's **Universal Input Mode Select** jumper to indicate the type of input.
5 Connect digital and analog output wiring to the UO screw terminals on the ME812u and to the controlled device. Connect the ground wire to the UO's Gnd terminal.

⚠️ **WARNING** Do not apply 24 Vac to these universal outputs.

6 Set each output's jumper to the type of device wired to the output.

7 For each digital output, turn the output's potentiometer clockwise until it stops (maximum output).

8 Turn **on** the ME812u's power.
Wiring devices to the ME812u's Rnet port

You can wire the following devices to the ME812u's Rnet port in a daisy-chain or star configuration:

- ZS sensors
- Wireless Adapter that communicates with wireless sensors
- Equipment Touch
- OptiPoint™ Interface

See the device's Technical Instructions for complete wiring instructions.

NOTES

- ZS sensors, a Wireless Adapter, and an Equipment Touch can share the same Rnet, but not RS sensors.
- The Rnet communicates at a rate of 115 kbps.

Downloading the ME812u

Download to send the following items to the ME812u:

<table>
<thead>
<tr>
<th>Item</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Up to 999 control programs, depending on available memory</td>
<td>Must be in WebCTRLx.webroot&lt;system_name&gt;\programs.</td>
</tr>
<tr>
<td>DRV_MELGR_VANILLA driver</td>
<td>Must be in WebCTRLx.webroot&lt;system_name&gt;\drivers.</td>
</tr>
</tbody>
</table>

**NOTE** To verify that you have the driver's latest version, go to http://accounts.automatedlogic.com/download, then select Drivers > ExecB. Compare the latest version to the ME812u's driver in SiteBuilder.

Editable properties

Schedules

If you change any of the above items or the ME812u's address after the initial download, you must download again. The first download takes longer than subsequent downloads.

**CAUTIONS**

- The ME812u will lose stored data when you download.
- Equipment controlled by the ME812u will shut down and restart when you download.
- After you download, the Archive Valid LED lights to indicate the downloaded items are stored in the ME812u's flash memory. This type of memory is not dependent on power or battery backup. If you need to remove power from the controller after downloading, make sure this LED is lit.
To download from the WebCTRL® Interface

If your network is complete, you can download from any network browser. If not complete, connect a laptop with a local copy of the system database to the ME812u's local access port. See To communicate through the local access port (page 26).

1. On the WebCTRL® Network tree, select the controller.
2. Click Downloads.
3. Do one of the following:
   ○ If the controller is in the Downloads list, go to step 4.
   ○ If the controller is not in the list:
     a. Click Add.
     b. In the pop-up, select the controller.
     c. Select All Content.
     d. Click Add.
     e. Click Close.
4. Select the controller in the Downloads list.
5. Click Start.

NOTES
- If the download fails, locate and resolve the problem, then retry the download.
- You can also download a controller from the Devices page.

To assign inputs or outputs to points

An input or output must be assigned to its corresponding point in the control program. This is typically done when the control program is created, but you can adjust the settings at the time of installation in the WebCTRL® interface.

1. In the WebCTRL® Geographic tree, select the equipment controlled by the ME812u.
2. On the Properties page, select the I/O Points tab.
3. In each point's Num field, type the number of the controller's corresponding input or output. For example, if you use DO1 on the ME812u for the point Pump S/S, type 1 in the Num field for Pump S/S.

   NOTES
   ○ Exp (expander number) is 00 for the ME812u.
   ○ Do not assign the same output number to more than one point.
4. Enter the appropriate values for each input and output in the remaining columns. See Input values, Output values, Resolution values and Offset/Polarity values below.
   NOTE You can also enter these values in the EIKON® LogicBuilder application.
5. If you have not performed the initial download to the ME812u, you must download now so you can verify inputs and outputs.
6. To verify each input's operation, force each sensor to a known value, then compare it to the Value shown on the Properties page on the I/O Points tab.
7. To verify each output's operation, lock each output to a known condition on the I/O Points tab, then verify that the equipment operates correctly.
### Input values

<table>
<thead>
<tr>
<th>Input</th>
<th>I/O Type</th>
<th>Sensor/Actuator Type</th>
<th>Min/Max</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Analog (BAI)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0-5 Vdc</td>
<td>0–5 Volt</td>
<td>Linear Full Range</td>
<td>Engineering values associated with 0 Vdc (Min) and 5 Vdc (Max) ¹</td>
</tr>
<tr>
<td>0-10 Vdc</td>
<td>0–10 Volt</td>
<td>Linear Full Range</td>
<td>Engineering values associated with 0 Vdc (Min) and 10 Vdc (Max) ¹</td>
</tr>
<tr>
<td>2-10 Vdc</td>
<td>0–10 Volt</td>
<td>Linear w/Offset, 2–10 Volts</td>
<td>Engineering values associated with 2 Vdc (Min) and 10 Vdc (Max) ¹</td>
</tr>
<tr>
<td>0-20 mA</td>
<td>0–20 mA</td>
<td>Linear Full Range</td>
<td>Engineering values associated with 0 mA (Min) and 20 mA (Max) ¹</td>
</tr>
<tr>
<td>4-20 mA</td>
<td>0–20 mA</td>
<td>Linear w/Offset, 4–20 mA</td>
<td>Engineering values associated with 4 mA (Min) and 20 mA (Max) ¹</td>
</tr>
<tr>
<td><strong>RTD</strong></td>
<td>RTD Input</td>
<td></td>
<td>N/A</td>
</tr>
<tr>
<td><strong>Thermistor</strong></td>
<td></td>
<td></td>
<td>N/A</td>
</tr>
<tr>
<td><strong>Pulse to Analog (BPTA)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pulse Counter</td>
<td>Counter Input</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td><strong>Digital (Binary) (BBI)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dry Contact</td>
<td>Dry Contact</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>

¹ The sensor reads a value and sends a corresponding signal (Volt, mA, or psi) to the ME812u's physical input. The Analog Input microblock uses the Min and Max values to linearly translate the signal into the engineering value used in subsequent control logic. For example, set Min to 0 and Max to 10 for a 4–20 mA sensor that measures velocity from 0.0 to 10.0 inches/second so that when the input reads 4 mA, the microblock outputs a value of 0. Similarly, when the input reads 8 mA, the microblock outputs a value of 2.5.

² You can set up a custom translation table (page 23) on the driver's Custom Translation Tables pages in the WebCTRL® interface.

³ The control program must have one Pulse to Analog Input microblock for each pulse counting input.
Output values

<table>
<thead>
<tr>
<th>Output</th>
<th>I/O Type</th>
<th>Sensor/Actuator Type</th>
<th>Min/Max</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Analog (BAO)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0-10 Vdc</td>
<td>Electrical</td>
<td>Linear Full Range</td>
<td>Engineering values associated with 0 Vdc (Min) and 10 Vdc (Max) ¹</td>
</tr>
<tr>
<td></td>
<td>0-10 Volt</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2-10 Vdc</td>
<td>Electrical</td>
<td>Linear with Offset, 2–10 Volts</td>
<td>Engineering values associated with 2 Vdc (Min) and 10 Vdc (Max) ¹</td>
</tr>
<tr>
<td></td>
<td>0-10 Volt</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0-20 mA</td>
<td>Electrical</td>
<td>Linear Full Range</td>
<td>Engineering values associated with 0 mA (Min) and 20 mA (Max) ¹</td>
</tr>
<tr>
<td></td>
<td>0-20 mA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4-20 mA</td>
<td>Electrical</td>
<td>Linear with Offset, 4–20 mA</td>
<td>Engineering values associated with 4 mA (Min) and 20 mA (Max) ¹</td>
</tr>
<tr>
<td></td>
<td>0-20 mA</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Digital (Binary) (BB0)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Relay</td>
<td>Relay/Triac</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Output</td>
<td>Output</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

¹ The Analog Output microblock uses the Min and Max values to linearly translate its EIKON® LogicBuilder wire value into a physical output signal (Volt, mA, or psi) sent from the ME812u to an actuator. For example, set Min to 0 and Max to 100 for an Analog Output microblock that receives a 0 to 100% open signal from a PID microblock and that controls a 0–10 Vdc actuator so that when the PID signal is 100%, the ME812u output is 10 Vdc. Similarly, when the PID signal is 50%, the ME812u output is 5 Vdc.

Resolution values

**Resolution** is not particular to a type of input or output, but the driver handles analog and digital (binary) inputs and outputs differently. To set these values appropriately, you should understand how the driver uses them.

<table>
<thead>
<tr>
<th>Resolution</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Analog Input (BAI)</td>
<td>The driver truncates the microblock’s present value according to the resolution.</td>
</tr>
<tr>
<td></td>
<td><strong>EXAMPLE</strong> If the calculated present value is 13.789 and you set the Resolution to 0.1, the control program uses 13.7 for any calculations downstream from the microblock.</td>
</tr>
<tr>
<td>Analog Output (BAO)</td>
<td>The driver truncates the wire input value to the microblock before performing any scaling calculations.</td>
</tr>
<tr>
<td></td>
<td><strong>EXAMPLE</strong> If the wire input value is 13.789 and you set the Resolution to 0.1, the microblock uses 13.7 for any scaling calculations.</td>
</tr>
<tr>
<td>Digital (Binary) Inputs and Outputs</td>
<td>N/A</td>
</tr>
</tbody>
</table>
Offset/Polarity values

Offset/Polarity is not particular to a type of input or output, but the driver handles analog and digital (binary) inputs and outputs differently. To set these values appropriately, you should understand how the driver uses them.

<table>
<thead>
<tr>
<th>Offset/Polarity</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Analog Input (BAI)</td>
<td><strong>Offset</strong> value (positive or negative) adds a fine adjustment to a sensor reading after all scaling for calibration.</td>
</tr>
<tr>
<td></td>
<td><strong>EXAMPLE</strong> If a sensor reads 74.9°F when the actual measured value is 73.6°F, enter an <strong>Offset</strong> of −1.3 to calibrate the sensor to the measured value.</td>
</tr>
<tr>
<td>Analog Output (BAO)</td>
<td>You can use the <strong>Offset</strong> value (positive or negative) to calibrate an output, but you generally do not need to. If used, the driver adds the offset value to the wire input value before performing any scaling calculations to determine the ME812u's output.</td>
</tr>
<tr>
<td>Digital (Binary) Input (BBI)</td>
<td><strong>Polarity</strong> determines the microblock's present value when no signal is received from the equipment.</td>
</tr>
<tr>
<td></td>
<td>When no signal is received from the equipment, if <strong>Polarity</strong> is set to:</td>
</tr>
<tr>
<td></td>
<td>normal—present value is off</td>
</tr>
<tr>
<td></td>
<td>reversed—present value is on</td>
</tr>
<tr>
<td>Digital (Binary) Output (BBO)</td>
<td><strong>Polarity</strong> determines the ME812u's output based on the control program's signal to the microblock.</td>
</tr>
<tr>
<td></td>
<td>When the control program's signal to the microblock is on, if <strong>Polarity</strong> is set to:</td>
</tr>
<tr>
<td></td>
<td>normal—output is on</td>
</tr>
<tr>
<td></td>
<td>reversed—output is off</td>
</tr>
<tr>
<td></td>
<td><strong>NOTE</strong> Regardless of <strong>Polarity</strong>, the output will be off if the ME812u loses power.</td>
</tr>
</tbody>
</table>

To use the Auto-Off-On switches

**NOTE** If the ME812u has an expander mounted to its coverplate, see ME812u coverplate (page 33) for the location of switches.

You can control an output using the Auto-Off-On switch.

<table>
<thead>
<tr>
<th>Set the switch to...</th>
<th>To...</th>
</tr>
</thead>
<tbody>
<tr>
<td>On</td>
<td>Turn on the output.</td>
</tr>
<tr>
<td>Off</td>
<td>Turn off the output</td>
</tr>
<tr>
<td>Auto</td>
<td>Let the control program control the output</td>
</tr>
</tbody>
</table>
The potentiometer, located between the Auto-Off-On switch and the jumper, allows you to manually control the output level of an analog output. Place the Auto-Off-On switch in the On position, then turn the potentiometer counterclockwise to reduce the output, or clockwise to increase the output.

Travel range

For a digital output, turn the potentiometer clockwise until it stops (maximum output) and leave it in this position.

The control program can monitor the status of an Auto-Off-On switch and display the status on the control program’s Properties page > I/O Points tab in the WebCTRL® interface. The Value of the point monitoring the Auto-Off-On switch shows Off if the switch is set to Auto, and On if the switch is set to Off or On.

To monitor an Auto-Off-On switch
1 Insert a BACnet Binary Input microblock in the control program.
2 On the microblock's Properties page in the WebCTRL® interface, set the I/O Type field to H-O-A Status Feedback.
3 In the Input Number field, type the number of the output you want to monitor.

To set up the driver

After you download the driver and control program(s) to the ME812u, you may want to change the driver's properties in the WebCTRL® interface to suit your application.

1 On the WebCTRL® Network tree, click to the left of your ME812u.
2 Click to the left of Driver to see its children.
3 Make changes as needed on the Properties page for Driver and any of its children.

Driver

On the Driver page, you can change the following properties:

- Backup battery conservation settings. See table below.
- Module clock synchronization and failure. See table below.
- Network Input microblock communication properties.
### Backup Battery

<table>
<thead>
<tr>
<th>Turn off internal backup battery after ___ days to conserve battery life (shutoff date/time)</th>
<th>How long backup battery should run after power loss.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>TIP</strong></td>
<td>Downloading activates the battery backup. To conserve battery life when you know the ME812u will be without power for an extended period after downloading (for example, during shipment):</td>
</tr>
<tr>
<td>1</td>
<td>Verify the <strong>Archive Valid</strong> LED is lit, then set this field to 0.</td>
</tr>
<tr>
<td>2</td>
<td>After you install the ME812u and apply power, enter a number greater than 0.</td>
</tr>
</tbody>
</table>

### BACview Control

| Keypad Inactivity timeout (minutes) | Log out the user (if a user-level password is required), turn off the backlight, and display the standby screen after this period of inactivity. |
| Keypad user-level password | Numeric password user must enter to access system through a BACview® device. |

### TouchScreen Control

<table>
<thead>
<tr>
<th>TouchScreen Schedule Edit Enable</th>
<th>Check this field to allow a user to edit this controller's schedules from an Equipment Touch's Schedules screen.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>NOTE</strong></td>
<td>Schedules edited on an Equipment Touch are not uploaded to the WebCTRL® application. This could result in the controller operating on a schedule that differs from the one you see in the WebCTRL® interface.</td>
</tr>
</tbody>
</table>

### Module Clock

| Clock Fail Date and Time | Date and time the control program uses when controller's real-time clock is invalid. |
| **TIP** | Use an occupied date and time (such as a Tuesday at 10 a.m.) so the equipment does not operate in unoccupied mode if the controller loses power during occupancy. |
| Time Synch Sensitivity (seconds) | When the controller receives a time sync request, if the difference between the controller's time and the time sync's time is greater than this field's value, the controller's time is immediately changed. If the difference is less than this field's value, the controller's time is slowly adjusted until the time is correct. |

### Network Microblocks

| Number of poll retries before Network Input Microblocks Indicate failure | The maximum number of retries after the initial attempt that a Network microblock will attempt to communicate with its target device. If unsuccessful, the point will transition to an idle state for 30 seconds before attempting to communicate again. Change this field only if directed by Technical Support. |
| Periodic rebinding interval | If a microblock uses a wildcard in its address, this timer determines how often the microblock will attempt to find the nearest instance of its target. For example, if an outside air temperature address uses a wildcard, a VAV application will look for the outside air temperature on the same network segment or on the nearest device containing that object. |
BACnet COV Throttling

Enable COV Throttling

Under normal circumstances, COV Throttling should be enabled to prevent excessive network traffic if an object's COV Increment is set too low. See EXCEPTION below.

When enabled, if an object generates excessive COV broadcasts (5 updates in 3 seconds), the driver automatically throttles the broadcasts to 1 per second. Also, if the object's value updates excessively for 30 seconds, an alarm is sent to the WebCTRL® application listing all objects that are updating excessively. A Return-to-normal alarm is sent only after all objects have stopped updating excessively.

EXCEPTION: In rare circumstances, such as process control, a subscribing object may require COV updates more frequently than once per second. For these situations, clear this checkbox, but make sure that your network can support the increased traffic. You will also need to disable the Excessive COV alarms under the driver's Common Alarms.

Trend Sampling

Collect a daily midnight sample for all points in this controller that are sampling on COV

For values that change infrequently, select to verify at midnight daily that the point is still able to communicate trend values.

Device

On the Device page, you can change the following properties:

- BACnet device object properties for the ME812u
- ME812u communication

Configuration

NOTE The three APDU fields refer to all networks over which the ME812u communicates.

Max Masters and Max Info Frames

Apply only if the ME812u's MS/TP network is enabled.

Notification Classes

A BACnet alarm's Notification Class defines:

- Alarm priority for Alarm, Fault, and Return to Normal states
- Options for BACnet alarm acknowledgment
- Where alarms should be sent (recipients)

Alarms in the WebCTRL® application use Notification Class #1. The WebCTRL® application is automatically a recipient of these alarms.
### Priorities

**NOTE** BACnet defines the following Network message priorities for Alarms and Events.

<table>
<thead>
<tr>
<th>Priority range</th>
<th>Network message priority</th>
</tr>
</thead>
<tbody>
<tr>
<td>00–63</td>
<td>Life Safety</td>
</tr>
<tr>
<td>64–127</td>
<td>Critical Equipment</td>
</tr>
<tr>
<td>128–191</td>
<td>Urgent</td>
</tr>
<tr>
<td>192–255</td>
<td>Normal</td>
</tr>
</tbody>
</table>

### Priority of Off-Normal

BACnet priority for Alarms.

### Priority of Fault

BACnet priority for Fault messages.

### Priority of Normal

BACnet priority for Return-to-normal messages.

### Ack Required for Off-Normal, Fault, and Normal

Specifies whether alarms associated with this Notification Class require a BACnet Acknowledgment for Off-Normal, Fault, or Normal alarms.

**TIP** You can require operator acknowledgment for an Alarm or Return-to-normal message (stored in the WebCTRL® database). In the WebCTRL® interface on the Alarm > Enable/Disable tab, change the acknowledgment settings for an alarm source or an alarm category.

### Recipient List

**Recipients**

The first row in this list is from the WebCTRL® application. Do not delete this row. Click Add if you want other BACnet devices to receive alarms associated with this Notification Class.

**Recipient Description**

Name that appears in the Recipients table.

**Recipient Type**

Use Address (static binding) for either of the following:
- Third-party BACnet device recipients that do not support dynamic binding
- When you want alarms to be broadcast (you must uncheck Issue Confirmed Notifications). This use is rare.

**Days and times**

The days and times during which the recipient will receive alarms.

**Recipient Device Object Identifier**

Type the Device Instance from SiteBuilder (or from the network administrator for third-party devices) in the # field.

**Process Identifier**

Change for third-party devices that use a BACnet Process Identifier other than 1. The WebCTRL® application processes alarms for any 32-bit Process Identifier.

**Issue Confirmed Notifications**

Select to have a device continue sending an alarm message until it receives delivery confirmation from the recipient.

**Transitions to Send**

Uncheck the types of alarms you do not want the recipient to get.
Calendars

Calendars are provided in the driver for BACnet compatibility only. Instead, use the Schedules feature in the WebCTRL® interface.

Common and Specific Alarms

On these pages, you can enable/disable, change BACnet alarm properties, or set delays for the following BACnet alarms:

**Common alarms:**
- Module Halted
- All Programs Stopped
- Duplicate Address
- Locked I/O
- Control Program
- Program Stopped
- Excessive COV

**Specific alarm:**
- Dead Module Timeout
- Low Battery Alarm
- Pneumatic Unstable Alarm
- Pneumatic Leak Alarm
- Low Main Air Alarm

**NOTE** To set up alarm actions for controller generated alarms, see Setting up alarm actions in WebCTRL® Help.

Module Generated Alarm

<table>
<thead>
<tr>
<th>Description</th>
<th>Short message shown on the Alarms page or in an alarm action when this type of alarm is generated.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Events</td>
<td>See Customizing alarms in WebCTRL® Help.</td>
</tr>
<tr>
<td>Alarm Category and Alarm Template</td>
<td>➤ Clear these checkboxes to disable Alarm or Return to normal messages of this type from this controller.</td>
</tr>
<tr>
<td>Notification Class</td>
<td>Do not change this field.</td>
</tr>
</tbody>
</table>

Custom Translation Tables

You can set up a translation table that an analog input will use to translate the raw data from a non-linear sensor to the engineering units you want it to output on the wire. In the Network tree, select Custom Translation Table #1, #2, or #3. The Properties page has instructions. For the input to use the translation table, navigate to the input in the Geographic tree, select the Details tab, then set Sensor Type (Scaling Method) to Non-Linear, Custom Table #__.
## I/O Tuning

Applies if an expander with pneumatic analog outputs is attached to the ME812u.

On the I/O Tuning page, you can change communication and control settings for pneumatic inputs and outputs.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pneumatic control power up delay (seconds)</td>
<td>Delay after controller is reset before pneumatic control is available.</td>
</tr>
<tr>
<td>Refresh all channels every ____ seconds</td>
<td>Each pneumatic output is refreshed at this interval and when its setpoint changes.</td>
</tr>
<tr>
<td>Maximum service time per channel (seconds)</td>
<td>Time allowed for each output to reach setpoint.</td>
</tr>
<tr>
<td>Use coarse control when more than ____ PSI beyond setpoint</td>
<td>Coarse control allows faster but less accurate pressure changes. Use fine control when pressure is closer than this value to setpoint.</td>
</tr>
<tr>
<td>Fine control supply gain</td>
<td>Proportional gain used when setpoint is greater than current pressure. Larger actuators require higher gains.</td>
</tr>
<tr>
<td>Fine control bleed gain</td>
<td>Proportional gain used when setpoint is less than current pressure.</td>
</tr>
<tr>
<td>Fine control minimum valve pulse length (msec)</td>
<td>The shortest duration that a pneumatic valve is pulsed open when making fine adjustments to the line pressure.</td>
</tr>
</tbody>
</table>

**NOTE** Enter an even multiple of 10msec between 20 and 4000.

| "on" pressure for pneumatic digital outputs (psi)      | Pressure maintained by digital outputs that are ON.                          |
| "off" pressure for pneumatic digital outputs (psi)      | Pressure maintained by digital outputs that are OFF.                          |
| Main air low pressure limit (psi)                      | Trigger Low Main Air Alarm when main air pressure drops below this value.    |

## Pneumatic Lines

Applies if an expander with pneumatic analog outputs is attached to the ME812u.

This page shows pneumatic line status information.

## BACnet router properties

Select Disable Color Cache. The other BACnet router properties do not apply to the ME812u.
BACnet half-router properties

Does not apply to the ME812u.

Alarm Store/Forward

On the Alarm Store and Forward page, you can change alarm delivery settings for the ME812u used to store and forward alarms from a remote dial-up site.

BACnet firewall

Does not apply to the ME812u.

Xnet

If the ME812u has MEx expanders attached, you can change the baud rate and communications timeout on the Xnet page.

<table>
<thead>
<tr>
<th>Xnet Configuration</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Data Rate</td>
<td>Set at 500 kbps.</td>
</tr>
<tr>
<td>Comm. Timeout (seconds)</td>
<td>If the expander does not receive communication from the controller for this amount of time, the expander will reset itself. The range is 15–300 seconds.</td>
</tr>
</tbody>
</table>

Expanders

If the ME812u has expanders attached, the Expanders page displays expander status information.
To communicate through the local access port

Using a computer and a USB Link Kit, you can communicate locally with the ME812u to download or to troubleshoot.

PREREQUISITES

- A computer with a USB port
- A USB Link Kit. See the USB Link Kit Technical Instructions.

**NOTE** The USB Link Kit driver is installed with a WebCTRL® v5 or later system. But if needed, you can get the latest driver from http://www.silabs.com/products/mcu/Pages/USBtoUARTBridgeVCPDrivers.aspx. Install the driver before you connect the USB Link Kit to your computer.

- The controller driver drv_melgr_vanilla v2-04-139 or later

**CAUTION** If multiple controllers share power but polarity was not maintained when they were wired, the difference between the controller's ground and the computer's AC power ground could damage the USB Link Kit and the controller. If you are not sure of the wiring polarity, use a USB isolator between the computer and the USB Link Kit. Purchase a USB isolator online from a third-party manufacturer.

1. Connect the USB Link Kit to the computer and to the controller's Local Access port.

   ![USB Link Kit Diagram]

   **NOTE** If using a USB isolator, plug the isolator into your computer's USB port, and then plug the USB Link Kit cable into the isolator.

2. Set the controller's **Enhanced Access** DIP switch.

<table>
<thead>
<tr>
<th>To communicate in...</th>
<th>Set switch to...</th>
</tr>
</thead>
<tbody>
<tr>
<td>The WebCTRL® application</td>
<td>Off</td>
</tr>
<tr>
<td>PuTTY or HyperTerminal</td>
<td>On</td>
</tr>
<tr>
<td>SiteBuilder to set a custom IP address</td>
<td>On</td>
</tr>
</tbody>
</table>

3. Turn the controller's power off, then on again.
To set up a Local Access connection in the WebCTRL® interface

For the WebCTRL® application to communicate with the Local Access port, you must do the following:

1. On the System Configuration tree, select Connections.
2. On the Configure tab, click Add.
3. From the Type drop-down list, select BACnet Local Access.
4. Optional: Edit the Description.
5. Type the computer’s Port number that the USB cable is connected to.
   **NOTE** To find the port number, plug the USB cable into the computer's USB port, then select Start > Control Panel > System > Device Manager > Ports (Com & LPT). The COM port number is beside Silicon Labs CP210x USB to UART Bridge.

6. Set the Baud rate to 115200.
7. Click Accept.
8. On the View tab, click the button next to the BACnet/IP network, then select BACnet Local Access.
9. Click Accept.
10. On the Configure tab, select BACnet Local Access, then click Start.
    **NOTE** If an error message appears, make sure the COM port you selected is not in use. For example, PuTTY may be open and is holding the port open.
11. On the Network tree, select the controller that you are connected to.
12. Click then select Manual Command.
13. Type rnet here in the dialog box, then click OK.
14. On the Properties page, click Module Status. If a Modstat report appears, the WebCTRL® application is communicating with the controller.
# Troubleshooting

If you have problems mounting, wiring, or addressing the ME812u, contact Automated Logic® Technical Support.

## LED's

The **Module Status** LED can display the following error codes.

<table>
<thead>
<tr>
<th>Error Code...</th>
<th>Indicates...</th>
<th>Possible solutions</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>The control program or driver has not been downloaded.</td>
<td>Download All Content to the ME812u. See <em>Downloading the ME812u</em> (page 14).</td>
</tr>
<tr>
<td>1</td>
<td>A control program error</td>
<td>Obtain a Module Status Report (Modstat) and look for error conditions. See <em>To get the controller's serial number</em> (page 29) for instructions on obtaining a Modstat. If you cannot determine the error from the Modstat, send a screenshot of the Modstat to Technical Support.</td>
</tr>
<tr>
<td>2</td>
<td>The controller's memory is full</td>
<td>In the WebCTRL® interface, reduce the amount of trend data being stored in the controller. In SiteBuilder, reduce the amount of control programs.</td>
</tr>
</tbody>
</table>
| 3             | A setup error | Verify:  
  - The address has been set on the rotary switches. See *Addressing the ME812u* (page 7).  
  - The address is unique on the network  
  - DIP switches are set correctly |
| 4             | A system error | Obtain a Module Status Report (Modstat) and look for error messages. See *To get the controller's serial number* (page 29) for instructions on obtaining a Modstat.  
If you cannot determine the error from the Modstat, send a screenshot of the Modstat to Technical Support. |
| 7             | An abnormal restart | See solution above for #4. |
| 8             | The controller is formatting | The number 8 should display only during the short formatting period. If this number displays continuously or flashes intermittently with another number, try each of the following:  
  - Turn the ME812u's power off, then on.  
  - Format the ME812u. See *To format the controller* (page 29).  
  - Download the controller. See *Downloading the ME812u* (page 14).  
  - Replace the ME812u. |
Other LED's show the status of certain functions.

<table>
<thead>
<tr>
<th>If this LED is on...</th>
<th>Status is...</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power</td>
<td>The ME812u has power.</td>
</tr>
<tr>
<td>BACnet TX</td>
<td>The ME812u is transmitting data over the controller network.</td>
</tr>
<tr>
<td>BACnet RX</td>
<td>The ME812u is receiving data from the controller network.</td>
</tr>
<tr>
<td>Archive Valid</td>
<td>The controller's memory backup is valid</td>
</tr>
<tr>
<td>Brownout</td>
<td>Incoming power is low</td>
</tr>
<tr>
<td>Battery low</td>
<td>The battery is low</td>
</tr>
</tbody>
</table>

**Formatting the controller**

If you cannot communicate with a controller after downloading it, as a last resort, you can manually format the controller to erase its memory.

1. Turn **off** the ME812u's power.
2. Make sure the address switches are not set to 0, 0.
3. Hold down the controller’s **Format** button while you turn its power on.
4. Continue to hold down the **Format** button until the controller displays **8** and then **0**, then release the button.
5. Download the ME812u.

**To get the ME812u's serial number**

If you need the ME812u's serial number when troubleshooting, the number is on:

- a sticker on the back of the main controller board
- a Module Status report (Modstat) under Core (or Main) board hardware

```
Core board hardware:
- Type=812, Board=1
- manufactured on 06/27/2013
- RAM: 512 kBytes; FLASH: 1024 kBytes, type = 3
```

To obtain a modstat in the WebCTRL® interface:

1. Select the ME812u in the **Network** tree.
2. On the **Properties** page, click **Module Status**.
Recovering from a power outage

Battery function
The ME812u has a 10-year Lithium CR123A battery that retains the following data for a maximum of 720 hours during power outages.

- Time
- Control programs
- Editable properties
- Schedules
- Trends

To conserve battery life, you can set the driver to turn off battery backup after a specified number of days and depend on the archive function to restore data when the power returns. See To set up the driver > Driver (page 19).

Archive function
The following items are archived to non-volatile Flash memory daily and after every power up or download.

- Control programs
- Editable properties
- Schedules

If a power outage occurs and the battery backup fails or is turned off after a specified number of days, the above data is automatically restored from the archive. If changes were made in the WebCTRL® interface since the last archive, you may need to download parameters after power returns to correct any mismatches.

You can see the status of the latest archive in the WebCTRL® interface on the controller's Driver page under Flash Memory Archive.

Replacing the ME812u's battery
If the ME812u's Battery low LED is lit or if the ME812u sends a Low Battery alarm to the WebCTRL® application, replace the battery.

1. Verify that the ME812u's power is on.
2. Using a small flathead screwdriver, pry up each side of the black battery clip until it is free and you can remove it.
3. Remove the battery from the controller, making note of the battery's polarity.
4. Insert the new battery into the controller, matching the polarity of the battery you removed.
5. Push the black clip back onto the battery until you hear both sides click in place.
6. Download the ME812u.
To replace the ME812u's fuse

If you turn on the ME812u's power switch and the Power LED is not lit, use a multimeter to see if the 3 Amp Pico fuse that protects the incoming power is blown.

Before replacing the fuse, try to determine why the fuse blew.

- Check the Power wiring polarity of the ME812u, any attached MEx expanders, and any other controllers that share the power supply. Use the same polarity for all of them.
- Verify that outputs are wired to the appropriate types of devices. See Outputs (page 4). For example, you cannot wire a 24 Vac device to an output.
- If the Aux Power Out connector is used, verify that it is wired correctly. See To wire inputs and outputs (page 11).

To replace the fuse:

1. Turn off the ME812u's power.
2. Using needle-nose pliers, pull the bad fuse from the ME812u.
3. Cut the wires on the new fuse so that the total length is approximately 1 inch and the fuse is centered.
4. Bend the wire ends so that the length is approximately 1/2 inch.
5. Use the pliers to grip one wire end of the fuse and push into a fuse socket on the ME812u.
6. Grip the other wire end of the fuse and push into the other fuse socket.
7. Turn on the power and verify that the Power LED is lit.

To take the ME812u out of service

If needed for troubleshooting or start-up, you can stop communication between the WebCTRL® application and the ME812u.

1. On the WebCTRL® Network tree, select the ME812u.
2. On the Properties page, check Out of Service.
3. Click Accept.
Compliance

FCC Compliance

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

⚠️ CAUTION Changes or modifications not expressly approved by the responsible party for compliance could void the user’s authority to operate the equipment.

CE Compliance

⚠️ WARNING This is a Class A product. In a domestic environment, this product may cause radio interference in which case the user may be required to take adequate measures.

BACnet Compliance

Compliance of listed products to requirements of ASHRAE Standard 135 is the responsibility of BACnet International. BTL® is a registered trademark of BACnet International.
If the ME812u has an expander mounted to its coverplate, see the drawing below for the location of ports, connectors, switches, and jumpers.
## Document revision history

Important changes to this document are listed below. Minor changes such as typographical or formatting errors are not listed.

<table>
<thead>
<tr>
<th>Date</th>
<th>Topic</th>
<th>Change description</th>
<th>Code*</th>
</tr>
</thead>
<tbody>
<tr>
<td>10/2/18</td>
<td>Specifications</td>
<td>Reworded Rnet port and Protection specifications.</td>
<td>X-H-JS-O</td>
</tr>
<tr>
<td></td>
<td>Outputs</td>
<td>Added /F to end of formula.</td>
<td>X-CC-E</td>
</tr>
<tr>
<td>8/30/18</td>
<td>Wiring inputs and outputs &gt; Wiring specifications</td>
<td>Removed RS sensor from Input wiring table, and added OptiPoint™ Interface</td>
<td>X-D</td>
</tr>
<tr>
<td>8/23/18</td>
<td>Specifications</td>
<td>Reworded Rnet port specification and added power supplied by Rnet port. Added first paragraph to Protection specification.</td>
<td>X-H-JS-O</td>
</tr>
<tr>
<td></td>
<td>Zone sensors</td>
<td>Complete revision</td>
<td>X-D</td>
</tr>
<tr>
<td></td>
<td>Touchscreen devices</td>
<td>Changed title from Equipment Touch to Touchscreen devices. Added OptiPoint™ Interface</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Wiring devices to the ME812u's Rnet port</td>
<td>Added OptiPoint™ Interface. Removed sub-topics and directed user to see each device's Technical Instructions.</td>
<td></td>
</tr>
<tr>
<td>2/6/17</td>
<td>Specifications</td>
<td>Added wireless sensors to the Rnet port specification.</td>
<td>X-D</td>
</tr>
<tr>
<td></td>
<td>Zone sensors</td>
<td>Added wireless sensors to this topic.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Equipment Touch</td>
<td>Added Wireless Adapter to this topic.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Wiring inputs and outputs &gt; Wiring specifications</td>
<td>Added Wireless Adapter to this topic.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Wiring devices to the Rnet port</td>
<td>Added Wireless Adapter to this topic.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>To wire a Wireless Adapter to the ME812u</td>
<td>New topic.</td>
<td></td>
</tr>
<tr>
<td>9/28/16</td>
<td>To set up a Local Access connection in the WebCTRL interface</td>
<td>Updated WebCTRL menu button in step 12.</td>
<td>A-D</td>
</tr>
<tr>
<td></td>
<td>Appendix - ME812u coverplate</td>
<td>Updated coverplate</td>
<td>A-D</td>
</tr>
<tr>
<td>8/12/16</td>
<td>LEDs</td>
<td>Added description of #7 LED to table.</td>
<td>X-TS-RB-F</td>
</tr>
<tr>
<td>3/1/16</td>
<td>BACnet firewall</td>
<td>New topic.</td>
<td>A-D</td>
</tr>
<tr>
<td></td>
<td>To replace the ME812u's fuse</td>
<td>Removed sentence, &quot;You can order replacement fuses from Automated Logic, Part #FUSEPKG.&quot;</td>
<td></td>
</tr>
<tr>
<td>4/20/15</td>
<td>Entire document</td>
<td>New look, no content changes</td>
<td>A-D</td>
</tr>
<tr>
<td>11/14/14</td>
<td>BACnet Compliance</td>
<td>Changed BACnet Manufacturers Association to BACnet International</td>
<td>X-D-CP-MW</td>
</tr>
<tr>
<td>10/7/14</td>
<td>Driver</td>
<td>Added the Network Microblock fields</td>
<td>A-TS-RB-F</td>
</tr>
<tr>
<td>7/22/14</td>
<td>Equipment Touch</td>
<td>Changed 5 ZS sensors to 15 ZS sensors</td>
<td>X-D</td>
</tr>
<tr>
<td>5/13/14</td>
<td>Specifications</td>
<td>Rnet Port: Added Equipment Touch and removed BACview® devices</td>
<td>A-D-CP-O-TC</td>
</tr>
<tr>
<td></td>
<td>Zone sensors</td>
<td>Removed references to BACview</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Equipment Touch</td>
<td>New topic</td>
<td></td>
</tr>
<tr>
<td>Date</td>
<td>Topic</td>
<td>Change description</td>
<td>Code*</td>
</tr>
<tr>
<td>------</td>
<td>-------</td>
<td>--------------------</td>
<td>-------</td>
</tr>
<tr>
<td></td>
<td>BACview devices</td>
<td>Removed topic</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Wiring zone sensors to the ME812u</td>
<td>Changed to &quot;Wiring devices to the ME812u's Rnet port&quot;</td>
<td></td>
</tr>
<tr>
<td></td>
<td>To wire an Equipment Touch to the ME812u</td>
<td>New topic</td>
<td></td>
</tr>
<tr>
<td></td>
<td>To set up the driver &gt; Driver</td>
<td>Added new driver property: TouchScreen Schedule Edit Enable</td>
<td></td>
</tr>
</tbody>
</table>

* For internal use only
Verify that you have the most current version of this document. Go to https://accounts.automatedlogic.com, then select Support > Download > Documents. Important changes are listed in Document revision history at the end of this document.

© 2018 Automated Logic Corporation. All rights reserved throughout the world. Automated Logic, WebCTRL, EIKON, Eco-Screen, and BACview are registered trademarks of Automated Logic Corporation. EnergyReports, Environmental Index, OptiFlex, and OptiPoint are trademarks of Automated Logic Corporation. All other trademarks are the property of their respective owners.

This page does not contain any export regulated technical data.
What is the MEx816u expander?

The MEx816u expander connects to an ME line controller to increase the number of inputs and outputs. You can connect up to 5 MEx816u's to the ME line controller.

Specifications

<table>
<thead>
<tr>
<th>Specification</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Power</strong></td>
<td>24 Vac ±10%, 50–60 Hz, 45 VA</td>
</tr>
<tr>
<td></td>
<td>26 Vdc ±10%, 21 W</td>
</tr>
<tr>
<td><strong>Inputs</strong></td>
<td>16 inputs, configurable for 0–5 Vdc, 0–10 Vdc, 0–20 mA, RTD, thermistor,</td>
</tr>
<tr>
<td></td>
<td>or dry contact</td>
</tr>
<tr>
<td><strong>Input resolution</strong></td>
<td>14 bit A/D</td>
</tr>
<tr>
<td><strong>Input pulse frequency</strong></td>
<td>40 pulses per second. Minimum pulse width (on or off time) required for</td>
</tr>
<tr>
<td></td>
<td>each pulse is 12.5 msec.</td>
</tr>
<tr>
<td><strong>Outputs</strong></td>
<td>8 outputs for 24 Vdc relay driver, 0–10 Vdc, or 0-20 mA</td>
</tr>
<tr>
<td><strong>Output resolution</strong></td>
<td>12 bit D/A</td>
</tr>
<tr>
<td><strong>Microprocessor</strong></td>
<td>8-bit microprocessor with 60 kB Flash memory, 2 kB SRAM, and CAN</td>
</tr>
<tr>
<td></td>
<td>controller</td>
</tr>
<tr>
<td><strong>Protection</strong></td>
<td>Built-in surge and transient protection for power and communications in</td>
</tr>
<tr>
<td></td>
<td>compliance with EN61000-6-1.</td>
</tr>
<tr>
<td></td>
<td>Incoming power is protected by 2 replaceable 3 Amp Pico® fuses. The</td>
</tr>
<tr>
<td></td>
<td>power, network, input, and output connections are protected against</td>
</tr>
<tr>
<td></td>
<td>transient excess voltage/surge events lasting no more than 10 msec.</td>
</tr>
<tr>
<td><strong>Status indicators</strong></td>
<td>LEDs indicate status of communications, running, errors, and outputs.</td>
</tr>
<tr>
<td><strong>Environmental operating range</strong></td>
<td>-20 to 140°F (-29 to 60°C), 10–90% relative humidity, non-condensing</td>
</tr>
<tr>
<td></td>
<td><strong>NOTE</strong> Install in a UL Listed enclosure only.</td>
</tr>
<tr>
<td><strong>Physical</strong></td>
<td>Rugged aluminum cover, removable screw-type terminal blocks</td>
</tr>
<tr>
<td><strong>Overall dimensions</strong></td>
<td>Height: 9 in. (22.9 cm)</td>
</tr>
<tr>
<td></td>
<td>Width: 5 1/2 in. (14 cm)</td>
</tr>
<tr>
<td><strong>Mounting dimensions</strong></td>
<td>Height: 8 9/16 in. (21.8 cm)</td>
</tr>
<tr>
<td></td>
<td>Width: 3 5/16 in. (8.4 cm)</td>
</tr>
<tr>
<td><strong>Recommended panel depth</strong></td>
<td>2 3/4 in. (7cm)</td>
</tr>
<tr>
<td><strong>Weight</strong></td>
<td>13.3 oz. (.377 kg)</td>
</tr>
<tr>
<td><strong>Listed by</strong></td>
<td>UL-916 (PAZX), cUL-916 (PAZX7), FCC Part 15-Subpart B-Class A, CE</td>
</tr>
</tbody>
</table>
Inputs

The MEx816u has 16 inputs that accept the following signal types.

<table>
<thead>
<tr>
<th>Signal Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thermistor ¹</td>
<td>Precon type 2 (10 kOhm at 77°F). Input voltages should be from 0.489 Vdc to 3.825 Vdc for thermistors. Accuracy: ±0.5 °F (±0.28°C)</td>
</tr>
<tr>
<td>Dry contact</td>
<td>A 5 Vdc wetting voltage detects contact position, resulting in a 1 mA maximum sense current when the contacts are closed.</td>
</tr>
<tr>
<td>0–5 Vdc 0–10 Vdc</td>
<td>The output impedance of a 0–5 Vdc or a 0–10 Vdc source must not exceed 200 Ohms. The input impedance of the MEx816u is approximately 20 kOhm.</td>
</tr>
<tr>
<td>0–20 mA</td>
<td>The input resistance on the positive (+) terminal is 250 Ohms. The Aux Power Out connector is capable of supplying 24 Vdc to multiple 4–20 mA transducers, but the total current demanded must not exceed 200 mA. If the voltage measured from the Aux Power Out connector to Gnd is less than 18 Vdc, you need to use an external power supply.</td>
</tr>
<tr>
<td>RTD ¹</td>
<td>Platinum - 1 kOhm at 32°F (0°C) Nickel/Iron - 1 kOhm at 70°F (21°C) Balco TS8000 - 1 kOhm at 70°F (21°C) Input voltages should be from 0.6–1.2 V NOTE Automated Logic® recommends use of an external current transducer between an RTD and the MEx816u to improve accuracy and resolution.</td>
</tr>
<tr>
<td>Pulse counter ²</td>
<td>Pulse counting up to 40 pulses per second. Minimum pulse width (on or off time) required for each pulse is 12.5 msec.</td>
</tr>
</tbody>
</table>

¹ To use a thermistor or RTD not listed above, you can set up a custom translation table for your sensor.
² The MEx816u can perform pulse counting for dry contact or voltage inputs if you assign the input to a Pulse to Analog Input microblock. See To assign inputs or outputs to points (page 10).

NOTE If you have one or more RTD's connected to the inputs, the total current draw of all Thermistor, RTD, and Dry contact devices wired to the inputs should not exceed 10 mA. Exceeding this limit will affect the accuracy of the RTD's. Use the following approximations as a reference:
- 10 kOhm Thermistor draws approximately 0.334 mA
- 1 kOhm RTD draws approximately 0.834 mA
- Dry contact draws approximately 1 mA

For example, if you connect 12 RTD's to the inputs, you cannot use the remaining 4 inputs for Thermistor, RTD, or Dry contact devices. This assumes negligible wiring impedance (<10 Ohms) for each RTD input with up to 100 feet of 22 AWG cable.
Outputs

The MEx816u has 8 universal outputs that you can use as digital outputs or analog outputs. The outputs support:

- driving external 24 Vdc relays
- 0-10 Vdc devices
- 0-20 mA devices

⚠️ WARNING Do not apply 24 Vac to these universal outputs.

<table>
<thead>
<tr>
<th>If output controls a...</th>
<th>Resistance to ground must be...</th>
</tr>
</thead>
<tbody>
<tr>
<td>0–10 Vdc device</td>
<td>500 Ohms minimum</td>
</tr>
<tr>
<td>0–20 mA device</td>
<td>800 Ohms maximum</td>
</tr>
</tbody>
</table>

NOTES

- The device must share the same ground as the controller.
- The total output current from all outputs and the Aux Power Out connector must not exceed:
  - 500 mA at 115°F
  - 300 mA at 140°F

  For temperatures above 115°F, use the following equation to calculate the total current at 8 mA per degree:

  \[ 500 \text{mA} - ((\text{max. expected temp.} - 115°F) \times 8 \text{mA/F}) \]
To mount the MEx816u

You can mount an MEx816u in one of the following locations:

- On an ME812u, ME812u-E, or ME812u-LGR controller using the 2 provided 7/64 socket head cap screws, 6-32 thread.

- In an enclosed panel. Screw the MEx816u to the panel using the four mounting holes on the cover plate. Leave about 2 in. (5 cm) on each side for wiring.

See Wiring for communications (page 5) to wire the MEx816u to the controller.

Wiring for power

⚠️ WARNING  Do not apply line voltage (mains voltage) to the controller’s ports and terminals.

⚠️ CAUTIONS

- The MEx816u is powered by a Class 2 power source. Take appropriate isolation measures when mounting it in a control panel where non-Class 2 circuits are present.
- Automated Logic® controllers can share a power supply as long as you:
  - Maintain the same polarity.
  - Use the power supply only for Automated Logic® controllers.

NOTE  For the controller to recognize an attached expander, you must turn on the expander before you turn on the controller.
To wire for power

1. Turn off the MEx816u's power to prevent it from powering up before you can verify the correct voltage.
2. Remove power from the power supply.
3. Pull the screw terminal connector from the MEx816u's power terminals labeled 24 Vac and Gnd (Return).
4. Connect the transformer wires to the screw terminal connector.
5. Apply power to the power supply.
6. Measure the voltage at the MEx816u's power input terminals to verify that the voltage is within the operating range of 21.6–26.4 Vac.
7. Insert the screw terminal connector into the MEx816u's power terminals.
8. Turn on the MEx816u's power.
9. Verify that the Power LED is on and the Run LED is blinking.

To address the MEx816u

You must give the MEx816u an address that is unique on the network. You can address the MEx816u before or after you wire it for power.

1. If wired for power, turn off the MEx816u's power and the attached controller's power.
2. Set the MEx816u's address on the rotary switch. For example, the switch below shows an address of 5.
3. Turn on the MEx816u's power, then turn on the attached controller's power. The controller reads the powered MEx816u's address each time you turn on the controller.

Wiring for communications

Use ARC156 wiring to wire the MEx expander to the controller. Do not exceed 100 feet total wire length.

ARC156 wiring specifications

Below are the specifications for ARC156 wiring. The wire jacket and UL temperature rating specifications list two acceptable alternatives. Halar has a higher temperature rating and a tougher outer jacket than SmokeGard, and it is appropriate for use in applications where you are concerned about abrasion. Halar is also less likely to crack in extremely low temperatures.

NOTE Use the specified type of wire and cable for maximum signal integrity.
To wire the MEx816u to the controller

⚠️ **WARNING** Do not apply line voltage (mains voltage) to the controller's ports and terminals.

1. Wire the MEx816u's **Xnet Remote Expansion** port to the same port on the controller.

   **NOTE** To use more than one expander, wire their **Xnet Remote Expansion** ports together in a daisy-chain configuration. The controller must be the first device on the expander network.

2. Set the MEx816u's **Baud Select** jumper to 500k.

3. If the expander network has more than one expander, place the **Term** jumper in the down position or remove it from all expanders except the one at the end of the expander network. The **Term** jumper must be in the up position on the expander at the end of the network.
Wiring inputs and outputs

Wiring specifications

Input wiring

<table>
<thead>
<tr>
<th>Input</th>
<th>Maximum length</th>
<th>Minimum gauge</th>
<th>Shielding</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thermistor</td>
<td>1000 feet (305 m)</td>
<td>22 AWG</td>
<td>Shielded</td>
</tr>
<tr>
<td>Dry contact</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0–5 Vdc</td>
<td>1000 feet (305 m)</td>
<td>26 AWG</td>
<td>Shielded</td>
</tr>
<tr>
<td>0–10 Vdc</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0–20 mA</td>
<td>3000 feet (914 m)</td>
<td>26 AWG</td>
<td>Shielded or unshielded</td>
</tr>
<tr>
<td>RTD</td>
<td>100 feet (30 m)</td>
<td>22 AWG</td>
<td>Shielded</td>
</tr>
</tbody>
</table>

**NOTE** Automated Logic® recommends use of an external current transducer between an RTD and the MEx816u to improve accuracy and resolution.

Output wiring

To size output wiring, consider the following:

- Total loop distance from the power supply to the controller, and then to the controlled device
  
  **NOTE** Include the total distance of actual wire. For 2-conductor wires, this is twice the cable length.

- Acceptable voltage drop in the wire from the controller to the controlled device

- Resistance (Ohms) of the chosen wire gauge

- Maximum current (Amps) the controlled device requires to operate

To wire inputs and outputs

**WARNING** Do not apply line voltage (mains voltage) to the controller's ports and terminals.

1. Verify that the MEx816u's power and communications connections work properly.
2. Turn off the MEx816u's power.
3 Connect the input wiring to the screw terminals on the MEx816u.

**NOTE** Connect the shield wire to the GND terminal with the ground wire.

**NOTE** For a loop-powered 4-20 mA sensor, wire the sensor’s positive terminal to the + terminal on the MEx816u’s Aux Power Out connector. Wire the sensor’s negative terminal to an input’s + terminal.

4 Set each input’s **Universal Input Mode Select** jumper to indicate the type of input.
5 Connect digital and analog output wiring to the UO screw terminals on the MEx816u and to the controlled device. Connect the ground wire to the UO's Gnd terminal.

⚠️ **WARNING** Do not apply 24 Vac to these universal outputs.

6 Set each output's jumper to the type of device wired to the output.
7 For each digital output, turn the output's potentiometer clockwise until it stops (maximum output).
8 Turn on the MEx816u's power.
To assign inputs or outputs to points

An input or output must be assigned to its corresponding point in the control program. This is typically done when the control program is created, but you can adjust the settings at the time of installation in the WebCTRL® interface.

1. In the WebCTRL® Geographic tree, select the equipment controlled by the MEx816u.
2. On the Properties page, select the I/O Points tab.
3. For each point, type the expander's rotary switch address in the Exp field and the number of the expander's corresponding input or output in the Num field.
   EXAMPLE If DO1 on the MEx816u (which has a rotary switch address of 5) is used for the point Fan S/S, enter 5:1 in the Exp:Num column for Fan S/S.
   NOTE Do not assign the same output number to more than one point.
4. Enter the appropriate values for each input and output in the remaining columns. See Input values, Output values, Resolution values and Offset/Polarity values below.
   NOTE You can also enter these values in the EIKON® LogicBuilder application.
5. If you have not performed the initial download to the attached controller, you must download now to verify inputs and outputs.
6. To verify each input's operation, force each sensor to a known value, then compare it to the Value shown on the Properties page on the I/O Points tab.
7. To verify each output's operation, lock each output to a known condition on the I/O Points tab, then verify that the equipment operates correctly.

### Input values

<table>
<thead>
<tr>
<th>Input</th>
<th>I/O Type</th>
<th>Sensor/Actuator Type</th>
<th>Min/Max</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Analog (BAI)</td>
<td></td>
<td>Engineering values associated with 0 Vdc (Min) and 5 Vdc (Max) ¹</td>
</tr>
<tr>
<td>0-5 Vdc</td>
<td>0–5 Volt</td>
<td>Linear Full Range</td>
<td>Engineering values associated with 0 Vdc (Min) and 5 Vdc (Max) ¹</td>
</tr>
<tr>
<td>0-10 Vdc</td>
<td>0–10 Volt</td>
<td>Linear Full Range</td>
<td>Engineering values associated with 0 Vdc (Min) and 10 Vdc (Max) ¹</td>
</tr>
<tr>
<td>2-10 Vdc</td>
<td>0–10 Volt</td>
<td>Linear w/Offset, 2–10 Volts</td>
<td>Engineering values associated with 2 Vdc (Min) and 10 Vdc (Max) ¹</td>
</tr>
<tr>
<td>0-20 mA</td>
<td>0–20 mA</td>
<td>Linear Full Range</td>
<td>Engineering values associated with 0 mA (Min) and 20 mA (Max) ¹</td>
</tr>
<tr>
<td>4-20 mA</td>
<td>0–20 mA</td>
<td>Linear w/Offset, 4–20 mA</td>
<td>Engineering values associated with 4 mA (Min) and 20 mA (Max) ¹</td>
</tr>
<tr>
<td>RTD</td>
<td>RTD Input</td>
<td>Select your RTD type or set</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>up and select a Non-Linear,</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Custom Table ²</td>
<td></td>
</tr>
<tr>
<td>Thermistor</td>
<td>Thermistor</td>
<td>Select your Thermistor type</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>or set up and select a Non-Linear, Custom Table ²</td>
<td></td>
</tr>
</tbody>
</table>
### Input

<table>
<thead>
<tr>
<th>I/O Type</th>
<th>Sensor/Actuator Type</th>
<th>Min/Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pulse to Analog (BPTA)</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Pulse Counter</td>
<td>Counter Input</td>
<td>N/A</td>
</tr>
<tr>
<td>Digital (Binary) (BBI)</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>

1. The sensor reads a value and sends a corresponding signal (Volt, mA, or psi) to the MEx816u's physical input. The Analog Input microblock uses the **Min** and **Max** values to linearly translate the signal into the engineering value used in subsequent control logic. For example, set **Min** to 0 and **Max** to 10 for a 4–20 mA sensor that measures velocity from 0.0 to 10.0 inches/second so that when the input reads 4 mA, the microblock outputs a value of 0. Similarly, when the input reads 8 mA, the microblock outputs a value of 2.5.

2. You can set up a custom translation table on the driver's Custom Translation Tables pages in the WebCTRL® interface.

3. The control program must have one Pulse to Analog Input microblock for each pulse counting input.

### Output values

<table>
<thead>
<tr>
<th>Output</th>
<th>I/O Type</th>
<th>Sensor/Actuator Type</th>
<th>Min/Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Analog (BAO)</td>
<td>Electrical</td>
<td>Linear Full Range</td>
<td>Engineering values associated with 0 Vdc (Min) and 10 Vdc (Max) ¹</td>
</tr>
<tr>
<td>0–10 Vdc</td>
<td>0–10 Volt</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2–10 Vdc</td>
<td>0–10 Volt</td>
<td>Linear w/Offset, 2–10 Volts</td>
<td>Engineering values associated with 2 Vdc (Min) and 10 Vdc (Max) ¹</td>
</tr>
<tr>
<td>0–20 mA</td>
<td>0–20 mA</td>
<td>Linear Full Range</td>
<td>Engineering values associated with 0 mA (Min) and 20 mA (Max) ¹</td>
</tr>
<tr>
<td>4–20 mA</td>
<td>0–20 mA</td>
<td>Linear w/Offset, 4–20 mA</td>
<td>Engineering values associated with 4 mA (Min) and 20 mA (Max) ¹</td>
</tr>
<tr>
<td>Digital (Binary) (BBO)</td>
<td>Relay/Triac Output</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>

1. The Analog Output microblock uses the **Min** and **Max** values to linearly translate its EIKON® LogicBuilder wire value into a physical output signal (Volt, mA, or psi) sent from the MEx816u to an actuator. For example, set **Min** to 0 and **Max** to 100 for an Analog Output microblock that receives a 0 to 100% open signal from a PID microblock that controls a 0–10 Vdc actuator so that when the PID signal is 100%, the MEx816u output is 10 Vdc. Similarly, when the PID signal is 50%, the MEx816u output is 5 Vdc.
Resolution values

**Resolution** is not particular to a type of input or output, but the driver handles analog and digital (binary) inputs and outputs differently. To set these values appropriately, you should understand how the driver uses them.

<table>
<thead>
<tr>
<th>Resolution</th>
<th>Notes</th>
</tr>
</thead>
</table>
| Analog Input (BAI) | The driver truncates the microblock's present value according to the resolution.  
**EXAMPLE** If the calculated present value is 13.789 and you set the **Resolution** to 0.1, the control program uses 13.7 for any calculations downstream from the microblock. |
| Analog Output (BAO) | The driver truncates the wire input value to the microblock before performing any scaling calculations.  
**EXAMPLE** If the wire input value is 13.789 and you set the **Resolution** to 0.1, the microblock uses 13.7 for any scaling calculations. |
| Digital (Binary) Inputs and Outputs | N/A |

Offset/Polarity values

**Offset/Polarity** is not particular to a type of input or output, but the driver handles analog and digital (binary) inputs and outputs differently. To set these values appropriately, you should understand how the driver uses them.

<table>
<thead>
<tr>
<th>Offset/Polarity</th>
<th>Notes</th>
</tr>
</thead>
</table>
| Analog Input (BAI)  | **Offset** value (positive or negative) adds a fine adjustment to a sensor reading after all scaling for calibration.  
**EXAMPLE** If a sensor reads 74.9°F when the actual measured value is 73.6°F, enter an **Offset** of −1.3 to calibrate the sensor to the measured value. |
| Analog Output (BAO) | You can use the **Offset** value (positive or negative) to calibrate an output, but you generally do not need to. If used, the driver adds the offset value to the wire input value before performing any scaling calculations to determine the MEx816u's output. |
| Digital (Binary) Input (BBI) | **Polarity** determines the microblock's present value when no signal is received from the equipment.  
When no signal is received from the equipment, if **Polarity** is set to: normal—present value is off  
reversed—present value is on |
| Digital (Binary) Output (BBO) | **Polarity** determines the MEx816u's output based on the control program's signal to the microblock.  
When the control program's signal to the microblock is on, if **Polarity** is set to: normal—output is on  
reversed—output is off  
**NOTE** Regardless of **Polarity**, the output will be off if the MEx816u loses power. |
To use the Auto-Off-On switches

You can control an output using the Auto-Off-On switch.

<table>
<thead>
<tr>
<th>Set the switch to...</th>
<th>To...</th>
</tr>
</thead>
<tbody>
<tr>
<td>On</td>
<td>Turn on the output</td>
</tr>
<tr>
<td>Off</td>
<td>Turn off the output</td>
</tr>
<tr>
<td>Auto</td>
<td>Let the control program control the output</td>
</tr>
</tbody>
</table>

The potentiometer, located between the Auto-Off-On switch and the jumper, allows you to manually control the output level of an analog output. Place the Auto-Off-On switch in the On position, then turn the potentiometer counterclockwise to reduce the output, or clockwise to increase the output.

Travel range

For a digital output, turn the potentiometer clockwise until it stops (maximum output) and leave it in this position.

The control program can monitor the status of an Auto-Off-On switch and display the status on the control program's Properties page > I/O Points tab in the WebCTRL® interface. The Value of the point monitoring the Auto-Off-On switch shows Off if the switch is set to Auto, and On if the switch is set to Off or On.

To monitor an Auto-Off-On switch

1. Insert a BACnet Binary Input microblock in the control program.
2. On the microblock's Properties page in the WebCTRL® interface, set the I/O Type field to H-O-A Status Feedback.
3. In the Input Number field, type the number of the output you want to monitor.
Troubleshooting

If you have problems mounting, wiring, or addressing the MEx816u, contact Automated Logic® Technical Support.

LED's

The LED's on the show the status of certain functions.

<table>
<thead>
<tr>
<th>If this LED is on...</th>
<th>Status is...</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power</td>
<td>The MEx816u has power.</td>
</tr>
<tr>
<td>Rx</td>
<td>The MEx816u is receiving data from the network segment</td>
</tr>
<tr>
<td>Tx</td>
<td>The MEx816u is transmitting data over the network segment</td>
</tr>
<tr>
<td>DO#</td>
<td>The digital output is active</td>
</tr>
</tbody>
</table>

The Run and Error LED's indicate controller and network status.

<table>
<thead>
<tr>
<th>If Run LED shows...</th>
<th>And Error LED shows...</th>
<th>Status is...</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 flashes per second</td>
<td>Off</td>
<td>Normal</td>
</tr>
<tr>
<td>5 flashes per second</td>
<td>2 flashes per second</td>
<td>Boot is running</td>
</tr>
<tr>
<td>5 flashes per second</td>
<td>On</td>
<td>Fatal error. Replace expander or return for repair.</td>
</tr>
</tbody>
</table>

To get the MEx816u's serial number

If you need the MEx816u's serial number when troubleshooting, the number is on a sticker on the back of the main board.

To monitor expander communication

You can add an analog input in a control program that will provide the communication status of the MEx816u. If the input reads a value of 55, the expander is communicating. If the input reads 0, the expander is not communicating.

To have the input provide the MEx816u's status, define the following properties for the input.

- **Expander**: The expander number you want to read
- **Input Number**: 1
- **Input Type**: Special
To replace the MEx816u's fuses

If you turn on the MEx816u's power switch and the Power LED is not lit, use a multimeter to see if either of the 3 Amp Pico fuses that protect the incoming power is blown.

Before replacing the fuse, try to determine why the fuse blew.

- Check the power wiring polarity of the MEx816u, the controller that the MEx is attached to, and any other controllers that share the power supply. Use the same polarity for all of them.
- Verify that outputs are wired to the appropriate types of devices. See Outputs (page 3). For example, you cannot wire a 24 Vac device to an output.

To replace the fuse:

1. Turn off the MEx816u's power.
2. Remove the MEx816u's coverplate.
3. Using needle-nose pliers, pull the bad fuse from the MEx816u.
4. Cut the wires on the new fuse so that the total length is approximately 1 inch and the fuse is centered.
   ![1 inch](image)
5. Bend the wire ends so that the length is approximately 1/2 inch.
   ![1/2 inch](image)
6. Use the pliers to grip one wire end of the fuse and push into a fuse socket on the MEx816u.
7. Grip the other wire end of the fuse and push into the other fuse socket.
8. Replace the MEx816u's coverplate.
9. Turn on the power and verify that the Power LED is lit.
Compliance

FCC Compliance

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

⚠️ CAUTION Changes or modifications not expressly approved by the responsible party for compliance could void the user’s authority to operate the equipment.

CE Compliance

⚠️ WARNING This is a Class A product. In a domestic environment, this product may cause radio interference in which case the user may be required to take adequate measures.
## Document revision history

Important changes to this document are listed below. Minor changes such as typographical or formatting errors are not listed.

<table>
<thead>
<tr>
<th>Date</th>
<th>Topic</th>
<th>Change description</th>
<th>Code*</th>
</tr>
</thead>
<tbody>
<tr>
<td>10/3/18</td>
<td>Specifications</td>
<td>Reworded Protection specification.</td>
<td>X-H-JS-O</td>
</tr>
<tr>
<td>10/3/18</td>
<td>Outputs</td>
<td>Added /F to end of formula.</td>
<td>X-CC-E</td>
</tr>
<tr>
<td>10/3/18</td>
<td>Entire document</td>
<td>Added export control marking.</td>
<td>X-D</td>
</tr>
<tr>
<td>8/22/18</td>
<td>Specifications</td>
<td>Added first paragraph to Protection specification.</td>
<td>X-H-JS</td>
</tr>
<tr>
<td>9/28/16</td>
<td>Appendix - MEx816u coverplate</td>
<td>Updated coverplate</td>
<td>A-D</td>
</tr>
<tr>
<td>9/28/16</td>
<td>To wire the MEx816u to the controller</td>
<td>Clarified final step in connecting multiple expanders.</td>
<td>X-TS-RD-E-BR</td>
</tr>
<tr>
<td>9/23/15</td>
<td>To replace the MEx816u's fuse</td>
<td>Removed sentence, &quot;You can order replacement fuses from Automated Logic, Part #FUSEPKG.&quot;</td>
<td></td>
</tr>
<tr>
<td>4/20/15</td>
<td>Entire document</td>
<td>New look, no content changes</td>
<td>A-D</td>
</tr>
</tbody>
</table>

* For internal use only
Technical Data

- **Power Supply**: 24 VAC, ±20%, 50/60 Hz, 24 VDC, -10% / +20%
- **Power Consumption Running**: 3.5 W
- **Power Consumption Holding**: 2.5 W
- **Transformer Sizing**: 6 VA (class 2 power source)
- **Shaft Diameter**: 1/2” to 1.05” round, centers on 1/2” and 3/4” with insert, 1.05” without insert
- **Electrical Connection**: 3ft [1m], 18 GA appliance cable with 1/2” conduit connector
- **Overload Protection**: electronic throughout 0° to 95° rotation
- **Electrical Protection**: actuators are double insulated
- **Operating Range Y**: 2 to 10 VDC, 4 to 20 mA w/ ZG-R01 (500 Ω, 1/4 W resistor)
- **Input Impedance**: 100 kΩ for 2 to 10 VDC (0.1 mA), 500 Ω for 4 to 20 mA
- **Feedback Output U**: DC 2...10 V, Max. 0.5 mA
- **Angle of Rotation**: 95°, adjustable with mechanical end stop, 35° to 95°
- **Torque Motor**: 90 in-lbs [10 Nm]
- **Direction of Rotation (Motor)**: reversible with built-in switch
- **Direction of Rotation (Fail-Safe)**: reversible with CW/CCW mounting
- **Position Indication**: visual indicator, 0° to 95° (0° is full spring return position)
- **Manual Override**: 5 mm hex crank (3/16” Allen), supplied
- **Running Time (Motor)**: 95 sec
- **Running Time (Fail-Safe)**: <20 sec @ -4°F to 122°F [-20°C to 50°C], <60 sec @ -22°F [-30°C]
- **Ambient Humidity**: max. 95% RH non-condensing
- **Ambient Temperature Range**: -22...122 °F [-30...50 °C]
- **Storage Temperature Range**: -40...176 °F [-40...80 °C]
- **Housing**: IP54, NEMA 2, UL Enclosure Type 2
- **Housing Material**: zinc coated metal and plastic casing
- **Agency Listings†**: cULus acc. to UL60730-1A/-2-14, CAN/CSA E60730-1:02, CE acc. to 2004/108/EC
- **Noise Level (Motor)**: ≤40 dB (A)
- **Noise Level (Fail-Safe)**: ≤62 dB (A)
- **Servicing**: maintenance free
- **Quality Standard**: ISO 9001
- **Weight**: 4.2 lb [1.9 kg]

*†Rated Impulse Voltage 800V, Type of action 1.AA, Control Pollution Degree 3*

---

**Application**

For fail-safe, modulating control of dampers in HVAC systems. Actuator sizing should be done in accordance with the damper manufacturer’s specifications. The actuator is mounted directly to a damper shaft up to 1.05” in diameter by means of its universal clamp. A crank arm and several mounting brackets are available for applications where the actuator cannot be direct coupled to the damper shaft. The actuator operates in response to a 2 to 10 VDC or, with the addition of a 500Ω resistor, a 4 to 20 mA control input from an electronic controller or positioner. A 2 to 10 VDC feedback signal is provided for position indication. Not to be used for a master-slave application.

**Operation**

The NF..24-SR series actuators provide true spring return operation for reliable fail-safe application and positive close off on air tight dampers. The spring return system provides constant torque to the damper with, and without, power applied to the actuator. The NF..24-SR series provides 95° of rotation and is provided with a graduated position indicator showing 0° to 95°. The NF.24-SR uses a brushless DC motor which is controlled by an Application Specific Integrated Circuit (ASIC) and a microprocessor. The microprocessor provides the intelligence to the ASIC to provide a constant rotation rate and to know the actuator’s exact fail-safe position. The ASIC monitors and controls the brushless DC motor’s rotation and provides a digital rotation sensing function to prevent damage to the actuator in a stall condition. The actuator may be stalled anywhere in its normal rotation without the need of mechanical end switches. The NF.24-SR actuator is shipped at 5° (5° from full fail-safe) to provide automatic compression against damper gaskets for tight shut-off.
**NFB24-SR - Damper Actuator**

Modulating, Spring Return, 24 VAC/DC, for 2 to 10 VDC or 4 to 20 mA Control Signal

---

### Accessories

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AF-P</td>
<td>Anti-rotation bracket AF/NF.</td>
</tr>
<tr>
<td>AV-25</td>
<td>9.8&quot; shaft extension for 5/16&quot; to 1&quot; diameter shafts.</td>
</tr>
<tr>
<td>IND-AFB</td>
<td>AF8(B)/NFB8(B) position indicator.</td>
</tr>
<tr>
<td>K7-2</td>
<td>Standard AF8(B)/NFB8(B) clamp (1/2&quot; to 1.05&quot;).</td>
</tr>
<tr>
<td>KG10A</td>
<td>Ball joint for 3/8&quot; diameter rod, zinc plated.</td>
</tr>
<tr>
<td>KG8</td>
<td>Ball joint for 5/16&quot; diameter rod, 90°, galvanized steel.</td>
</tr>
<tr>
<td>KH10</td>
<td>Univ. crank arm, slot 2164° w, for 9/16&quot; to 1&quot; dia. shafts.</td>
</tr>
<tr>
<td>KH8</td>
<td>Univ. crank arm, slot 2164° w, for 3/8&quot; to 11/16&quot; dia. shafts.</td>
</tr>
<tr>
<td>KH-AFB</td>
<td>AF8(B)/NFB8(B) crank arm (with 3/4&quot; dia. shaft pass through).</td>
</tr>
<tr>
<td>SH10</td>
<td>Push rod for KG10A ball joint (36°, 3/8&quot; diameter).</td>
</tr>
<tr>
<td>SR8</td>
<td>Push rod for KG6 &amp; KG8 ball joints (36°, 5/16&quot; diameter).</td>
</tr>
<tr>
<td>TOOL-06</td>
<td>8&quot; and 10 mm wrench.</td>
</tr>
<tr>
<td>ZG-100</td>
<td>Univ. right angle bracket (17&quot; H x 11-1/8&quot; W x 6&quot; base).</td>
</tr>
<tr>
<td>ZG-101</td>
<td>Univ. right angle bracket (15&quot; H x 11&quot; W x 7-7/16&quot; base).</td>
</tr>
<tr>
<td>ZG-109</td>
<td>Right angle bracket for ZS-260.</td>
</tr>
<tr>
<td>ZG-110</td>
<td>Stand-off bracket for ZS-260.</td>
</tr>
<tr>
<td>ZG-118</td>
<td>AF8(B)/NFB8(B) U bracket (5-7/8&quot; H x 5-1/2&quot; W x 2-19/32&quot; D).</td>
</tr>
<tr>
<td>ZG-120</td>
<td>Jackshaft mounting bracket.</td>
</tr>
<tr>
<td>ZG-AFB</td>
<td>AF8(B)/NFB8(B) crank arm adaptor kit.</td>
</tr>
<tr>
<td>ZG-AFB118</td>
<td>AF8(B)/NFB8(B) crank arm adaptor kit.</td>
</tr>
<tr>
<td>ZG-DC1</td>
<td>Damper clip for damper blade, 3.5&quot; width.</td>
</tr>
<tr>
<td>ZG-DC2</td>
<td>Damper clip for damper blade, 6&quot; width.</td>
</tr>
<tr>
<td>ZG-JSA-1</td>
<td>1&quot; diameter jackshaft adaptor (11&quot; L).</td>
</tr>
<tr>
<td>ZG-JSA-2</td>
<td>1.5/16&quot; diameter jackshaft adaptor (12&quot; L).</td>
</tr>
<tr>
<td>ZG-JSA-3</td>
<td>1.05&quot; diameter jackshaft adaptor (12&quot; L).</td>
</tr>
<tr>
<td>ZS-100</td>
<td>Weather shield - galvaneal (13&quot; L x 8&quot; W x 6&quot; D).</td>
</tr>
<tr>
<td>ZS-101</td>
<td>Base plate for ZS-100.</td>
</tr>
<tr>
<td>ZS-150</td>
<td>Weather shield - PC w/ foam seal (16&quot; L x 8-3/8&quot; W x 4&quot; D).</td>
</tr>
<tr>
<td>ZS-260</td>
<td>Explosion proof housing.</td>
</tr>
<tr>
<td>ZS-300</td>
<td>NEMA 4X, 304 stainless steel enclosure.</td>
</tr>
<tr>
<td>ZS-300-5</td>
<td>NEMA 4X, 316 stainless steel enclosure.</td>
</tr>
<tr>
<td>ZS-300-C1</td>
<td>1/2&quot; shaft adaptor, standard with ZS-300(-5).</td>
</tr>
<tr>
<td>ZS-300-C2</td>
<td>3/4&quot; shaft adaptor for ZS-300(-5).</td>
</tr>
<tr>
<td>ZS-300-C3</td>
<td>1&quot; shaft adaptor for ZS-300(-5).</td>
</tr>
<tr>
<td>Z-SF</td>
<td>20 piece Z-AF kit.</td>
</tr>
<tr>
<td>ADS-100</td>
<td>Analog to digital switch for modulating actuators.</td>
</tr>
<tr>
<td>IRM-100</td>
<td>Input rescaling module for modulating actuators.</td>
</tr>
<tr>
<td>P475</td>
<td>Shaft mount, non-Mercury aux. switch for 1/2&quot; dia. shafts.</td>
</tr>
<tr>
<td>P475-1</td>
<td>Shaft mount, non-Mercury aux. switch for 1&quot; dia. shafts.</td>
</tr>
<tr>
<td>PS-100</td>
<td>Actuator power supply and control simulator.</td>
</tr>
<tr>
<td>PTA-250</td>
<td>Pulse width modulation interface for modulating actuators.</td>
</tr>
<tr>
<td>TF-CC US</td>
<td>Cable conduit connector, 1/2&quot;.</td>
</tr>
<tr>
<td>ZG-R01</td>
<td>4 to 20 mA adaptor, 500Ω, 1/4 W resistor w 6&quot; pigtail wires.</td>
</tr>
<tr>
<td>ZG-R02</td>
<td>50% voltage divider kit (resistors w wires).</td>
</tr>
<tr>
<td>ZG-SGF</td>
<td>Mounting plate for SGF.</td>
</tr>
<tr>
<td>ZG-X40</td>
<td>120 to 24 VAC, 40 VA transformer.</td>
</tr>
</tbody>
</table>
Typical Specification

Spring return control damper actuators shall be direct coupled type which require no crank arm and linkage and be capable of direct mounting to a jackshaft up to a 1.05” diameter. The actuator must provide modulating damper control in response to a 2 to 10 VDC or, with the addition of a 500Ω resistor, a 4 to 20 mA control input from an electronic controller or positioner. The actuators must be designed so that they may be used for either clockwise or counter clockwise fail-safe operation. Actuators shall use a brushless DC motor controlled by a microprocessor and be protected from overload at all angles of rotation. Run time shall be constant, and independent of torque. A 2 to 10 VDC feedback signal shall be provided for position feedback. Actuators with auxiliary switches must be constructed to meet the requirements for Double Insulation so an electrical ground is not required to meet agency listings. Actuators shall be cULus listed and have a 5 year warranty, and be manufactured under ISO 9001 International Quality Control Standards. Actuators shall be as manufactured by Belimo.

Wiring Diagrams

WARNING! LIVE ELECTRICAL COMPONENTS!

During installation, testing, servicing and troubleshooting of this product, it may be necessary to work with live electrical components. Have a qualified licensed electrician or other individual who has been properly trained in handling live electrical components perform these tasks. Failure to follow all electrical safety precautions when exposed to live electrical components could result in death or serious injury.

Meets cULus requirements without the need of an electrical ground connection.

- Actuators with appliance cables are numbered.
- Provide overload protection and disconnect as required.
- Actuators may also be powered by 24 VDC.
- Only connect common to negative (-) leg of control circuits.
- A 500 Ω resistor (ZG-R01) converts the 4 to 20 mA control signal to 2 to 10 VDC.
- Actuators may be connected in parallel if not mechanically linked. Power consumption and input impedance must be observed.
The Automated Logic® OptiFlex™ BACnet Integrator is an integral component of the WebCTRL® building automation system.

The OptiFlex Integrator supports routing between multiple BACnet networks. It also supports custom control programs to easily integrate with third party BACnet or Modbus equipment such as variable speed drives, boilers, and lighting.

Key Features and Benefits

**BACnet Features**

- Supports routing between BACnet/IP, BACnet/Ethernet, BACnet ARCnet, and BACnet MS/TP networks
- Supports up to 1,500 third party BACnet points
- Supports up to two BACnet/IP networks on the Gig-E port
- Includes two additional BACnet ports for supporting either two simultaneous BACnet MS/TP networks (with up to 60 controllers each), or one ARCnet network (with up to 99 ARCnet controllers) and one BACnet MS/TP network (with up to 60 controllers)
- Can serve as a BACnet Broadcast Management Device (BBMD), routing any BACnet broadcast messages directly to other BBMD devices on the BACnet network
- Supports BACnet Foreign Device Registration (FDR)

**Modbus Features**

- Can act as a master or slave on a Modbus serial network
- Can act as a server or client on a Modbus TCP/IP network

**Hardware Features**

- Supports and executes control programs
- Supports Gig-E, 1,000Mbps BACnet IP and DHCP IP addressing
- Ethernet port provides local access for system start-up and troubleshooting
- Supports network captures for advanced diagnostics
- Provides network statistics numerically or as trend graphs inside the WebCTRL building automation system
- Supports DIN rail and screw mounting
- Capacitor-backed real-time clock keeps time in the event of power failure or network interruption for up to three days
- Connects seamlessly to the WebCTRL building automation system

The WebCTRL® building automation system gives you the ability to understand your building operations and analyze the results. The WebCTRL system integrates environmental, energy, security and safety systems into one powerful management tool that allows you to reduce energy consumption, increase occupant comfort, and achieve sustainable building operations. Our web-based platform allows building managers to control and access information about their HVAC, lighting, central plant and critical processes on premises or remotely at any time of day.
## OptiFlex™ BACnet Integrator Specifications

<table>
<thead>
<tr>
<th>Part #</th>
<th>G5CE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control Program Execution</td>
<td>Maximum number of control programs: 999 depending upon available memory.</td>
</tr>
<tr>
<td>BACnet Objects</td>
<td>Maximum number of BACnet objects: 12,000 for programming purposes.</td>
</tr>
<tr>
<td>Third-party integration</td>
<td>Supports up to 1,500 third-party BACnet integration points, and 25 modbus integration points.</td>
</tr>
<tr>
<td>Power</td>
<td>24 Vac ±10%, 50–60 Hz, 50 VA</td>
</tr>
<tr>
<td>Gig-E port</td>
<td>10/100/1000 BaseT Ethernet port for BACnet/IP and/or BACnet/Ethernet and/or Modbus full duplex</td>
</tr>
<tr>
<td>S1 port</td>
<td>For communication with either of the following:</td>
</tr>
<tr>
<td></td>
<td>• A BACnet ARCNET network at 156,000 bps</td>
</tr>
<tr>
<td></td>
<td>• A BACnet MS/TP network at 9,600 to 115,200 bps</td>
</tr>
<tr>
<td></td>
<td>• A Modbus at 1200 to 115200 bps</td>
</tr>
<tr>
<td>S2 port</td>
<td>For communication with a BACnet MS/TP network at 9,600 to 115,200 bps, or Modbus at 1200 to 115200 bps</td>
</tr>
<tr>
<td>Local Access port</td>
<td>Ethernet port at 10 or 100 Mbps for system start-up and troubleshooting</td>
</tr>
<tr>
<td>Microprocessor</td>
<td>32-bit ARM Cortex-A8, 600 MHz, processor with multi-level cache memory, two Ethernet controllers, and USB 2.0 host port</td>
</tr>
<tr>
<td>Memory</td>
<td>16 GBs eMMC Flash memory (120 MB available for use) and 256 MB DDR3 DRAM. User data is archived to non-volatile Flash memory when parameters are changed, every 90 seconds, and when the firmware is deliberately shutdown or restarted.</td>
</tr>
<tr>
<td>Real-time Clock</td>
<td>Real-time clock keeps track of time in the event of a power failure for up to 3 days</td>
</tr>
<tr>
<td>Protection:</td>
<td>Device is protected by a replaceable, fast acting, 250 Vac, 2A, 5mm x 20mm glass fuse</td>
</tr>
<tr>
<td></td>
<td>The power and network ports comply with the EMC requirements EN50491-5-2</td>
</tr>
<tr>
<td>Env. Operating Range</td>
<td>32 to 140°F (0 to 60°C); 10 - 90% relative humidity, non-condensing</td>
</tr>
<tr>
<td>Compliance</td>
<td>United States of America: FCC compliant to Title CFR47, Chapter 1, Subchapter A, Part 15, Subpart B, Class A; UL Listed to UL 916, PAZX, Energy Management Equipment</td>
</tr>
<tr>
<td></td>
<td>Canada: Industry Canada Compliant, ICES-003, Class A cUL Listed UL 916, PAZX, Energy Management Equipment</td>
</tr>
<tr>
<td></td>
<td>RoHS Compliant: 2011/65/EU</td>
</tr>
<tr>
<td></td>
<td>Australia and New Zealand: C-Tick Mark AS/NZS 61000-6-3</td>
</tr>
<tr>
<td>Physical</td>
<td>Fire-retardant plastic ABS, UL94-SVA</td>
</tr>
<tr>
<td>Mounting</td>
<td>DIN rail mounting or screw mounting</td>
</tr>
<tr>
<td>Weight</td>
<td>1 lb. 1 oz. (0.482kg)</td>
</tr>
</tbody>
</table>

All trademarks used herein are the property of their respective owners.

**1150 Roberts Boulevard, Kennesaw, Georgia 30144**

**770-429-3000** Fax **770-429-3001** | **www.automatedlogic.com**
The Automated Logic® OptiFlex™ BACnet Building Controller is a high-performance, BACnet native direct digital controller and router. As a component of the WebCTRL® building automation system, this controller provides comprehensive control of connected equipment.

The OptiFlex BACnet Building Controller provides the speed, power, memory, and I/O flexibility needed for the most demanding control applications in the industry. Capable of controlling multiple pieces of HVAC equipment simultaneously, this robust BACnet controller can support complex control strategies.

Key Features and Benefits

Application Features

- Designed to address HVAC applications including complex central plants
- Graphically programmed through the EIKON® programming software, an object oriented tool that provides complete flexibility for any custom control sequence
- Supports Automated Logic communicating sensors, available in a variety of zone sensing combinations, and supports setpoint adjustment and occupancy overrides
- Enables live, visual displays of control logic, which uses real time operational data and aids in optimizing and troubleshooting system operations

BACnet Features

- Conforms to the following device profiles:
  - BACnet Building Controller (B-BC)
  - BACnet BBMD (B-BBMD)
  - BACnet Router (B-RTR)
- Supports BACnet Foreign Device Registration (FDR)
- Supports BACnet interoperability and routing with and between BACnet IP, BACnet MS/TP and BACnet over ARC156

Hardware Features

- Supports Gig-E, 1000 Mbps, BACnet IP and DHCP IP addressing
- Local Access Ethernet port at 100 Mbps for system start-up and troubleshooting
- Supports up to 9 FIO expanders in panel configuration or remotely mounted for scalable solutions (180 I/O total)
- Provides direct connect for power and communication for up to 5 FIO expansion modules
- All programs and historical data stored in non-volatile memory, eliminating the need for batteries
- Capacitor-backed real-time clock keeps time in the event of power failure or network interruption for up to three days
- Communications expansion port for future communication option cards
- Supports 200 Modbus points for system integrations
- USB port for local device updates
- DIN rail or screw mounting

System Benefits

- Connects seamlessly to the WebCTRL building automation system
- Multiple serial communication ports to simultaneously route and share data across a wide range of building subsystems

The WebCTRL® building automation system gives you the ability to understand your building operations and analyze the results. The WebCTRL system integrates environmental, energy, security and safety systems into one powerful management tool that allows you to reduce energy consumption, increase occupant comfort, and achieve sustainable building operations. Our web-based platform allows building managers to control and access information about their HVAC, lighting, central plant and critical processes on premises or remotely at any time of day.
# OptiFlex™ BACnet Building Controller

## Specifications

<table>
<thead>
<tr>
<th>Part #</th>
<th>OFBBC</th>
</tr>
</thead>
<tbody>
<tr>
<td>BACnet Conformance</td>
<td>Conforms to the BACnet Building Controller (B-BC) Standard Device, BACnet BBMD (B-BBMD) Device, and BACnet Router (B-RTR) Device as defined in BACnet 135-2001 2012 Annex L and tested to Protocol Revision 12</td>
</tr>
<tr>
<td>Control Program Execution</td>
<td>Maximum number of control programs: 999 depending upon available memory.</td>
</tr>
<tr>
<td>BACnet Objects</td>
<td>Maximum number of BACnet objects: 12,000 depending upon available memory.</td>
</tr>
<tr>
<td>Third-party integration</td>
<td>Supports up to 1,500 third-party BACnet points, and 200 Modbus points depending upon available memory.</td>
</tr>
<tr>
<td>Power</td>
<td>24 Vac ±10%, 50–60 Hz, 50 VA</td>
</tr>
<tr>
<td>Gig-E port</td>
<td>10/100/1000 BaseT Ethernet port for BACnet/IP and/or BACnet/Ethernet and/or Modbus TCP/IP communication on the Ethernet at 10, 100, or 1000 Mbps, full duplex</td>
</tr>
<tr>
<td>Serial port 1</td>
<td>For communication with either of the following:</td>
</tr>
<tr>
<td></td>
<td>• A BACnet ARCNET network at 156000 bps</td>
</tr>
<tr>
<td></td>
<td>• A BACnet MS/TP network at 9600 to 115200 bps</td>
</tr>
<tr>
<td>Serial port 2</td>
<td>For communication with a BACnet MS/TP network at 9600 to 115200 bps or Modbus network at 1200 to 115200 bps</td>
</tr>
<tr>
<td>Service port</td>
<td>Ethernet port at 10 or 100 Mbps for system start-up and troubleshooting</td>
</tr>
<tr>
<td>Rnet Port</td>
<td>Supports Communicating ZS Sensors, OptiFlex™ and OptiPoint™ devices</td>
</tr>
<tr>
<td>XNet Port</td>
<td>Supports MEx expanders</td>
</tr>
<tr>
<td>Expanders</td>
<td>Supports up to 9 FIO expanders and/or 6 MEX expanders, but no more than 9 expanders total</td>
</tr>
<tr>
<td>Microprocessor</td>
<td>32-bit ARM Cortex-A8, 600 MHz, processor with multi-level cache memory, two Ethernet controllers, and USB 2.0 host port</td>
</tr>
<tr>
<td>Memory</td>
<td>16 Gbs eMMC Flash memory and 256 MB DDR3 DRAM. User data is archived to non-volatile Flash memory when parameters are changed, every 90 seconds, and when the firmware is deliberately shutdown or restarted</td>
</tr>
<tr>
<td>Real-time Clock</td>
<td>Real-time clock keeps track of time in the event of a power failure for up to 3 days</td>
</tr>
<tr>
<td>Protection</td>
<td>Device is protected by 2 replaceable, fast acting, 250 Vac, 2A, 5 mm x 20 mm glass fuses</td>
</tr>
<tr>
<td>Compliance</td>
<td>United States of America: FCC compliant to Title CFR47, Chapter 1, Subchapter A, Part 15, Subpart B, Class A; UL Listed to UL 916, PAZX, Energy Management Equipment</td>
</tr>
<tr>
<td></td>
<td>RoHS Compliant: 2011/65/EU</td>
</tr>
<tr>
<td></td>
<td>ANZ: C-Tick Mark AS/NZS 61000-6-3</td>
</tr>
<tr>
<td></td>
<td>Canada: Industry Canada Compliant, ICES-003, Class A cUL Listed UL 916, PAZX, Energy Management Equipment</td>
</tr>
<tr>
<td></td>
<td>Physical</td>
</tr>
<tr>
<td></td>
<td>Fire-retardant plastic ABS, UL94-SVA</td>
</tr>
<tr>
<td></td>
<td>Mounting</td>
</tr>
<tr>
<td></td>
<td>DIN rail mounting or screw mounting</td>
</tr>
<tr>
<td></td>
<td>Weight</td>
</tr>
<tr>
<td></td>
<td>Recommended Panel Depth</td>
</tr>
</tbody>
</table>

All trademarks used herein are the property of their respective owners.

All specifications subject to change at Automated Logic's discretion.

1150 Roberts Boulevard, Kennesaw, Georgia 30144
770-429-3000  Fax 770-429-3001 | www.automatedlogic.com
PG/PV Series
Gauge Pressure Sensors

Product Overview

The PG, PV, PGE, and PVE pressure transducers are compatible with a variety of HVAC and industrial applications. Volt and mA output options ensure integration with building systems. A wide selection of pressure ranges offers application flexibility. PG and PV deluxe models have a stainless steel housing, while PGE and PVE standard models have a stainless steel wetted connector. All models are warranted for a period of five years.

Product Identification

<table>
<thead>
<tr>
<th>Type</th>
<th>Range</th>
<th>Wetted Material</th>
<th>Output</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PG</strong></td>
<td><strong>Blank = Deluxe</strong>&lt;br&gt;<strong>E = Economy</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>03</td>
<td>0 to 15 psig (Deluxe only)</td>
<td>= 316L stainless steel</td>
<td>B = 1-SVDC (economy only)</td>
</tr>
<tr>
<td>04</td>
<td>0 to 25 psig (Deluxe only)</td>
<td></td>
<td>M = 4-20mA</td>
</tr>
<tr>
<td>05</td>
<td>0 to 50 psig</td>
<td></td>
<td>V = 0-10VDC (deluxe only)</td>
</tr>
<tr>
<td>06</td>
<td>0 to 75 psig</td>
<td></td>
<td>J = 0-5VDC (deluxe only)</td>
</tr>
<tr>
<td>07</td>
<td>0 to 100 psig</td>
<td></td>
<td></td>
</tr>
<tr>
<td>08</td>
<td>0 to 250 psig</td>
<td></td>
<td></td>
</tr>
<tr>
<td>09</td>
<td>0 to 500 psig</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>0 to 1000 psig</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>0 to 5000 psig</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>0 to 10000 psig</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| **PV** | **Blank = Deluxe**<br>**E = Economy** | = 316L stainless steel | B = 1-SVDC (economy only) |
| 03 | -14.7 to 15 psig (Deluxe only) | | M = 4-20mA |
| 04 | -14.7 to 25 psig (Deluxe only) | | V = 0-10VDC (deluxe only) |
| 05 | -14.7 to 50 psig | | J = 0-5VDC (deluxe only) |
| 06 | -14.7 to 75 psig | | |
| 07 | -14.7 to 100 psig | | |
| 08 | -14.7 to 250 psig | | |
| 09 | -14.7 to 500 psig | | |
| 10 | -14.7 to 1000 psig | | |
| 11 | -14.7 to 5000 psig | | |
| 12 | -14.7 to 10000 psig | | |

Call factory for ranges not shown.
# Specifications

<table>
<thead>
<tr>
<th>ELECTRICAL</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Supply Voltage</strong></td>
</tr>
<tr>
<td><strong>Output</strong></td>
</tr>
<tr>
<td><strong>Load Impedance</strong></td>
</tr>
<tr>
<td><strong>Standard Connection</strong></td>
</tr>
<tr>
<td><strong>Pressure Port</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>PERFORMANCE AT 25°C (77°F)</th>
</tr>
</thead>
<tbody>
<tr>
<td>** Accuracy**</td>
</tr>
<tr>
<td><strong>Media Compatibility</strong></td>
</tr>
<tr>
<td><strong>Pressure Cycles</strong></td>
</tr>
<tr>
<td><strong>Over Pressure</strong></td>
</tr>
<tr>
<td><strong>Burst Pressure</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ENVIRONMENTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Shock</strong></td>
</tr>
<tr>
<td><strong>Vibration</strong></td>
</tr>
<tr>
<td><strong>EMI/RFI Protection</strong></td>
</tr>
<tr>
<td><strong>Rating</strong></td>
</tr>
<tr>
<td><strong>Operating Temp Range</strong></td>
</tr>
<tr>
<td><strong>Compensated Temp Range</strong></td>
</tr>
<tr>
<td><strong>Total Error Band Over Temp</strong></td>
</tr>
<tr>
<td><strong>Humidity</strong></td>
</tr>
</tbody>
</table>

* Accuracy includes nonlinearity and hysteresis.  
** BFSL = Best fit straight line

## Dimensions

### PG/PV

- Jacketed Cable length = 2 ft. (61 cm) diameter = 0.18" (4.5 mm)
- Shrink Tubing 0.375" dia.
- 0.25" MNPT Thread (6 mm)
- 0.9" HEX (22 mm)
- 3.5" (88 mm)
- 2.5" (64 mm)

### PGE/PVE

- Jacketed Cable length = 2 ft. (61 cm) diameter = 0.18" (4.5 mm)
- Shrink Tubing 0.375" dia.
- 0.25" MNPT Thread (6 mm)
- 0.9" HEX (22 mm)
Installation Guide
Pressure Sensors
PG/PV Series

1. Insert the probe into the area to be measured.
2. Wire according to the diagrams below.

**3-wire, 0-5VDC/0-10VDC**

- Red (+V)
- Blue or Black (-V)
- Yellow, Green, or White (Output)

**2-wire, 4-20mA**

- Red (+V)
- Blue or Black (-V)
Verify that you have the most current version of this document. Go to https://accounts.automatedlogic.com, then select Support > Download > Documents. Important changes are listed in Document revision history at the end of this document.

© 2018 Automated Logic Corporation. All rights reserved throughout the world. Automated Logic, WebCTRL, EIKON, Eco-Screen, and BACview are registered trademarks of Automated Logic Corporation. EnergyReports, Environmental Index, OptiFlex, and OptiPoint are trademarks of Automated Logic Corporation. All other trademarks are the property of their respective owners.
## Contents

What is a PROT485? ............................................................................................................................. 1  
Specifications ................................................................................................................................. 1  
To mount a PROT485 ...................................................................................................................... 2  
To wire for communications .......................................................................................................... 2  
Grounding the controller network ................................................................................................. 4  
CE Compliance ............................................................................................................................... 4  
Document revision history ............................................................................................................... 5
What is a PROT485?

The PROT485 is a device that protects against large electrical surges on high-speed (156 kbps) communication networks.

Place a PROT485:
- At each place wire enters or exits the building
- Within 250 feet (76 meters) of every controller. For maximum protection, place a PROT485 within 6 feet (1.8 meters) of each controller.

Sample daisy chain network configuration:

![Diagram of a daisy chain network configuration]

Specifications

<table>
<thead>
<tr>
<th>Environmental operating range</th>
<th>-20 to 140°F (-29 to 60°C), 10–90% relative humidity, non-condensing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Protection</td>
<td>The PROT485 has two replaceable 0.5 A fuses protecting the Fused connection: F1, type 3AG, 250 Vac, 0.5 A, T (time-lag) F2, type 3AG, 250 Vac, 0.5 A, T (time-lag) The protection element is a SIDACtor, transient voltage suppression component. This solid-state component shunts energy to ground.</td>
</tr>
<tr>
<td>Overall dimensions</td>
<td>Width: 2.5 in. (6.35 cm) Height: 4 in. (10.16 cm)</td>
</tr>
<tr>
<td>Listed by</td>
<td>CE</td>
</tr>
</tbody>
</table>
To mount a PROT485

⚠️ CAUTION  If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

Provide at least 1.5 in. (3.8 cm) clearance from each edge of the PROT485 for wiring.

1 Remove PROT485 from the snap track.
2 Mount the snap track using self-drilling screws. Drill directly into the plastic near the edges of the snap track so that the screws will be visible when you install the PROT485. This prevents loose screws from shorting out the back of the board.
3 Mount the PROT485 on the snap track by pushing it firmly into the grooves.

To wire for communications

⚠️ WARNING  Do not apply line voltage (mains voltage) to this device’s ports or terminals.

1 Check the communications wiring for shorts and grounds.
2 Connect the communication wires to the appropriate connectors as follows:
   ○ Use the **Shared** and **Unfused** connectors for wiring that leads to other controllers within a building.

![Diagram of wiring connections](image-url)
Use the **Shared** and **Fused** connectors for wiring that leads outside a building. Two fuses on the **Fused** connector provide additional protection against repeated or long-term surges such as repeated lightning strikes or line voltage on the network.

**NOTE** You should not use the **Fused** connector for wiring within a building. The PROT485s provide sufficient protection without the fuses. Also, the effort to replace fuses throughout a building could greatly impact the time needed to bring the system back up after a major surge.

**NOTE** Use the same polarity throughout the network segment.

3 Verify communication with the network by viewing Module Status reports (Modstats) in the WebCTRL® interface for controllers beyond the PROT485.
Grounding the controller network

Use 12 AWG grounding wire, no more than 6 feet (1.8 meters) long.
Connect grounding wire(s) to the PROT485’s Earth Ground connectors with a 3M Corporation female spade connector part number FD114-250C or equivalent.
If the controller is within 6 feet (1.8 meters) of the PROT485, connect one ground wire to the controller and another ground wire to earth ground.

If the controller is more than 6 feet (1.8 meters) from the PROT485, connect a ground wire to earth ground.

CE Compliance

⚠️ WARNING  This is a Class A product. In a domestic environment, this product may cause radio interference in which case the user may be required to take adequate measures.
## Document revision history

Important changes to this document are listed below. Minor changes such as typographical or formatting errors are not listed.

<table>
<thead>
<tr>
<th>Date</th>
<th>Topic</th>
<th>Change description</th>
<th>Code*</th>
</tr>
</thead>
<tbody>
<tr>
<td>11/9/18</td>
<td>Specifications</td>
<td>Changed Overall dimensions width to 2.5.</td>
<td>X-TS-JC-E</td>
</tr>
<tr>
<td>1/27/17</td>
<td>What is a Prot485?</td>
<td>Changed BT485 to Termination on diagram.</td>
<td>A-D</td>
</tr>
<tr>
<td>4/27/15</td>
<td>Entire document</td>
<td>New look, no content changes.</td>
<td>A-D</td>
</tr>
</tbody>
</table>

* For internal use only
Switching Power Supplies
PS5R-V Series

STANDARDS COMPLIANCE

<table>
<thead>
<tr>
<th>Applicable Standards</th>
<th>Mark</th>
<th>File No. or Organization</th>
</tr>
</thead>
<tbody>
<tr>
<td>UL508</td>
<td></td>
<td></td>
</tr>
<tr>
<td>UL1310</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ANSI/ISA 12.12.01</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CSA C22.2 No.107.1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CSA C22.2 No.213</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CSA C22.2 No.223</td>
<td></td>
<td></td>
</tr>
<tr>
<td>EN60950-1</td>
<td></td>
<td>UL/c-UL Listed</td>
</tr>
<tr>
<td>EN50178</td>
<td></td>
<td>File No. E467154, E177168</td>
</tr>
<tr>
<td>EN61204-3</td>
<td></td>
<td>TÜV SÜD</td>
</tr>
<tr>
<td>SEMI F47</td>
<td></td>
<td>EPRI</td>
</tr>
</tbody>
</table>

Note 1: PS5R-VA/VB/VC/VD/VE only
Note 2: EN60950-1, EN50178 only

PART NUMBERS

<table>
<thead>
<tr>
<th>Output Capacity</th>
<th>Part Number</th>
<th>Input Voltage</th>
<th>Output Voltage</th>
<th>Output Current</th>
</tr>
</thead>
<tbody>
<tr>
<td>7.5W</td>
<td>PSSR-VA05</td>
<td></td>
<td>5V</td>
<td>1.5A</td>
</tr>
<tr>
<td></td>
<td>PSSR-VA12</td>
<td>100 to 240V AC</td>
<td>12V</td>
<td>0.6A</td>
</tr>
<tr>
<td></td>
<td>PSSR-VA24</td>
<td>100 to 240V AC</td>
<td>24V</td>
<td>0.3A</td>
</tr>
<tr>
<td>10W</td>
<td>PSSR-VB05</td>
<td></td>
<td>5V</td>
<td>2.0A</td>
</tr>
<tr>
<td>15W</td>
<td>PSSR-VB12</td>
<td>100 to 240V AC</td>
<td>12V</td>
<td>1.3A</td>
</tr>
<tr>
<td></td>
<td>PSSR-VB24</td>
<td>100 to 240V AC</td>
<td>24V</td>
<td>0.65A</td>
</tr>
<tr>
<td>30W</td>
<td>PSSR-VC12</td>
<td>100 to 240V AC</td>
<td>12V</td>
<td>2.5A</td>
</tr>
<tr>
<td></td>
<td>PSSR-VC24</td>
<td>100 to 240V AC</td>
<td>24V</td>
<td>1.3A</td>
</tr>
<tr>
<td>60W</td>
<td>PSSR-VD24</td>
<td></td>
<td>24V</td>
<td>2.5A</td>
</tr>
<tr>
<td>90W</td>
<td>PSSR-VE24</td>
<td></td>
<td>24V</td>
<td>3.75A</td>
</tr>
<tr>
<td>120W</td>
<td>PSSR-VF24</td>
<td></td>
<td>24V</td>
<td>5.0A</td>
</tr>
<tr>
<td>240W</td>
<td>PSSR-VG24</td>
<td></td>
<td>24V</td>
<td>10.0A</td>
</tr>
</tbody>
</table>

Part Number Structure

PS5R - V

Output Capacity
A: 7.5W
B: 10W/15W
C: 30W
D: 60W
E: 90W
F: 120W
G: 240W

Note 3: PSSR-VA/VB only
Note 4: PSSR-VA/VB/VC only

Use only for interpreting part numbers.
Do not use for developing part numbers.

PRODUCT DESCRIPTION

DIN-rail mount switching power supplies with global approvals for both industrial and hazardous locations

KEY FEATURES

- Compact size preserves panel space
- Slim size (width):
  22.5mm (10W/15W/30W)
  36mm (60W/90W)
  46mm (120W)
  60mm (240W)
- Universal Voltage Input:
  85-264V AC/100-370V DC
- Wide operating temperature range
- Spring-up terminals accept ring & fork terminals
- Approved for use in Class I Division 2 hazardous locations
- Can be installed in 6 directions
- 10W ~ 90W meet NEC Class 2 output ratings
- Overcurrent protection with auto-reset
- Meets SEMI F47 Sag Immunity (208V AC input)
- RoHS compliant
- Five-year factory warranty
<table>
<thead>
<tr>
<th>Specifications</th>
<th>Table</th>
<th>Note 1: DC input voltage is not subject to safety standards. When using on DC input, connect a fuse to the input terminal for DC input protection.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model</td>
<td>DC output</td>
<td>PS5R-VB24</td>
</tr>
<tr>
<td>Frequency</td>
<td>50/60 Hz</td>
<td>50/60 Hz</td>
</tr>
<tr>
<td>Input Current (Typ.)</td>
<td>100V AC</td>
<td>5V: 0.20A, 12V: 0.18A</td>
</tr>
<tr>
<td>Inrush Current (Typ.)</td>
<td>100V AC</td>
<td>15A</td>
</tr>
<tr>
<td>Leakage Current</td>
<td>120V AC</td>
<td>0.5mA max.</td>
</tr>
<tr>
<td>Efficiency (Typ.)</td>
<td>100V AC</td>
<td>5V: 74%, 12V: 79%, 24V: 80%</td>
</tr>
<tr>
<td>Rated Voltage/Current</td>
<td>12V/2.5A, 12V/1.3A</td>
<td>24V/2.5A, 24V/1.3A</td>
</tr>
<tr>
<td>Adjustable Voltage Range</td>
<td>±10%</td>
<td>±5%</td>
</tr>
<tr>
<td>Output Holding Time (Typ.)</td>
<td>100V AC</td>
<td>45ms</td>
</tr>
<tr>
<td>Start Time</td>
<td>500ms max.</td>
<td>500ms max.</td>
</tr>
<tr>
<td>Rise Time</td>
<td>5V: 200ms max</td>
<td>24V: 250ms max</td>
</tr>
<tr>
<td>Overcurrent Protection</td>
<td>105% min. (auto reset)</td>
<td>105% min. (auto reset)</td>
</tr>
<tr>
<td>Overvoltage Protection</td>
<td>24V: 1.5% p-p max. (0 to +65°C)</td>
<td>24V: 1% p-p max. (0 to +55°C)</td>
</tr>
<tr>
<td>Undervoltage Protection</td>
<td>5V: 2.5% p-p max. (0 to -65°C)</td>
<td>12V: 1.5% p-p max. (0 to -65°C)</td>
</tr>
<tr>
<td>EMF</td>
<td>EN61204-3 (Class B)</td>
<td>EN61204-3 (industrial)</td>
</tr>
<tr>
<td>EMC</td>
<td>UL508 (listing), UL1310</td>
<td>Class 2, ANSI/ISA-12.12.01</td>
</tr>
<tr>
<td>Safety Standards</td>
<td>UL508 (listing), ANSI/ISA-12.12.01</td>
<td>CSA C22.2 No. 107.1, 213, 223</td>
</tr>
<tr>
<td>Shock Resistance</td>
<td>300 m/s² (30G), 3 times each in 6 directions</td>
<td></td>
</tr>
<tr>
<td>Dimensions (mm)</td>
<td>75H × 45W × 70D</td>
<td>90H × 22.5W × 95D</td>
</tr>
<tr>
<td>Weight (approx.)</td>
<td>130g</td>
<td>140g</td>
</tr>
<tr>
<td>Terminal Screw</td>
<td>M3.5</td>
<td></td>
</tr>
</tbody>
</table>

- Specifications for PS5R-VA05, PS5R-VB05, PS5R-VB24, PS5R-VE24, PS5R-VF24, PS5R-VD24, PS5R-VE24:
- Specifications for PS5R-VB12, PS5R-VE12, PS5R-VE24:
- Specifications for PS5R-VB12, PS5R-VE12, PS5R-VE24:
- Specifications for PS5R-VB12, PS5R-VE12, PS5R-VE24:
- Specifications for PS5R-VB12, PS5R-VE12, PS5R-VE24:
- Specifications for PS5R-VB12, PS5R-VE12, PS5R-VE24:
- Specifications for PS5R-VB12, PS5R-VE12, PS5R-VE24:

Note 1: DC input voltage is not subject to safety standards. When using on DC input, connect a fuse to the input terminal for DC input protection.
Note 2: Under stable state.
Note 3: PS5R-VB05 (5V DC/2.0A) is 10W (Up to 3.0A at Ta = 0 to +40°C). Not subject to safety standards above 2.0A.
Note 4: See the output derating curves.
Note 5: Calculation of the expected life is based on the actual life of the aluminum electrolytic capacitor. The expected life depends on operating conditions.
CHARACTERISTICS

Operating Temperature vs. Output Current (Derating Curves)
Conditions: Natural air cooling (Operating temperature is the temperature around the switching power supply.)

Input Voltage vs. Output Current (Derating Curves) Ta=25°C

Overcurrent Protection Characteristics
Operating Temperature Approved by Safety Standards

<table>
<thead>
<tr>
<th>Part Number</th>
<th>UL508, CSA C22.2 No.107.1, ANSI/ISA12.12.01, EN60950-1, EN50178</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mounting A</td>
</tr>
<tr>
<td>PS5R-VA05, -VA12, -VA24</td>
<td>65</td>
</tr>
<tr>
<td>PS5R-VB05, -VB12, -VB24</td>
<td>65</td>
</tr>
<tr>
<td>PS5R-VC12</td>
<td>50</td>
</tr>
<tr>
<td>PS5R-VC24</td>
<td>55</td>
</tr>
<tr>
<td>PS5R-VD24</td>
<td>55</td>
</tr>
<tr>
<td>PS5R-VE24</td>
<td>50</td>
</tr>
<tr>
<td>PS5R-VF24</td>
<td>55</td>
</tr>
<tr>
<td>PS5R-VG24</td>
<td>50</td>
</tr>
</tbody>
</table>

MOUNTING STYLE

<table>
<thead>
<tr>
<th>MOUNTING STYLE</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mounting A</td>
<td>(Vertical, standard)</td>
</tr>
<tr>
<td>Mounting B</td>
<td>(Upright)</td>
</tr>
<tr>
<td>Mounting C</td>
<td>(Right side up)</td>
</tr>
<tr>
<td>Mounting D</td>
<td>(Left side up)</td>
</tr>
<tr>
<td>Mounting E</td>
<td>(Upside down)</td>
</tr>
<tr>
<td>Mounting F</td>
<td>(Downward)</td>
</tr>
</tbody>
</table>

Front Panel

| PS5R-VA | PS5R-VB/VC | PS5R-VD/VE/VF | PS5R-VG |

<table>
<thead>
<tr>
<th>Marking</th>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>L, N</td>
<td>AC Input Terminal</td>
<td>Voltage range: 85 to 264V AC/100 to 370V DC</td>
</tr>
<tr>
<td></td>
<td>Ground Terminal</td>
<td>Be sure to connect this terminal to a proper ground.</td>
</tr>
</tbody>
</table>
| +V, -V  | DC Output Terminals | +V: Positive output terminal  
|         |                       | -V: Negative output terminal                      |
| VR.ADJ  | Output Voltage Adjustment | Allows adjustment within ±10%, (VE = ±5%)  
|         |                       | Turning clockwise increases the output voltage. Turning counterclockwise decreases the output voltage. |
| DC ON   | Operation Indicator (green) | Illuminates when the output voltage is on. |

ACCESSORIES

Panel Mounting Bracket

<table>
<thead>
<tr>
<th>Applicable Switching Power Supply</th>
<th>Part Number</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>PS5R-VB</td>
<td>PS9Z-5R1B</td>
<td>—</td>
</tr>
<tr>
<td>PS5R-VC</td>
<td>PS9Z-5R2B</td>
<td>For side mounting</td>
</tr>
<tr>
<td>PS5R-VD</td>
<td>PS9Z-5R1C</td>
<td>—</td>
</tr>
<tr>
<td>PS5R-VE</td>
<td>PS9Z-5R1E</td>
<td>—</td>
</tr>
<tr>
<td>PS5R-VF</td>
<td>PS9Z-5R1F</td>
<td>—</td>
</tr>
<tr>
<td>PS5R-VG</td>
<td>PS9Z-5R2F</td>
<td>For side mounting</td>
</tr>
</tbody>
</table>

Note 2: Used when installing on a panel directly, PS5R-VA model does not require panel mounting bracket.

DIN Rail (35mm-wide)

<table>
<thead>
<tr>
<th>Length</th>
<th>Part Number</th>
<th>Material</th>
</tr>
</thead>
<tbody>
<tr>
<td>1000mm</td>
<td>BNDN1000</td>
<td>Aluminum</td>
</tr>
</tbody>
</table>

End Clip

<table>
<thead>
<tr>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>BNL6</td>
</tr>
<tr>
<td>BNL8</td>
</tr>
</tbody>
</table>
DIMENSIONS (MM)

PS5R-VA

PS5R-VB/VC

PS5R-VD/VE

PS5R-VF

PS5R-VG

MTBF*

PS5R-VA: 1,150,000H minimum
PS5R-VB: 900,000H minimum
PS5R-VC: 650,000H minimum
PS5R-VD: 450,000H minimum
PS5R-VE: 380,000H minimum
PS5R-VF: 350,000H minimum
PS5R-VG: 290,000H minimum

*MIL-HDBK-217FN2
(GB, 30°C)

MTBF stands for Mean Time Between Failure, which is calculated according to statistical device failures, and indicates reliability of a device. It is the statistical representation of the likelihood of the unit to fail and does not necessarily represent the expected life of a product.
Panel Mounting Bracket

PS9Z-5R1B

PS9Z-5R2B Side-mount

PS9Z-5R1C

PS9Z-5R1E

PS9Z-6R1F

PS9Z-6R2F Side-mount

When installed on switching power supply

Front View Side View

Mounting hole layout when installing on a panel directly

2-M4 or 2- ø 4.5 holes

2-M4 or 2- ø 4.5 holes

2-M4 or 2- ø 4.5 holes

2-M4 or 2- ø 4.5 holes

2-M4 or 2- ø 4.5 holes

Mounting hole layout for side mounting

Mounting Screws (4- M3×6 countersunk screws)
SAFETY PRECAUTIONS

The PS5R-V should be placed in a proper enclosure. It is designed to be used with general electrical equipment and industrial electric devices.

Do not use switching power supplies with electric equipment whose malfunction or inadvertent operation may damage the human body or life directly.

Make sure that the input voltage and output current do not exceed the ratings. If the input voltage and output current exceed the ratings, electric shock, fire, or malfunction may occur.

Do not touch the terminals of the switching power supply while input voltage is applied, otherwise electric shock may occur.

Provide the final product with protection against malfunction or damage that may be caused by malfunction of the switching power supply.

Operating temperatures should not exceed the ratings. Be sure to note the derating characteristics. If the operating temperature exceeds the ratings, electric shock, fire, or malfunction may occur.

Blown fuses indicate that the internal circuits are damaged. Contact IDEC for repair. Do not just replace the fuse and reoperate, otherwise electric shock, fire, or malfunction may occur.

Do not use the switching power supplies to charge rechargeable batteries.

Do not overload or short-circuit the switching power supply for a long period of time, otherwise the internal elements may be damaged.

Do not disassemble, repair, or modify the power supplies, otherwise the high voltage internal part may cause electric shock, fire, or malfunction.

The fuse inside the PS5R-V switching power supply is for AC input. Use an external fuse for DC input.

OPERATING INSTRUCTIONS

Notes for installation

Do not close the top or bottom openings of the PS5R-V to allow for heat radiation by convection.

When mounting multiple PS5R-V switching power supplies side by side, maintain a minimum of 10 mm clearance. Observe the derating curves in consideration of the ambient temperature.

When the derating voltage may exceed the recommended value, provide forced air-cooling.

Make sure to wire the ground terminal correctly.

For wiring, use wires of heat resistance of 60°C or higher (PS5R-VB: 80°C or higher). Use copper wire of the following sizes, according to the rated current.

<table>
<thead>
<tr>
<th>Terminal</th>
<th>Wire Size (allowable current)</th>
<th>Wire Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input</td>
<td>AWG18 to 14</td>
<td>Copper Solid/Stranded</td>
</tr>
<tr>
<td>Output</td>
<td>AWG18 to 14 (AWG18: 7A, AWG16: 10A, AWG14: 15A)</td>
<td>Copper Solid/Stranded</td>
</tr>
</tbody>
</table>

Cross-sectional area: AWG18: 0.82mm², AWG16: 1.31mm², AWG14: 2.0mm²

Recommended tightening torque of the input and output terminals is 1.0 to 1.3Nm (0.8N·m for UL).

Mounting on DIN Rails

1. Use a 35mm-wide DIN rail.
2. Place the PS5R-V on the DIN rail as shown with input terminal side up (➀), and press the PS5R-V towards the DIN rail (➁). Make sure that the PS5R-V is installed firmly.
3. Use BNL6 end clips to ensure power supplies do not slide off the end of the DIN rail. Use of BNL8 end clips is recommended when excessive vibration or shock is anticipated.

Removal

- Insert a flat screwdriver into the slot in the clamp, and pull out until it clicks (➀). The lock mechanism is released and the PS5R-V can be removed (➁). When mounting the PS5R-V again, push in the latch first.

Installing a Panel Mounting Bracket

Panel Mounting Bracket (PS9Z-5R1F, PS9Z-6R1F)

1. Push in the latch to LOCK position.
2. Install the tab on the panel mounting bracket into the slot on the power supply.
3. Install the brackets as shown on the left.
4. Ensure that the panel mounting bracket is locked by the latch.

Panel Mounting Bracket (PS9Z-5R2B)

1. Pull out the latch to UNLOCK position.
2. Insert the tab on the panel mounting bracket into the slot on the power supply.
3. Push in the latch to LOCK position.
4. Ensure that the panel mounting bracket is locked by the latch.
Installing PS9Z-6R2F Side-mount Panel Mounting Bracket

Install the bracket on the switching power supply using four M3 × 6 countersunk screws supplied with the bracket. Recommended tightening torque is 0.5 to 0.6N.m (should be in the center positions)

Adjustment of Output Voltage

The output voltage can be adjusted within ±10% (VE: ±5%) of the rated output voltage by using the VR.ADJ control on the front. Turning the VR.ADJ clockwise increases the output voltage. Turning the VR.ADJ counterclockwise decreases the output voltage.

Overcurrent Protection

The output voltage drops automatically when an overcurrent flows due to an overload or short circuit. Normal voltage is automatically restored when the load returns to normal conditions.

Insulation/Dielectric Test

When performing an insulation/dielectric test, short-circuit the input (between L and N) and output (between +V and -V). Do not apply or interrupt the voltage quickly, otherwise surge voltages may be generated and the PS5R-V may be damaged.

Notes for Operation

• Output interruption may indicate blown fuses. Contact IDEC.
• The PS5R-V switching power supply contains an internal fuse for AC input. When using DC input, install an external fuse. To avoid blown fuses, select a fuse in consideration of the rated current of the internal fuse.

Rated Current of Internal Fuses

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Internal FuseRated Current</th>
</tr>
</thead>
<tbody>
<tr>
<td>PS5R-VB/VC</td>
<td>2A</td>
</tr>
<tr>
<td>PS5R-VD/VE/VF</td>
<td>4A</td>
</tr>
<tr>
<td>PS5R-VG</td>
<td>6.3A</td>
</tr>
</tbody>
</table>

• Avoid overload and short-circuit for a long period of time, otherwise the internal elements may be damaged.

WARRANTY

IDEC warranties the PS5R-V switching power supply for a period of five years from the date of shipment.

Scope

IDEC agrees to repair or replace the PS5R-V switching power supply if the product has been operated under the following conditions. The maximum value of output capacity is within the range shown in "Operating Temperature vs. Output Current on page 3.

1. Average operating temperature (ambient temperature of switching power supply) is 40°C maximum.
2. The load is 80% maximum.
3. Input voltage is the rated input voltage.
4. Standard mounting style

• DC input operation is not subject to safety standards.

Rust and Scratches on Metal parts

Bonded metal parts are used for the PS5R-V. Rust on the edge and scratches on the surfaces may be developed depending on the storage condition, but the performance of the PS5R-V is not affected.

Noise

Small acoustic noise inside the PS5R-V may be heard depending on the input voltage and load, but the performance of the PS5R-V is not affected.

Series Operation

Series operation is allowed. Connect Schottky barrier diodes D as shown below. Select a Schottky diode in consideration of the rated current. The diode’s reverse voltage must be higher than the PS5R-V’s output voltage.

Parallel Operation

Parallel operation is not possible to increase the output capacity, because the internal elements and load may be damaged.

Backup Operation

Backup operation is a connection method of two switching power supplies in parallel for emergency. Normally one switching power supply has a sufficient output. If one switching power supply fails, another one operates to continue the output. Make sure that the sum of power consumption by load and diode is not greater than the rated wattage (rated voltage × rated current) of one switching power supply.

Select a diode in consideration of:
Diode’s current must be more than double the PS5R-V’s output current. Take heat dissipation into consideration.

IDEC shall not be liable for other damages including consequential, contingent or incidental damages. Warranty does not apply if the PS5R-V switching power supply was subject to:
1. Inappropriate handling, or operation beyond specifications.
2. Modification or repair by other than IDEC.
3. Failure caused by other than the PS5R-V switching power supply.
4. Failure caused by natural disasters.
AC POWER SUPPLY: 120 VAC TO 24 VAC

PSB40AB10
Panel Mount 40 VA Power Supply, 120 to 24 Vac

PSB100AB10
Panel Mount 100 VA Power Supply, 120 to 24 Vac

Notes:
• To order UL508, add "-IC" to end of model number.

Transformer:
One 40 VA Split-Bobbin (PSB40AB10)
One 100 VA Split-Bobbin (PSB100AB10)

Primary:
120 Vac

Secondary:
24 Vac, w/ LED Indicator

Frequency:
50/60 Hz

Over Current Protection:
Inherently Limited + Circuit Breaker (PSB40AB10)
Circuit Breaker (PSB100AB10)

24 Vac ON/OFF:
On / Off Switch

Main Breaker ON/OFF:
Switch / Breaker (10 Amp)
(Kills power to entire unit:
Outlets, Aux. Output, & Transformer)*
Total Combined Output 9A

Mounting: Panel mount
Temperature: 40° C
Approvals: Class 2 (UL Approved
UL5085-3), UL916, UL508 for -IC
models, C-UL
Dimensions: 5.200" x 5.250" x 3.750"
Weight: 3.18 lbs. (PSB40AB10)
3.58 lbs. (PSB100AB10)

Notes:
• To order UL508, add "-IC" to end of model number.

* Move internal jumper to "HOT" position if you wish outlets to always be hot otherwise outlets will be switched by main breaker.

SPECIFICATIONS

- Transformer:
  One 40 VA Split-Bobbin (PSB40AB10)
  One 100 VA Split-Bobbin (PSB100AB10)

- Primary:
  120 Vac

- Secondary:
  24 Vac, w/ LED Indicator

- Frequency:
  50/60 Hz

- Over Current Protection:
  Inherently Limited + Circuit Breaker (PSB40AB10)
  Circuit Breaker (PSB100AB10)

- 24 Vac ON/OFF:
  On / Off Switch

- Main Breaker ON/OFF:
  Switch / Breaker (10 Amp)
  (Kills power to entire unit:
  Outlets, Aux. Output, & Transformer)*
  Total Combined Output 9A

Notes:
• To order UL508, add "-IC" to end of model number.
AC POWER SUPPLY

PSH300A
Enclosed 300VA Power Supply with Three 100VA Class 2 Outputs, 480/277/240/120 Vac to 24 Vac

PSMN300A
Open Style 300VA Power Supply with Three 100VA Class 2 Outputs, 480/277/240/120 Vac to 24 Vac

SPECIFICATIONS

Transformer: One (1) 300 VA
Over Current Protection: Circuit Breaker
Primary: 480/277/240/120 Vac
Frequency: 50/60 Hz
Dimensions: 12.125” x 12.125” x 6.000” (PSH300A)
11.330” x 11.400” x 4.500” (PSMN300A)
Approvals:
- Class 2 (UL Approved UL5085-3), UL916, UL508, C-UL
- Seismic Certification of Equipment and Components: OSP-0201-10 Plenum
Sub-Panel: One (1) 300 VA Circuit Breaker
Housing: NEMA1 Metal Enclosure (PSH300A)
Weight: 20.00 lbs. (PSH300A)
11.00 lbs. (PSMN300A)

3 Secondaries:
- 24 Vac, with LED Indicators
- 4 Amp breaker for each output

24 Vac ON/OFF:
- On / Off Switch & Breaker

Input:
- 480/277/240/120 Vac Finger-Safe Terminals, 8-18 AWG

Output:
- 3 Ungrounded, Isolated, 100 VA, Class 2, 24 Vac Outputs. Terminals accept 12-26 AWG wire.

Ambient Temperature Derating:
- 4A up to 40˚ C ; 3A up to 50˚ C ; 2A up to 55˚ C (When All 3 Outputs Operated Simultaneously)

Standby Wattage:
- 16.61 W @ 120 Vac
- 17.70 W @ 240 Vac
- 16.26 W @ 277 Vac
- 19.20 W @ 480 Vac

Full Load Primary Current:
- 2.66 A @ 120 Vac
- 1.36 A @ 240 Vac
- 1.18 A @ 277 Vac
- 0.68 A @ 480 Vac

Secondary Output Voltage vs. Load:
- 24.5 V @ 1 Amp
- 23.5 V @ 2 Amp
- 22.8 V @ 3 Amp
- 22.3 V @ 4 Amp

Notes:
- To order UL508, add “-IC” to end of model number.
- Open style (PSMN300A) is mounted to sub-panel SP3303 for shipping. Sub-panel may be removed to suit application.
- Primary voltage terminal cover available. See model APS53-TC on page 141.
- Design is in accordance with ASCE 7-05 Chapter 13: "www.oshpd.ca.gov/FDO/Pre-Approval/OSP-0201-10.pdf"

GREAT FOR VAV APPLICATIONS
SPECIFICATIONS

Transformer: One (1) 500 VA
Over Current Protection: Circuit Breaker
Primary: 480/277/240/120 Vac
Frequency: 50/60 Hz
Dimensions: 12.125" x 12.125" x 6.000" (PSH500A)
11.130" x 11.400" x 5.000" (PSMN500A)
Approvals: Class 2 (UL Approved UL5085-3); UL916, UL508, C-UL
Seismic Certification of Equipment and Components: OSP-0201-10
Sub-Panel: Plenum Rated Polymetal
Housing: NEMA1 Metal Enclosure (PSH500A)
Weight: 30.16 lbs. (PSH500A)
20.60 lbs. (PSMN500A)

5 Secondaries:
24 Vac, with LED Indicators
4 Amp breaker for each output
24 Vac ON/OFF:
On / Off Switch & Breaker
Input:
480/277/240/120 Vac Finger-Safe Terminals, 8-18 AWG
Output:
5 Ungrounded, Isolated, 100 VA, Class 2, 24 Vac Outputs. Terminals accept 12-26 AWG wire.
Ambient Temperature Derating:
4A up to 40˚C; 3A up to 50˚C; 2A up to 55˚C
(When All 5 Outputs Operated Simultaneously)

Notes:
- To order UL508, add “-IC” to end of model number.
- Open style (PSMN500A) is mounted to sub-panel SP3303 for shipping. Sub-panel may be removed to suit application.
- Primary voltage terminal cover available. See model APS53-TC on page 141.
- Design is in accordance with ASCE 7-05 Chapter 13:
  www.oshpd.ca.gov/FDD/Pre-Approval/OSP-0201-10.pdf

Standby Wattage:
48.515 W @ 120 Vac
48.699 W @ 240 Vac
49.564 W @ 277 Vac
48.255 W @ 480 Vac

Full Load Primary Current:
4.66 A @ 120 Vac
2.41 A @ 240 Vac
2.06 A @ 277 Vac
1.17 A @ 480 Vac

Secondary Output Voltage vs. Load:
24.0 V @ 1 Amp
23.0 V @ 2 Amp
21.8 V @ 3 Amp
21.1 V @ 4 Amp
- With 240 Vac, primary input voltage
- When all 5 outputs operated simultaneously, at room temperature

GREAT FOR VAV APPLICATIONS
PSH600-UPS-STAT

Kit Consisting of Enclosed Power Control Center Model PSH2C2RB10 (10 Amp Switch / Circuit Breaker, Two (2) 120 Vac Outlets, Terminals, 120 Vac Input) with a 600VA UPS. (Status Contacts)

Input Power Status Contacts and LED Indicator
The input power status contacts and LED indicate the presence of normal power. When normal power is present, the relay is energized, and the LED is on. When normal power is lost, the relay is de-energized, and the LED is off.

UPS Status Contacts and LED Indicator
The UPS status contacts and LED indicate power from the UPS. When normal power is present, the relay is energized, and the LED is on. When normal power is lost, the relay will be energized as long as the UPS can sustain it (until the UPS battery is depleted), and the LED is on.

SPECIFICATIONS

**UPS**
- UPS: 550 or 600VA
- Backup Time: 2.5 Min. @ Full 600 VA Load
  10 Min. @ 1/2 Load
- Power Consumption: Up to 3 Amp @120Vac
- Max Load: 330Watt
- Frequency: 50/60 Hz
- Temperature Rating of UPS: 32 to 104°F
- UPS Transfer Time: 6ms
- Approvals: UL Listed, UL1778

**PSH2C2RB10**
- Operating Temperature: -30 to 140°F
- Humidity Range: 5 to 95% (noncondensing)
- Main Breaker ON/OFF: Switch / Breaker (10 Amp)
- Approvals: UL Listed, UL916, C-UL, CE, RoHS
- Dimensions: 12.000” x 16.000” x 6.000” Metal Housing with Screw Cover
- Weight: 14.3 lbs.

**Line Input Status Contacts and UPS**
Output Status Contacts Rated:
- 10 Amp @ 277 Vac General Use
- 10 Amp @ 30 Vdc (N/O)
- 7 Amp @ 30 Vdc (N/C)
- 1/2 HP @ 125 Vac
- 1/4 HP @ 277 Vac
- 1000 VA @ 120 Vac Magnetic Ballast (N/C)
- C300 Pilot Duty
- 16.8 VA @ 24 Vac Pilot Duty

Notes:
- To order without UPS, so that any other commercial UPS with appropriate ratings and within housing space limitations may be used, see model PSH2C2RB10.
- To order interface board for replacement or for separate use, order model PSMN2C2RB10.
- Average battery life: 3-5 years depending on the number of discharge cycles and environmental temperature
- UPS may change based on quality and availability

ESTIMATED BACKUP TIME VS. LOAD

---

04.26.2017
Input Power Status Contacts and LED Indicator
The input power status contacts and LED indicate the presence of normal power. When normal power is present, the relay is energized, and the LED is on. When normal power is lost, the relay is de-energized, and the LED is off.

UPS Status Contacts and LED Indicator
The UPS status contacts and LED indicate power from the UPS. When normal power is present, the relay is energized, and the LED is on. When normal power is lost, the relay will be energized as long as the UPS can sustain it (until the UPS battery is depleted), and the LED is on.

---

**SPECIFICATIONS**

**UPS**
- **UPS:** 850VA
- **Backup Time:**
  - 2 Min. @ Full 850 VA Load
  - 8 Min. @ 1/2 Load
- **Input:** 120 Vac, 12 Amp
- **Sine Wave Output:** 120 Vac, 7.1 Amp
- **Max Load:** 510 Watt
- **Frequency:** 50/60 Hz
- **Temperature Rating of UPS:** 32 to 95° F
- **UPS Transfer Time:** 4ms
- **Approvals:** UL Listed, UL1778
- **Model:** Cyber Power Model 850PFCLCD
- **Weight:** 15 lbs.
- **Operating Temperature:** -30 to 140° F
- **Humidity Range:** 5 to 95% (noncondensing)
- **Main Breaker ON/OFF:** Switch / Breaker (10 Amp)
- **Approvals:** UL Listed, UL916, C-UL, CE, RoHS
- **Dimensions:** 14.000” x 16.000” x 6.000”

**Line Input Status Contacts and UPS Output Status Contacts Rated:**
- 10 Amp @ 277 Vac General Use
- 10 Amp @ 30 Vdc (N/O)
- 7 Amp @ 30 Vdc (N/C)
- 1/2 HP @ 125 Vac
- 1/4 HP @ 277 Vac
- 1000 VA @ 120 Vac Magnetic Ballast (N/C)
- C300 Pilot Duty
- 16.8 VA @ 24 Vac Pilot Duty

**Notes:**
- To order without UPS, so that any other commercial UPS with appropriate ratings and within housing space limitations may be used, see model PSH2C2RB10-L.
- To order interface board for replacement or for separate use, order model PSMN2C2RB10.
- Typical battery life: 3-6 years, depending on number of discharge/recharge cycles

---

**ESTIMATED BACKUP TIME VS. LOAD**

**INPUT POWER STATUS CONTACTS AND LED INDICATOR**

---

**SINUSOIDAL OUTPUT OR PURE SINE WAVE OUTPUT**
The PW Series wet pressure transducers incorporate microprocessor profiled sensors for exceptional accuracy and reliability. Easy to use and designed to provide exceptional installation savings, the PW Series is ideal for measuring pressure across pumps, filters, heat exchangers, compressors, and other non-corrosive wet media applications.

The jumper-selectable port swap feature eliminates costly replumbing when the high and low ports are improperly plumbed, allowing the jumper position to be changed from normal to swap.

**SPECIFICATIONS**

**GENERAL**
- Input Power: Class 2; 12 to 30 Vdc or 24 Vac nominal, 50/60 Hz
- Max. Current Draw DC: 125 mA; AC: 280 mA
- Output: 3-wire transmitter; user selectable 4 to 20 mA (clipped & capped)/0-5 V/0-10 V*
- Surge Damping: Electronic, 5-second averaging
- Test Mode: Overrides output to full-scale (20 mA, 5 V, 10 V)
- Zero Adjust: Pushbutton auto-zero & digital input (2-pos terminal block)
- Status Indication: Dual-color LED: Green = Normal, Green Blinking = Low > High, Red = Overrange, Red Blinking = Overpressure
- Housing Material: White powder-coated aluminum
- Fittings: psig: 1/8” NPT female thread, 17 to 4 PH stainless; barg: 1/8” BSPT female thread, 17 to 4 PH stainless

**PRESSURE RANGES (SELECTABLE)**
- 0 to 50 psig (Gauge) 0 to 5/10/25/50 psid (Differential)
- 0 to 100 psig (Gauge) 0 to 10/20/50/100 psid (Differential)
- 0 to 250 psig (Gauge) 0 to 25/125/250 psid (Differential)

**SENSOR**
- Accuracy @ 25 °C**: Range A, B, C: ±1% F.S.; Range D: ±2% F.S.***
- Long Term Stability: ±0.25% per year
- Media Compatibility: Media compatible with 17 to 4 PH stainless steel
- Proof Pressure: Max. 2x F.S. range
- Burst Pressure: Max. 5x F.S. range
- Temperature Compensated Range: 0 to 50 °C (32 to 122 °F); TC Zero ≤±1.5% of product F.S. per sensor; TC Span ≤±1.5% of product F.S. per sensor (2 sensors per unit)

**APPLICATIONS**
- Monitoring and controlling pump differential pressure
- Chiller/boiler differential pressure drop
- CW/HW system differential pressure

**WARRANTY**
- Limited Warranty: 5 years

**AGENCY APPROVALS**
- CE Conformance - CE option: Low voltage directive 2014/35/EU; EMC directive 2014/30/EU.
- EMC Special Note: Connect this product to a DC distribution network or an AC/DC power adaptor with proper surge protection (EN 61000-6-1 specification requirements).
**WIRING DIAGRAM**

**DIMENSIONAL DRAWING**

**ORDERING INFORMATION**

- **Local Display**
  - L: LCD Display
  - X: No Display

- **NIST**
  - N: NIST
  - X: None

- **Operational Range**
  - 03: 0-50 psi
  - 04: 0-100 psi
  - 05: 0-250 psi

- **CE**
  - S: Standard
  - X: None

**Example:**
- PW L X 04 C

*Select operational range according to maximum gauge pressure, NOT differential pressure.
Example: High gauge pressure=90 psig, Select 100 psig model (04).

**MICROPROCESSOR PROVIDES DIGITAL SIGNAL CONDITIONING**

- Noise rejection reduces fluctuating readings due to noise or turbulence
- Surge damping prevents false alarms by averaging fast peaks

**Output Clamping**

**Use the Range switch to select F.S. differential pressure.**

**Example:**
- PW-04

**Input Conditions**

<table>
<thead>
<tr>
<th>HI PORT</th>
<th>LO PORT</th>
<th>Result</th>
<th>Outputs Read</th>
</tr>
</thead>
<tbody>
<tr>
<td>100 psi</td>
<td>0 psi</td>
<td>+100 psi</td>
<td>4-20mA 0-10V</td>
</tr>
<tr>
<td>100 psi</td>
<td>50 psi</td>
<td>+50 psi</td>
<td>16mA 7.5V</td>
</tr>
<tr>
<td>50 psi</td>
<td>50 psi</td>
<td>0 psi</td>
<td>12mA 5V</td>
</tr>
<tr>
<td>50 psi</td>
<td>100 psi</td>
<td>-50 psi</td>
<td>8mA 2.5V</td>
</tr>
<tr>
<td>0 psi</td>
<td>100 psi</td>
<td>-100 psi</td>
<td>4mA 0V</td>
</tr>
</tbody>
</table>

**Range (psi)**

- **PW-03**
  - A: 50
  - B: 25
  - C: 10
  - D: 5

- **PW-04**
  - A: 100
  - B: 50
  - C: 20
  - D: 10

- **PW-05**
  - A: 250
  - B: 125
  - C: 50
  - D: 25

**Example:**
- PW-04
**SD, SD-R01, SD-Z & MX1**

**Spot Leak Detectors**

SD, SD-R01, SD-Z and MX1 Spot Detectors detect conductive fluids at a single point for the most economical way to detect fluids in small, confined areas. These devices are commonly used in small rooms and in air-conditioning drip pans. Use only with SC conductive fluid leak detection cables.

Veris offers four models of spot detectors which can integrate with various building management systems.

**SPECIFICATIONS**

<table>
<thead>
<tr>
<th>SD, SD-R01, SD-Z</th>
<th>MX1</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Input Power:</strong></td>
<td></td>
</tr>
<tr>
<td>SD-R01 Only</td>
<td>24 Vac/dc ±10%, 0.1 A max. (AC: 50/60 Hz)</td>
</tr>
<tr>
<td>Storage Environment</td>
<td>-20 to 70 °C (-4 to 158 °F)</td>
</tr>
<tr>
<td><strong>OUTPUTS</strong></td>
<td></td>
</tr>
<tr>
<td>Solid-state:</td>
<td></td>
</tr>
<tr>
<td>SD Only</td>
<td>12 to 36 Vac@0.01 A min., 0.1 A max., 50/60 Hz</td>
</tr>
<tr>
<td>SD-R01 Only</td>
<td>18 to 36 Vdc@0.01 A min., 0.1 A max.</td>
</tr>
<tr>
<td>Relay:</td>
<td></td>
</tr>
<tr>
<td>SD-R01 Only</td>
<td>Dry Contact; Form C: 1 A@24 Vdc, 0.5 A @120 Vac resistive</td>
</tr>
<tr>
<td><strong>LEADER CABLE (NSC)</strong></td>
<td></td>
</tr>
<tr>
<td>Length:</td>
<td></td>
</tr>
<tr>
<td>SD</td>
<td>14 ft. (4.2 m)</td>
</tr>
<tr>
<td>SD-R01</td>
<td>14 ft. (4.2 m)</td>
</tr>
<tr>
<td>SD-Z</td>
<td>10 ft. (0.3 m) (2 cables included)</td>
</tr>
<tr>
<td>Connector:</td>
<td></td>
</tr>
<tr>
<td>SD-Z Only</td>
<td>1 male, 1 female; 4 pin, 0.96” (24.38 mm) diameter; connects to SC or NSC Cable</td>
</tr>
<tr>
<td><strong>OPERATING ENVIRONMENT</strong></td>
<td></td>
</tr>
<tr>
<td>Temperature</td>
<td>0 to 50 °C (32 to 122 °F)</td>
</tr>
<tr>
<td>Humidity</td>
<td>5% to 95% RH non-condensing</td>
</tr>
<tr>
<td>Altitude</td>
<td>10,000 ft. (3,048 m) max.</td>
</tr>
<tr>
<td><strong>WARRANTY</strong></td>
<td></td>
</tr>
<tr>
<td>Limited Warranty</td>
<td>2 years</td>
</tr>
</tbody>
</table>

**SPECIFICATIONS**

<table>
<thead>
<tr>
<th>SD Spot Detector</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Operates on either 12 to 36 Vac or 18 to 36 Vdc power</td>
<td></td>
</tr>
<tr>
<td>• Includes a 14 ft. (4.2 m) leader cable</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SD-R01 Spot Detector with Relay Output</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Works with any system that accepts dry contacts</td>
<td></td>
</tr>
<tr>
<td>• Operates on 24 Vac/dc ±10%</td>
<td></td>
</tr>
<tr>
<td>• Automatically resets when conductive fluid is no longer present (AC power only; if DC power is used, device must be reset by disconnecting power momentarily)</td>
<td></td>
</tr>
<tr>
<td>• Includes a 14 ft. (4.2 m) leader cable</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SD-Z Spot Detector</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Designed for use with all RLE detection panels, with SC sensing cable to integrate both zone and spot detection into one panel</td>
<td></td>
</tr>
<tr>
<td>• Powered by the LD310, LD1000, LD5200, LDRA6, or LD2000</td>
<td></td>
</tr>
<tr>
<td>• When used with a distance read panel (LD2000 or LD5200), the location of the leak will be identified (simulates 50 feet)</td>
<td></td>
</tr>
<tr>
<td>• Includes one male and one female end connector, each on a 1 ft (30 cm) lead wire</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>MX1 Spot Detector</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Battery-operated or 12 to 30 Vdc/24 Vac powered</td>
<td></td>
</tr>
</tbody>
</table>

**Simple installation**

Simple installation – screw, or ram-set to floor (SD, SD-R01, SD-Z)

**Simple operation**

Simple operation…no maintenance

**Polymer coated**

SD, SD-R01, SD-Z models have polymer-coated sensing probes…no exposed metal that will rust

**Durability**

All models are fully potted for water resistance…maximum durability

**Solid-state design**

No moving parts to fail

*The CE mark indicates RoHS2 compliance. Please refer to the CE Declaration of Conformity for additional details.*
**POWER/ALARM**

- **LD310** or **SC NSC**
- **End Terminator (EOL)**
- **Leader cable kit (LC-Kit)**
- **Spot detector (SD-Z)**

**LD1000**

- **24 Vdc (not polarity sensitive)**
- **Normally Closed**
- **Reset Push Button**
  - White/Red (+)
  - Black (-)
- **Once triggered, device remains on until power is removed (if using Vdc power).**

**24 Vac/dc**

- **(Normally Closed, Vdc applications only)**
- **Reset Push Button**
  - Red (+)
  - Brown (Not Used)
  - Blue (N.C.)
  - Green (Comm)
  - White (N.O.)
  - Black (-)
- **Once triggered, device remains on until power is removed (if using Vdc power).**

**POWER SOURCE**

- **DIGITAL CONTROL**
  - **Digital Input**
    - Black
    - Red
    - White
    - Green

**NOTE:** Power supply not required for battery powered version

**ORDERING INFORMATION**

<table>
<thead>
<tr>
<th>MODEL</th>
<th>MANUF. PART #</th>
<th>DESCRIPTION</th>
<th>CE</th>
<th>ETL</th>
</tr>
</thead>
<tbody>
<tr>
<td>U006-0006</td>
<td>SD</td>
<td>Spot Detector, 14’ leader cable</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>U006-0007</td>
<td>SD-R01</td>
<td>Spot Detector, 14’ leader cable, relay out</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>U006-0008</td>
<td>SD-Z*</td>
<td>Spot Detector, 2x10’ leader cable</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>MX1B</td>
<td>MX1B</td>
<td>Spot Detector, battery</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>MX1V</td>
<td>MX1V</td>
<td>Spot Detector, 12 to 30 Vdc/24 Vac</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

* The SD-Z uses DIN style connectors. Connect it via the LC-KIT, or integrate it into an LC-KIT-SC/NSC cable configuration.
Verify that you have the most current version of this document. Go to https://accounts.automatedlogic.com, then select Support > Download > Documents. Important changes are listed in Document revision history at the end of this document.

© 2018 Automated Logic Corporation. All rights reserved throughout the world. Automated Logic, WebCTRL, EIKON, Eco-Screen, and BACview are registered trademarks of Automated Logic Corporation. EnergyReports, Environmental Index, OptiFlex, and OptiPoint are trademarks of Automated Logic Corporation. All other trademarks are the property of their respective owners.

This page does not contain any export regulated technical data.
Contents

What is the SE563a controller? ................................................................. 1
  Driver and control programs ................................................................. 1
  Specifications ......................................................................................... 1
  Inputs .................................................................................................... 3
  Binary outputs ..................................................................................... 4
  Analog outputs ................................................................................... 4
  Zone sensors ....................................................................................... 4
  Touchscreen devices ........................................................................... 5

To mount the SE563a ........................................................................... 5

Wiring for power .................................................................................. 6
  To wire for power ................................................................................. 6

To address the SE563a ......................................................................... 6

Wiring for communications ................................................................ 7
  Wiring specifications ........................................................................... 7
  To wire the SE563a for communications ................................................. 7

Wiring inputs and outputs ................................................................... 8
  Wiring specifications ........................................................................... 8
  To wire inputs and outputs ................................................................. 9

Wiring devices to the SE563a’s Rnet port ............................................. 11

Wiring a LogiStat sensor to the SE563a .............................................. 11

Downloading the SE563a ................................................................... 11
  To download from the WebCTRL® interface ......................................... 12

To assign inputs or outputs to points .................................................. 12
  Input values ....................................................................................... 13
  Output values ................................................................................... 14
  Resolution values ............................................................................. 14
  Offset/Polarity values ...................................................................... 15

To set up the driver ............................................................................. 15
  Driver ............................................................................................... 16
  Device ............................................................................................... 17
  Notification Classes ........................................................................ 17
  Calendars ......................................................................................... 17
  Common Alarms ............................................................................. 19
  Custom Translation Tables ............................................................... 19
  Switch and Jumper Positions ............................................................ 19

To communicate through the Local Access port ............................... 20
  To set up a local access connection in the WebCTRL® interface ........ 20

Troubleshooting ................................................................................... 21
  LED’s ............................................................................................... 21
  To format the controller .................................................................... 22
  To get the SE563a’s serial number .................................................... 22
  Recovering from a power outage ....................................................... 23
  To replace the SE563a’s battery ......................................................... 23
  To take the SE563a out of service .................................................... 23

Compliance .......................................................................................... 24
  FCC Compliance .............................................................................. 24
  CE Compliance .............................................................................. 24
  BACnet Compliance ....................................................................... 24

Appendix - SE563a coverplate ............................................................ 25

Document revision history ................................................................. 26

This page does not contain any export regulated technical data.
What is the SE563a controller?

The SE563a controller controls rooftop air handling units (AHUs), other large pieces of equipment, or zones. You can mount the SE563a inside the rooftop equipment or inside an enclosed panel.

**SOFTWARE REQUIREMENT** WebCTRL® v6.0 or later

Driver and control programs

<table>
<thead>
<tr>
<th>Driver</th>
<th>drv_se563a</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum number of BACnet objects*</td>
<td>400*</td>
</tr>
<tr>
<td>Maximum number of control programs</td>
<td>2**</td>
</tr>
</tbody>
</table>

* Any points that exceed this number will not be network visible.

** Depends on number of BACnet objects and available memory.

Specifications

<table>
<thead>
<tr>
<th>Power</th>
<th>24 Vac ±10%, 50–60 Hz</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>18 VA power consumption (24 VA with BACview® device attached)</td>
</tr>
<tr>
<td></td>
<td>26 Vdc (25 V min, 30 V max)</td>
</tr>
<tr>
<td></td>
<td>Single Class 2 source only, 100 VA or less</td>
</tr>
</tbody>
</table>

BACnet Port

For communication with the controller network using ARC156 or MS/TP (9600 bps–76.8 kbps)

Rnet port

- Supports up to 10 wireless and/or ZS sensors, and one Equipment Touch or OptiPoint™ Interface
- Supplies 12 Vdc/210 mA power to the Rnet at an ambient temperature of 77 °F (25 °C) with a 24 Vac nominal power source.

**NOTE** Ambient temperature and power source fluctuations may reduce the power supplied by the Rnet port.

If the total power required by the sensors on the Rnet exceeds the power supplied by the Rnet port, use an external power source. The Wireless Adapter, Equipment Touch, or OptiPoint™ Interface must be powered by an external power source. See the specifications in each device's Technical Instructions to determine the power required.

Local Access port

For system start-up and troubleshooting

Inputs

Inputs 1 - 6 are configurable for thermistor or dry contact. Inputs 1 and 2 are also configurable for 0–5 Vdc sensors. Inputs 5 and 6 are also configurable to connect a LogiStat sensor.
<table>
<thead>
<tr>
<th>Feature</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input resolution</td>
<td>10 bit A/D</td>
</tr>
</tbody>
</table>
| Input pulse frequency               | Maximum of 10 pulses per second. Minimum pulse width required for each pulse:  
|                                    | • ON to OFF time (half cycle) is 50 msec                    |
|                                    | • ON to OFF to ON time (full cycle) is 100 msec             |
| Binary outputs                      | 5 binary outputs, relay contacts rated at 1 A max. @ 24 Vac/Vdc. Configured normally open. |
| Binary output resolution            | 10 bit D/A                                                  |
| Analog outputs                      | 3 analog outputs, 0–10 Vdc (5 mA max)                       |
| Analog output resolution            | 8 bit D/A                                                   |
| Memory                              | 1 MB non-volatile battery-backed RAM, 4 MB Flash memory, 16-bit memory bus |
| Real-time clock                     | Battery-backed real-time clock keeps track of time in event of power failure |
| Battery                             | 10-year Lithium CR2032 battery ensures the following data is retained for a maximum of 10,000 hours during power outages:  
|                                    | • Time                                                      |
|                                    | • Graphics                                                  |
|                                    | • Control programs                                          |
|                                    | • Editable properties                                       |
|                                    | • Schedules                                                 |
|                                    | • Trends                                                    |
| Protection                          | Built-in surge and transient protection for power and communications in compliance with EN61000-6-1.  
|                                    | Incoming power and network connections are protected by non-replaceable internal solid-state polyswitches that reset themselves when the condition that causes a fault returns to normal.  
|                                    | The power, network, input, and output connections are also protected against transient excess voltage/surge events lasting no more than 10 msec. |
| Status indicators                   | LEDs indicate status of communications, running, errors, and power. |
| Electrostatic Discharge (ESD) Protection |  
|                                    | • Level: 2                                                  |
|                                    | • Contact Discharge (kV): ±4                                |
|                                    | • Air-Gap Discharge (kV): ±4                                |
| Environmental operating range       | 0 to 130 °F (-17.8 to 54.4 °C), 10–90% relative humidity, non-condensing |
| Physical                            | Rugged GE C2950HF Cycoloy plastic                           |
### Overall dimensions

| A: | 5-5/8 in. (14.3 cm) |
| B: | 5-1/8 in. (13 cm) |

### Mounting dimensions

| C: | 5-1/4 in. (13.3 cm) |
| D: | 2-9/16 in. (6.5 cm) |
| E: | 3/16 in. (.5 cm) |

### Depth

1-5/8 in. (4.1 cm)

### Weight

0.44 lbs. (0.20 kg)

### BACnet support

Conforms to the BACnet Advanced Application Controller (B-AAC) Standard Device Profile as defined in ANSI/ASHRAE Standard 135-2012 (BACnet) Annex L, Protocol Revision 9

### Compliance

**United States of America:**

FCC compliant to Title CFR47, Chapter 1, Subchapter A, Part 15, Subpart B, Class A; UL Listed to UL 916, PAZX, Energy Management Equipment

**Canada:**

Industry Canada Compliant, ICES-003, Class A
cUL Listed UL 916, PAZX7, Energy Management Equipment

**Europe:**

Mark
EMC Directive 2014/30/EU
Low Voltage Directive: 2014/35/EU
RoHS Compliant: 2011/65/EU

**Australia and New Zealand:**

C-Tick Mark, AS/NZS 61000-6-4

**BACnet International:**

BACnet Test Laboratories (BTL) BACnet Protocol Revision 9

### Inputs

The SE563a has 6 inputs that accept the following signal types.

<table>
<thead>
<tr>
<th>Inputs...</th>
<th>Support this signal type...</th>
<th>Description</th>
</tr>
</thead>
</table>
| All       | Thermistor                  | Precon type 2 (10 kOhm at 77 °F/25 °C)  
Input voltage for IN-5:  1 to 2.52 Vdc  
Input voltage for all other inputs:  0.33 to 2.52 Vdc |
<p>| All       | Dry contact                 | A 3.3 Vdc wetting voltage detects contact position, resulting in a 0.3 mA maximum sense current when the contacts are closed. |
| IN-1, IN-2| 0–5 Vdc                     | The output impedance of a 0–5 Vdc source must not exceed 100 Ohms. The input impedance of the SE563a is approximately 30 kOhm. |</p>
<table>
<thead>
<tr>
<th>These inputs...</th>
<th>Support this signal type...</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>All</td>
<td>Pulse counter</td>
<td>Pulse counting up to 10 pulses per second. Minimum pulse width (on or off time) required for each pulse is 50 msec.</td>
</tr>
<tr>
<td>IN-5, IN-6</td>
<td>LogiStat*</td>
<td>IN-5–See Thermistor. IN-6–Setpoint adjust. Input voltages should be from 1.4–3.4 Vdc.</td>
</tr>
</tbody>
</table>

**Binary outputs**

The SE563a has 5 binary outputs. You can connect each output to a maximum of 24 Vac/Vdc. Each output is a dry contact rated at 1 A, 24 V maximum and is normally open.

**Analog outputs**

The SE563a has 3 analog outputs that support voltage or current devices. The controlled device must share the same ground as the controller and have the following input impedance:

<table>
<thead>
<tr>
<th>Signal Type</th>
<th>Impedance</th>
</tr>
</thead>
<tbody>
<tr>
<td>0–10 Vdc</td>
<td>min 500 Ohms, max 5 mA</td>
</tr>
</tbody>
</table>

**Zone sensors**

You can wire ZS sensors and/or a Wireless Adapter that communicates with wireless sensors to the SE563a’s Rnet port. You can have up to 10 ZS and/or wireless sensors.

**NOTES**
- A control program can use no more than 5 ZS sensors, so you must use multiple control programs if your Rnet network has more than 5 sensors.
- ZS and wireless sensors can share the Rnet with an Equipment Touch or OptiPoint™ Interface.
- An Rnet with the above devices cannot have RS sensors.
- You can wire a LogiStat or LogiStat Plus (not a LogiStat Pro) to the SE563a’s IN-5 and IN-6 inputs.

**NOTES**
- A LogiStat or LogiStat Plus wired to the SE563a cannot be used for local access.
- If you use the Rnet port, you cannot connect a LogiStat sensor to IN-5 and IN-6.
**Touchscreen devices**

You can wire an Equipment Touch or OptiPoint™ Interface to the SE563a's Rnet port to view or change the controller's property values, schedule equipment, view trends and alarms, and more, without having to access the system's server. The Rnet can have one Equipment Touch or OptiPoint™ Interface, plus ZS sensors and/or a Wireless Adapter that communicates with wireless sensors.

**NOTE** These touchscreen devices are not powered by the Rnet.

- The OptiPoint™ Interface requires a 24 Vdc external power source.
- The Equipment Touch requires a 24 Vac external power source.

**CAUTION** A touchscreen device can share a power supply with the Automated Logic® controller as long as:

- The power source shared by the controller and Equipment Touch is AC power.
- The power source shared by the controller and OptiPoint™ Interface is DC power.
- You maintain the same polarity.
- You use the power source only for Automated Logic® controllers.

**To mount the SE563a**

Screw the SE563a into an enclosed panel or inside the rooftop equipment using the mounting slots shown below. Leave about 2 in. (5 cm) on each side of the controller for wiring.
Wiring for power

⚠️ WARNING Do not apply line voltage (mains voltage) to the controller's ports and terminals.

⚠️ CAUTIONS
- The SE563a is powered by a Class 2 power source. Take appropriate isolation measures when mounting it in a control panel where non-Class 2 circuits are present.
- Automated Logic® controllers can share a power supply as long as you:
  - Maintain the same polarity.
  - Use the power supply only for Automated Logic® controllers.

To wire for power

1. Remove power from the power supply.
2. Pull the screw terminal connector from the controller's power terminals labeled Gnd and Hot.
3. Connect the transformer wires to the screw terminal connector.
4. Apply power to the power supply.
5. Measure the voltage at the SE563a's power input terminals to verify that the voltage is within the operating range of 21.6–26.4 Vac.
6. Connect a 4-inch (10.2 cm) wire from Gnd to the control panel.
7. Insert the screw terminal connector into the SE563a's power terminals.
8. Verify that the Power LED is on and the Run LED is blinking.

To address the SE563a

You must give the SE563a an address that is unique on the network. You can address the SE563a before or after you wire it for power.

1. If the SE563a has been wired for power, pull the screw terminal connector from the controller's power terminals labeled Gnd and Hot. The controller will read the address when you reapply power to it.
2. Using the rotary switches, set the controller's address to match the Address in the controller's properties dialog box in SiteBuilder. Set the Tens (10's) switch to the tens digit of the address, and set the Ones (1's) switch to the ones digit.

   EXAMPLE If the controller’s address is 25, point the arrow on the Tens (10's) switch to 2 and the arrow on the Ones (1's) switch to 5.
Wiring for communications

The SE563a communicates using BACnet on the following types of network segments:

- ARC156 communicating at 156 kbps
- MS/TP communicating at 9600 bps, 19.2 kbps, 38.4 kbps, or 76.8 kbps

**NOTE** ARC156 is a unique implementation of the industry standard ARCNET. For a summary of differences between ARCNET and ARC156, see the *ARC156 Wiring Technical Instructions*.

Wiring specifications

<table>
<thead>
<tr>
<th>For...</th>
<th>Use...</th>
<th>Maximum Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>ARC156 and MS/TP</td>
<td>22 AWG, low-capacitance, twisted, stranded, shielded copper wire</td>
<td>2000 feet (610 meters)</td>
</tr>
</tbody>
</table>

1 See the *ARC156 Wiring Technical Instructions*.
2 See the *MS/TP Networking and Wiring Technical Instructions*.

⚠️ **WARNING** Do not apply line voltage (mains voltage) to the controller's ports and terminals.

To wire the SE563a for communications

1 Pull the screw terminal connector from the controller's power terminals labeled Gnd and Hot.
2 Check the communications wiring for shorts and grounds.
3 Connect the communications wiring to the controller's screw terminals labeled Net +, Net -, and Shield.

**NOTE** Use the same polarity throughout the network segment.
4 Set the communication type and baud rate.

<table>
<thead>
<tr>
<th>For...</th>
<th>Set the BACnet Mode Jumper to... (See figure below)</th>
<th>Set DIP switches 1 and 2 to...</th>
</tr>
</thead>
<tbody>
<tr>
<td>ARC156</td>
<td>ARC156</td>
<td>N/A. Baud rate will be 156 kbps regardless of the DIP switch settings.</td>
</tr>
<tr>
<td>MS/TP</td>
<td>MSTP</td>
<td>The appropriate baud rate. See the MSTP Baud Rate diagram on the controller.</td>
</tr>
</tbody>
</table>

**NOTE** Use the same baud rate for all controllers on the network segment.

5 If the SE563a is at either end of a network segment, connect a BT485 to the SE563a.

6 Insert the power screw terminal connector into the SE563a’s power terminals.

7 Verify communication with the network by viewing a Module Status report in the WebCTRL® interface.

### Wiring inputs and outputs

#### Wiring specifications

**Input wiring**

<table>
<thead>
<tr>
<th>Input</th>
<th>Maximum length</th>
<th>Minimum gauge</th>
<th>Shielding</th>
</tr>
</thead>
<tbody>
<tr>
<td>0–5 Vdc</td>
<td>1000 feet (305 meters)</td>
<td>24 AWG</td>
<td>Shielded</td>
</tr>
<tr>
<td>Thermistor</td>
<td>1000 feet (305 meters)</td>
<td>22 AWG</td>
<td>Shielded</td>
</tr>
<tr>
<td>Dry contact</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pulse counter TLO</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ZS sensor</td>
<td>See Wiring devices to the SE563a’s Rnet port (page 11).</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wireless Adapter for wireless sensors</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Equipment Touch</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OptiPoint™ Interface</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Output wiring
To size output wiring, consider the following:

- Total loop distance from the power supply to the controller, and then to the controlled device
  NOTE Include the total distance of actual wire. For 2-conductor wires, this is twice the cable length.
- Acceptable voltage drop in the wire from the controller to the controlled device
- Resistance (Ohms) of the chosen wire gauge
- Maximum current (Amps) the controlled device requires to operate

To wire inputs and outputs

⚠️ WARNING Do not apply line voltage (mains voltage) to the controller's ports and terminals.

1 Verify that the SE563a’s power and communications connections work properly.
2 Pull the screw terminal connector from the controller’s power terminals labeled Gnd and Hot.
3 Connect the input wiring to the screw terminals on the SE563a.

NOTES
○ Connect the shield wire to the Gnd terminal with the ground wire.
○ IN-5 and IN-6 share the Gnd terminal above IN-5.
4 Set the appropriate jumpers on the SE563a.

<table>
<thead>
<tr>
<th>To use...</th>
<th>For...</th>
</tr>
</thead>
<tbody>
<tr>
<td>IN-1 or IN-2</td>
<td>Thermistor Dry contact 0–5 Vdc</td>
</tr>
</tbody>
</table>
| IN-5 or IN-6 | Thermistor Dry contact | Verify the following:  
• The **LStat/Rnet** jumper is on **Rnet**.  
• The **LStat/IN** jumper is on. |

5 Connect the binary output wiring to the screw terminals on the SE563a and to the controlled device.

6 Connect the analog output wiring to the screw terminals on the SE563a and to the controlled device.

7 Insert the power screw terminal connector into the SE563a's power terminals.
Wiring devices to the SE563a's Rnet port

You can wire the following devices to the SE563a's Rnet port in a daisy-chain or star configuration:

- ZS sensors
- Wireless Adapter that communicates with wireless sensors
- Equipment Touch
- OptiPoint™ Interface

See the device's Technical Instructions for complete wiring instructions.

NOTES

- ZS sensors, a Wireless Adapter, and an Equipment Touch can share the same Rnet, but not RS sensors.
- The Rnet communicates at a rate of 115 kbps.

Wiring a LogiStat sensor to the SE563a

You can wire a LogiStat or LogiStat Plus to the SE563a's IN-5 and IN-6 inputs. See the LogiStat Sensors Technical Instructions for complete wiring instructions.

Downloading the SE563a

Download the following items to the SE563a's battery-backed memory:

<table>
<thead>
<tr>
<th>Item</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Up to 2 control programs, depending on available memory</td>
<td>Must be in WebCTRL\x&lt;system_name&gt;\programs.</td>
</tr>
<tr>
<td>driv_se563a driver</td>
<td>Must be in WebCTRL\x&lt;system_name&gt;\drivers.</td>
</tr>
<tr>
<td></td>
<td>NOTE To verify that you have the driver's latest version, go to <a href="http://accounts.automatedlogic.com/download">http://accounts.automatedlogic.com/download</a>, then select &lt;Drivers &gt; ExecB. Compare the latest version to the SE563a's driver in SiteBuilder.</td>
</tr>
</tbody>
</table>

Editable properties

Schedules

If you change any of the above items or the SE563a's address after the initial download, you must download again. The first download takes longer than subsequent downloads.
CAUTIONS

- The SE563a will lose stored data when you download.
- Equipment controlled by the SE563a will shut down and restart when you download.

To download from the WebCTRL® Interface

If your network is complete, you can download from any network browser. If not complete, connect a laptop with a local copy of the system database to the SE563a's local access port. See *To communicate through the local access port* (page 20).

1. On the WebCTRL® Network tree, select the controller.
2. Click Downloads.
3. Do one of the following:
   - If the controller is in the Downloads list, go to step 4.
   - If the controller is not in the list:
     a. Click Add.
     b. In the pop-up, select the controller.
     c. Select All Content.
     d. Click Add.
     e. Click Close.
4. Select the controller in the Downloads list.
5. Click Start.

NOTES

- If the download fails, locate and resolve the problem, then retry the download.
- You can also download a controller from the Devices page.

To assign inputs or outputs to points

An input or output must be assigned to its corresponding point in the control program. This is typically done when the control program is created, but you can adjust the settings at the time of installation in the WebCTRL® interface.

1. In the WebCTRL® Geographic tree, select the equipment controlled by the SE563a.
2. On the Properties page, select the I/O Points tab.
3. In each point's Num field, type the number of the controller's corresponding input or output. For example, if you use BO1 on the SE563a for the point Pump S/S, type 1 in the Num field for Pump S/S.

NOTES

- Exp (expander number) is 00 for the SE563a.
- Do not assign the same output number to more than one point.
4 Enter the appropriate values for each input and output in the remaining columns. See Input values, Output values, Resolution values and Offset/Polarity values below.

**NOTE** You can also enter these values in the EIKON® application.

5 If you have not performed the initial download to the SE563a, you must download now so you can verify inputs and outputs.

6 To verify each input's operation, force each sensor to a known value, then compare it to the Value shown on the Properties page on the I/O Points tab.

7 To verify each output's operation, lock each output to a known condition on the I/O Points tab, then verify that the equipment operates correctly.

### Input values

<table>
<thead>
<tr>
<th>Input</th>
<th>I/O Type</th>
<th>Sensor/Actuator Type</th>
<th>Min/Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Analog (BAI)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0-5 Vdc</td>
<td>0–5 Volt</td>
<td>Linear Full Range</td>
<td>Engineering values associated with 0 Vdc (Min) and 5 Vdc (Max) ¹</td>
</tr>
<tr>
<td>Thermistor</td>
<td>Thermistor</td>
<td>Select your Thermistor type or set up and select a Non-Linear, Custom Table ²</td>
<td>N/A</td>
</tr>
<tr>
<td>Pulse to Analog (BPTA) ³</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pulse Counter</td>
<td>Counter Input</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Digital (Binary) (BBI)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dry Contact</td>
<td>Dry Contact</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>

1 The sensor reads a value and sends a corresponding signal (Volt or psi) to the SE563a's physical input. The Analog Input microblock uses the Min and Max values to linearly translate the signal into the engineering value used in subsequent control logic.

2 You can set up a custom translation table (page 19) on the driver's Custom Translation Tables pages in the WebCTRL® interface.

3 The control program must have one Pulse to Analog Input microblock for each pulse counting input.
### Output values

<table>
<thead>
<tr>
<th>Output</th>
<th>I/O Type</th>
<th>Sensor/Actuator Type</th>
<th>Min/Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Analog (BAO)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0-10 Vdc</td>
<td>Electrical 0–10 Volt</td>
<td>Linear Full Range</td>
<td>Engineering values associated with 0 Vdc (Min) and 10 Vdc (Max) (^1)</td>
</tr>
<tr>
<td>2-10 Vdc</td>
<td>Electrical 0–10 Volt</td>
<td>Linear w/Offset, 2–10 Volts</td>
<td>Engineering values associated with 2 Vdc (Min) and 10 Vdc (Max) (^1)</td>
</tr>
<tr>
<td>Digital (Binary) (BBO)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Relay</td>
<td>Relay/Triac Output</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>

\(^1\) The Analog Output microblock uses the Min and Max values to linearly translate its EIKON® wire value into a physical output signal (Volt, mA, or psi) sent from the SE563a to an actuator. For example, set Min to 0 and Max to 100 for an Analog Output microblock that receives a 0 to 100% open signal from a PID microblock and that controls a 0–10 Vdc actuator so that when the PID signal is 100%, the SE563a output is 10 Vdc. Similarly, when the PID signal is 50%, the SE563a output is 5 Vdc.

### Resolution values

**Resolution** is not particular to a type of input or output, but the driver handles analog and digital (binary) inputs and outputs differently. To set these values appropriately, you should understand how the driver uses them.

<table>
<thead>
<tr>
<th>Resolution</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Analog Input (BAI)</td>
<td>The driver truncates the microblock’s present value according to the resolution. <strong>EXAMPLE</strong> If the calculated present value is 13.789 and you set the Resolution to 0.1, the control program uses 13.7 for any calculations downstream from the microblock.</td>
</tr>
<tr>
<td>Analog Output (BAO)</td>
<td>The driver truncates the wire input value to the microblock before performing any scaling calculations. <strong>EXAMPLE</strong> If the wire input value is 13.789 and you set the Resolution to 0.1, the microblock uses 13.7 for any scaling calculations.</td>
</tr>
<tr>
<td>Digital (Binary) Inputs and Outputs</td>
<td>N/A</td>
</tr>
</tbody>
</table>
Offset/Polarity values

*Offset/Polarity* is not particular to a type of input or output, but the driver handles analog and digital (binary) inputs and outputs differently. To set these values appropriately, you should understand how the driver uses them.

<table>
<thead>
<tr>
<th>Offset/Polarity</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Analog Input (BAI)</td>
<td><strong>Offset</strong> value (positive or negative) adds a fine adjustment to a sensor reading after all scaling for calibration.</td>
</tr>
<tr>
<td></td>
<td><strong>EXAMPLE</strong> If a sensor reads 74.9°F when the actual measured value is 73.6°F, enter an <strong>Offset</strong> of –1.3 to calibrate the sensor to the measured value.</td>
</tr>
<tr>
<td>Analog Output (BAO)</td>
<td>You can use the <strong>Offset</strong> value (positive or negative) to calibrate an output, but you generally do not need to. If used, the driver adds the offset value to the wire input value before performing any scaling calculations to determine the SE563a's output.</td>
</tr>
<tr>
<td>Digital (Binary) Input (BBI)</td>
<td><strong>Polarity</strong> determines the microblock's present value when no signal is received from the equipment.</td>
</tr>
<tr>
<td></td>
<td>When no signal is received from the equipment, if <strong>Polarity</strong> is set to:</td>
</tr>
<tr>
<td></td>
<td>normal—present value is <strong>off</strong></td>
</tr>
<tr>
<td></td>
<td>reversed—present value is <strong>on</strong></td>
</tr>
<tr>
<td>Digital (Binary) Output (BBO)</td>
<td><strong>Polarity</strong> determines the SE563a's output based on the control program's signal to the microblock.</td>
</tr>
<tr>
<td></td>
<td>When the control program’s signal to the microblock is <strong>on</strong>, if <strong>Polarity</strong> is set to:</td>
</tr>
<tr>
<td></td>
<td>normal—output is <strong>on</strong></td>
</tr>
<tr>
<td></td>
<td>reversed—output is <strong>off</strong></td>
</tr>
<tr>
<td></td>
<td><strong>NOTE</strong> Regardless of <strong>Polarity</strong>, the output will be off if the SE563a loses power.</td>
</tr>
</tbody>
</table>

To set up the driver

After you download the driver and control program(s) to the SE563a, you may want to change the driver's properties in the WebCTRL® interface to suit your application.

1. On the WebCTRL® Network tree, click to the left of your SE563a.
2. Click to the left of Driver to see its children.
3. Make changes as needed on the Properties page for Driver and any of its children.
Driver

On the **Driver** page, you can change the following properties:
- Module clock synchronization and failure. See table below.
- Network Input microblock communication properties.

### BACview Control

<table>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Keypad inactivity timeout (minutes)</td>
<td>Log out the user (if a user-level password is required), turn off the backlight, and display the standby screen after this period of inactivity.</td>
</tr>
<tr>
<td>Keypad user-level password</td>
<td>Numeric password user must enter to access system through a BACview® device.</td>
</tr>
</tbody>
</table>

**TouchScreen Control**

<table>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>TouchScreen Schedule Edit Enable</td>
<td>Check this field to allow a user to edit this controller's schedules from an Equipment Touch's Schedules screen.</td>
</tr>
<tr>
<td><strong>NOTE</strong></td>
<td>Schedules edited on an Equipment Touch are not uploaded to the WebCTRL® application. This could result in the controller operating on a schedule that differs from the one you see in the WebCTRL® interface.</td>
</tr>
</tbody>
</table>

### Module Clock

<table>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clock Fail Date and Time</td>
<td>Date and time the control program uses when controller's real-time clock is invalid.</td>
</tr>
<tr>
<td><strong>TIP</strong></td>
<td>Use an occupied date and time (such as a Tuesday at 10 a.m.) so the equipment does not operate in unoccupied mode if the controller loses power during occupancy.</td>
</tr>
<tr>
<td>Time Synch Sensitivity (seconds)</td>
<td>When the controller receives a time sync request, if the difference between the controller's time and the time sync's time is greater than this field's value, the controller's time is immediately changed. If the difference is less than this field's value, the controller's time is slowly adjusted until the time is correct.</td>
</tr>
</tbody>
</table>

### Network Microblocks

<table>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of poll retries before Network Input Microblocks indicate failure</td>
<td>The maximum number of retries after the initial attempt that a Network microblock will attempt to communicate with its target device. If unsuccessful, the point will transition to an idle state for 30 seconds before attempting to communicate again. Change this field only if directed by Technical Support.</td>
</tr>
<tr>
<td>Periodic rebinding interval</td>
<td>If a microblock uses a wildcard in its address, this timer determines how often the microblock will attempt to find the nearest instance of its target. For example, if an outside air temperature address uses a wildcard, a VAV application will look for the outside air temperature on the same network segment or on the nearest device containing that object.</td>
</tr>
</tbody>
</table>
### BACnet COV Throttling

**Enable COV Throttling**
Under normal circumstances, COV Throttling should be enabled to prevent excessive network traffic if an object's COV Increment is set too low. See EXCEPTION below.

When enabled, if an object generates excessive COV broadcasts (5 updates in 3 seconds), the driver automatically throttles the broadcasts to 1 per second. Also, if the object's value updates excessively for 30 seconds, an alarm is sent to the WebCTRL® application listing all objects that are updating excessively. A Return-to-normal alarm is sent only after all objects have stopped updating excessively.

**EXCEPTION:** In rare circumstances, such as process control, a subscribing object may require COV updates more frequently than once per second. For these situations, clear this checkbox, but make sure that your network can support the increased traffic. You will also need to disable the Excessive COV alarms under the driver's Common Alarms.

### Trend Sampling

**Collect a daily midnight sample for all points in this controller that are sampling on COV**
For values that change infrequently, select to verify at midnight daily that the point is still able to communicate trend values.

### Device

On the **Device** page, you can change the following properties:

- BACnet device object properties for the SE563a
- SE563a network communication

### Configuration

**NOTE** The three APDU fields refer to all networks over which the SE563a communicates.

**Max Masters and Max Info Frames**
Apply only if the SE563a is on an MS/TP network.

### Notification Classes

A BACnet alarm's Notification Class defines:

- Alarm priority for Alarm, Fault, and Return to Normal states
- Options for BACnet alarm acknowledgment
- Where alarms should be sent (recipients)

Alarms in the WebCTRL® application use Notification Class #1. The WebCTRL® application is automatically a recipient of these alarms.
### Priorities

**NOTE** BACnet defines the following Network message priorities for Alarms and Events.

<table>
<thead>
<tr>
<th>Priority range</th>
<th>Network message priority</th>
</tr>
</thead>
<tbody>
<tr>
<td>00–63</td>
<td>Life Safety</td>
</tr>
<tr>
<td>64–127</td>
<td>Critical Equipment</td>
</tr>
<tr>
<td>128–191</td>
<td>Urgent</td>
</tr>
<tr>
<td>192–255</td>
<td>Normal</td>
</tr>
</tbody>
</table>

**Priority of Off-Normal**

BACnet priority for Alarms.

**Priority of Fault**

BACnet priority for Fault messages.

**Priority of Normal**

BACnet priority for Return-to-normal messages.

**Ack Required for Off-Normal, Fault, and Normal**

Specifies whether alarms associated with this Notification Class require a BACnet Acknowledgment for Off-Normal, Fault, or Normal alarms.

![TIP]

You can require operator acknowledgment for an Alarm or Return-to-normal message (stored in the WebCTRL® database). In the WebCTRL® interface on the Alarm > Enable/Disable tab, change the acknowledgment settings for an alarm source or an alarm category.

### Recipient List

<table>
<thead>
<tr>
<th>Recipients</th>
<th>The first row in this list is from the WebCTRL® application. Do not delete this row. Click Add if you want other BACnet devices to receive alarms associated with this Notification Class.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recipient Description</td>
<td>Name that appears in the Recipients table.</td>
</tr>
</tbody>
</table>
| Recipient Type | Use Address (static binding) for either of the following:  
- Third-party BACnet device recipients that do not support dynamic binding  
- When you want alarms to be broadcast (you must uncheck Issue Confirmed Notifications). This use is rare. |
| Days and times | The days and times during which the recipient will receive alarms. |
| Recipient Device Object Identifier | Type the Device Instance from SiteBuilder (or from the network administrator for third-party devices) in the # field. |
| Process Identifier | Change for third-party devices that use a BACnet Process Identifier other than 1. The WebCTRL® application processes alarms for any 32-bit Process Identifier. |
| Issue Confirmed Notifications | Select to have a device continue sending an alarm message until it receives delivery confirmation from the recipient. |
| Transitions to Send | Uncheck the types of alarms you do not want the recipient to get. |
Calendars

Calendars are provided in the driver for BACnet compatibility only. Instead, use the Schedules feature in the WebCTRL® interface.

Common Alarms

On these pages, you can enable/disable, change BACnet alarm properties, or set delays for the following BACnet alarms:

- Module Halted
- All Programs Stopped
- Duplicate Address
- Locked I/O
- Control Program
- Program Stopped
- Excessive COV

NOTE To set up alarm actions for controller generated alarms, see Setting up alarm actions in WebCTRL® Help.

<table>
<thead>
<tr>
<th>Module Generated Alarm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description</td>
</tr>
<tr>
<td>Short message shown on the Alarms page or in an alarm action when this type of alarm is generated.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Events</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alarm Category and Alarm Template</td>
</tr>
<tr>
<td>See Customizing alarms in WebCTRL® Help.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Enable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clear these checkboxes to disable Alarm or Return to normal messages of this type from this controller.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Notification Class</th>
</tr>
</thead>
<tbody>
<tr>
<td>Do not change this field.</td>
</tr>
</tbody>
</table>

Custom Translation Tables

You can set up a translation table that an analog input will use to translate the raw data from a non-linear sensor to the engineering units you want it to output on the wire. In the Network tree, select Custom Translation Table #1, #2, or #3. The Properties page has instructions. For the input to use the translation table, navigate to the input in the Geographic tree, select the Details tab, then set Sensor Type (Scaling Method) to Non-Linear, Custom Table #__.

Switch and Jumper Positions

The Switch and Jumper Positions page shows the current physical settings on the SE563a.
To communicate through the Local Access port

Using a computer and a USB Link Kit, you can communicate locally with the SE563a to download or to troubleshoot.

**PREREQUISITES**
- A computer with a USB port
- A USB Link Kit. See the *USB Link Kit Technical Instructions.*

**NOTE** The USB Link Kit driver is installed with a WebCTRL® v5 or later system. But if needed, you can get the latest driver from http://www.silabs.com/products/mcu/Pages/USBtoUARTBridgeVCPDrivers.aspx. Install the driver before you connect the USB Link Kit to your computer.
- v1.70 or later controller driver

⚠️ **CAUTION** If multiple controllers share power but polarity was not maintained when they were wired, the difference between the controller's ground and the computer's AC power ground could damage the USB Link Kit and the controller. If you are not sure of the wiring polarity, use a USB isolator between the computer and the USB Link Kit. Purchase a USB isolator online from a third-party manufacturer.

Connect the USB Link Kit to the computer and to the controller's Local Access port.

![USB Link Kit](image)

**NOTE** If using a USB isolator, plug the isolator into your computer's USB port, and then plug the USB Link Kit cable into the isolator.

**To set up a local access connection in the WebCTRL® interface**

For the WebCTRL® application to communicate with the Local Access port, you must do the following:

1. On the **System Configuration** tree, select **Connections**.
2. On the **Configure** tab, click **Add**.
3. From the **Type** drop-down list, select **BACnet Local Access**.
4. Optional: Edit the **Description**.
5 Type the computer's **Port** number that the USB cable is connected to.

**NOTE** To find the port number, plug the USB cable into the computer's USB port, then select **Start**
> **Control Panel** > **System** > **Device Manager** > **Ports (Com & LPT)**. The COM port number is beside
Silicon Labs CP210x USB to UART Bridge.

6 Set the **Baud** rate to 115200.
7 Click **Accept**.
8 On the **View** tab, click the button next to the BACnet/IP network, then select **BACnet Local Access**.
9 Click **Accept**.
10 On the **Configure** tab, select **BACnet Local Access**, then click **Start**.

**NOTE** If an error message appears, make sure the COM port you selected is not in use. For example, PuTTY may be open and is holding the port open.
11 On the **Network** tree, select the controller that you are connected to.
12 Click , then select **Manual Command**.
13 Type `rnet here` in the dialog box, then click **OK**.
14 On the **Properties** page, click **Module Status**. If a Modstat report appears, the WebCTRL®
application is communicating with the controller.

### Troubleshooting

If you have problems mounting, wiring, or addressing the SE563a, contact Automated Logic® Technical
Support.

### LED’s

The LED’s on the  show the status of certain functions.

<table>
<thead>
<tr>
<th>If this LED is on...</th>
<th>Status is...</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Power</strong></td>
<td>The SE563a has power.</td>
</tr>
<tr>
<td><strong>Rx</strong></td>
<td>The SE563a is receiving data from the network segment</td>
</tr>
<tr>
<td><strong>Tx</strong></td>
<td>The SE563a is transmitting data over the network segment</td>
</tr>
<tr>
<td><strong>BO#</strong></td>
<td>The binary output is active</td>
</tr>
</tbody>
</table>
The **Run** and **Error** LED's indicate controller and network status.

<table>
<thead>
<tr>
<th>If Run LED shows...</th>
<th>And Error LED shows...</th>
<th>Status is...</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 flashes per second</td>
<td>Off</td>
<td>Normal</td>
</tr>
<tr>
<td>2 flashes per second</td>
<td>2 flashes, alternating with Run LED</td>
<td>Five minute auto-restart delay after system error</td>
</tr>
<tr>
<td>2 flashes per second</td>
<td>3 flashes, then off</td>
<td>The controller has just been formatted</td>
</tr>
<tr>
<td>2 flashes per second</td>
<td>4 flashes, then pause</td>
<td>Two or more devices on this network have the same network address</td>
</tr>
<tr>
<td>2 flashes per second</td>
<td>1 flash per second</td>
<td>The controller is alone on the network</td>
</tr>
</tbody>
</table>
| 2 flashes per second| On                     | Obtain a Module Status Report (Modstat) to determine which of the following occurred:  
|                     |                        |   • Exec halted after frequent system errors  
|                     |                        |   • Control programs halted |
| 5 flashes per second| On                     | Exec start-up aborted, Boot is running |
| 5 flashes per second| Off                    | Firmware transfer in progress, Boot is running |
| 7 flashes per second| 7 flashes per second, alternating with Run LED | Ten second recovery period after brownout |
| 14 flashes per second| 14 flashes per second, alternating with Run LED | Brownout |
| On                  | On                     | Failure. Try the following solutions:  
|                     |                        |   • Turn the SE563a off, then on.  
|                     |                        |   • Format the SE563a.  
|                     |                        |   • Download the SE563a.  
|                     |                        |   • Replace the SE563a.  

**NOTE** If you resolve the issue but the **Error** LED does not turn off, cycle power to the controller.

**To format the controller**

If you cannot communicate with a controller after downloading it, as a last resort, you can manually format the controller to erase its memory.

1. Pull the screw terminal connector from the controller's power terminals labeled **Gnd** and **Hot**.
2. Make sure the address switches are not set to 0, 0.
3. Short the **Format** jumper’s pins and maintain the short for steps 3 and 4.
4. Insert the power screw terminal connector into the SE563a's power terminals.
5. Continue to short the jumper until the **Error** LED flashes three times in sync with the **Run** LED.
6. Remove the short.
7. Download the SE563a.
To get the SE563a's serial number

If you need the SE563a's serial number when troubleshooting, the number is on:
- a sticker on the back of the main controller board
- a Module Status report (Modstat) under Core (or Main) board hardware

![Core board hardware: S/N 021362247P]

To obtain a modstat in the WebCTRL® interface:
1. Select the SE563a in the Network tree.
2. On the Properties page, click Module Status.

Recovering from a power outage

The SE563a has a 10-year Lithium CR2032 battery that retains the following data for a maximum of 10,000 hours during power outages.
- Time
- Control programs
- Editable properties
- Trends
- Schedules

If the above data is lost after power returns, replace the battery and then download the SE563a. See instructions below.

To replace the SE563a's battery

If the SE563a experiences a power outage and the control program stops functioning, replace the battery.
1. Verify that the SE563a's power is on.
2. Remove the battery from the controller, making note of the battery's polarity.
3. Insert the new battery into the controller, matching the polarity of the battery you removed.
4. Download the SE563a.

To take the SE563a out of service

If needed for troubleshooting or start-up, you can stop communication between the WebCTRL® application and the SE563a.
1. On the WebCTRL® Network tree, select the SE563a.
2. On the Properties page, check Out of Service.
3. Click Accept.
Compliance

FCC Compliance

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

⚠️ CAUTION Changes or modifications not expressly approved by the responsible party for compliance could void the user's authority to operate the equipment.

CE Compliance

⚠️ WARNING This is a Class A product. In a domestic environment, this product may cause radio interference in which case the user may be required to take adequate measures.

BACnet Compliance

Compliance of listed products to requirements of ASHRAE Standard 135 is the responsibility of BACnet International. BTL® is a registered trademark of BACnet International.
Appendix - SE563a coverplate
**Document revision history**

Important changes to this document are listed below. Minor changes such as typographical or formatting errors are not listed.

<table>
<thead>
<tr>
<th>Date</th>
<th>Topic</th>
<th>Change description</th>
<th>Code*</th>
</tr>
</thead>
<tbody>
<tr>
<td>10/24/18</td>
<td>Driver and control programs</td>
<td>Changed driver to drv_se563a</td>
<td>X-D</td>
</tr>
<tr>
<td></td>
<td>Downloading the SE563a</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* For internal use only
The Automated Logic® SE563 controller is a fully programmable, native BACnet Advanced Application Controller (AAC) well suited for rooftop units, mechanical rooms, equipment closets or almost any other weather-tight location. Fully programmable using the EIKON® software graphic programming language, SE controllers use native BACnet communications over either a high-speed ARCNET 156 kbps network or a medium-speed MS/TP network to provide maximum flexibility and interoperability.

Key Features and Benefits

Application Features

- Versatile controller suitable for a variety of applications, including rooftop units, pumping systems and boilers
- Standard library of control programs available for most single equipment applications
- Supports EIKON® graphical programming software, an object-oriented tool that provides complete flexibility for any custom control sequence that you need
- Supports Automated Logic communicating sensors, which are available in a variety of zone sensing combinations and support setpoint adjustment and occupancy overrides
- Supports Automated Logic touchscreen interfaces for managing and troubleshooting the connected equipment easily
- Supports live, visual displays of control logic, which uses real-time operational data and aids in optimizing and troubleshooting system operations
- Quick & easy test and balancing process

Hardware Features

- Controls up to 14 points (5 binary outputs, 6 inputs and 3 analog outputs)
- High-speed, native BACnet over ARC156 communications delivers high speed response when you need it
- Supports native BACnet over MS/TP communications when required
- Fast, powerful, and fully distributed control allows complete independence from any other devices in the system
- Firmware upgrades can be performed remotely
- Easy startup and commissioning using the WebCTRL system user interfaces
- Battery-backed real-time clock keeps time in the event of power failure or network interruption

System Benefits

- Connects seamlessly to the WebCTRL building automation system
- Supports demand limiting and optimal start for maximum energy savings

The WebCTRL® building automation system gives you the ability to understand your building operations and analyze the results. The WebCTRL system integrates environmental, energy, security and safety systems into one powerful management tool that allows you to reduce energy consumption, increase occupant comfort, and achieve sustainable building operations. Our web-based platform allows building managers to control and access information about their HVAC, lighting, central plant and critical processes on premises or remotely at any time of day.
SE563 Single Equipment Controller

Specifications

<table>
<thead>
<tr>
<th>Specification</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>BACnet Support</strong></td>
<td>Conforms to the BACnet Advanced Application Controller (B-AAC) Standard Device as defined in BACnet 135-2001 Annex L. Tested to Protocol Revision 9. Up to 1,000 network visible BACnet objects</td>
</tr>
<tr>
<td><strong>BACnet Port</strong></td>
<td>For communication with the controller network using ARC156 or MS/TP (9600 bps–76.8 kbps)</td>
</tr>
<tr>
<td><strong>Rnet Port</strong></td>
<td>Supports: • Up to 15 ZS sensors • One Equipment Touch • Up to 4 RS Standard sensors and one RS Plus, RS Pro, or RS Pro-F sensor. <strong>NOTE</strong> Only ZS sensors can share the Rnet with an Equipment Touch.</td>
</tr>
<tr>
<td><strong>Binary Outputs</strong></td>
<td>Five binary outputs, relay contact rated at 1 A max @ 24 Vac/Vdc. Configured normally open.</td>
</tr>
<tr>
<td><strong>Analog Outputs</strong></td>
<td>Three analog outputs, 0–10 Vdc (5 mA max) at 8 bit D/A</td>
</tr>
<tr>
<td><strong>Inputs</strong></td>
<td>Inputs 1 - 6 are configurable for thermistor or dry contact. 10 bit A/D resolution Inputs 1 and 2 are also configurable for 0–5 Vdc sensors. Inputs 5 and 6 are also configurable to connect a LogiStat sensor. All of these inputs support Pulse counting up to 10 pulses per second. Minimum pulse width (on or off time) required for each pulse is 50 msec.</td>
</tr>
<tr>
<td><strong>Real-time Clock</strong></td>
<td>Battery-backed real-time clock keeps track of time in event of power failure</td>
</tr>
<tr>
<td><strong>Memory</strong></td>
<td>1 MB non-volatile battery-backed RAM, 4 MB Flash memory, 16-bit memory bus</td>
</tr>
<tr>
<td><strong>Status Indicators</strong></td>
<td>LED status indicators for EIA-485 communication, running, error, power and all binary outputs</td>
</tr>
<tr>
<td><strong>Module Addressing</strong></td>
<td>Rotary dip switches for intuitive network addressing of modules</td>
</tr>
<tr>
<td><strong>Protection</strong></td>
<td>Built-in surge and transient protection circuitry for power, communications, inputs and outputs</td>
</tr>
<tr>
<td><strong>Listed by</strong></td>
<td>UL-916 (PAZX), cUL-916 (PAZX7), FCC Part 15-Subpart B-Class A, CE</td>
</tr>
<tr>
<td><strong>Environmental</strong></td>
<td>-0ºF to 130ºF (-17.8C to 54.4ºC); 10 to 90% relative humidity, non-condensing</td>
</tr>
<tr>
<td><strong>Operating Range</strong></td>
<td>-10ºF to 130ºF (-17.8C to 54.4ºC); 10 to 90% relative humidity, non-condensing</td>
</tr>
<tr>
<td><strong>Electrostatic Discharge (ESD) Protection</strong></td>
<td>• Level: 2 • Contact Discharge (kV): ±4 • Air-Gap Discharge (kV): ±4</td>
</tr>
<tr>
<td><strong>Power Requirements</strong></td>
<td>24 Vac ± 10%, 50–60 Hz 18 VA power consumption (24 VA with BACview® device attached) 26 Vdc (25 V min, 30 V max) Single Class 2 source only, 100 VA or less</td>
</tr>
<tr>
<td><strong>Physical</strong></td>
<td>Rugged GE C2950 Cycoloy plastic</td>
</tr>
<tr>
<td><strong>Weight</strong></td>
<td>0.44 lbs. (0.20 kg)</td>
</tr>
<tr>
<td><strong>Depth</strong></td>
<td>1-5/8 in. (4.1 cm)</td>
</tr>
</tbody>
</table>

All trademarks used herein are the property of their respective owners.
Verify that you have the most current version of this document. Go to https://accounts.automatedlogic.com, then select Support > Download > Documents. Important changes are listed in Document revision history at the end of this document.

© 2018 Automated Logic Corporation. All rights reserved throughout the world. Automated Logic, WebCTRL, EIKON, Eco-Screen, and BACview are registered trademarks of Automated Logic Corporation. EnergyReports, Environmental Index, OptiFlex, and OptiPoint are trademarks of Automated Logic Corporation. All other trademarks are the property of their respective owners.

This page does not contain any export regulated technical data.
## Contents

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>What is the SE6104a controller?</td>
<td>1</td>
</tr>
<tr>
<td>Driver and control programs</td>
<td>1</td>
</tr>
<tr>
<td>Specifications</td>
<td>1</td>
</tr>
<tr>
<td>Inputs</td>
<td>3</td>
</tr>
<tr>
<td>Digital outputs</td>
<td>4</td>
</tr>
<tr>
<td>Analog outputs</td>
<td>4</td>
</tr>
<tr>
<td>Zone sensors</td>
<td>5</td>
</tr>
<tr>
<td>Touchscreen devices</td>
<td>5</td>
</tr>
<tr>
<td>To mount the SE6104a</td>
<td>5</td>
</tr>
<tr>
<td>Wiring for power</td>
<td>6</td>
</tr>
<tr>
<td>To wire for power</td>
<td>6</td>
</tr>
<tr>
<td>To address the SE6104a</td>
<td>6</td>
</tr>
<tr>
<td>Wiring for communications</td>
<td>7</td>
</tr>
<tr>
<td>Wiring specifications</td>
<td>7</td>
</tr>
<tr>
<td>To wire the SE6104a for communications</td>
<td>7</td>
</tr>
<tr>
<td>Wiring Inputs and outputs</td>
<td>8</td>
</tr>
<tr>
<td>Wiring specifications</td>
<td>8</td>
</tr>
<tr>
<td>To wire inputs and outputs</td>
<td>9</td>
</tr>
<tr>
<td>Wiring devices to the SE6104a’s Rnet port</td>
<td>11</td>
</tr>
<tr>
<td>Wiring a LogiStat sensor to the SE6104a</td>
<td>12</td>
</tr>
<tr>
<td>LogiStat wiring specifications</td>
<td>12</td>
</tr>
<tr>
<td>To wire a LogiStat sensor</td>
<td>12</td>
</tr>
<tr>
<td>Downloading the SE6104a</td>
<td>12</td>
</tr>
<tr>
<td>To download from the WebCTRL® interface</td>
<td>13</td>
</tr>
<tr>
<td>To assign inputs or outputs to points</td>
<td>13</td>
</tr>
<tr>
<td>Input values</td>
<td>14</td>
</tr>
<tr>
<td>Output values</td>
<td>15</td>
</tr>
<tr>
<td>Resolution values</td>
<td>15</td>
</tr>
<tr>
<td>Offset/Polarity values</td>
<td>16</td>
</tr>
<tr>
<td>To use the Auto-Off-On switches</td>
<td>16</td>
</tr>
<tr>
<td>To set up the driver</td>
<td>17</td>
</tr>
<tr>
<td>Driver</td>
<td>17</td>
</tr>
<tr>
<td>Device</td>
<td>19</td>
</tr>
<tr>
<td>Notification Classes</td>
<td>19</td>
</tr>
<tr>
<td>Calendars</td>
<td>20</td>
</tr>
<tr>
<td>Common and Specific Alarms</td>
<td>20</td>
</tr>
<tr>
<td>Custom Translation Tables</td>
<td>21</td>
</tr>
<tr>
<td>Switch and Jumper Positions</td>
<td>21</td>
</tr>
<tr>
<td>To communicate through the Local Access port</td>
<td>21</td>
</tr>
<tr>
<td>To set up a local access connection in the WebCTRL® interface</td>
<td>22</td>
</tr>
<tr>
<td>Troubleshooting</td>
<td>23</td>
</tr>
<tr>
<td>LED’s</td>
<td>23</td>
</tr>
<tr>
<td>To format the controller</td>
<td>24</td>
</tr>
<tr>
<td>To get the SE6104a’s serial number</td>
<td>24</td>
</tr>
<tr>
<td>Recovering from a power outage</td>
<td>25</td>
</tr>
<tr>
<td>To replace the SE6104a’s battery</td>
<td>25</td>
</tr>
<tr>
<td>To take the SE6104a out of service</td>
<td>25</td>
</tr>
<tr>
<td>Compliance</td>
<td>26</td>
</tr>
<tr>
<td>FCC Compliance</td>
<td>26</td>
</tr>
<tr>
<td>CE Compliance</td>
<td>26</td>
</tr>
<tr>
<td>BACnet Compliance</td>
<td>26</td>
</tr>
<tr>
<td>Appendix - SE6104a coverplate</td>
<td>27</td>
</tr>
<tr>
<td>Document revision history</td>
<td>28</td>
</tr>
</tbody>
</table>
What is the SE6104a controller?

The SE6104a controller controls rooftop air handling units (AHUs), other large single pieces of equipment, or zones. You can mount the SE6104a on or inside the rooftop equipment.

Driver and control programs

<table>
<thead>
<tr>
<th>Driver</th>
<th>DRV_SE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum number of BACnet objects*</td>
<td>600*</td>
</tr>
<tr>
<td>Maximum number of control programs</td>
<td>5**</td>
</tr>
</tbody>
</table>

**NOTE** To have more than one control program, you must use the v6.00a-067 or later driver.

* Any points that exceed this number will not be network visible.
** Depends on number of BACnet objects and available memory.

Specifications

<table>
<thead>
<tr>
<th>Specification</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power</td>
<td>24 Vac ±10%, 50–60 Hz, 20 VA power consumption (38.4 VA with a BACview® device attached) single Class 2 source only, 100 VA or less</td>
</tr>
<tr>
<td>BACnet port</td>
<td>For communication with the controller network using ARC156 or MS/TP (9600 bps–76.8 kbps)</td>
</tr>
<tr>
<td>Local Access port</td>
<td>For system start-up and troubleshooting</td>
</tr>
</tbody>
</table>
**NOTE** The SE6104a does not support the LogiStat Pro. Use an RS Pro on the Rnet port instead. |
| Rnet port                  | • Supports up to 15 wireless and/or ZS sensors, and one Equipment Touch or OptiPoint™ Interface  
• Supplies 12 Vdc/210 mA power to the Rnet at an ambient temperature of 77 °F (25 °C) with a 24 Vac nominal power source.  
**NOTE** Ambient temperature and power source fluctuations may reduce the power supplied by the Rnet port.  
**NOTE** If the total power required by the sensors on the Rnet exceeds the power supplied by the Rnet port, use an external power source. The Wireless Adapter, Equipment Touch, or OptiPoint™ Interface must be powered by an external power source. See the specifications in each device's Technical Instructions to determine the power required. |
### Inputs

- 10 inputs, configurable for 0–10 Vdc, 0–20 mA, RTD, thermistor, or dry contact, and one LogiStat port. Inputs 1 and 2 are also configurable for pulse counter or timed local override (TLO).

**NOTE** If using a LogiStat or LogiStat Plus, temperature and setpoint adjust inputs replace inputs 9 and 10, making 9 and 10 unavailable.

### Input resolution

12 bit A/D

### Input pulse frequency

40 pulses per second. Minimum pulse width (on or off time) required for each pulse is 12.5 msec.

### Digital outputs

6 digital outputs, relay contacts rated at 3 A max @ 24 Vac. Configured normally open.

### Analog outputs

4 analog outputs, 0–10 Vdc or 0–20 mA selectable

### Output resolution

8 bit D/A

### Microprocessor

High speed 16-bit microprocessor with ARCNET communication co-processor

### Memory

1 MB non-volatile battery-backed RAM, 1 MB Flash memory, 16-bit memory bus

### Real-time clock

Battery-backed real-time clock keeps track of time in event of power failure

### Battery

10-year Lithium CR2032 battery retains the following data for a maximum of 10,000 hours during power outages: time, control programs, editable properties, schedules, and trends. A low battery is indicated by a low battery alarm in the WebCTRL® application.

### Protection

Built-in surge and transient protection for power and communications in compliance with EN61000-6-1.

Incoming power and network connections are protected by non-replaceable internal solid-state polyswitches that reset themselves when the condition that causes a fault returns to normal.

The power, network, input, and output connections are also protected against transient excess voltage/surge events lasting no more than 10 msec.

### BT485 connector

You attach a BT485 (not included) to a controller at the beginning and end of a network segment to add bias and to terminate a network segment.

### Status indicators

LEDs indicate status of communications, running, errors, power, and digital outputs

### Environmental operating range

-20 to 140°F (-29 to 60°C), 10–90% relative humidity, non-condensing

**NOTE** The controllers should be mounted in a protective enclosure.

### Physical

Rugged aluminum cover, removable screw-type terminal blocks

### Overall dimensions

<table>
<thead>
<tr>
<th>Width</th>
<th>Height</th>
</tr>
</thead>
<tbody>
<tr>
<td>8 5/16 in. (21.1 cm)</td>
<td>7 in. (17.8 cm)</td>
</tr>
</tbody>
</table>

### Mounting dimensions

<table>
<thead>
<tr>
<th>Width</th>
<th>Height</th>
</tr>
</thead>
<tbody>
<tr>
<td>7 7/8 in. (19.9 cm)</td>
<td>5 in. (12.7 cm)</td>
</tr>
</tbody>
</table>
Recommended panel depth 1 1/2 in. (3.8 cm)

Weight 1.05 lbs (0.48 kg)

BACnet support Conforms to the BACnet Advanced Application Controller (B-AAC) Standard Device Profile as defined in ANSI/ASHRAE Standard 135-2012 (BACnet) Annex L, Protocol Revision 9

Listed by UL-916 (PAZX), cUL-916 (PAZX7), FCC Part 15-Subpart B-Class A, CE

Inputs
The SE6104a has 10 inputs that accept the following signal types.

<table>
<thead>
<tr>
<th>These Inputs...</th>
<th>Support this signal type...</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>All</td>
<td>Thermistor ¹</td>
<td>Precon type 2 (10 kOhm at 77°F). Input voltages should be from 0.489 Vdc to 3.825 Vdc for thermistors.</td>
</tr>
<tr>
<td>All</td>
<td>Dry contact</td>
<td>A 5 Vdc wetting voltage detects contact position, resulting in a 1 mA maximum sense current when the contacts are closed.</td>
</tr>
<tr>
<td>All</td>
<td>0–5 Vdc</td>
<td>The output impedance of a 0–5 Vdc or a 0–10 Vdc source must not exceed 200 Ohms. The input impedance of the SE6104a is approximately 20 kOhm.</td>
</tr>
<tr>
<td>All</td>
<td>0–10 Vdc</td>
<td>The input resistance on the positive (+) terminal is 250 Ohms. The <strong>Aux Power Out</strong> connector is capable of supplying 24 Vdc to multiple 4–20 mA transducers, but the total current demanded must not exceed 200 mA. If the voltage measured from the <strong>Aux Power Out</strong> connector to <strong>Gnd</strong> is less than 18 Vdc, you need to use an external power supply.</td>
</tr>
<tr>
<td>All</td>
<td>RTD ¹</td>
<td>Platinum - 1 kOhm at 32°F (0°C) Nickel/Iron - 1 kOhm at 70°F (21°C) Balco TS8000 - 1 kOhm at 70°F (21°C) Input voltages should be from 0.6–1.2V <strong>NOTE</strong> Automated Logic® recommends use of an external current transducer between an RTD and the SE6104a to improve accuracy and resolution.</td>
</tr>
<tr>
<td>IN-1, IN-2</td>
<td>Pulse counter ²</td>
<td>Pulse counting up to 40 pulses per second. Minimum pulse width (on or off time) required for each pulse is 12.5 msec.</td>
</tr>
<tr>
<td>IN-1, IN-2</td>
<td>Timed local override</td>
<td>A momentary contact switch that overrides a schedule and turns equipment on for a defined period of time. The override time added for each push of the button and the maximum allowable On time are software adjustable.</td>
</tr>
</tbody>
</table>
### Digital outputs

The SE6104a has 6 digital outputs. You can connect each output to a maximum of 24 Vac. Each output is a dry contact rated at 3 A maximum and is normally open.

### Analog outputs

The SE6104a has 4 analog outputs that support 0–10 Vdc or 0–20 mA devices.

<table>
<thead>
<tr>
<th>If output controls a...</th>
<th>Resistance to ground must be...</th>
</tr>
</thead>
<tbody>
<tr>
<td>0–10 Vdc device</td>
<td>500 Ohms minimum</td>
</tr>
<tr>
<td>0–20 mA device</td>
<td>800 Ohms maximum</td>
</tr>
</tbody>
</table>

**NOTES**

- The SE6104a supervises all outputs.
- The device must share the same ground as the controller.
- The total output current from all outputs and the **Aux Power Out** connector must not exceed:
  - 200 mA at 113°F
  - 81 mA at 140°F

For temperatures above 113°F, use the following equation to calculate the total current at 4.4 mA per degree:

\[ \text{200mA} - (\text{(max. expected temp. - 113°F)} \times 4.44 \text{ mA/F}) \]
Zone sensors

You can wire ZS sensors and/or a Wireless Adapter that communicates with wireless sensors to the SE6104a's Rnet port. You can have up to 15 ZS and/or wireless sensors.

NOTES

• A control program can use no more than 5 ZS sensors, so you must use multiple control programs if your Rnet network has more than 5 sensors.
• ZS and wireless sensors can share the Rnet with an Equipment Touch or OptiPoint™ Interface.
• An Rnet with the above devices cannot have RS sensors.

NOTES

○ A LogiStat or LogiStat Plus wired to the SE6104a cannot be used for local access.
○ If you use the Rnet port, you cannot connect a LogiStat sensor to LogiStat port.

Touchscreen devices

You can wire an Equipment Touch or OptiPoint™ Interface to the SE6104a's Rnet port to view or change the controller's property values, schedule equipment, view trends and alarms, and more, without having to access the system's server. The Rnet can have one Equipment Touch or OptiPoint™ Interface, plus ZS sensors and/or a Wireless Adapter that communicates with wireless sensors.

NOTE These touchscreen devices are not powered by the Rnet.

• The OptiPoint™ Interface requires a 24 Vdc external power source.
• The Equipment Touch requires a 24 Vac external power source.

⚠️ CAUTION A touchscreen device can share a power supply with the Automated Logic® controller as long as:

• The power source shared by the controller and Equipment Touch is AC power.
• The power source shared by the controller and OptiPoint™ Interface is DC power.
• You maintain the same polarity.
• You use the power source only for Automated Logic® controllers.

To mount the SE6104a

Screw the SE6104a into an enclosed panel using the mounting holes provided on the cover plate. Leave about 2 in. (5 cm) on each side of the controller for wiring.
Wiring for power

⚠️ WARNING  Do not apply line voltage (mains voltage) to the controller's ports and terminals.

⚠️ CAUTIONS
- The SE6104a is powered by a Class 2 power source. Take appropriate isolation measures when mounting it in a control panel where non-Class 2 circuits are present.
- Automated Logic® controllers can share a power supply as long as you:
  - Maintain the same polarity.
  - Use the power supply only for Automated Logic® controllers.

To wire for power

1. Turn off the SE6104a's power to prevent it from powering up before you can verify the correct voltage.
2. Remove power from the 24 Vac transformer.
3. Pull the screw terminal connector from the controller's power terminals labeled Gnd and 24 Vac.
4. Connect the transformer wires to the screw terminal connector.
5. Apply power to the transformer.
6. Measure the voltage at the SE6104a's power input terminals to verify that the voltage is within the operating range of 21.6–26.4 Vac.
7. Insert the screw terminal connector into the SE6104a's power terminals.
8. Turn on the SE6104a's power.
9. Verify that the Power LED is on and the Run LED is blinking.

To address the SE6104a

You must give the SE6104a an address that is unique on the network. You can address the SE6104a before or after you wire it for power.

1. If wired for power, turn off the controller's power.
2. NOTE  The controller only reads the rotary switch positions during power up or upon reset.
3. Using the rotary switches, set the controller's address to match the Address in the controller's properties dialog box in SiteBuilder. Set the Tens (10's) switch to the tens digit of the address, and set the Ones (1's) switch to the ones digit.

   EXAMPLE  If the controller's address is 25, point the arrow on the Tens (10's) switch to 2 and the arrow on the Ones (1's) switch to 5.
Wiring for communications

The SE6104a communicates using BACnet on the following types of network segments:

- ARC156 communicating at 156 kbps
- MS/TP communicating at 9600 bps, 19.2 kbps, 38.4 kbps, or 76.8 kbps

**NOTE** ARC156 is a unique implementation of the industry standard ARCNET. For a summary of differences between ARCNET and ARC156, see the **ARC156 Wiring Technical Instructions**.

Wiring specifications

<table>
<thead>
<tr>
<th>For...</th>
<th>Use...</th>
<th>Maximum Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>ARC156 and MS/TP</td>
<td>22 AWG, low-capacitance, twisted, stranded, shielded copper wire</td>
<td>2000 feet (610 meters)</td>
</tr>
</tbody>
</table>

1 See the **ARC156 Wiring Technical Instructions**.

2 See the **MS/TP Networking and Wiring Technical Instructions**.

**WARNING** Do not apply line voltage (mains voltage) to the controller's ports and terminals.

To wire the SE6104a for communications

1 Turn off the SE6104a's power.
2 Check the communications wiring for shorts and grounds.
3 Connect the communications wiring to the controller's screw terminals labeled Net +, Net -, and Shield.
   **NOTE** Use the same polarity throughout the network segment.
4 Set the communication type and baud rate.

<table>
<thead>
<tr>
<th>For...</th>
<th>Set DIP switch 4 to...</th>
<th>Set DIP switches 1 and 2 to...</th>
</tr>
</thead>
<tbody>
<tr>
<td>ARC156</td>
<td><strong>ARC156</strong></td>
<td>N/A. Baud rate will be 156 kbps regardless of the DIP switch settings.</td>
</tr>
<tr>
<td>MS/TP</td>
<td><strong>MSTP</strong></td>
<td>The appropriate baud rate. See the <strong>MSTP Baud</strong> diagram on the controller.</td>
</tr>
</tbody>
</table>

**NOTE** Use the same baud rate for all controllers on the network segment.

5 If the SE6104a is at either end of a network segment, connect a BT485 to the SE6104a.
6 Turn on the SE6104a's power.
7 Verify communication with the network by viewing a Module Status report in the WebCTRL® interface.
Wiring inputs and outputs

Wiring specifications

Input wiring

<table>
<thead>
<tr>
<th>Input</th>
<th>Maximum length</th>
<th>Minimum gauge</th>
<th>Shielding</th>
</tr>
</thead>
<tbody>
<tr>
<td>0–5 Vdc</td>
<td>1000 feet</td>
<td>26 AWG</td>
<td>Shielded</td>
</tr>
<tr>
<td>0–10 Vdc</td>
<td>(305 meters)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0–20 mA</td>
<td>3000 feet</td>
<td>26 AWG</td>
<td>Shielded or unshielded</td>
</tr>
<tr>
<td></td>
<td>(914 meters)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Thermistor</td>
<td>1000 feet</td>
<td>22 AWG</td>
<td>Shielded</td>
</tr>
<tr>
<td>Dry contact</td>
<td>(305 meters)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pulse counter</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TLO</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RTD</td>
<td>100 feet</td>
<td>22 AWG</td>
<td>Shielded</td>
</tr>
<tr>
<td></td>
<td>(30 meters)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ZS sensor</td>
<td>See Wiring devices to the SE6104a's Rnet port (page 11).</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wireless Adapter for wireless sensors</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Equipment Touch</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OptiPoint™ Interface</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

NOTE Automated Logic® recommends use of an external current transducer between an RTD and the SE6104a to improve accuracy and resolution.

Output wiring

To size output wiring, consider the following:

- Total loop distance from the power supply to the controller, and then to the controlled device
  NOTE Include the total distance of actual wire. For 2-conductor wires, this is twice the cable length.
- Acceptable voltage drop in the wire from the controller to the controlled device
- Resistance (Ohms) of the chosen wire gauge
- Maximum current (Amps) the controlled device requires to operate
To wire inputs and outputs

**WARNING** Do not apply line voltage (mains voltage) to the controller's ports and terminals.

1. Verify that the SE6104a's power and communications connections work properly.
2. Turn off the SE6104a's power.
3. Connect the input wiring to the screw terminals on the SE6104a.

Set Universal Input Mode
Select jumper to...

- Thermistor
- Dry-contact
- RTD

+ Any input
+ Gnd

External 24 Vdc
half-wave
power supply

2 wire

3 wire

4 wire

Out
V+ Gnd
n/c

Out
V+ Gnd

Out +
Out -
Gnd

V+ 0-5 Vdc,
0-10 Vdc,
or 4-20 mA

V+ 0-5 Vdc,
0-10 Vdc,
or 4-20 mA

V+ 0-5 Vdc,
0-10 Vdc,
or 4-20 mA

mA
Volts
mA
Volts
mA
Volts
mA
Volts

0-5 Vdc,
0-10 Vdc,
or 4-20 mA

0-5 Vdc,
0-10 Vdc,
or 4-20 mA

0-5 Vdc,
0-10 Vdc,
or 4-20 mA

0-5 Vdc,
0-10 Vdc,
or 4-20 mA

Aux Power Out
+24 Vdc
200 mA max
NOTES
- Connect the shield wire to the GND terminal with the ground wire.
- Use only IN-1 or IN-2 for pulse counter or timed local override.
- For a loop-powered 4-20 mA sensor, wire the sensor's positive terminal to the + terminal on the SE6104a's Aux Power Out connector. Wire the sensor's negative terminal to an input's + terminal.

4 Set the appropriate jumpers on the SE6104a.

<table>
<thead>
<tr>
<th>To use...</th>
<th>For...</th>
</tr>
</thead>
<tbody>
<tr>
<td>Any input</td>
<td>Thermistor&lt;br&gt;Dry contract&lt;br&gt;0–5 Vdc&lt;br&gt;0-10 Vdc&lt;br&gt;0–20 mA&lt;br&gt;RTD</td>
</tr>
</tbody>
</table>

| Aux Power Out connector | Loop-powered<br>4-20 mA | Set the **Select** jumper to +5V or +24V as required by the sensor. |

5 Connect the digital output wiring to the screw terminals on the SE6104a and to the controlled device.
6 Connect the analog output wiring to the screw terminals on the SE6104a and to the controlled device.

7 Set the AO Mode Select jumper to...

8 Turn on the SE6104a's power.

Wiring devices to the SE6104a's Rnet port

You can wire the following devices to the SE6104a's Rnet port in a daisy-chain or star configuration:

- ZS sensors
- Wireless Adapter that communicates with wireless sensors
- Equipment Touch
- OptiPoint™ Interface

See the device's Technical Instructions for complete wiring instructions.

NOTES

- ZS sensors, a Wireless Adapter, and an Equipment Touch can share the same Rnet, but not RS sensors.
- The Rnet communicates at a rate of 115 kbps.
Wiring a LogiStat sensor to the SE6104a


LogiStat wiring specifications

Use 22 AWG, unshielded wire, maximum length 100 feet (30 meters).

To wire a LogiStat sensor

1. Turn off the SE6104a's power.
2. Wire each terminal on the SE6104a's Lstat port to the terminal of the same name on the LogiStat.
4. Turn on the SE6104a's power.

Downloading the SE6104a

Download the following items to the SE6104a's battery-backed memory:

<table>
<thead>
<tr>
<th>Item</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control program</td>
<td>Must be in WebCTRL\webroot&lt;system_name&gt;\programs.</td>
</tr>
<tr>
<td>DRV_SE driver</td>
<td>Must be in WebCTRL\webroot&lt;system_name&gt;\drivers.</td>
</tr>
<tr>
<td></td>
<td><strong>NOTE</strong> To verify that you have the driver's latest version, go to <a href="http://accounts.automatedlogic.com/download">http://accounts.automatedlogic.com/download</a>, then select Drivers &gt; ExecB. Compare the latest version to the SE6104a's driver in SiteBuilder.</td>
</tr>
<tr>
<td>Editable properties</td>
<td></td>
</tr>
<tr>
<td>Schedules</td>
<td></td>
</tr>
</tbody>
</table>

If you change any of the above items or the SE6104a's address after the initial download, you must download again. The first download takes longer than subsequent downloads.

⚠️ CAUTIONS

- The SE6104a will lose stored data when you download.
- Equipment controlled by the SE6104a will shut down and restart when you download.
To download from the WebCTRL® Interface

If your network is complete, you can download from any network browser. If not complete, connect a laptop with a local copy of the system database to the SE6104a's local access port. See To communicate through the local access port (page 21).

1. On the WebCTRL® Network tree, select the controller.
2. Click Downloads.
3. Do one of the following:
   o If the controller is in the Downloads list, go to step 4.
   o If the controller is not in the list:
     a. Click Add.
     b. In the pop-up, select the controller.
     c. Select All Content.
     d. Click Add.
     e. Click Close.
4. Select the controller in the Downloads list.
5. Click Start.

NOTES
• If the download fails, locate and resolve the problem, then retry the download.
• You can also download a controller from the Devices page.

To assign inputs or outputs to points

An input or output must be assigned to its corresponding point in the control program. This is typically done when the control program is created, but you can adjust the settings at the time of installation in the WebCTRL® interface.

1. In the WebCTRL® Geographic tree, select the equipment controlled by the SE6104a.
2. On the Properties page, select the I/O Points tab.
3. In each point's Num field, type the number of the controller's corresponding input or output. For example, if you use DO1 on the SE6104a for the point Pump S/S, type 1 in the Num field for Pump S/S.

   NOTES
   o Exp (expander number) is 00 for the SE6104a.
   o Do not assign the same output number to more than one point.
4. Enter the appropriate values for each input and output in the remaining columns. See Input values, Output values, Resolution values and Offset/Polarity values below.
   NOTE You can also enter these values in the EIKON® LogicBuilder application.
5. If you have not performed the initial download to the SE6104a, you must download now so you can verify inputs and outputs.
6. To verify each input's operation, force each sensor to a known value, then compare it to the Value shown on the Properties page on the I/O Points tab.
7. To verify each output's operation, lock each output to a known condition on the I/O Points tab, then verify that the equipment operates correctly.
### Input values

<table>
<thead>
<tr>
<th>Input</th>
<th>I/O Type</th>
<th>Sensor/Actuator Type</th>
<th>Min/Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Analog (BAI)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0-5 Vdc</td>
<td>0–5 Volt</td>
<td>Linear Full Range</td>
<td>Engineering values associated with 0 Vdc (Min) and 5 Vdc (Max) ¹</td>
</tr>
<tr>
<td>0-10 Vdc</td>
<td>0–10 Volt</td>
<td>Linear Full Range</td>
<td>Engineering values associated with 0 Vdc (Min) and 10 Vdc (Max) ¹</td>
</tr>
<tr>
<td>2-10 Vdc</td>
<td>0–10 Volt</td>
<td>Linear w/Offset, 2–10 Volts</td>
<td>Engineering values associated with 2 Vdc (Min) and 10 Vdc (Max) ¹</td>
</tr>
<tr>
<td>0-20 mA</td>
<td>0–20 mA</td>
<td>Linear Full Range</td>
<td>Engineering values associated with 0 mA (Min) and 20 mA (Max) ¹</td>
</tr>
<tr>
<td>4-20 mA</td>
<td>0–20 mA</td>
<td>Linear w/Offset, 4–20 mA</td>
<td>Engineering values associated with 4 mA (Min) and 20 mA (Max) ¹</td>
</tr>
<tr>
<td>RTD</td>
<td>RTD Input</td>
<td>Select your RTD type or set up and select a Non-Linear, Custom Table ²</td>
<td>N/A</td>
</tr>
<tr>
<td>Thermistor</td>
<td>Thermistor</td>
<td>Select your Thermistor type or set up and select a Non-Linear, Custom Table ²</td>
<td>N/A</td>
</tr>
<tr>
<td>Pulse to Analog (BPTA) ³</td>
<td>Pulse Counter</td>
<td>Counter Input</td>
<td>N/A</td>
</tr>
<tr>
<td>Digital (Binary) (BBI)</td>
<td>Dry Contact</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>

¹ The sensor reads a value and sends a corresponding signal (Volt, mA, or psi) to the SE6104a's physical input. The Analog Input microblock uses the Min and Max values to linearly translate the signal into the engineering value used in subsequent control logic. For example, set Min to 0 and Max to 10 for a 4–20 mA sensor that measures velocity from 0.0 to 10.0 inches/second so that when the input reads 4 mA, the microblock outputs a value of 0. Similarly, when the input reads 8 mA, the microblock outputs a value of 2.5.

² You can set up a custom translation table (page 21) on the driver's Custom Translation Tables pages in the WebCTRL® interface.

³ The control program must have one Pulse to Analog Input microblock for each pulse counting input.
Output values

<table>
<thead>
<tr>
<th>Output</th>
<th>I/O Type</th>
<th>Sensor/Actuator Type</th>
<th>Min/Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Analog (BAO)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0-10 Vdc</td>
<td>Electrical 0–10 Volt</td>
<td>Linear Full Range</td>
<td>Engineering values associated with 0 Vdc (Min) and 10 Vdc (Max) ¹</td>
</tr>
<tr>
<td>2-10 Vdc</td>
<td>Electrical 0–10 Volt</td>
<td>Linear w/Offset, 2–10 Volts</td>
<td>Engineering values associated with 2 Vdc (Min) and 10 Vdc (Max) ¹</td>
</tr>
<tr>
<td>0-20 mA</td>
<td>Electrical 0–20 mA</td>
<td>Linear Full Range</td>
<td>Engineering values associated with 0 mA (Min) and 20 mA (Max) ¹</td>
</tr>
<tr>
<td>4-20 mA</td>
<td>Electrical 0–20 mA</td>
<td>Linear w/Offset, 4–20 mA</td>
<td>Engineering values associated with 4 mA (Min) and 20 mA (Max) ¹</td>
</tr>
</tbody>
</table>

Digital (Binary) (BBO)

| Relay | Relay/Triac Output | N/A | N/A |

¹ The Analog Output microblock uses the Min and Max values to linearly translate its EIKON® LogicBuilder wire value into a physical output signal (Volt, mA, or psi) sent from the SE6104a to an actuator. For example, set Min to 0 and Max to 100 for an Analog Output microblock that receives a 0 to 100% open signal from a PID microblock and that controls a 0–10 Vdc actuator so that when the PID signal is 100%, the SE6104a output is 10 Vdc. Similarly, when the PID signal is 50%, the SE6104a output is 5 Vdc.

Resolution values

Resolution is not particular to a type of input or output, but the driver handles analog and digital (binary) inputs and outputs differently. To set these values appropriately, you should understand how the driver uses them.

<table>
<thead>
<tr>
<th>Resolution</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Analog Input (BAI)</td>
<td>The driver truncates the microblock’s present value according to the resolution. EXAMPLE If the calculated present value is 13.789 and you set the Resolution to 0.1, the control program uses 13.7 for any calculations downstream from the microblock.</td>
</tr>
<tr>
<td>Analog Output (BAO)</td>
<td>The driver truncates the wire input value to the microblock before performing any scaling calculations. EXAMPLE If the wire input value is 13.789 and you set the Resolution to 0.1, the microblock uses 13.7 for any scaling calculations.</td>
</tr>
<tr>
<td>Digital (Binary) Inputs and Outputs</td>
<td>N/A</td>
</tr>
</tbody>
</table>
Offset/Polarity values

Offset/Polarity is not particular to a type of input or output, but the driver handles analog and digital (binary) inputs and outputs differently. To set these values appropriately, you should understand how the driver uses them.

<table>
<thead>
<tr>
<th>Offset/Polarity</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Analog Input (BAI)</td>
<td>Offset value (positive or negative) adds a fine adjustment to a sensor reading after all scaling for calibration. Example: If a sensor reads 74.9°F when the actual measured value is 73.6°F, enter an Offset of –1.3 to calibrate the sensor to the measured value.</td>
</tr>
<tr>
<td>Analog Output (BAO)</td>
<td>You can use the Offset value (positive or negative) to calibrate an output, but you generally do not need to. If used, the driver adds the offset value to the wire input value before performing any scaling calculations to determine the SE6104a's output.</td>
</tr>
<tr>
<td>Digital (Binary) Input (BBI)</td>
<td>Polarity determines the microblock's present value when no signal is received from the equipment. When no signal is received from the equipment, if Polarity is set to: normal—present value is off reversed—present value is on</td>
</tr>
<tr>
<td>Digital (Binary) Output (BBO)</td>
<td>Polarity determines the SE6104a's output based on the control program's signal to the microblock. When the control program's signal to the microblock is on, if Polarity is set to: normal—output is on reversed—output is off NOTE Regardless of Polarity, the output will be off if the SE6104a loses power.</td>
</tr>
</tbody>
</table>

To use the Auto-Off-On switches

You can control a digital output using the Auto-Off-On switch.

<table>
<thead>
<tr>
<th>If switch position is...</th>
<th>Normally open output contacts are...</th>
</tr>
</thead>
<tbody>
<tr>
<td>Auto</td>
<td>Determined by control program</td>
</tr>
<tr>
<td>Off</td>
<td>Locked open</td>
</tr>
<tr>
<td>On</td>
<td>Locked closed</td>
</tr>
</tbody>
</table>

The control program can monitor the status of an Auto-Off-On switch and display the status on the control program's Properties page > I/O Points tab in the WebCTRL® interface. The Value of the point monitoring the Auto-Off-On switch shows Off if the switch is set to Auto, and On if the switch is set to Off or On.
To monitor an Auto-Off-On switch

1. Insert a BACnet Binary Input microblock in the control program.
2. On the microblock's Properties page in the WebCTRL® interface, set the I/O Type field to H-O-A Status Feedback.
3. In the Input Number field, type the number of the output you want to monitor.

To set up the driver

After you download the driver and control program(s) to the SE6104a, you may want to change the driver's properties in the WebCTRL® interface to suit your application.

1. On the WebCTRL® Network tree, click ▶ to the left of your SE6104a.
2. Click ▶ to the left of Driver to see its children.
3. Make changes as needed on the Properties page for Driver and any of its children.

Driver

On the Driver page, you can change the following properties:
- Module clock synchronization and failure. See table below.
- Network Input microblock communication properties.

<table>
<thead>
<tr>
<th>BACview Control</th>
<th>TouchScreen Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>Keypad Inactivity timeout (minutes)</td>
<td>TouchScreen Schedule Edit Enable</td>
</tr>
<tr>
<td>Keypad user-level password</td>
<td></td>
</tr>
<tr>
<td>Log out the user (if a user-level password is required), turn off the backlight, and display the standby screen after this period of inactivity.</td>
<td>Check this field to allow a user to edit this controller's schedules from an Equipment Touch's Schedules screen.</td>
</tr>
<tr>
<td>Numeric password user must enter to access system through a BACview® device.</td>
<td>NOTE Schedules edited on an Equipment Touch are not uploaded to the WebCTRL® application. This could result in the controller operating on a schedule that differs from the one you see in the WebCTRL® interface.</td>
</tr>
</tbody>
</table>

Module Clock

<table>
<thead>
<tr>
<th>Clock Fail Date and Time</th>
<th>Date and time the control program uses when controller's real-time clock is invalid.</th>
</tr>
</thead>
<tbody>
<tr>
<td>TIP</td>
<td>Use an occupied date and time (such as a Tuesday at 10 a.m.) so the equipment does not operate in unoccupied mode if the controller loses power during occupancy.</td>
</tr>
</tbody>
</table>
| **Time Synch Sensitivity**  
| (seconds) | When the controller receives a time sync request, if the difference between the controller's time and the time sync's time is greater than this field's value, the controller's time is immediately changed. If the difference is less than this field's value, the controller's time is slowly adjusted until the time is correct. |
| **Network Microblocks** |  |
| **Number of poll retries**  
| **before Network Input**  
| **Microblocks indicate**  
| **failure** | The maximum number of retries after the initial attempt that a Network microblock will attempt to communicate with its target device. If unsuccessful, the point will transition to an idle state for 30 seconds before attempting to communicate again. Change this field only if directed by Technical Support. |
| **Periodic rebinding interval** | If a microblock uses a wildcard in its address, this timer determines how often the microblock will attempt to find the nearest instance of its target. For example, if an outside air temperature address uses a wildcard, a VAV application will look for the outside air temperature on the same network segment or on the nearest device containing that object. |
| **BACnet COV Throttling** |  |
| **Enable COV Throttling** | Under normal circumstances, COV Throttling should be enabled to prevent excessive network traffic if an object's COV Increment is set too low. See EXCEPTION below.  
When enabled, if an object generates excessive COV broadcasts (5 updates in 3 seconds), the driver automatically throttles the broadcasts to 1 per second. Also, if the object's value updates excessively for 30 seconds, an alarm is sent to the WebCTRL® application listing all objects that are updating excessively. A Return-to-normal alarm is sent only after all objects have stopped updating excessively.  
EXCEPTION: In rare circumstances, such as process control, a subscribing object may require COV updates more frequently than once per second. For these situations, clear this checkbox, but make sure that your network can support the increased traffic. You will also need to disable the Excessive COV alarms under the driver's Common Alarms. |
| **Trend Sampling** |  |
| **Collect a daily midnight sample for all points in this controller that are sampling on COV** | For values that change infrequently, select to verify at midnight daily that the point is still able to communicate trend values. |
Device

On the **Device** page, you can change the following properties:

- BACnet device object properties for the SE6104a
- SE6104a network communication

**Configuration**

**NOTE** The three APDU fields refer to all networks over which the SE6104a communicates.

**Max Masters and Max Info Frames**

Apply only if the SE6104a is on an MS/TP network.

---

**Notification Classes**

A BACnet alarm's Notification Class defines:

- Alarm priority for Alarm, Fault, and Return to Normal states
- Options for BACnet alarm acknowledgment
- Where alarms should be sent (recipients)

Alarms in the WebCTRL® application use Notification Class #1. The WebCTRL® application is automatically a recipient of these alarms.

**Priorities**

**NOTE** BACnet defines the following Network message priorities for Alarms and Events.

<table>
<thead>
<tr>
<th>Priority range</th>
<th>Network message priority</th>
</tr>
</thead>
<tbody>
<tr>
<td>00–63</td>
<td>Life Safety</td>
</tr>
<tr>
<td>64–127</td>
<td>Critical Equipment</td>
</tr>
<tr>
<td>128–191</td>
<td>Urgent</td>
</tr>
<tr>
<td>192–255</td>
<td>Normal</td>
</tr>
</tbody>
</table>

**Priority of Off-Normal**

BACnet priority for Alarms.

**Priority of Fault**

BACnet priority for Fault messages.

**Priority of Normal**

BACnet priority for Return-to-normal messages.

**Ack Required for Off-Normal, Fault, and Normal**

Specifies whether alarms associated with this Notification Class require a BACnet Acknowledgment for Off-Normal, Fault, or Normal alarms.

**TIP** You can require operator acknowledgment for an Alarm or Return-to-normal message (stored in the WebCTRL® database). In the WebCTRL® interface on the **Alarm > Enable/Disable** tab, change the acknowledgment settings for an alarm source or an alarm category.

**Recipient List**

**Recipients**

The first row in this list is from the WebCTRL® application. Do not delete this row. Click **Add** if you want other BACnet devices to receive alarms associated with this Notification Class.
**Recipient Description**  
Name that appears in the **Recipients** table.

**Recipient Type**  
Use **Address** (static binding) for either of the following:
- Third-party BACnet device recipients that do not support dynamic binding
- When you want alarms to be broadcast (you must uncheck **Issue Confirmed Notifications**). This use is rare.

**Days and times**  
The days and times during which the recipient will receive alarms.

**Recipient Device Object Identifier**  
Type the **Device Instance** from SiteBuilder (or from the network administrator for third-party devices) in the # field.

**Process Identifier**  
Change for third-party devices that use a BACnet Process Identifier other than 1. The WebCTRL® application processes alarms for any 32-bit Process Identifier.

**Issue Confirmed Notifications**  
Select to have a device continue sending an alarm message until it receives delivery confirmation from the recipient.

**Transitions to Send**  
Uncheck the types of alarms you do not want the recipient to get.

### Calendars

Calendars are provided in the driver for BACnet compatibility only. Instead, use the **Schedules** feature in the WebCTRL® interface.

### Common and Specific Alarms

On these pages, you can enable/disable, change BACnet alarm properties, or set delays for the following BACnet alarms:

**Common alarms:**
- Module Halted
- All Programs Stopped
- Duplicate Address
- Locked I/O
- Control Program
- Program Stopped
- Excessive COV

**Specific alarm:**
- Low Battery Alarm

**NOTE**  
To set up alarm actions for controller generated alarms, see **Setting up alarm actions** in WebCTRL® Help.

**Module Generated Alarm**

**Description**  
Short message shown on the **Alarms** page or in an alarm action when this type of alarm is generated.
Custom Translation Tables

You can set up a translation table that an analog input will use to translate the raw data from a non-linear sensor to the engineering units you want it to output on the wire. In the Network tree, select Custom Translation Table #1, #2, or #3. The Properties page has instructions. For the input to use the translation table, navigate to the input in the Geographic tree, select the Details tab, then set Sensor Type (Scaling Method) to Non-Linear, Custom Table #__.

Switch and Jumper Positions

The Switch and Jumper Positions page shows the current physical settings on the SE6104a.

To communicate through the Local Access port

Using a computer and a USB Link Kit, you can communicate locally with the SE6104a to download or to troubleshoot.

**PREREQUISITES**

- A computer with a USB port
- A USB Link Kit. See the USB Link Kit Technical Instructions.

**NOTE** The USB Link Kit driver is installed with a WebCTRL® v5 or later system. But if needed, you can get the latest driver from http://www.silabs.com/products/mcu/Pages/USBtoUARTBridgeVCPDrivers.aspx. Install the driver before you connect the USB Link Kit to your computer.

- v1.70 or later controller driver

**CAUTION** If multiple controllers share power but polarity was not maintained when they were wired, the difference between the controller's ground and the computer's AC power ground could damage the USB Link Kit and the controller. If you are not sure of the wiring polarity, use a USB isolator between the computer and the USB Link Kit. Purchase a USB isolator online from a third-party manufacturer.
Connect the USB Link Kit to the computer and to the controller's Local Access port.

NOTE If using a USB isolator, plug the isolator into your computer's USB port, and then plug the USB Link Kit cable into the isolator.

To set up a local access connection in the WebCTRL® interface

For the WebCTRL® application to communicate with the Local Access port, you must do the following:

1. On the System Configuration tree, select Connections.
2. On the Configure tab, click Add.
3. From the Type drop-down list, select BACnet Local Access.
4. Optional: Edit the Description.
5. Type the computer's Port number that the USB cable is connected to.  
   NOTE To find the port number, plug the USB cable into the computer's USB port, then select Start > Control Panel > System > Device Manager > Ports (Com & LPT). The COM port number is beside Silicon Labs CP210x USB to UART Bridge.
6. Set the Baud rate to 115200.
7. Click Accept.
8. On the View tab, click the button next to the BACnet/IP network, then select BACnet Local Access.
9. Click Accept.
10. On the Configure tab, select BACnet Local Access, then click Start.
    NOTE If an error message appears, make sure the COM port you selected is not in use. For example, PutTTY may be open and is holding the port open.
11. On the Network tree, select the controller that you are connected to.
12. Click , then select Manual Command.
13. Type rnet here in the dialog box, then click OK.
14. On the Properties page, click Module Status. If a Modstat report appears, the WebCTRL® application is communicating with the controller.
Troubleshooting

If you have problems mounting, wiring, or addressing the SE6104a, contact Automated Logic® Technical Support.

LED's

The LED's on the  show the status of certain functions.

<table>
<thead>
<tr>
<th>If this LED is on...</th>
<th>Status is...</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power</td>
<td>The SE6104a has power.</td>
</tr>
<tr>
<td>Rx</td>
<td>The SE6104a is receiving data from the network segment</td>
</tr>
<tr>
<td>Tx</td>
<td>The SE6104a is transmitting data over the network segment</td>
</tr>
<tr>
<td>DO#</td>
<td>The digital output is active</td>
</tr>
</tbody>
</table>

The Run and Error LED's indicate controller and network status.

<table>
<thead>
<tr>
<th>If Run LED shows...</th>
<th>And Error LED shows...</th>
<th>Status is...</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 flashes per second</td>
<td>Off</td>
<td>Normal</td>
</tr>
<tr>
<td>2 flashes per second</td>
<td>2 flashes, alternating with Run LED</td>
<td>Five minute auto-restart delay after system error</td>
</tr>
<tr>
<td>2 flashes per second</td>
<td>3 flashes, then off</td>
<td>The controller has just been formatted</td>
</tr>
<tr>
<td>2 flashes per second</td>
<td>4 flashes, then pause</td>
<td>Two or more devices on this network have the same network address</td>
</tr>
<tr>
<td>2 flashes per second</td>
<td>1 flash per second</td>
<td>The controller is alone on the network</td>
</tr>
<tr>
<td>2 flashes per second</td>
<td>On</td>
<td>Obtain a Module Status Report (Modstat) to determine which of the following occurred:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Exec halted after frequent system errors</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Control programs halted</td>
</tr>
<tr>
<td>5 flashes per second</td>
<td>On</td>
<td>Exec start-up aborted, Boot is running</td>
</tr>
<tr>
<td>5 flashes per second</td>
<td>Off</td>
<td>Firmware transfer in progress, Boot is running</td>
</tr>
<tr>
<td>7 flashes per second</td>
<td>7 flashes per second, alternating with Run LED</td>
<td>Ten second recovery period after brownout</td>
</tr>
<tr>
<td>14 flashes per second</td>
<td>14 flashes per second, alternating with Run LED</td>
<td>Brownout</td>
</tr>
</tbody>
</table>
### If Run LED shows... And Error LED shows... Status is...

<table>
<thead>
<tr>
<th>On</th>
<th>On</th>
<th>Failure. Try the following solutions:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>• Turn the SE6104a off, then on.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Format the SE6104a.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Download the SE6104a.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Replace the SE6104a.</td>
</tr>
</tbody>
</table>

**NOTE** If you resolve the issue but the Error LED does not turn off, cycle power to the controller.

---

### To format the controller

If you cannot communicate with a controller after downloading it, as a last resort, you can manually format the controller to erase its memory.

1. Turn off the SE6104a's power.
2. Make sure the address switches are not set to 0, 0.
3. Hold down the controller’s Format button while you turn its power on.
4. Continue to hold down the Format button until the Error LED stops flashing and turns on, then release the button.
5. Download the SE6104a.

---

### To get the SE6104a's serial number

If you need the SE6104a's serial number when troubleshooting, the number is on:

- a sticker on the back of the main controller board
- a Module Status report (Modstat) under Core (or Main) board hardware

To obtain a modstat in the WebCTRL® interface:

1. Select the SE6104a in the Network tree.
2. On the Properties page, click Module Status.
Recovering from a power outage

The SE6104a has a 10-year Lithium CR2032 battery that retains the following data for a maximum of 10,000 hours during power outages.

- Time
- Control programs
- Editable properties
- Trends
- Schedules

If the above data is lost after power returns, replace the battery and then download the SE6104a. See instructions below.

To replace the SE6104a's battery

If the SE6104a sends a Low Battery alarm to the WebCTRL® application, replace the battery.

1. Verify that the SE6104a's power is on.
2. Remove the battery from the controller, making note of the battery's polarity.
3. Insert the new battery into the controller, matching the polarity of the battery you removed.
4. Download the SE6104a.

To take the SE6104a out of service

If needed for troubleshooting or start-up, you can stop communication between the WebCTRL® application and the SE6104a.

1. On the WebCTRL® Network tree, select the SE6104a.
2. On the Properties page, check Out of Service.
3. Click Accept.
Compliance

FCC Compliance

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

⚠️ CAUTION Changes or modifications not expressly approved by the responsible party for compliance could void the user’s authority to operate the equipment.

CE Compliance

⚠️ WARNING This is a Class A product. In a domestic environment, this product may cause radio interference in which case the user may be required to take adequate measures.

BACnet Compliance

Compliance of listed products to requirements of ASHRAE Standard 135 is the responsibility of BACnet International. BTL® is a registered trademark of BACnet International.
## Document revision history

Important changes to this document are listed below. Minor changes such as typographical or formatting errors are not listed.

<table>
<thead>
<tr>
<th>Date</th>
<th>Topic</th>
<th>Change description</th>
<th>Code*</th>
</tr>
</thead>
<tbody>
<tr>
<td>10/22/18</td>
<td>Specifications</td>
<td>Reworded Rnet port specification and added power supplied by Rnet port.</td>
<td>X-H-JS-O</td>
</tr>
<tr>
<td></td>
<td>Analog outputs</td>
<td>Added /F to end of formula.</td>
<td>X-CC-E</td>
</tr>
<tr>
<td></td>
<td>Zone sensors</td>
<td>Complete revision</td>
<td>X-D</td>
</tr>
<tr>
<td></td>
<td>Touchscreen devices</td>
<td>Changed title from Equipment Touch to Touchscreen devices.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Wiring inputs and outputs</td>
<td>Removed RS sensor from Input wiring table, and added OptiPoint™ Interface.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Wiring devices to the SE6104a's Rnet port</td>
<td>Added OptiPoint™ Interface. Removed sub-topics and directed user to see each device's Technical Instructions.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Entire document</td>
<td>Added export control marking.</td>
<td></td>
</tr>
<tr>
<td>2/7/17</td>
<td>Specifications</td>
<td>Added wireless sensors to the Rnet port specification.</td>
<td>X-D</td>
</tr>
<tr>
<td></td>
<td>Zone sensors</td>
<td>Added wireless sensors to this topic.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Equipment Touch</td>
<td>Added Wireless Adapter to this topic.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Wiring inputs and outputs</td>
<td>Added Wireless Adapter to this topic.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Wiring devices to the SE6104a's Rnet port</td>
<td>Added Wireless Adapter to this topic.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>To wire a Wireless Adapter to the SE6104a</td>
<td>New topic.</td>
<td></td>
</tr>
<tr>
<td>11/2/16</td>
<td>Specifications</td>
<td>Changed Weight to 1.05 lbs (0.48 kg).</td>
<td>A-D-DB</td>
</tr>
<tr>
<td>10/26/16</td>
<td>Zone sensors</td>
<td>Changed section under ZS Sensors from 5 sensors to 15.</td>
<td>A-TS-EE-O</td>
</tr>
<tr>
<td>9/27/16</td>
<td>To set up a Local Access connection</td>
<td>Updated WebCTRL menu button in step 12.</td>
<td>A-D</td>
</tr>
<tr>
<td></td>
<td>in the WebCTRL interface</td>
<td>Updated coverplate</td>
<td>A-D</td>
</tr>
<tr>
<td>8/31/15</td>
<td>Driver and control programs</td>
<td>Changed maximum number of control programs from 1 to 999.</td>
<td>A-O-DY-O</td>
</tr>
<tr>
<td>4/20/15</td>
<td>Entire document</td>
<td>New look, no content changes</td>
<td>A-D</td>
</tr>
<tr>
<td>11/14/14</td>
<td>BACnet Compliance</td>
<td>Changed BACnet Manufacturers Association to BACnet International</td>
<td>X-D-CP-MW</td>
</tr>
<tr>
<td>10/7/14</td>
<td>Driver</td>
<td>Added the Network Microblock fields</td>
<td>A-TS-RB-F</td>
</tr>
<tr>
<td>9/8/14</td>
<td>LED's</td>
<td>Changed the Status description for when the Run LED shows 2 flashes per second and the Error LED is On. Also added a note below the table regarding cycling power to turn off Error LED.</td>
<td>A-TS-JM-F-BK</td>
</tr>
<tr>
<td>Date</td>
<td>Topic</td>
<td>Change description</td>
<td>Code*</td>
</tr>
<tr>
<td>----------</td>
<td>-------------------------------</td>
<td>-------------------------------------------------------------------------------------</td>
<td>------------------------</td>
</tr>
<tr>
<td>5/13/14</td>
<td>Specifications</td>
<td>Rnet Port: Added Equipment Touch and removed BACview® devices</td>
<td>A-D-CP-O-TC</td>
</tr>
<tr>
<td></td>
<td>Zone sensors</td>
<td>Removed references to BACview</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Equipment Touch devices</td>
<td>New topic</td>
<td></td>
</tr>
<tr>
<td></td>
<td>BACview devices</td>
<td>Removed topic</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Wiring zone sensors to the</td>
<td>Changed to &quot;Wiring devices to the SE6104a's Rnet port&quot;</td>
<td></td>
</tr>
<tr>
<td></td>
<td>SE6104a</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>To wire an Equipment Touch to</td>
<td>New topic</td>
<td></td>
</tr>
<tr>
<td></td>
<td>the SE6104a</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Wiring a Log/Stat sensor to</td>
<td>New topic</td>
<td></td>
</tr>
<tr>
<td></td>
<td>the SE6104a</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>To set up the driver &gt; Driver</td>
<td>Added new driver property: TouchScreen Schedule Edit Enable</td>
<td></td>
</tr>
</tbody>
</table>

* For internal use only
Contents

What is the SE6166sp controller? ........................................................................................................... 1
  Driver and control program .................................................................................................................... 1
  Specifications ....................................................................................................................................... 1
  Inputs .................................................................................................................................................. 3
  Digital outputs ................................................................................................................................. 4
  Analog outputs ................................................................................................................................. 4
  Zone sensors ..................................................................................................................................... 4
  Touchscreen devices .......................................................................................................................... 5
To mount the SE6166sp ............................................................................................................................ 5
Wiring for power ....................................................................................................................................... 5
  To wire for power .............................................................................................................................. 6
To address the SE6166sp .......................................................................................................................... 6
Wiring for communications ...................................................................................................................... 6
  Wiring specifications ........................................................................................................................ 7
  To wire the SE6166sp for communications ....................................................................................... 7
Wiring Inputs and outputs ......................................................................................................................... 8
  Wiring specifications ........................................................................................................................ 8
  To wire inputs and outputs .............................................................................................................. 8
Wiring devices to the SE6166sp’s Rnet port ............................................................................................ 11
Wiring a LogiStat sensor to the SE6166sp ............................................................................................. 12
Downloading the SE6166sp .................................................................................................................... 12
  To download from the WebCTRL® interface .................................................................................... 12
To assign inputs or outputs to points ..................................................................................................... 13
  Input values ..................................................................................................................................... 14
  Output values .................................................................................................................................. 15
  Resolution values .......................................................................................................................... 15
  Offset/Polarity values ..................................................................................................................... 16
  To use the Auto-Off-On switches .................................................................................................. 16
To set up the driver ............................................................................................................................... 17
  Driver ............................................................................................................................................. 17
  Device ............................................................................................................................................ 19
  Notification Classes ....................................................................................................................... 19
  Calendars ....................................................................................................................................... 20
  Common and Specific Alarms ......................................................................................................... 20
  Custom Translation Tables ............................................................................................................ 21
  Switch and Jumper Positions ............................................................................................................ 21
To communicate through the Local Access port .................................................................................. 21
  To set up a local access connection in the WebCTRL® interface .................................................... 22
Troubleshooting .................................................................................................................................... 23
  LED’s ............................................................................................................................................. 23
  To format the controller .................................................................................................................. 24
  To get the SE6166sp’s serial number .............................................................................................. 24
  Recovering from a power outage .................................................................................................... 25
  To replace the SE6166sp’s battery ................................................................................................. 25
  To take the SE6166sp out of service ............................................................................................. 25
Compliance ............................................................................................................................................... 26
  FCC Compliance ........................................................................................................................... 26
  CE Compliance .............................................................................................................................. 26
  BACnet Compliance ....................................................................................................................... 26
Appendix - SE6166sp coverplate ............................................................................................................ 27
Document revision history ..................................................................................................................... 28
This page does not contain any export regulated technical data.
What is the SE6166sp controller?

The SE6166sp controller controls rooftop air handling units (AHUs), other large single pieces of equipment, or zones. You can mount the SE6166sp on or inside the rooftop equipment.

Driver and control program

<table>
<thead>
<tr>
<th>Driver</th>
<th>DRV_SESP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum number of control programs</td>
<td>1</td>
</tr>
<tr>
<td>Maximum number of BACnet objects*</td>
<td>400</td>
</tr>
</tbody>
</table>

* Depends on available memory.

Specifications

<table>
<thead>
<tr>
<th>Power</th>
<th>24 Vac ±10%, 50–60 Hz, 20 VA power consumption (38.4 VA with a BACview® device attached) single Class 2 source only, 100 VA or less</th>
</tr>
</thead>
<tbody>
<tr>
<td>BACnet port</td>
<td>For communication with the controller network using ARC156 or MS/TP (9600 bps–76.8 kbps)</td>
</tr>
<tr>
<td>Local Access port</td>
<td>For system start-up and troubleshooting</td>
</tr>
</tbody>
</table>
| Rnet port | - Supports up to 5 wireless and/or ZS sensors, and one Equipment Touch or OptiPoint™ Interface  
- Supplies 12 Vdc/210 mA power to the Rnet at an ambient temperature of 77 °F (25 °C) with a 24 Vac nominal power source. **NOTE** Ambient temperature and power source fluctuations may reduce the power supplied by the Rnet port.  
**NOTE** If the total power required by the sensors on the Rnet exceeds the power supplied by the Rnet port, use an external power source. The Wireless Adapter, Equipment Touch, or OptiPoint™ Interface must be powered by an external power source. See the specifications in each device's Technical Instructions to determine the power required. |
<p>| Inputs | 16 inputs, configurable for 0–10 Vdc, 0–20 mA, RTD, thermistor, or dry contact, and one LogiStat port. Inputs 1 and 2 are also configurable for pulse counter or timed local override (TLO). <strong>NOTE</strong> If using a LogiStat or LogiStat Plus, temperature and setpoint adjust inputs replace inputs 9 and 10, making 9 and 10 unavailable. |
| Input resolution | 12 bit A/D |</p>
<table>
<thead>
<tr>
<th>Feature</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input pulse frequency</td>
<td>40 pulses per second. Minimum pulse width (on or off time) required for each pulse is 12.5 msec.</td>
</tr>
<tr>
<td>Digital outputs</td>
<td>6 digital outputs, relay contacts rated at 3 A max @ 24 Vac. Configured normally open.</td>
</tr>
<tr>
<td>Analog outputs</td>
<td>6 analog outputs, 0–10 Vdc or 0–20 mA selectable</td>
</tr>
<tr>
<td>Output resolution</td>
<td>8 bit D/A</td>
</tr>
<tr>
<td>Microprocessor</td>
<td>High speed 16-bit microprocessor with ARCNET communication co-processor</td>
</tr>
<tr>
<td>Memory</td>
<td>1 MB non-volatile battery-backed RAM, 1 MB Flash memory, 16-bit memory bus</td>
</tr>
<tr>
<td>Real-time clock</td>
<td>Battery-backed real-time clock keeps track of time in event of power failure</td>
</tr>
<tr>
<td>Battery</td>
<td>10-year Lithium CR2032 battery retains the following data for a maximum of 10,000 hours during power outages: time, control program, editable properties, schedules, and trends. A low battery is indicated by a low battery alarm in the WebCTRL® application.</td>
</tr>
<tr>
<td>Protection</td>
<td>Built-in surge and transient protection for power and communications in compliance with EN61000-6-1. Incoming power and network connections are protected by non-replaceable internal solid-state polyswitches that reset themselves when the condition that causes a fault returns to normal. The power, network, input, and output connections are also protected against transient excess voltage/surge events lasting no more than 10 msec.</td>
</tr>
<tr>
<td>BT485 connector</td>
<td>You attach a BT485 (not included) to a controller at the beginning and end of a network segment to add bias and to terminate a network segment.</td>
</tr>
<tr>
<td>Status indicators</td>
<td>LEDs indicate status of communications, running, errors, power, and digital outputs</td>
</tr>
<tr>
<td>Environmental operating range</td>
<td>-20 to 140°F (-29 to 60°C), 10–90% relative humidity, non-condensing</td>
</tr>
<tr>
<td></td>
<td><strong>NOTE</strong> The controllers should be mounted in a protective enclosure.</td>
</tr>
<tr>
<td>Physical</td>
<td>Rugged aluminum cover, removable screw-type terminal blocks</td>
</tr>
<tr>
<td>Overall dimensions</td>
<td>Width: 8 5/16 in. (21.1 cm) / Height: 7 in. (17.8 cm)</td>
</tr>
<tr>
<td>Mounting dimensions</td>
<td>Width: 7 7/8 in. (19.9 cm) / Height: 5 in. (12.7 cm)</td>
</tr>
<tr>
<td>Recommended panel depth</td>
<td>1 1/2 in. (3.8 cm)</td>
</tr>
<tr>
<td>Weight</td>
<td>1.05 lbs (0.48 kg)</td>
</tr>
<tr>
<td>BACnet support</td>
<td>Conforms to the BACnet Advanced Application Controller (B-AAC) Standard Device Profile as defined in ANSI/ASHRAE Standard 135-2012 (BACnet) Annex L, Protocol Revision 9</td>
</tr>
<tr>
<td>Listed by</td>
<td>UL-916 (PAZX), cUL-916 (PAZX7), FCC Part 15-Subpart B-Class A, CE</td>
</tr>
</tbody>
</table>
## Inputs

The SE6166sp has 16 inputs that accept the following signal types.

<table>
<thead>
<tr>
<th>These Inputs...</th>
<th>Support this signal type...</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>All</td>
<td>Thermistor ¹</td>
<td>Precon type 2 (10 kOhm at 77 °F). Input voltages should be from 0.489 Vdc to 3.825 Vdc for thermistors.</td>
</tr>
<tr>
<td>All</td>
<td>Dry contact</td>
<td>A 5 Vdc wetting voltage detects contact position, resulting in a 1 mA maximum sense current when the contacts are closed.</td>
</tr>
<tr>
<td>All</td>
<td>0–5 Vdc</td>
<td>The output impedance of a 0–5 Vdc or a 0–10 Vdc source must not exceed 200 Ohms. The input impedance of the SE6166sp is approximately 20 kOhm.</td>
</tr>
<tr>
<td>All</td>
<td>0–10 Vdc</td>
<td>The input resistance on the positive (+) terminal is 250 Ohms. The <strong>Aux Power Out</strong> connector is capable of supplying 24 Vdc to multiple 4–20 mA transducers, but the total current demanded must not exceed 200 mA. If the voltage measured from the <strong>Aux Power Out</strong> connector to <strong>Gnd</strong> is less than 18 Vdc, you need to use an external power supply.</td>
</tr>
<tr>
<td>All</td>
<td>RTD ¹</td>
<td>Platinum - 1 kOhm at 32 °F (0 °C) Nickel/Iron - 1 kOhm at 70 °F (21 °C) Balco TS8000 - 1 kOhm at 70 °F (21 °C) Input voltages should be from 0.6–1.2 V</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>NOTE</strong> Automated Logic® recommends use of an external current transducer between an RTD and the SE6166sp to improve accuracy and resolution.</td>
</tr>
<tr>
<td>IN-1, IN-2</td>
<td>Pulse counter ²</td>
<td>Pulse counting up to 40 pulses per second. Minimum pulse width (on or off time) required for each pulse is 12.5 msec.</td>
</tr>
<tr>
<td>IN-1, IN-2</td>
<td>Timed local override</td>
<td>A momentary contact switch that overrides a schedule and turns equipment on for a defined period of time. The override time added for each push of the button and the maximum allowable On time are software adjustable.</td>
</tr>
<tr>
<td>IN-9, IN-10</td>
<td>LogiStat LogiStat Plus ³</td>
<td>IN-9–See Thermistor. IN-10–Setpoint adjust. Input voltages should be from 1.4–3.4 Vdc.</td>
</tr>
</tbody>
</table>

¹ To use a thermistor or RTD not listed above, you can set up a custom translation table (page 21) for your sensor.

² The SE6166sp can perform pulse counting for dry contact or voltage inputs if you assign the input to a Pulse to Analog Input microblock. See **To assign inputs or outputs to points** (page 13).

³ A LogiStat or LogiStat Plus connected to the SE6166sp uses IN-9 and IN-10. A LogiStat Pro, a ZS sensor, or an RS sensor does not use these inputs.
Digital outputs

The SE6166sp has 6 digital outputs. You can connect each output to a maximum of 24 Vac. Each output is a dry contact rated at 3 A maximum and is normally open.

Analog outputs

The SE6166sp has 6 analog outputs that support 0–10 Vdc or 0–20 mA devices.

<table>
<thead>
<tr>
<th>If output controls a...</th>
<th>Resistance to ground must be...</th>
</tr>
</thead>
<tbody>
<tr>
<td>0–10 Vdc device</td>
<td>500 Ohms minimum</td>
</tr>
<tr>
<td>0–20 mA device</td>
<td>800 Ohms maximum</td>
</tr>
</tbody>
</table>

NOTES
- The SE6166sp supervises all outputs.
- The device must share the same ground as the controller.
- The total output current from all outputs and the Aux Power Out connector must not exceed:
  - 200 mA at 113°F
  - 81 mA at 140°F
- For temperatures above 113°F, use the following equation to calculate the total current at 4.4 mA per degree:
  \[ \text{Total current} = 200 \text{mA} - ((\text{max. expected temp.} - 113°F) \times 4.44 \text{mA/F}) \]

Zone sensors

You can wire ZS sensors and/or a Wireless Adapter that communicates with wireless sensors to the SE6166sp's Rnet port. You can have up to 5 ZS and/or wireless sensors.

NOTES
- ZS and wireless sensors can share the Rnet with an Equipment Touch or OptiPoint™ Interface.
- An Rnet with the above devices cannot have RS sensors.

NOTES
- A LogiStat or LogiStat Plus wired to the SE6166sp cannot be used for local access.
- If you use the Rnet port, you cannot connect a LogiStat sensor to the LogiStat port.
Touchscreen devices

You can wire an Equipment Touch or OptiPoint™ Interface to the SE6166sp's Rnet port to view or change the controller's property values, schedule equipment, view trends and alarms, and more, without having to access the system's server. The Rnet can have one Equipment Touch or OptiPoint™ Interface, plus ZS sensors and/or a Wireless Adapter that communicates with wireless sensors.

**NOTE** These touchscreen devices are not powered by the Rnet.
- The OptiPoint™ Interface requires a 24 Vdc external power source.
- The Equipment Touch requires a 24 Vac external power source.

⚠️ **CAUTION** A touchscreen device can share a power supply with the Automated Logic® controller as long as:
- The power source shared by the controller and Equipment Touch is AC power.
- The power source shared by the controller and OptiPoint™ Interface is DC power.
- You maintain the same polarity.
- You use the power source only for Automated Logic® controllers.

To mount the SE6166sp

Screw the SE6166sp into an enclosed panel using the mounting holes provided on the cover plate. Leave about 2 in. (5 cm) on each side of the controller for wiring.

Wiring for power

⚠️ **WARNING** Do not apply line voltage (mains voltage) to the controller's ports and terminals.

⚠️ **CAUTIONS**
- The SE6166sp is powered by a Class 2 power source. Take appropriate isolation measures when mounting it in a control panel where non-Class 2 circuits are present.
- Automated Logic® controllers can share a power supply as long as you:
  - Maintain the same polarity.
  - Use the power supply only for Automated Logic® controllers.
To wire for power

1. Turn off the SE6166sp’s power to prevent it from powering up before you can verify the correct voltage.
2. Remove power from the 24 Vac transformer.
3. Pull the screw terminal connector from the controller's power terminals labeled Gnd and 24 Vac.
4. Connect the transformer wires to the screw terminal connector.
5. Apply power to the transformer.
6. Measure the voltage at the SE6166sp's power input terminals to verify that the voltage is within the operating range of 21.6–26.4 Vac.
7. Insert the screw terminal connector into the SE6166sp's power terminals.
8. Turn on the SE6166sp's power.
9. Verify that the Power LED is on and the Run LED is blinking.

To address the SE6166sp

You must give the SE6166sp an address that is unique on the network. You can address the SE6166sp before or after you wire it for power.

1. If wired for power, turn off the controller's power.
2. **NOTE** The controller only reads the rotary switch positions during power up or upon reset.
3. Using the rotary switches, set the controller's address to match the Address in the controller's properties dialog box in SiteBuilder. Set the Tens (10's) switch to the tens digit of the address, and set the Ones (1's) switch to the ones digit.
   
   **EXAMPLE** If the controller's address is 25, point the arrow on the Tens (10's) switch to 2 and the arrow on the Ones (1's) switch to 5.

Wiring for communications

The SE6166sp communicates using BACnet on the following types of network segments:

- ARC156 communicating at 156 kbps
- MS/TP communicating at 9600 bps, 19.2 kbps, 38.4 kbps, or 76.8 kbps

**NOTE** ARC156 is a unique implementation of the industry standard ARCNET. For a summary of differences between ARCNET and ARC156, see the ARC156 Wiring Technical Instructions.
Wiring specifications

<table>
<thead>
<tr>
<th>For...</th>
<th>Use...</th>
<th>Maximum Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>ARC156 and MS/TP</td>
<td>22 AWG, low-capacitance, twisted, stranded, shielded copper wire</td>
<td>2000 feet (610 meters)</td>
</tr>
</tbody>
</table>

1 See the ARC156 Wiring Technical Instructions.
2 See the MS/TP Networking and Wiring Technical Instructions.

WARNING Do not apply line voltage (mains voltage) to the controller's ports and terminals.

To wire the SE6166sp for communications

1 Turn off the SE6166sp's power.
2 Check the communications wiring for shorts and grounds.
3 Connect the communications wiring to the controller's screw terminals labeled Net +, Net - , and Shield.
   NOTE Use the same polarity throughout the network segment.
4 Set the communication type and baud rate.

<table>
<thead>
<tr>
<th>For...</th>
<th>Set DIP switch 4 to...</th>
<th>Set DIP switches 1 and 2 to...</th>
</tr>
</thead>
<tbody>
<tr>
<td>ARC156</td>
<td>ARC156</td>
<td>N/A. Baud rate will be 156 kbps regardless of the DIP switch settings.</td>
</tr>
<tr>
<td>MS/TP</td>
<td>MSTP</td>
<td>The appropriate baud rate. See the MSTP Baud diagram on the controller.</td>
</tr>
</tbody>
</table>

NOTE Use the same baud rate for all controllers on the network segment.
5 If the SE6166sp is at either end of a network segment, connect a BT485 to the SE6166sp.
6 Turn on the SE6166sp's power.
7 Verify communication with the network by viewing a Module Status report in the WebCTRL® interface.
**Wiring inputs and outputs**

**Wiring specifications**

### Input wiring

<table>
<thead>
<tr>
<th>Input</th>
<th>Maximum length</th>
<th>Minimum gauge</th>
<th>Shielding</th>
</tr>
</thead>
<tbody>
<tr>
<td>0–5 Vdc</td>
<td>1000 feet</td>
<td>26 AWG</td>
<td>Shielded</td>
</tr>
<tr>
<td>0–10 Vdc</td>
<td>(305 meters)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0–20 mA</td>
<td>3000 feet</td>
<td>26 AWG</td>
<td>Shielded or unshielded</td>
</tr>
<tr>
<td>(914 meters)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Thermistor</td>
<td>1000 feet</td>
<td>22 AWG</td>
<td>Shielded</td>
</tr>
<tr>
<td>Dry contact</td>
<td>(305 meters)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pulse counter</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TLO</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RTD</td>
<td>100 feet</td>
<td>22 AWG</td>
<td>Shielded</td>
</tr>
<tr>
<td></td>
<td>(30 meters)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ZS sensor</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wireless Adapter for wireless sensors</td>
<td>See Wiring devices to the SE6166sp's Rnet port (page 11).</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Equipment Touch</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OptiPoint™ Interface</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LogiStat sensor</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>See Wiring a LogiStat sensor to the SE6166sp (page 12).</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**NOTE** Automated Logic® recommends use of an external current transducer between an RTD and the SE6166sp to improve accuracy and resolution.

### Output wiring

To size output wiring, consider the following:
- Total loop distance from the power supply to the controller, and then to the controlled device
  **NOTE** Include the total distance of actual wire. For 2-conductor wires, this is twice the cable length.
- Acceptable voltage drop in the wire from the controller to the controlled device
- Resistance (Ohms) of the chosen wire gauge
- Maximum current (Amps) the controlled device requires to operate

**To wire inputs and outputs**

**WARNING** Do not apply line voltage (mains voltage) to the controller's ports and terminals.

1. Verify that the SE6166sp's power and communications connections work properly.
2. Turn off the SE6166sp's power.
3 Connect the input wiring to the screw terminals on the SE6166sp.

**NOTES**
- Connect the shield wire to the **GND** terminal with the ground wire.
- Use only IN-1 or IN-2 for pulse counter or timed local override.
- For a loop-powered 4-20 mA sensor, wire the sensor’s positive terminal to the + terminal on the SE6166sp’s **Aux Power Out** connector. Wire the sensor’s negative terminal to an input’s + terminal.
4 Set the appropriate jumpers on the SE6166sp.

<table>
<thead>
<tr>
<th>To use...</th>
<th>For...</th>
<th>Set each input's <strong>Universal Input Mode Select</strong> jumper to the type of signal the input will receive.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Any input</td>
<td>Thermistor Dry contract 0–5 Vdc 0-10 Vdc 0–20 mA RTD</td>
<td>Jumper for inputs...</td>
</tr>
<tr>
<td>1 3 5 7 9 11 13 15</td>
<td>2 4 6 8 10 12 14 16</td>
<td></td>
</tr>
</tbody>
</table>

**Aux Power Out** connector Loop-powered 4-20 mA Set the **Select** jumper to +5V or +24V as required by the sensor.

5 Connect the digital output wiring to the screw terminals on the SE6166sp and to the controlled device.
6 Connect the analog output wiring to the screw terminals on the SE6166sp and to the controlled device.

Set AO Mode Select jumper to...

7 Set the **AO Mode Select** jumper to the type of device you are wiring the output to.

8 Turn **on** the SE6166sp's power.

---

**Wiring devices to the SE6166sp's Rnet port**

You can wire the following devices to the SE6166sp's Rnet port in a daisy-chain or star configuration:

- ZS sensors
- Wireless Adapter that communicates with wireless sensors
- Equipment Touch
- OptiPoint™ Interface

See the device's Technical Instructions for complete wiring instructions.

**NOTES**

- ZS sensors, a Wireless Adapter, and an Equipment Touch can share the same Rnet, but not RS sensors.
- The Rnet communicates at a rate of 115 kbps.
Wiring a LogiStat sensor to the SE6166sp


Download the SE6166sp

Download the following items to the SE6166sp's battery-backed memory:

<table>
<thead>
<tr>
<th>Item</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control program</td>
<td>Must be in <code>WebCTRL\webroot\&lt;system_name&gt;\programs</code>.</td>
</tr>
<tr>
<td>DRV_SESP driver</td>
<td>Must be in <code>WebCTRL\webroot\&lt;system_name&gt;\drivers</code>.</td>
</tr>
<tr>
<td></td>
<td><strong>NOTE</strong> To verify that you have the driver's latest version, go to <a href="http://accounts.automatedlogic.com/download">http://accounts.automatedlogic.com/download</a>, then select Drivers &gt; ExecB. Compare the latest version to the SE6166sp's driver in SiteBuilder.</td>
</tr>
</tbody>
</table>

**Editable properties**

**Schedules**

If you change any of the above items or the SE6166sp's address after the initial download, you must download again. The first download takes longer than subsequent downloads.

**CAUTIONS**

- The SE6166sp will lose stored data when you download.
- Equipment controlled by the SE6166sp will shut down and restart when you download.

To download from the WebCTRL® Interface

If your network is complete, you can download from any network browser. If not complete, connect a laptop with a local copy of the system database to the SE6166sp's local access port. See To communicate through the local access port (page 21).

1. On the WebCTRL® Network tree, select the controller.
2. Click Downloads.
3. Do one of the following:
   - If the controller is in the Downloads list, go to step 4.
   - If the controller is not in the list:
     a. Click Add.
     b. In the pop-up, select the controller.
     c. Select All Content.
     d. Click Add.
     e. Click Close.
4 Select the controller in the Downloads list.
5 Click Start.

NOTES
- If the download fails, locate and resolve the problem, then retry the download.
- You can also download a controller from the Devices page.

To assign inputs or outputs to points

An input or output must be assigned to its corresponding point in the control program. This is typically done when the control program is created, but you can adjust the settings at the time of installation in the WebCTRL® interface.

1 In the WebCTRL® Geographic tree, select the equipment controlled by the SE6166sp.
2 On the Properties page, select the I/O Points tab.
3 In each point's Num field, type the number of the controller's corresponding input or output. For example, if you use DO1 on the SE6166sp for the point Pump S/S, type 1 in the Num field for Pump S/S.

NOTES
- Exp (expander number) is 00 for the SE6166sp.
- Do not assign the same output number to more than one point.

4 Enter the appropriate values for each input and output in the remaining columns. See Input values, Output values, Resolution values and Offset/Polarity values below.

NOTE You can also enter these values in the EIKON® application.

5 If you have not performed the initial download to the SE6166sp, you must download now so you can verify inputs and outputs.

6 To verify each input's operation, force each sensor to a known value, then compare it to the Value shown on the Properties page on the I/O Points tab.

7 To verify each output's operation, lock each output to a known condition on the I/O Points tab, then verify that the equipment operates correctly.
## Input values

<table>
<thead>
<tr>
<th>Input</th>
<th>I/O Type</th>
<th>Sensor/Actuator Type</th>
<th>Min/Max</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Analog (BAI)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0-5 Vdc</td>
<td>0–5 Volt</td>
<td>Linear Full Range</td>
<td>Engineering values associated with 0 Vdc (Min) and 5 Vdc (Max) ¹</td>
</tr>
<tr>
<td>0-10 Vdc</td>
<td>0–10 Volt</td>
<td>Linear Full Range</td>
<td>Engineering values associated with 0 Vdc (Min) and 10 Vdc (Max) ¹</td>
</tr>
<tr>
<td>2-10 Vdc</td>
<td>0–10 Volt</td>
<td>Linear w/Offset, 2–10 Volts</td>
<td>Engineering values associated with 2 Vdc (Min) and 10 Vdc (Max) ¹</td>
</tr>
<tr>
<td>0-20 mA</td>
<td>0–20 mA</td>
<td>Linear Full Range</td>
<td>Engineering values associated with 0 mA (Min) and 20 mA (Max) ¹</td>
</tr>
<tr>
<td>4-20 mA</td>
<td>0–20 mA</td>
<td>Linear w/Offset, 4–20 mA</td>
<td>Engineering values associated with 4 mA (Min) and 20 mA (Max) ¹</td>
</tr>
<tr>
<td>RTD</td>
<td>RTD Input</td>
<td></td>
<td>N/A</td>
</tr>
<tr>
<td>Thermistor</td>
<td>Thermistor</td>
<td></td>
<td>N/A</td>
</tr>
</tbody>
</table>

### Pulse to Analog (BPTA) ³

<table>
<thead>
<tr>
<th>Input</th>
<th>I/O Type</th>
<th>Sensor/Actuator Type</th>
<th>Min/Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pulse Counter</td>
<td><strong>Counter Input</strong></td>
<td></td>
<td>N/A</td>
</tr>
</tbody>
</table>

### Digital (Binary) (BBI)

<table>
<thead>
<tr>
<th>Input</th>
<th>I/O Type</th>
<th>Sensor/Actuator Type</th>
<th>Min/Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dry Contact</td>
<td><strong>Dry Contact</strong></td>
<td></td>
<td>N/A</td>
</tr>
</tbody>
</table>

---

¹ The sensor reads a value and sends a corresponding signal (Volt, mA, or psi) to the SE6166sp’s physical input. The Analog Input microblock uses the Min and Max values to linearly translate the signal into the engineering value used in subsequent control logic. For example, set Min to 0 and Max to 10 for a 4–20 mA sensor that measures velocity from 0.0 to 10.0 inches/second so that when the input reads 4 mA, the microblock outputs a value of 0. Similarly, when the input reads 8 mA, the microblock outputs a value of 2.5.

² You can set up a custom translation table (page 21) on the driver’s Custom Translation Tables pages in the WebCTRL® interface.

³ The control program must have one Pulse to Analog Input microblock for each pulse counting input.
Output values

<table>
<thead>
<tr>
<th>Output</th>
<th>I/O Type</th>
<th>Sensor/Actuator Type</th>
<th>Min/Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Analog (BAO)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0-10 Vdc</td>
<td>Electrical 0–10 Volt</td>
<td>Linear Full Range</td>
<td>Engineering values associated with 0 Vdc (Min) and 10 Vdc (Max) ¹</td>
</tr>
<tr>
<td>2-10 Vdc</td>
<td>Electrical 0–10 Volt</td>
<td>Linear w/Offset, 2–10 Volts</td>
<td>Engineering values associated with 2 Vdc (Min) and 10 Vdc (Max) ¹</td>
</tr>
<tr>
<td>0-20 mA</td>
<td>Electrical 0–20 mA</td>
<td>Linear Full Range</td>
<td>Engineering values associated with 0 mA (Min) and 20 mA (Max) ¹</td>
</tr>
<tr>
<td>4-20 mA</td>
<td>Electrical 0–20 mA</td>
<td>Linear w/Offset, 4–20 mA</td>
<td>Engineering values associated with 4 mA (Min) and 20 mA (Max) ¹</td>
</tr>
<tr>
<td>Digital (Binary) (BBO)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Relay</td>
<td>Relay/Triac Output</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>

¹ The Analog Output microblock uses the Min and Max values to linearly translate its EiKON® wire value into a physical output signal (Volt, mA, or psi) sent from the SE6166sp to an actuator. For example, set Min to 0 and Max to 100 for an Analog Output microblock that receives a 0 to 100% open signal from a PID microblock and that controls a 0–10 Vdc actuator so that when the PID signal is 100%, the SE6166sp output is 10 Vdc. Similarly, when the PID signal is 50%, the SE6166sp output is 5 Vdc.

Resolution values

Resolution is not particular to a type of input or output, but the driver handles analog and digital (binary) inputs and outputs differently. To set these values appropriately, you should understand how the driver uses them.

<table>
<thead>
<tr>
<th>Resolution</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Analog Input (BAI)</td>
<td>The driver truncates the microblock’s present value according to the resolution. EXAMPLE If the calculated present value is 13.789 and you set the Resolution to 0.1, the control program uses 13.7 for any calculations downstream from the microblock.</td>
</tr>
<tr>
<td>Analog Output (BAO)</td>
<td>The driver truncates the wire input value to the microblock before performing any scaling calculations. EXAMPLE If the wire input value is 13.789 and you set the Resolution to 0.1, the microblock uses 13.7 for any scaling calculations.</td>
</tr>
<tr>
<td>Digital (Binary) Inputs and Outputs</td>
<td>N/A</td>
</tr>
</tbody>
</table>
Offset/Polarity values

Offset/Polarity is not particular to a type of input or output, but the driver handles analog and digital (binary) inputs and outputs differently. To set these values appropriately, you should understand how the driver uses them.

<table>
<thead>
<tr>
<th>Offset/Polarity</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Analog Input (BAI)</td>
<td><strong>Offset</strong> value (positive or negative) adds a fine adjustment to a sensor reading after all scaling for calibration. <strong>EXAMPLE</strong> If a sensor reads 74.9°F when the actual measured value is 73.6°F, enter an Offset of –1.3 to calibrate the sensor to the measured value.</td>
</tr>
<tr>
<td>Analog Output (BAO)</td>
<td>You can use the <strong>Offset</strong> value (positive or negative) to calibrate an output, but you generally do not need to. If used, the driver adds the offset value to the wire input value before performing any scaling calculations to determine the SE6166sp's output.</td>
</tr>
<tr>
<td>Digital (Binary) Input (BBI)</td>
<td><strong>Polarity</strong> determines the microblock's present value when no signal is received from the equipment. When no signal is received from the equipment, if <strong>Polarity</strong> is set to: <strong>normal</strong>—present value is off <strong>reversed</strong>—present value is on</td>
</tr>
<tr>
<td>Digital (Binary) Output (BBO)</td>
<td><strong>Polarity</strong> determines the SE6166sp's output based on the control program's signal to the microblock. When the control program's signal to the microblock is <strong>on</strong>, if <strong>Polarity</strong> is set to: <strong>normal</strong>—output is on <strong>reversed</strong>—output is off <strong>NOTE</strong> Regardless of <strong>Polarity</strong>, the output will be off if the SE6166sp loses power.</td>
</tr>
</tbody>
</table>

To use the Auto-Off-On switches

You can control a digital output using the Auto-Off-On switch.

<table>
<thead>
<tr>
<th>If switch position is...</th>
<th>Normally open output contacts are...</th>
</tr>
</thead>
<tbody>
<tr>
<td>Auto</td>
<td>Determined by control program</td>
</tr>
<tr>
<td>Off</td>
<td>Locked open</td>
</tr>
<tr>
<td>On</td>
<td>Locked closed</td>
</tr>
</tbody>
</table>

The control program can monitor the status of an Auto-Off-On switch and display the status on the control program's Properties page > I/O Points tab in the WebCTRL® interface. The Value of the point monitoring the Auto-Off-On switch shows Off if the switch is set to Auto, and On if the switch is set to Off or On.
To monitor an Auto-Off-On switch

1. Insert a BACnet Binary Input microblock in the control program.
2. On the microblock's Properties page in the WebCTRL® interface, set the I/O Type field to H-O-A Status Feedback.
3. In the Input Number field, type the number of the output you want to monitor.

To set up the driver

After you download the driver and control program to the SE6166sp, you may want to change the driver's properties in the WebCTRL® interface to suit your application.

1. On the WebCTRL® Network tree, click to the left of your SE6166sp.
2. Click to the left of Driver to see its children.
3. Make changes as needed on the Properties page for Driver and any of its children.

Driver

On the Driver page, you can change the following properties:

- Module clock synchronization and failure. See table below.
- Network Input microblock communication properties.

<table>
<thead>
<tr>
<th>BACview Control</th>
<th>TouchScreen Control</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Keypad Inactivity timeout (minutes)</strong></td>
<td><strong>TouchScreen Schedule Edit Enable</strong></td>
</tr>
</tbody>
</table>
| Log out the user (if a user-level password is required), turn off the backlight, and display the standby screen after this period of inactivity. | Check this field to allow a user to edit this controller's schedules from an Equipment Touch's Schedules screen. **NOTE** Schedules edited on an Equipment Touch are not uploaded to the WebCTRL® application. This could result in the controller operating on a schedule that differs from the one you see in the WebCTRL® interface.
| Keypad user-level password | **Clock Fail Date and Time** |
| Numeric password user must enter to access system through a BACview® device. | Date and time the control program uses when controller's real-time clock is invalid. **TIP** Use an occupied date and time (such as a Tuesday at 10 a.m.) so the equipment does not operate in unoccupied mode if the controller loses power during occupancy.
| **Time Synch Sensitivity (seconds)** | When the controller receives a time sync request, if the difference between the controller's time and the time sync's time is greater than this field's value, the controller's time is immediately changed. If the difference is less than this field's value, the controller's time is slowly adjusted until the time is correct. |
| **Network Microblocks** | The maximum number of retries after the initial attempt that a Network microblock will attempt to communicate with its target device. If unsuccessful, the point will transition to an idle state for 30 seconds before attempting to communicate again. Change this field only if directed by Technical Support. |
| **Number of poll retries before Network Input Microblocks indicate failure** | If a microblock uses a wildcard in its address, this timer determines how often the microblock will attempt to find the nearest instance of its target. For example, if an outside air temperature address uses a wildcard, a VAV application will look for the outside air temperature on the same network segment or on the nearest device containing that object. |
| **Periodic rebinding interval** | Under normal circumstances, COV Throttling should be enabled to prevent excessive network traffic if an object's COV Increment is set too low. See EXCEPTION below. When enabled, if an object generates excessive COV broadcasts (5 updates in 3 seconds), the driver automatically throttles the broadcasts to 1 per second. Also, if the object's value updates excessively for 30 seconds, an alarm is sent to the WebCTRL® application listing all objects that are updating excessively. A Return-to-normal alarm is sent only after all objects have stopped updating excessively. EXCEPTION: In rare circumstances, such as process control, a subscribing object may require COV updates more frequently than once per second. For these situations, clear this checkbox, but make sure that your network can support the increased traffic. You will also need to disable the Excessive COV alarms under the driver's Common Alarms. |
| **BACnet COV Throttling** | Collect a daily midnight sample for all points in this controller that are sampling on COV For values that change infrequently, select to verify at midnight daily that the point is still able to communicate trend values. |
Device

On the **Device** page, you can change the following properties:

- BACnet device object properties for the SE6166sp
- SE6166sp network communication

<table>
<thead>
<tr>
<th>Configuration</th>
<th>NOTE</th>
<th>The three APDU fields refer to all networks over which the SE6166sp communicates.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max Masters and Max Info Frames</td>
<td>Apply only if the SE6166sp is on an MS/TP network.</td>
<td></td>
</tr>
</tbody>
</table>

### Notification Classes

A BACnet alarm's Notification Class defines:

- Alarm priority for Alarm, Fault, and Return to Normal states
- Options for BACnet alarm acknowledgment
- Where alarms should be sent (recipients)

Alarms in the WebCTRL® application use Notification Class #1. The WebCTRL® application is automatically a recipient of these alarms.

<table>
<thead>
<tr>
<th>Priorities</th>
<th>NOTE</th>
<th>BACnet defines the following Network message priorities for Alarms and Events.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Priority range</td>
<td>Network message priority</td>
<td></td>
</tr>
<tr>
<td>00–63</td>
<td>Life Safety</td>
<td></td>
</tr>
<tr>
<td>64–127</td>
<td>Critical Equipment</td>
<td></td>
</tr>
<tr>
<td>128–191</td>
<td>Urgent</td>
<td></td>
</tr>
<tr>
<td>192–255</td>
<td>Normal</td>
<td></td>
</tr>
</tbody>
</table>

**Priority of Off-Normal**

BACnet priority for Alarms.

**Priority of Fault**

BACnet priority for Fault messages.

**Priority of Normal**

BACnet priority for Return-to-normal messages.

**Ack Required for Off-Normal, Fault, and Normal**

Specifies whether alarms associated with this Notification Class require a BACnet Acknowledgment for Off-Normal, Fault, or Normal alarms.

💡 **TIP** You can require operator acknowledgment for an Alarm or Return-to-normal message (stored in the WebCTRL® database). In the WebCTRL® interface on the **Alarm > Enable/Disable** tab, change the acknowledgment settings for an alarm source or an alarm category.

<table>
<thead>
<tr>
<th>Recipient List</th>
<th>Recipients</th>
</tr>
</thead>
<tbody>
<tr>
<td>The first row in this list is from the WebCTRL® application. Do not delete this row. Click <strong>Add</strong> if you want other BACnet devices to receive alarms associated with this Notification Class.</td>
<td></td>
</tr>
<tr>
<td><strong>Recipient Description</strong></td>
<td>Name that appears in the <strong>Recipients</strong> table.</td>
</tr>
<tr>
<td>---------------------------</td>
<td>------------------------------------------------</td>
</tr>
<tr>
<td><strong>Recipient Type</strong></td>
<td>Use <strong>Address</strong> (static binding) for either of the following:</td>
</tr>
<tr>
<td></td>
<td>• Third-party BACnet device recipients that do not support dynamic binding</td>
</tr>
<tr>
<td></td>
<td>• When you want alarms to be broadcast (you must uncheck <strong>Issue Confirmed Notifications</strong>). This use is rare.</td>
</tr>
<tr>
<td><strong>Days and times</strong></td>
<td>The days and times during which the recipient will receive alarms.</td>
</tr>
<tr>
<td><strong>Recipient Device Object Identifier</strong></td>
<td>Type the <strong>Device Instance</strong> from SiteBuilder (or from the network administrator for third-party devices) in the # field.</td>
</tr>
<tr>
<td><strong>Process Identifier</strong></td>
<td>Change for third-party devices that use a BACnet Process Identifier other than 1. The WebCTRL® application processes alarms for any 32-bit Process Identifier.</td>
</tr>
<tr>
<td><strong>Issue Confirmed Notifications</strong></td>
<td>Select to have a device continue sending an alarm message until it receives delivery confirmation from the recipient.</td>
</tr>
<tr>
<td><strong>Transitions to Send</strong></td>
<td>Uncheck the types of alarms you do not want the recipient to get.</td>
</tr>
</tbody>
</table>

**Calendars**

Calendars are provided in the driver for BACnet compatibility only. Instead, use the **Schedules** feature in the WebCTRL® interface.

**Common and Specific Alarms**

On these pages, you can enable/disable, change BACnet alarm properties, or set delays for the following BACnet alarms:

- **Common alarms:**
  - Module Halted
  - All Programs Stopped
  - Duplicate Address
  - Locked I/O
  - Control Program
  - Program Stopped
  - Excessive COV

- **Specific alarm:**
  - Low Battery Alarm

**NOTE** To set up alarm actions for controller generated alarms, see **Setting up alarm actions** in WebCTRL® Help.

<table>
<thead>
<tr>
<th><strong>Module Generated Alarm</strong></th>
<th>Short message shown on the <strong>Alarms</strong> page or in an alarm action when this type of alarm is generated.</th>
</tr>
</thead>
</table>
Events

<table>
<thead>
<tr>
<th>Alarm Category and Alarm Template</th>
<th>See Customizing alarms in WebCTRL® Help.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enable</td>
<td>Clear these checkboxes to disable Alarm or Return to normal messages of this type from this controller.</td>
</tr>
<tr>
<td>Notification Class</td>
<td>Do not change this field.</td>
</tr>
</tbody>
</table>

Custom Translation Tables

You can set up a translation table that an analog input will use to translate the raw data from a non-linear sensor to the engineering units you want to output on the wire. In the Network tree, select Custom Translation Table #1, #2, or #3. The Properties page has instructions. For the input to use the translation table, navigate to the input in the Geographic tree, select the Details tab, then set Sensor Type (Scaling Method) to Non-Linear, Custom Table #__.

Switch and Jumper Positions

The Switch and Jumper Positions page shows the current physical settings on the SE6166sp.

To communicate through the Local Access port

Using a computer and a USB Link Kit, you can communicate locally with the SE6166sp to download or to troubleshoot.

**PREREQUISITES**

- A computer with a USB port
- A USB Link Kit. See the USB Link Kit Technical Instructions.

**NOTE** The USB Link Kit driver is installed with a WebCTRL® v5 or later system. But if needed, you can get the latest driver from http://www.silabs.com/products/mcu/Pages/USBtoUARTBridgeVCPDrivers.aspx. Install the driver before you connect the USB Link Kit to your computer.

- v1.70 or later controller driver

**CAUTION** If multiple controllers share power but polarity was not maintained when they were wired, the difference between the controller's ground and the computer's AC power ground could damage the USB Link Kit and the controller. If you are not sure of the wiring polarity, use a USB isolator between the computer and the USB Link Kit. Purchase a USB isolator online from a third-party manufacturer.
Connect the USB Link Kit to the computer and to the controller's Local Access port.

NOTE If using a USB isolator, plug the isolator into your computer's USB port, and then plug the USB Link Kit cable into the isolator.

To set up a local access connection in the WebCTRL® interface

For the WebCTRL® application to communicate with the Local Access port, you must do the following:

1. On the System Configuration tree, select Connections.
2. On the Configure tab, click Add.
3. From the Type drop-down list, select BACnet Local Access.
4. Optional: Edit the Description.
5. Type the computer's Port number that the USB cable is connected to.
   NOTE To find the port number, plug the USB cable into the computer's USB port, then select Start > Control Panel > System > Device Manager > Ports (Com & LPT). The COM port number is beside Silicon Labs CP210x USB to UART Bridge.
6. Set the Baud rate to 115200.
7. Click Accept.
8. On the View tab, click the button next to the BACnet/IP network, then select BACnet Local Access.
9. Click Accept.
10. On the Configure tab, select BACnet Local Access, then click Start.
    NOTE If an error message appears, make sure the COM port you selected is not in use. For example, PuTTY may be open and is holding the port open.
11. On the Network tree, select the controller that you are connected to.
12. Click , then select Manual Command.
13. Type rnet here in the dialog box, then click OK.
14. On the Properties page, click Module Status. If a Modstat report appears, the WebCTRL® application is communicating with the controller.
Troubleshooting

If you have problems mounting, wiring, or addressing the SE6166sp, contact Automated Logic® Technical Support.

LED's

The LED's on the show the status of certain functions.

<table>
<thead>
<tr>
<th>If this LED is on...</th>
<th>Status is...</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power</td>
<td>The SE6166sp has power.</td>
</tr>
<tr>
<td>Rx</td>
<td>The SE6166sp is receiving data from the network segment</td>
</tr>
<tr>
<td>Tx</td>
<td>The SE6166sp is transmitting data over the network segment</td>
</tr>
<tr>
<td>DO#</td>
<td>The digital output is active</td>
</tr>
</tbody>
</table>

The Run and Error LED's indicate controller and network status.

<table>
<thead>
<tr>
<th>If Run LED shows...</th>
<th>And Error LED shows...</th>
<th>Status is...</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 flashes per second</td>
<td>Off</td>
<td>Normal</td>
</tr>
<tr>
<td>2 flashes per second</td>
<td>2 flashes, alternating with Run LED</td>
<td>Five minute auto-restart delay after system error</td>
</tr>
<tr>
<td>2 flashes per second</td>
<td>3 flashes, then off</td>
<td>The controller has just been formatted</td>
</tr>
<tr>
<td>2 flashes per second</td>
<td>4 flashes, then pause</td>
<td>Two or more devices on this network have the same network address</td>
</tr>
<tr>
<td>2 flashes per second</td>
<td>1 flash per second</td>
<td>The controller is alone on the network</td>
</tr>
</tbody>
</table>
| 2 flashes per second| On                     | Obtain a Module Status Report (Modstat) to determine which of the following occurred:  
|                     |                         | • Exec halted after frequent system errors  
<p>|                     |                         | • Control programs halted |
| 5 flashes per second| On                     | Exec start-up aborted, Boot is running |
| 5 flashes per second| Off                    | Firmware transfer in progress, Boot is running |
| 7 flashes per second| 7 flashes per second, alternating with Run LED | Ten second recovery period after brownout |
| 14 flashes per second| 14 flashes per second, alternating with Run LED | Brownout |</p>
<table>
<thead>
<tr>
<th>If Run LED shows...</th>
<th>And Error LED shows...</th>
<th>Status is...</th>
</tr>
</thead>
<tbody>
<tr>
<td>On</td>
<td>On</td>
<td>Failure. Try the following solutions:</td>
</tr>
</tbody>
</table>

- Turn the SE6166sp off, then on.
- Format the SE6166sp.
- Download the SE6166sp.
- Replace the SE6166sp.

**NOTE** If you resolve the issue but the Error LED does not turn off, cycle power to the controller.

### To format the controller

If you cannot communicate with a controller after downloading it, as a last resort, you can manually format the controller to erase its memory.

1. Turn off the SE6166sp's power.
2. Make sure the address switches are not set to 0, 0.
3. Hold down the controller’s **Format** button while you turn its power on.
4. Continue to hold down the **Format** button until the Error LED stops flashing and turns on, then release the button.
5. Download the SE6166sp.

### To get the SE6166sp's serial number

If you need the SE6166sp's serial number when troubleshooting, the number is on:

- a sticker on the back of the main controller board
- a Module Status report (Modstat) under **Core** (or **Main**) board hardware

#### Core board hardware:

```
Type: SE6166sp, Board 001, manufactured on 06/27/2013
RAM: 512 kBytes; FLASH: 1024 kBytes, type = 3
```

S/N 021362247P

To obtain a modstat in the WebCTRL® interface:

1. Select the SE6166sp in the **Network** tree.
2. On the **Properties** page, click **Module Status**.
Recovering from a power outage

The SE6166sp has a 10-year Lithium CR2032 battery that retains the following data for a maximum of 10,000 hours during power outages.

- Time
- Control programs
-Editable properties
- Trends
- Schedules

If the above data is lost after power returns, replace the battery and then download the SE6166sp. See instructions below.

To replace the SE6166sp's battery

If the SE6166sp sends a **Low Battery** alarm to the WebCTRL® application, replace the battery.

1. Verify that the SE6166sp's power is on.
2. Remove the battery from the controller, making note of the battery's polarity.
3. Insert the new battery into the controller, matching the polarity of the battery you removed.
4. Download the SE6166sp.

To take the SE6166sp out of service

If needed for troubleshooting or start-up, you can stop communication between the WebCTRL® application and the SE6166sp.

1. On the WebCTRL® **Network** tree, select the SE6166sp.
2. On the **Properties** page, check **Out of Service**.
3. Click **Accept**.
Compliance

FCC Compliance

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

⚠️ CAUTION Changes or modifications not expressly approved by the responsible party for compliance could void the user’s authority to operate the equipment.

CE Compliance

⚠️ WARNING This is a Class A product. In a domestic environment, this product may cause radio interference in which case the user may be required to take adequate measures.

BACnet Compliance

Compliance of listed products to requirements of ASHRAE Standard 135 is the responsibility of BACnet International. BTL® is a registered trademark of BACnet International.
Appendix - SE6166sp coverplate
**Document revision history**

Important changes to this document are listed below. Minor changes such as typographical or formatting errors are not listed.

<table>
<thead>
<tr>
<th>Date</th>
<th>Topic</th>
<th>Change description</th>
<th>Code*</th>
</tr>
</thead>
<tbody>
<tr>
<td>10/24/18</td>
<td>Driver and control program</td>
<td>Changed driver to DRV_SESP</td>
<td>X-D</td>
</tr>
<tr>
<td></td>
<td>Downloading the SE6166sp</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* For internal use only
**Outside Air**

**CO2 Sensor**

LCD display with field calibration menu  
2000/5000 ppm CO2  
Integrated set-point relay  
Field replaceable element  
Internal heater for increased operating range

---

**DESCRIPTION**

Senva CO2 sensors maximize energy savings by ensuring optimal ventilation. Measuring exterior CO2 levels ensures optimized economizer control. The CO2O series is an outside air sensor with NDIR sensing element and features that include a built-in heater, standard LCD, setpoint relay, menu selectable auto-calibration and provision to offset the reading +/-250ppm.

**APPLICATIONS**

- Controlling ventilation in response to occupancy  
- Economizer control  
- Facilitates compliance with ASHRAE 62.1 standard for air quality

---

**FEATURES**

**Easy to install and maintain**

- Integrated display and push-button menus for field selectable scale, calibration, and operational modes  
- Dual 4-20mA and 0-5V/0-10V output (jumper selectable)  
- Integrated high-reliability solid-state set-point relay is ideal for direct control applications; easy to set up thanks to LCD

**High reliability reduces call backs**

- Non-dispersive infrared sensing element (NDIR)  
- Field replaceable CO2 sensor  
- 15+ year life expectancy on CO2 sensing element  
- Industry leading 7-year limited warranty on electronics; NDIR module 3 years

**High accuracy for improved system performance**

- Internal heater for reliable outdoor operation  
- Selectable auto-calibration mode returns sensor to baseline values  
- ±40ppm, ±3% of reading

---

**Display and menu**

- Easy set point and calibration adjustments. Set offsets for CO2

**Field replaceable element**

- Replaceable NDIR CO2 element for easy service

---

7 year limited warranty
### ORDERING

**CO2O-A CO2 Outside Air**

To order replacement sensor elements, please consult factory

### SPECIFICATIONS

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Power Supply</strong></td>
<td>12-30VDC/24VAC, 100mA max.</td>
</tr>
<tr>
<td><strong>Analog Outputs</strong></td>
<td>Dual Analog 3-wire 4-20mA and 0-5V/0-10V (jumper)</td>
</tr>
<tr>
<td><strong>Output scaling</strong></td>
<td>0 - 2000 or 0 - 5000 ppm (selectable)</td>
</tr>
<tr>
<td><strong>Digital Setpoint Output</strong></td>
<td>Programmable Solid-state, 1A @ 30VAC/DC, N.O.</td>
</tr>
<tr>
<td><strong>Sensor Performance</strong></td>
<td>Type Non-dispersive Infrared (NDIR)</td>
</tr>
<tr>
<td><strong>Accuracy</strong></td>
<td>±40ppm, ±3% of reading</td>
</tr>
<tr>
<td><strong>Response time</strong></td>
<td>2 minutes to 90% reading</td>
</tr>
<tr>
<td><strong>Output update rate</strong></td>
<td>3 seconds</td>
</tr>
<tr>
<td><strong>SPH</strong>, Setpoint, Hi (On point)</td>
<td>500ppm to full-scale (700ppm default)</td>
</tr>
<tr>
<td><strong>SPL</strong>, Setpoint, Lo (Off point)</td>
<td>400ppm to full-scale-50 (600ppm default)</td>
</tr>
<tr>
<td><strong>LCD Menu Setup Parameters</strong></td>
<td><strong>SCL</strong>, Scaling 0-2000ppm or 0-5000ppm (2000ppm default)</td>
</tr>
<tr>
<td><strong>Adj. Adjustment</strong></td>
<td>Offset adjustment +/-250ppm (0 default)</td>
</tr>
<tr>
<td><strong>Calibration mode</strong></td>
<td>Automatic mode ON or OFF (default=ON)</td>
</tr>
<tr>
<td><strong>Run mode</strong></td>
<td>Displays CO2 in ppm</td>
</tr>
<tr>
<td><strong>Operating Environment</strong></td>
<td><strong>Temperature</strong> 0 to 122°F (-18 to 50°C)</td>
</tr>
<tr>
<td><strong>Humidity</strong></td>
<td>0-95% non-condensing</td>
</tr>
<tr>
<td><strong>Enclosure</strong></td>
<td><strong>Material</strong> ABS Plastic</td>
</tr>
<tr>
<td><strong>Dimensions</strong></td>
<td>4.0’ h x 4.4” w x 2.1” d</td>
</tr>
</tbody>
</table>

(1) One side of transformer secondary is connected to signal common. Dedicated transformer is recommended.
(2) 15-30VDC/24VAC power supply voltage required for 10 volt output.
SERIES T
Differential Pressure Transmitters

DESCRIPTION
The Series T family of differential pressure transmitters measure low pressures and feature low power consumption and a variety of analog signal outputs. A wide selection of standard pressure ranges and electrical ratings is available.

These transmitters feature: no moving parts to wear out, reliable long term stability, and are virtually position insensitive.

The Series T transmitters are an excellent choice for many HVAC, process and automation monitoring requirements. These transmitters monitor: filter differential pressures, fan static pressures, clean room pressures, variable air volume systems and velocity pressures. They have been used for bubbler level systems, leak detection and in medical and analytical instruments.

The transmitters are housed in a flame retardant, glass-reinforced polyphenylene oxide (NORYL™) case. Electrical connections are made by means of a 3/8” terminal strip with #6 screws.

The Series T includes four models: Model T10, Model T20, Model T30 and Model T40. These four models incorporate a variety of power and signal options.

The span or zero adjustment is performed with a 20-turn potentiometer for fine resolution.

OPERATION
The pressure sensing element is a differential capacitance cell for pressure measurements ranging from 0.1 to 5 inches of water (25 Pa to 1.0 kPa), or piezoresistive (silicon) sensors for pressure measurements ranging from 5 inches of water to 30 psi (1.0 kPa to 200 kPa).

The capacitance cell is capable of sensing very low pressures, negative or differential. A very light weight, responsive diaphragm within the cell deflects a small amount when a small pressure is applied. This deflection results in a change in capacitance which is then detected and amplified electronically.

The piezoresistive sensor is a solid state device designed in a Wheatstone bridge configuration. When pressure is applied to the device the resistance of the bridge changes by a small amount. This resistance change is converted to a voltage and amplified.

SPECIFICATIONS

General
Measures differential, gage pressure, or vacuum
Suitable for air or inert gases
Maximum safe momentary overpressure: see reference table A
Calibration: (Traceable to N.I.S.T.)

Performance
Accuracy: ±1% of span (including non-linearity and hysteresis)
Calibration: (Traceable to N.I.S.T.)

Environmental
Operating temperature range: 0°C to 45°C (32°F to 115°F)
Storage temperature: -30°C to 70°C (-20°F to 160°F)
Effect of temperature
on zero: ±0.05%/°C
on span: ±0.02%/°C
Operating humidity range: 10% to 90% R.H. non-condensing
Shock resistance: 10G (11ms)
Vibration resistance: 5G to 50 Hz

Electrical Connections
Connections: External 3/8” terminal strip with #6 screws

Physical
Pressure port connections: 3/16” dia. suitable for:
1/8” I.D. Tygon™ or polyurethane tubing (3 - 4mm)
1/4” O.D. polyethylene tubing (6mm)
Integral filters at both ports
Dimensions: 3.00”W x 5.15”L x 1.40”H (76 x 131 x 36mm)
Material: Flame retardant, glass-reinforced polyphenylene oxide (NORYL™) case
Weight: 0.42 lb max (190 g)
MODEL T10
DC Power Input/Voltage Output

Diagram shows area of detail.
Please see inset diagrams for wiring of each individual model below.

SPECIFICATIONS
Electrical
Supply Voltage: 11 to 32 Vdc (14.5 to 32 Vdc for 10 Volts output)
Protected against reversal of polarity
Supply Current: 10mA
Output:
0 to 5 Volts, linear
0 to 10 Volts, linear
Sink or source 3.5mA
Protected against short circuit

ORDERING INFORMATION
Order Number (See Table below and Reference Table A on page 26)

T10 - PPP - V - O

EXAMPLE: T10 - 01E - 5 - A

ORDERING INFORMATION
Order Number (See Table below and Reference Table A on page 26)

MODEL T20
AC Power Input/Voltage Output

SPECIFICATIONS
Electrical
Transformer isolation between power supply and output is 2500 Vrms
Output voltage:
0 to 5 Volts, or
0 to 10 Volts
Sink or source 3.5mA
Protected against short circuit

ORDERING INFORMATION
Order Number (See Table below and Reference Table A on page 26)

T20 - PPP - S - V - O

EXAMPLE: T20 - 07P - C - X - B

ORDERING INFORMATION
Order Number (See Table below and Reference Table A on page 26)

T20 - PPP - S - V - O

EXAMPLE: T20 - 07P - C - X - B

ORDERING INFORMATION
Order Number (See Table below and Reference Table A on page 26)

T10 - PPP - V - O

EXAMPLE: T10 - 01E - 5 - A

ORDERING INFORMATION
Order Number (See Table below and Reference Table A on page 26)
MODEL T30
Two Wire / 4-20mA Output

SPECIFICATIONS

Electrical
Supply Voltage: 11 to 32 Vdc
(See diagram below for maximum loop resistance)
Protected against reversal of polarity
Output limited to approx. 3.85mA at low end of span and approx. 25mA at upper end of span

MODEL T40
AC Power Input / 4-20mA Output

SPECIFICATIONS

Electrical

<table>
<thead>
<tr>
<th>Nominal Input Voltage</th>
<th>Power Consumption</th>
<th>Operating Voltage Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>24 Vac, 50/60Hz</td>
<td>1.5W</td>
<td>20 to 30 Vac</td>
</tr>
<tr>
<td>120 Vac, 50/60Hz</td>
<td>1.5W</td>
<td>100 to 140 Vac</td>
</tr>
<tr>
<td>240 Vac, 50/60Hz</td>
<td>1.5W</td>
<td>200 to 260 Vac</td>
</tr>
</tbody>
</table>

Transformer isolation between power supply and output is 2500 Vrms
Receiver resistance can be from 0 to 600 Ohms
Output limited to approx. 27mA at the upper end of span

ORDERING INFORMATION

Order Number (See Table below and Reference Table A on page 26)
T30 - PPP - O
EXAMPLE: T30 - 06E - B

PPP = Pressure Range

<table>
<thead>
<tr>
<th>PPP</th>
<th>O = Offset</th>
</tr>
</thead>
<tbody>
<tr>
<td>PPP</td>
<td>O = Offset</td>
</tr>
<tr>
<td>See Reference Table A</td>
<td>- = No offset</td>
</tr>
<tr>
<td>A = 1/4 offset</td>
<td></td>
</tr>
<tr>
<td>B = 1/2 offset</td>
<td></td>
</tr>
</tbody>
</table>

ORDERING INFORMATION

Order Number (See Table below and Reference Table A on page 26)
T40 - PPP - S - O
EXAMPLE: T40 - 03M - E - B

PPP = Pressure Range

<table>
<thead>
<tr>
<th>PPP</th>
<th>S = Supply Voltage</th>
<th>O = Offset</th>
</tr>
</thead>
<tbody>
<tr>
<td>PPP</td>
<td>S = Supply Voltage</td>
<td>O = Offset</td>
</tr>
<tr>
<td>See Reference Table A</td>
<td>C = 24 Vac</td>
<td></td>
</tr>
<tr>
<td>D = 120 Vac</td>
<td></td>
<td></td>
</tr>
<tr>
<td>E = 240 Vac</td>
<td></td>
<td></td>
</tr>
<tr>
<td>See Reference Table A</td>
<td>- = No offset</td>
<td></td>
</tr>
<tr>
<td>A = 1/4 offset</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B = 1/2 offset</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

NOTES

Note 1:
If the measured differential pressure is expected to go from positive to negative, a transmitter with offset (elevated zero) should be ordered. Three options are available:

“-” No offset. At zero differential pressure the output signal is:
4mA (4 to 20mA range)
0V (0 to 5V range)
0V (0 to 10V range)
Pressure excursion: 0% to 100% of Range, see Table A

“A” 1/4 span offset. At zero differential pressure the output signal is:
8mA (4 to 20mA range)
1.25V (0 to 5V range)
2.5V (0 to 10V range)
Pressure excursion: -33% to 100% of Range, see Table A

“B” 1/2 span offset. At zero differential pressure the output signal is:
12mA (4 to 20mA range)
2.5V (0 to 5V range)
5V (0 to 10V range)
Pressure excursion: -100% to 100% of Range see Table A

To order: determine the positive pressure range; from Table A find the corresponding pressure code, then add the required offset (none, A, or B).

For example, T30 05E A is a transmitter with a maximum range of 1” of H2O at 20mA and a minimum range of -0.33” of H2O at 4mA.
### Table A—Standard Pressure Ranges

<table>
<thead>
<tr>
<th>ENGLISH Units</th>
<th>METRIC UNITS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Maximum Safe Momentary Overpressure</strong></td>
<td><strong>Pressure</strong></td>
</tr>
<tr>
<td>01E 0-0.100 in. H2O 5 in. H2O</td>
<td>01P 0-25.0 Pa</td>
</tr>
<tr>
<td>02E 0-0.200 in. H2O 10 in. H2O</td>
<td>02P 0-50.0 Pa 1.25 kPa</td>
</tr>
<tr>
<td>03E 0-0.300 in. H2O 20 in. H2O</td>
<td>03P 0-75.0 Pa</td>
</tr>
<tr>
<td>04E 0-0.500 in. H2O 30 in. H2O</td>
<td>04P 0-100.0 Pa</td>
</tr>
<tr>
<td>05E 0-1.00 in. H2O 5 psid</td>
<td>05P 0-250 Pa 5 kPa</td>
</tr>
<tr>
<td>06E 0-2.00 in. H2O 10 psid</td>
<td>06P 0-500 Pa</td>
</tr>
<tr>
<td>07E 0-3.00 in. H2O 20 psid</td>
<td>07P 0-750 Pa</td>
</tr>
<tr>
<td>08E 0-5.00 in. H2O 50 psid</td>
<td>08P 0-1.000 kPa</td>
</tr>
<tr>
<td>09E 0-10.0 in. H2O 100 psid</td>
<td>09P 0-2.500 kPa 35 kPa</td>
</tr>
<tr>
<td>11E 0-20.0 in. H2O 200 psid</td>
<td>11P 0-5.000 kPa</td>
</tr>
<tr>
<td>12E 0-30.0 in. H2O 400 psid</td>
<td>12P 0-7.500 kPa</td>
</tr>
<tr>
<td>13E 0-50.0 in. H2O 1000 psid</td>
<td>13P 0-10.000 kPa</td>
</tr>
<tr>
<td>14E 0-100.0 in. H2O 2000 psid</td>
<td>14P 0-20.000 kPa</td>
</tr>
<tr>
<td>15E 0-1.00 psid</td>
<td>15P 0-50.000 kPa</td>
</tr>
<tr>
<td>16E 0-2.00 psid</td>
<td>16P 0-100.000 kPa</td>
</tr>
<tr>
<td>17E 0-3.00 psid</td>
<td>17P 0-200.000 kPa</td>
</tr>
<tr>
<td>18E 0-5.00 psid</td>
<td>18P 0-500.000 kPa</td>
</tr>
</tbody>
</table>

*Maximum safe momentary overpressure at any port is 2X the maximum operating static pressure.*

### Table B—Standard Pressure Ranges for W Series

<table>
<thead>
<tr>
<th>ENGLISH Units</th>
<th>METRIC UNITS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Pressure Range</strong></td>
<td><strong>Operating Static Pressure</strong></td>
</tr>
<tr>
<td>01E 0-0.100 in. H2O 5 in. H2O</td>
<td>01P 0-25.0 Pa 100.0</td>
</tr>
<tr>
<td>02E 0-0.200 in. H2O 10 in. H2O</td>
<td>02P 0-50.0 Pa 200.0</td>
</tr>
<tr>
<td>03E 0-0.300 in. H2O 20 in. H2O</td>
<td>03P 0-75.0 Pa 300.0</td>
</tr>
<tr>
<td>04E 0-0.500 in. H2O 30 in. H2O</td>
<td>04P 0-100.0 Pa 500.0</td>
</tr>
<tr>
<td>05E 0-1.00 in. H2O 5 psid</td>
<td>05P 0-250 Pa 750.0</td>
</tr>
<tr>
<td>06E 0-2.00 in. H2O 10 psid</td>
<td>06P 0-500 Pa 1000.0</td>
</tr>
<tr>
<td>07E 0-3.00 in. H2O 20 psid</td>
<td>07P 0-750 Pa 1500.0</td>
</tr>
<tr>
<td>08E 0-5.00 in. H2O 50 psid</td>
<td>08P 0-1.000 kPa 2000.0</td>
</tr>
<tr>
<td>09E 0-10.0 in. H2O 100 psid</td>
<td>09P 0-2.500 kPa 4000.0</td>
</tr>
<tr>
<td>11E 0-20.0 in. H2O 200 psid</td>
<td>11P 0-5.000 kPa 6000.0</td>
</tr>
<tr>
<td>12E 0-30.0 in. H2O 400 psid</td>
<td>12P 0-7.500 kPa 8000.0</td>
</tr>
<tr>
<td>13E 0-50.0 in. H2O 1000 psid</td>
<td>13P 0-10.000 kPa 10000.0</td>
</tr>
<tr>
<td>14E 0-100.0 in. H2O 2000 psid</td>
<td>14P 0-20.000 kPa 20000.0</td>
</tr>
<tr>
<td>15E 0-1.00 psid</td>
<td>15P 0-50.000 kPa 50000.0</td>
</tr>
<tr>
<td>16E 0-2.00 psid</td>
<td>16P 0-100.000 kPa 100000.0</td>
</tr>
<tr>
<td>17E 0-3.00 psid</td>
<td>17P 0-200.000 kPa 200000.0</td>
</tr>
<tr>
<td>18E 0-5.00 psid</td>
<td>18P 0-500.000 kPa 500000.0</td>
</tr>
</tbody>
</table>

### Table C—Standard Pressure Ranges for Manometer

<table>
<thead>
<tr>
<th>ENGLISH Units</th>
<th>METRIC UNITS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Pressure Range</strong></td>
<td><strong>Max. Safe Momentary Overpass</strong></td>
</tr>
<tr>
<td>01E 0-0.100 in. H2O 5 in. H2O</td>
<td>01P 0-25.0 Pa 25.0</td>
</tr>
<tr>
<td>02E 0-0.200 in. H2O 10 in. H2O</td>
<td>02P 0-50.0 Pa 50.0 1.25 kPa</td>
</tr>
<tr>
<td>03E 0-0.300 in. H2O 20 in. H2O</td>
<td>03P 0-75.0 Pa 75.0 100.0</td>
</tr>
<tr>
<td>04E 0-0.500 in. H2O 30 in. H2O</td>
<td>04P 0-100.0 Pa 100.0</td>
</tr>
<tr>
<td>05E 0-1.00 in. H2O 5 psid</td>
<td>05P 0-250 Pa 250.0</td>
</tr>
<tr>
<td>06E 0-2.00 in. H2O 10 psid</td>
<td>06P 0-500 Pa 500.0 5 kPa</td>
</tr>
<tr>
<td>07E 0-3.00 in. H2O 20 psid</td>
<td>07P 0-750 Pa 750.0</td>
</tr>
<tr>
<td>08E 0-5.00 in. H2O 50 psid</td>
<td>08P 0-1.000 kPa 1000.0</td>
</tr>
<tr>
<td>09E 0-10.0 in. H2O 100 psid</td>
<td>09P 0-2.500 kPa 2000.0</td>
</tr>
<tr>
<td>11E 0-20.0 in. H2O 200 psid</td>
<td>11P 0-5.000 kPa 3000.0</td>
</tr>
<tr>
<td>12E 0-30.0 in. H2O 400 psid</td>
<td>12P 0-7.500 kPa 4000.0</td>
</tr>
<tr>
<td>13E 0-50.0 in. H2O 1000 psid</td>
<td>13P 0-10.000 kPa 5000.0</td>
</tr>
<tr>
<td>14E 0-100.0 in. H2O 2000 psid</td>
<td>14P 0-20.000 kPa 6000.0</td>
</tr>
<tr>
<td>15E 0-1.00 psid</td>
<td>15P 0-50.000 kPa 7500.0</td>
</tr>
<tr>
<td>16E 0-2.00 psid</td>
<td>16P 0-100.000 kPa 10000.0</td>
</tr>
<tr>
<td>17E 0-3.00 psid</td>
<td>17P 0-200.000 kPa 15000.0</td>
</tr>
<tr>
<td>18E 0-5.00 psid</td>
<td>18P 0-500.000 kPa 20000.0</td>
</tr>
</tbody>
</table>

*Maximum safe momentary overpressure at any port is 2X the maximum operating static pressure.*
Thermomagnetic device circuit breaker - TMC 81C 05A - 2907562

Please be informed that the data shown in this PDF Document is generated from our Online Catalog. Please find the complete data in the user's documentation. Our General Terms of Use for Downloads are valid (http://phoenixcontact.com/download)

Key Commercial Data

<table>
<thead>
<tr>
<th>Packing unit</th>
<th>1 STK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight per Piece (excluding packing)</td>
<td>150.0 g</td>
</tr>
<tr>
<td>Country of origin</td>
<td>China</td>
</tr>
</tbody>
</table>

Technical data

General

<table>
<thead>
<tr>
<th>Mounting type</th>
<th>DIN rail</th>
</tr>
</thead>
<tbody>
<tr>
<td>Color</td>
<td>gray</td>
</tr>
</tbody>
</table>

Electrical data

<table>
<thead>
<tr>
<th>Operating voltage</th>
<th>240 V AC</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>277 V AC</td>
</tr>
<tr>
<td></td>
<td>60 V DC</td>
</tr>
<tr>
<td>Rated current $I_N$</td>
<td>5 A</td>
</tr>
<tr>
<td>Rated short-circuit switching capacity $I_{cn}$</td>
<td>10 kA (IC)</td>
</tr>
</tbody>
</table>

Dimensions

<table>
<thead>
<tr>
<th>Height</th>
<th>116 mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Width</td>
<td>17.6 mm</td>
</tr>
<tr>
<td>Depth</td>
<td>65.7 mm</td>
</tr>
</tbody>
</table>

Ambient conditions
Thermomagnetic device circuit breaker - TMC 81C 05A - 2907562

Technical data

Ambient conditions

| Ambient temperature (operation) | -35 °C ... 70 °C |

Standards and Regulations

| Standards/specifications | UL 489 IEC 60947-2 |

Drawings

Diagram

Dimensional drawing

Classifications

eCl@ss

| eCl@ss 8.0 | 27130806 |
| eCl@ss 9.0 | 27130806 |

ETIM

| ETIM 5.0 | EC000942 |

Phoenix Contact 2016 © - all rights reserved

http://www.phoenixcontact.com
TR175VA003
Transformer 175 VA, 120 to 24 Vac, Foot and Single Threaded Hub Mount

SPECIFICATIONS

- VA Rating: 175
- Frequency: 50/60 Hz
- Mounting: Foot & Single Threaded Hub
- Over Current Protection: Thermal Fuse on Primary
- Dimensions: 4.030” x 3.786” x 3.161” (w/.500” NPT Hub)
- Wire Length: 8’ Typical w/.5” Strip
- Operating Temperature: -30 to 140° F
- MTBF: 100,000 Hours @ 77° F
- Construction: Split-Bobbins
- Weight: 7.44 lbs.
- Approvals: UL5085-2 Listed General Purpose, C-UL, CE, RoHS
**TRANSFORMER**

**TR50VA015**
Transformer 50 VA, 480/277/240/208/120 to 24 Vac, Circuit Breaker, Foot and Single Threaded Hub Mount

**SPECIFICATIONS**

- **VA Rating:** 50
- **Frequency:** 50/60 Hz
- **Mounting:** Foot & Single Threaded Hub
- **Over Current Protection:** Circuit Breaker
- **Dimensions:** 3.405” x 2.517” x 3.013” (w/.500” NPT Hub)
- **Wire Length:** 9.5" Typical w/.5” Strip
- **Operating Temperature:** -30 to 140°F
- **MTBF:** 100,000 Hours @ 77°F
- **Construction:** Split-Bobbin
- **Weight:** 2.80 lbs.
- **Approvals:** Class 2 UL5085-3 Listed, C-UL, CE, RoHS
V100

10 A SPDT Enclosed Relay
10-30 VDC/AC or 120 VAC Coil

Installer’s Specifications

- Operating Temperature: -34°C to 60°C ( -29°F to 140°F)
- Operating Humidity: 10-90% non condensing
- Expected Relay Life: Electrical (at rated current): 100,000 cycles; Mechanical (unpowered): 10,000,000 cycles
- Relay Status: LED ON=energized
- Wire Specifications:
  - Lead Length: 14” (356mm) min.
  - Gauge: UL1015; Coil: 18 AWG; Contacts: 16 AWG
- Insulation Class: 600 VAC RMS
- Agency Approvals: UL508 enclosed device listing

Installation

Disconnect and lock out all power sources before beginning the installation.

1. Using the threaded nipple, connect the relay to the desired enclosure through a knock out hole.
2. Secure with the conduit nut provided.
3. Connect Coil:
   - Choose the coil common lead (white with yellow stripe) and connect it to the (-) source termination point.
   - Choose either the low voltage (10-30 VAC/DC, white with blue stripe) or high voltage (120 VAC, white with black stripe) lead, depending on the application requirements, and connect it to the (+) source termination point.*
4. Connect Relay Contacts:
   - Choose the relay common wire (yellow) and connect to switched load.
   - Choose the relay N.O. (orange) and/or* N.C. (blue) lead and connect to switched load.
5. Secure the enclosure and reconnect power.

* Isolate or insulate all non-terminated wires according to local electrical code requirements, i.e. wire nut.
**WIRING COLOR CODES**

**CONTROL SYSTEM INPUT**
- HI (wht/black): 120VAC
- LOW (wht/blue): 10-30VAC/DC
- COMM (wht/yellow): Common

**CONTACT OUTPUT**
- BLUE: N.C.
- YELLOW: Common
- ORANGE: N.O.

**WIRING EXAMPLE**

- Nipple mount directly to a panel
- Nipple mount to any 2x or 4x electrical box

**CONTACT AND COIL SPECIFICATIONS**

### TYPICAL COIL PERFORMANCE

<table>
<thead>
<tr>
<th>Pull in Voltage</th>
<th>AC</th>
<th>DC</th>
</tr>
</thead>
<tbody>
<tr>
<td>10-30V</td>
<td>8</td>
<td>9</td>
</tr>
<tr>
<td>120V</td>
<td>78</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Drop Out Voltage</th>
<th>AC</th>
<th>DC</th>
</tr>
</thead>
<tbody>
<tr>
<td>10-30V</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>120V</td>
<td>18</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Voltage</th>
<th>Coil Current</th>
</tr>
</thead>
<tbody>
<tr>
<td>10V</td>
<td>25mA</td>
</tr>
<tr>
<td>12V</td>
<td>25mA</td>
</tr>
<tr>
<td>24V</td>
<td>31mA</td>
</tr>
<tr>
<td>30V</td>
<td>39mA</td>
</tr>
<tr>
<td>120V</td>
<td>22mA</td>
</tr>
</tbody>
</table>

### CONTACT RATINGS

- Resitive: 10A@277VAC, 28VDC
- Motor: 120VAC, 1/3HP N.O. & 1/6HP N.C.
- 240VAC, 1/3HP N.O. & 1/6HP N.C.
- 277VAC, 1/4HP N.O. & 1/8HP N.C.
- Pilot Duty: 277VAC, (1.7A), 480VA N.O.
- Ballast: 277VAC, 1.7A
- Tungsten: 120VAC, TV3 N.O. TV2 N.C.
- Gold Flash: Yes
Socket DPDT Relays

Socket Relays In A Wide Range Of Coil Voltages

DESCRIPTION

Veris VMD2B Series are DPDT blade-style relays for socket/DIN mounting. Both the full-featured and standard DIN rail sockets are compatible with all VMD2B relays.

The VMD2B-F is the full-featured model in a slim housing. The LED, the flag indicator, and the test button allow for worry-free operation and easy troubleshooting with minimal downtime. Never wonder where the problem is!

TYPICAL COIL PERFORMANCE

<table>
<thead>
<tr>
<th>Power Consumption</th>
</tr>
</thead>
<tbody>
<tr>
<td>AC Coils............. 1.2VA</td>
</tr>
<tr>
<td>DC Coils............. 0.9W</td>
</tr>
</tbody>
</table>

CONTACT RATINGS

<table>
<thead>
<tr>
<th>Standard (F &amp; C Series)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resistive........ 10A@120VAC</td>
</tr>
<tr>
<td>10A@277VAC</td>
</tr>
<tr>
<td>10A@28VDC</td>
</tr>
<tr>
<td>Motor........... 1/4 HP@120VAC</td>
</tr>
<tr>
<td>1/3 HP@240VAC</td>
</tr>
<tr>
<td>Pilot Duty........ B300</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Hybrid (S Series, Bifurcated)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low Side........ 3A@120VAC</td>
</tr>
<tr>
<td>3A@277VAC</td>
</tr>
<tr>
<td>3A@30VDC</td>
</tr>
<tr>
<td>Motor........... 1/16 HP@120VAC</td>
</tr>
<tr>
<td>1/3 HP@120VAC</td>
</tr>
<tr>
<td>Pilot Duty........ B300</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>High Side</th>
</tr>
</thead>
<tbody>
<tr>
<td>10A@120VAC</td>
</tr>
<tr>
<td>8A@277VAC</td>
</tr>
<tr>
<td>8A@28VDC</td>
</tr>
<tr>
<td>1 HP@277VAC</td>
</tr>
</tbody>
</table>

CSA

| Resistive........ 10A@277VAC |

FEATURES

**Full featured model:**
- Color-coded push button...allows manual operation of relay. AC coils red or DC coils blue
- Removable override lever...when activated, locks push button and contacts in the powered position
- Flag indicator...shows contact status in manual or powered condition
- LED status lamp...shows coil “ON” or “OFF” status
- I.D. tag/write-on plastic label...used for identification of relays in multi-relay circuits
- 2-Way side or DIN rail mounting system...retrofits existing panel mounting and 35 mm DIN rail
- Mating hold-down clip...secures relay to socket (-F sockets)

**Low level bifurcated model:**
- All of the above full featured benefits
- Bifurcated contacts for high reliability at extremely low current levels
- Perfect for HVAC applications when you need to switch and hold low loads for long periods of time
- Hybrid relay, good for both logic switching and power switching

**VMD2B-S has a hybrid design - great for installations where one pole is switching a dry circuit and the other pole is switching a motor starter!**

SPECIFICATIONS

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Operating Temperature Range</strong></td>
<td>-40° to 55°C (-40° to 131°F)</td>
</tr>
<tr>
<td><strong>Operating Range</strong></td>
<td>85% to 110% of rated voltage</td>
</tr>
<tr>
<td><strong>Drop-out Voltage Threshold</strong></td>
<td>15% of rated voltage</td>
</tr>
<tr>
<td><strong>Expected Relay Life</strong></td>
<td>Electrical (@ rated current) 100,000 cycles; Mechanical (unpowered) 10,000,000 cycles</td>
</tr>
<tr>
<td><strong>Operating Time</strong></td>
<td>20 msec typical</td>
</tr>
<tr>
<td><strong>Dielectric Strength</strong></td>
<td>1500VAC (RMS)</td>
</tr>
</tbody>
</table>

800.354.8556  +1 503.598.4564  www.veris.com  HQ0001852.B  01131
These relays are UL Listed, when used with the Veris sockets.

When relays and sockets are used together, amperage rating is the lesser of the two ratings.
The Automated Logic® ZASF-A secondary VAV damper is an integral component of the WebCTRL® building automation system.

The ZASF-A is intended specifically for VAV terminal box applications and is designed to be used with the ZN341A and ZN141A. It mounts directly on the secondary VAV damper shaft and provides an integral actuator and a second integrated flow sensor for damper positioning and air-flow sensing in dual duct or tracking systems.

Key Features and Benefits

Application Features

- Quick & easy test and balancing process

Hardware Features

- Separable actuator with a 45 inch-pound (5 Nm) torque rating that can be mounted up to a maximum distance of 300 feet from the controller
- Precision differential pressure sensor and advanced VAV algorithm increase occupant comfort at both minimum and maximum design air flows, while also extending actuator life

System Benefits

- Connects seamlessly to the WebCTRL building automation system

The WebCTRL® building automation system gives you the ability to understand your building operations and analyze the results. The WebCTRL system integrates environmental, energy, security and safety systems into one powerful management tool that allows you to reduce energy consumption, increase occupant comfort, and achieve sustainable building operations. Our web-based platform allows building managers to control and access information about their HVAC, lighting, central plant and critical processes on premises or remotely at any time of day.
ZASF-A Secondary VAV Damper

Specifications

Power
The ZASF-A receives power from the ZN341A or ZN141A. Increases the controller’s power supply by 3 VA when connecting a ZASF-A.

Actuator
Belimo brushless DC motor, torque 45 inch-pounds (5 Nm), runtime 154 seconds.

Act Net port
To connect the actuator to the ZASF-A controller and to the ZN341A or ZN141A.

Integral airflow sensor
Precision differential pressure sensor 0–2 in. H2O, sensitive down to ±0.001 in. H2O. Barbed tapered airflow connections accept 3/16 in. (4.75 mm) I.D. tubing. Allows for readings across the 0–2 in. H2O range, accurate to ±5% of full flow at 2 in. H2O.

Status indicators
LED’s indicate status of communications, running, power, and motor direction.

Environmental op.range
32 to 130°F (0 to 54.4°C), 10–90% relative humidity, non-condensing.

Physical
UL94-5VA plenum rated enclosure for installation in plenum (or other space for environmental air) in accordance with NEC Section 300.22 (c) and (d).

Controller and actuator mounting dimensions
7.1 in. (18.0 cm) from left side controller mounting hole centerline to actuator mounting hole centerline.

Controller mounting dimensions
5.3 in. (13.4 cm) from left side controller mounting hole centerline to right side controller mounting hole centerline.

Actuator mounting dimensions
4.4 in. (11.2 cm) from shaft centerline to mounting hole centerline.

Controller overall dimensions
Width: 6.4 in. (16.3 cm)
Height: 5.7 in. (14.5 cm)
Depth: 2.1 in. (5.3 cm)

Actuator overall dimensions
Width: 3.0 in. (7.6 cm)
Height: 5.9 in. (15.0 cm)
Depth: 2.5 in. (6.4 cm)

Listed by
UL-916 (PAZX), cUL-916 (PAZX7), FCC Part 15-Subpart B, Class B, CE.

Weight
1.8 lbs (0.82 kg)

All trademarks used herein are the property of their respective owners.
ZN141A Controller

Technical Instructions
Verify that you have the most current version of this document. Go to https://accounts.automatedlogic.com, then select Support > Download > Documents. Important changes are listed in Document revision history at the end of this document.

© 2018 Automated Logic Corporation. All rights reserved throughout the world. Automated Logic, WebCTRL, EIKON, Eco-Screen, and BACview are registered trademarks of Automated Logic Corporation. EnergyReports, Environmental Index, and OptiFlex are trademarks of Automated Logic Corporation. All other trademarks are the property of their respective owners.
## Contents

What is the ZN141A? .......................................................................................................................... 1  
   Driver and control program ......................................................................................................... 1  
   Specifications .............................................................................................................................. 1  
   Inputs ......................................................................................................................................... 3  
   Binary output .............................................................................................................................. 4  
   Analog outputs ............................................................................................................................ 4  
   Zone sensors ............................................................................................................................... 4  
   Touchscreen devices ................................................................................................................... 4  

To mount the ZN141A ....................................................................................................................... 5  

Wiring for power .............................................................................................................................. 7  
   To wire for power ......................................................................................................................... 7  

To address the ZN141A .................................................................................................................... 8  

Wiring for communications .......................................................................................................... 8  
   Wiring specifications .................................................................................................................... 8  
   To wire the ZN141A for communications .................................................................................... 9  

Wiring Inputs and outputs .............................................................................................................. 10  
   Wiring specifications .................................................................................................................... 10  
   To wire inputs and outputs ......................................................................................................... 10  

Wiring devices to the ZN141A’s Rnet port .................................................................................... 12  

Downloading the ZN141A ............................................................................................................. 12  
   To download from the WebCTRL® interface .............................................................................. 13  

To assign Inputs or outputs to points ........................................................................................... 13  
   Input values ............................................................................................................................... 14  
   Output values ............................................................................................................................. 15  
   Resolution values ....................................................................................................................... 15  
   Offset/Polarity values ............................................................................................................... 16  

Using flow sensors .................................................................................................................... 17  
   To connect duct tubes to the flow sensors ............................................................................... 17  
   To wire the ZASF-A to the ZN141A ............................................................................................ 18  
   To set up the Airflow Control microblock .................................................................................. 19  

To set up the driver ....................................................................................................................... 19  
   Driver ....................................................................................................................................... 20  
   Device ...................................................................................................................................... 21  
   Notification Classes .................................................................................................................. 21  
   Calendars ................................................................................................................................. 22  
   Common Alarms ....................................................................................................................... 22  
   Specific Events .......................................................................................................................... 23  
   Custom Translation Tables ....................................................................................................... 24  
   Switches, Jumpers, Options ...................................................................................................... 24  
   Flow Calibration Archive ......................................................................................................... 24  
   Act Net Network Details ......................................................................................................... 24  

To communicate through the Local Access port ........................................................................... 25  
   To set up a Local Access connection in the WebCTRL® interface ............................................ 25  

Troubleshooting .......................................................................................................................... 27  
   LED’s ....................................................................................................................................... 27  
   Possible delay before control program starts .............................................................................. 28  
   To format the controller ............................................................................................................ 28  
   To get the Automated Logic® ZN141A’s serial number .............................................................. 29  
   Recovering from a power outage ............................................................................................... 29  
   To replace the ZN141A’s battery ............................................................................................... 29  
   To clean the airflow sensor office ............................................................................................. 30  
   To take the ZN141A out of service ............................................................................................. 31
**What is the ZN141A?**

The ZN141A is used for zone control. It has a built-in flow sensor and detachable actuator, uses a patented flow control algorithm, and mounts directly on the VAV terminal damper shaft. You can disconnect the actuator from the controller and mount them separately, connecting them with just the actuator cable or using an additional extension cable, up to a maximum distance of 300 feet.

**Driver and control program**

<table>
<thead>
<tr>
<th>Driver</th>
<th>drv_zna</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum number of control programs</td>
<td>1</td>
</tr>
<tr>
<td>Maximum number of BACnet objects *</td>
<td>300</td>
</tr>
</tbody>
</table>

* Depends on available memory.

**Specifications**

| Power | 24 Vac ±10%, 50–60 Hz, 14 VA  
26 Vdc (25 V min, 28.8 V max) |
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Actuator</td>
<td>Belimo brushless DC motor, torque 45 inch-pounds (5 Nm), runtime 154 seconds</td>
</tr>
<tr>
<td>Act Net port</td>
<td>To connect the actuator cable and the ZASF-A</td>
</tr>
<tr>
<td>BACnet port</td>
<td>For communication with the controller network using ARC156 or MS/TP (9600 bps–76.8 kbps)</td>
</tr>
</tbody>
</table>
| Rnet port | • Supports up to 5 wireless and/or ZS sensors, and one Equipment Touch or OptiPoint™ Interface  
• Supplies 12 Vdc/200 mA power to the Rnet at an ambient temperature of 77°F (25°C) with a 24 Vac nominal power source.* |
| Local Access port | For system start-up and troubleshooting |

*Ambient temperature and power source fluctuations may reduce the power supplied by the Rnet port.*

**NOTE** If the total power required by the sensors on the Rnet exceeds the power supplied by the Rnet port, use an external power source. The Wireless Adapter, Equipment Touch, or OptiPoint™ Interface must be powered by an external power source. See the specifications in each device's Technical Instructions to determine the power required.
<table>
<thead>
<tr>
<th>Inputs</th>
<th>4 inputs configurable for thermistor or dry contact. Inputs 1 and 2 are also configurable for 0–5 Vdc.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input resolution</td>
<td>10 bit A/D</td>
</tr>
<tr>
<td>Input pulse frequency</td>
<td>10 pulses per second. Minimum pulse width (on or off time) required for each pulse is 50 msec.</td>
</tr>
<tr>
<td>Binary output</td>
<td>1 binary output, relay contact rated at 1 A max. @ 24 Vac/Vdc. Configured normally open.</td>
</tr>
<tr>
<td>Analog output</td>
<td>1 analog output, 0–10 Vdc (5 mA max)</td>
</tr>
<tr>
<td>Output resolution</td>
<td>8 bit D/A</td>
</tr>
<tr>
<td>Integral airflow sensor</td>
<td>Precision differential pressure sensor 0–2 in. H2O, sensitive down to ±0.001 in. H2O. Barbed tapered airflow connections accept 3/16 in. (4.75 mm) I.D. tubing. Allows for readings across the 0–2 in. H2O range, accurate to ±5% of full flow at 2 in. H2O.</td>
</tr>
<tr>
<td>Microprocessor</td>
<td>High speed 16-bit microprocessor with ARCNET communication co-processor</td>
</tr>
<tr>
<td>Memory</td>
<td>512 kB non-volatile battery-backed RAM, 1 MB Flash memory, 16-bit memory bus</td>
</tr>
<tr>
<td>Battery</td>
<td>10-year Lithium CR2032 battery retains the following data for a maximum of 10,000 hours during power outages: control programs, editable properties, schedules, and trends.</td>
</tr>
<tr>
<td>Protection</td>
<td>Built-in surge and transient protection circuitry for power, communications, inputs and outputs in compliance with EN61000-6-1. Incoming power and network connections are protected by non-replaceable internal solid-state polyswitches that reset themselves when the condition that causes a fault returns to normal. The power, network, input, and output connections are also protected against transient excess voltage/surge events lasting no more than 10 msec.</td>
</tr>
<tr>
<td>BT485 connector</td>
<td>You attach a BT485 (not included) to a controller at the beginning and end of a network segment to add bias and to terminate a network segment.</td>
</tr>
<tr>
<td>Status indicators</td>
<td>LEDs indicate status of communications, running, errors, power, and binary outputs</td>
</tr>
<tr>
<td>Environmental operating range</td>
<td>32 to 130°F (0 to 54.4 °C), 10–90% relative humidity, non-condensing</td>
</tr>
<tr>
<td>Physical</td>
<td>UL94-5VA plenum rated enclosure for installation in plenum (or other space for environmental air) in accordance with NEC Section 300.22 (c) and (d)</td>
</tr>
<tr>
<td>Controller and actuator overall dimensions</td>
<td>Width: 8.9 in. (22.7 cm)  Height: 5.9 in. (15.0 cm)</td>
</tr>
<tr>
<td>Controller and actuator mounting dimensions</td>
<td>7.1 in. (18.0 cm) from left side controller mounting hole centerline to actuator mounting hole centerline</td>
</tr>
<tr>
<td>Controller overall dimensions</td>
<td>Width: 6.4 in. (16.3 cm)  Height: 5.7 in. (14.5 cm)  Depth: 2.1 in. (5.3 cm)</td>
</tr>
</tbody>
</table>
Controller mounting dimensions | 5.3 in. (13.4 cm) from left side controller mounting hole centerline to right side controller mounting hole centerline
---|---
Actuator overall dimensions | Width: 3.0 in. (7.6 cm)
| Height: 5.9 in. (15.0 cm)
| Depth: 2.5 in. (6.4 cm)
Actuator mounting dimensions | 4.4 in. (11.2 cm) from shaft centerline to mounting hole centerline
Weight | 1.8 lbs (0.82 kg)
BACnet support | Conforms to the BACnet Advanced Application Controller (B-AAC) Standard Device Profile as defined in ANSI/ASHRAE Standard 135-2012 (BACnet) Annex L, Protocol Revision 9
Listed by | UL-916 (PAZX), cUL-916 (PAZX7), FCC Part 15-Subpart B, Class B, CE

**Inputs**

The ZN141A has 4 inputs that accept the following signal types.

<table>
<thead>
<tr>
<th>These Inputs...</th>
<th>Support this signal type...</th>
<th>Description</th>
</tr>
</thead>
</table>
| All             | Thermistor                  | Precon type 2 (10 kOhm at 77 °F)  
Input voltage: 0.33 to 2.52 Vdc |
| All             | Dry contact                 | A 3.3 Vdc wetting voltage detects contact position, resulting in a 0.3 mA maximum sense current when the contacts are closed. |
| IN-1, IN-2      | 0–5 Vdc                     | The output impedance of a 0–5 Vdc source must not exceed 100 Ohms. The input impedance of the ZN141A is approximately 30 kOhm. |
| All             | Timed local override        | A momentary contact switch that overrides a schedule and turns equipment on for a defined period of time. The override time added for each push of the button and the maximum allowable On time are software adjustable. |
| All             | Pulse counter³              | Pulse counting up to 10 pulses per second.  
Minimum pulse width (on or off time) required for each pulse is 50 msec. |
| IN-3, IN-4      | Thermistor                  |  
|                 | Dry contact                 | |

³ The ZN141A can perform pulse counting for dry contact or voltage inputs if you assign the input to a Pulse to Analog Input microblock. See To assign inputs or outputs to points (page 13).
Binary output
The ZN141A has one normally open binary output rated at 1A, 24 Vac/Vdc.
See To wire inputs and outputs for more information (page 10).

Analog outputs
The ZN141A has 1 analog output that supports voltage devices from 0-10 Vdc. The controlled device must have a minimum of 2000 Ohms resistance measured from its input to ground and must share the same ground as the controller.

Zone sensors
You can wire ZS sensors and/or a Wireless Adapter that communicates with wireless sensors to the ZN141A's Rnet port. You can have up to 5 ZS and/or wireless sensors.

NOTES
• ZS and wireless sensors can share the Rnet with an Equipment Touch or OptiPoint™ Interface.
• An Rnet with the above devices cannot have RS sensors.

Touchscreen devices
You can wire an Equipment Touch or OptiPoint™ Interface to the ZN141A's Rnet port to view or change the controller's property values, schedule equipment, view trends and alarms, and more, without having to access the system's server. The Rnet can have one Equipment Touch or OptiPoint™ Interface, plus ZS sensors and/or a Wireless Adapter that communicates with wireless sensors.

NOTE These touchscreen devices are not powered by the Rnet.
• The OptiPoint™ Interface requires a 24 Vdc external power source.
• The Equipment Touch requires a 24 Vac external power source.

CAUTION A touchscreen device can share a power supply with the Automated Logic® controller as long as:
• The power source shared by the controller and Equipment Touch is AC power.
• The power source shared by the controller and OptiPoint™ Interface is DC power.
• You maintain the same polarity.
• You use the power source only for Automated Logic® controllers.
To mount the ZN141A

To disconnect and mount the controller and actuator separately

Disconnect the actuator from the controller by inserting a screwdriver in the slot on the back of the ZN141A and pressing the tab. The actuator cable or an attached extension cable must connect to the controller's **Act Net** port.

**Adding an extension cable**

If you need to mount the actuator more than 14 in. from the controller, you can use an 18 AWG wire for an extension cable. The maximum distance that the actuator and controller can be separated is 300 feet (91.4 m). Connect the extension cable to the end of the actuator cable. You can use connectors or splice the wires. Terminate the extension cable in the **Act Net** port on the controller.
To mount the ZN141A

1  Turn the damper shaft to fully close the damper.
2  Mount the ZN141A to the VAV terminal by sliding the ZN141A's clamp assembly onto the damper shaft.
3  Insert screws through the mounting brackets to attach the ZN141A to the VAV terminal.
4  Hold down the ZN141A's actuator release button and rotate the actuator clamp in the same direction that closed the damper. Rotate the clamp until it stops, then rotate it back one notch.
5  Release the button.
6  Tighten the actuator clamp to the damper shaft by tightening the two M5 nuts.
7  Hold down the actuator release button and rotate the damper from fully closed to fully open. If the damper traveled less than 90 degrees, do the following to prevent the damper opening past fully open:
   a)  Loosen the appropriate stop clamp screw.
   b)  Move the stop clamp until it contacts the edge of the actuator cam.
   c)  Tighten the screw.
8  Hold down the actuator release button, rotate the damper to verify that it opens and closes, then release the button.
### Wiring for power

**WARNING** Do not apply line voltage (mains voltage) to the controller's ports and terminals.

**CAUTIONS**

- The ZN141A is powered by a Class 2 power source. Take appropriate isolation measures when mounting it in a control panel where non-Class 2 circuits are present.
- Automated Logic® controllers can share a power supply as long as you:
  - Maintain the same polarity.
  - Use the power supply only for Automated Logic® controllers.

### To wire for power

1. To remove the cover, pull up on the tabs located on both sides of the left mounting bracket on the controller.

![Image of the tabs for removing the cover]

1. Remove power from the power supply.
2. Pull the screw terminal connector from the controller's power terminals labeled Gnd and 24 Vac.
3. Connect the transformer wires to the screw terminal connector.
4. Apply power to the power supply.
5. Measure the voltage at the ZN141A’s power input terminals to verify that the voltage is within the operating range of 21.6–26.4 Vac.
6. Connect a 4-inch (10.2 cm) wire from Gnd to the control panel.
7. Insert the screw terminal connector into the ZN141A's power terminals.
8. Verify that the Pwr LED is on and the Run LED is blinking.
To address the ZN141A

You must give the ZN141A an address that is unique on the network. You can address the ZN141A before or after you wire it for power.

1 If the ZN141A has been wired for power, pull the screw terminal connector from the controller's power terminals labeled **Gnd** and **24 Vac**. The controller reads the address each time you apply power to it.

2 Using the rotary switches, set the controller's address to match the **Address** in the controller's properties dialog box in SiteBuilder. Set the **Tens (10's)** switch to the tens digit of the address, and set the **Ones (1's)** switch to the ones digit.

**EXAMPLE** If the controller’s address is 25, point the arrow on the **Tens (10's)** switch to 2 and the arrow on the **Ones (1's)** switch to 5.

<table>
<thead>
<tr>
<th>10's</th>
<th>1's</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>0</td>
<td>5</td>
</tr>
<tr>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>0</td>
<td>7</td>
</tr>
<tr>
<td>0</td>
<td>8</td>
</tr>
<tr>
<td>0</td>
<td>9</td>
</tr>
<tr>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>1</td>
<td>6</td>
</tr>
<tr>
<td>1</td>
<td>7</td>
</tr>
<tr>
<td>1</td>
<td>8</td>
</tr>
<tr>
<td>1</td>
<td>9</td>
</tr>
</tbody>
</table>

Wiring for communications

The ZN141A communicates using BACnet on the following types of network segments:

- ARC156 communicating at 156 kbps
- MS/TP communicating at 9600 bps, 19.2 kbps, 38.4 kbps, or 76.8 kbps

**NOTE** ARC156 is a unique implementation of the industry standard ARCNET. For a summary of differences between ARCNET and ARC156, see the **ARC156 Wiring Technical Instructions**.

Wiring specifications

<table>
<thead>
<tr>
<th>For...</th>
<th>Use...</th>
<th>Maximum Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>ARC156 1 and MS/TP 2</td>
<td>22 AWG, low-capacitance, twisted, stranded, shielded copper wire</td>
<td>2000 feet (610 meters)</td>
</tr>
</tbody>
</table>

**WARNING** Do not apply line voltage (mains voltage) to the controller's ports and terminals.

1 See the **ARC156 Wiring Technical Instructions**.

2 See the **MS/TP Networking and Wiring Technical Instructions**.
To wire the ZN141A for communications

**WARNING**  Attaching any ARCNET or MS/TP network to the **Act Net** port damages BT485s, DIAG485s, or terminating resistors on that network.

1. Pull the screw terminal connector from the controller's power terminals labeled **Gnd** and **24 Vac**.
2. Check the communications wiring for shorts and grounds.
3. Connect the communications wiring to the controller's screw terminals labeled **Net +**, **Net -**, and **Shield**.
   **NOTE**  Use the same polarity throughout the network segment.
4. Set the communication type and baud rate.

<table>
<thead>
<tr>
<th>For...</th>
<th>Set ARC156/MSTP jumper to...</th>
<th>Set DIP switches 1 and 2 to...</th>
</tr>
</thead>
<tbody>
<tr>
<td>ARC156</td>
<td><strong>ARC156</strong></td>
<td>N/A. Baud rate will be 156 kbps regardless of the DIP switch settings.</td>
</tr>
<tr>
<td>MS/TP</td>
<td><strong>MSTP</strong></td>
<td>The appropriate baud rate. See the <a href="#">MSTP Baud</a> diagram on the controller.</td>
</tr>
</tbody>
</table>

**NOTE**  Use the same baud rate for all controllers on the network segment.

5. If the ZN141A is at either end of a network segment, connect a BT485 to the ZN141A.
6. Insert the power screw terminal connector into the ZN141A's power terminals.
7. Verify communication with the network by viewing a Module Status report in the WebCTRL® interface.
Wiring inputs and outputs

Wiring specifications

Input wiring

<table>
<thead>
<tr>
<th>Input</th>
<th>Maximum length</th>
<th>Minimum gauge</th>
<th>Shielding</th>
</tr>
</thead>
<tbody>
<tr>
<td>0–5 Vdc</td>
<td>1000 feet (305 meters)</td>
<td>26 AWG</td>
<td>Shielded</td>
</tr>
<tr>
<td>Thermistor</td>
<td>1000 feet (305 meters)</td>
<td>22 AWG</td>
<td>Shielded</td>
</tr>
<tr>
<td>Dry contact</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ZS sensor</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wireless Adapter for wireless sensors</td>
<td>See Wiring devices to the ZN141A's Rnet port (page 12).</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Equipment Touch</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OptiPoint™ Interface</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Output wiring

To size output wiring, consider the following:

- Total loop distance from the power supply to the controller, and then to the controlled device
  
  **NOTE** Include the total distance of actual wire. For 2-conductor wires, this is twice the cable length.
- Acceptable voltage drop in the wire from the controller to the controlled device
- Resistance (Ohms) of the chosen wire gauge
- Maximum current (Amps) the controlled device requires to operate

To wire inputs and outputs

**WARNING** Do not apply line voltage (mains voltage) to the controller's ports and terminals.

1. Verify that the ZN141A's power and communications connections work properly.
2. Pull the screw terminal connector from the controller's power terminals labeled **Gnd** and **24 Vac**.
3. Connect the input wiring to the screw terminals on the ZN141A.

**NOTES**
- Connect the shield wire to the **Gnd** terminal with the ground wire.
- **IN-3** and **IN-4** share the **Gnd** terminal beside **IN-3**.
4 To use **IN-1** or **IN-2**, set jumpers **IN-1** or **IN-2** to the type of signal the input will receive (thermistor/dry contact, or 0–5 Vdc).

5 Connect the binary output wiring to the screw terminals on the ZN141A and to the controlled device.

6 Connect the analog output wiring to the screw terminals on the ZN141A and to the controlled device.

7 Insert the power screw terminal connector into the ZN141A's power terminals.
Wiring devices to the ZN141A's Rnet port

You can wire the following devices to the ZN141A's Rnet port in a daisy-chain or star configuration:

- ZS sensors
- Wireless Adapter that communicates with wireless sensors
- Equipment Touch
- OptiPoint™ Interface

See the device's Technical Instructions for complete wiring instructions.

NOTES

- ZS sensors, a Wireless Adapter, and an Equipment Touch can share the same Rnet, but not RS sensors.
- The Rnet communicates at a rate of 115 kbps.

Downloading the ZN141A

Download the following items to the ZN141A's battery-backed memory:

<table>
<thead>
<tr>
<th>Item</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control program</td>
<td>Must be in WebCTRLx\webroot&lt;system_name&gt;\programs.</td>
</tr>
<tr>
<td>drv_zna driver</td>
<td>Must be in WebCTRLx\webroot&lt;system_name&gt;\drivers.</td>
</tr>
<tr>
<td></td>
<td>NOTE To verify that you have the driver's latest version, go to <a href="http://accounts.automatedlogic.com/download">http://accounts.automatedlogic.com/download</a>, then select Drivers &gt; ExecB. Compare the latest version to the ZN141A's driver in SiteBuilder.</td>
</tr>
</tbody>
</table>

Editable properties

Schedules

If you change any of the above items or the ZN141A's address after the initial download, you must download again. The first download takes longer than subsequent downloads.

⚠️ CAUTIONS

- The ZN141A will lose stored data when you download.
- Equipment controlled by the ZN141A will shut down and restart when you download.
To download from the WebCTRL® Interface

If your network is complete, you can download from any network browser. If not complete, connect a laptop with a local copy of the system database to the ZN141A's local access port. See To communicate through the local access port (page 25).

1 On the WebCTRL® Network tree, select the controller.
2 Click Downloads.
3 Do one of the following:
   o If the controller is in the Downloads list, go to step 4.
   o If the controller is not in the list:
     a. Click Add.
     b. In the pop-up, select the controller.
     c. Select All Content.
     d. Click Add.
     e. Click Close.
4 Select the controller in the Downloads list.
5 Click Start.

NOTES
• If the download fails, locate and resolve the problem, then retry the download.
• You can also download a controller from the Devices page.

To assign inputs or outputs to points

An input or output must be assigned to its corresponding point in the control program. This is typically done when the control program is created, but you can adjust the settings at the time of installation in the WebCTRL® interface.

1 In the WebCTRL® Geographic tree, select the equipment controlled by the ZN141A.
2 On the Properties page, select the I/O Points tab.
3 In each point's Num field, type the number of the controller's corresponding input or output. For example, if you use BO1 on the ZN141A for the point Fan S/S, type 1 in the Num field for Fan S/S.

NOTES
• Exp (expander number) is 00 for the ZN141A.
• Do not assign the same output number to more than one point.
4 Enter the appropriate values for each input and output in the remaining columns. See Input values, Output values, Resolution values and Offset/Polarity values below.

NOTE You can also enter these values in the EIKON® application.
5 If you have not performed the initial download to the ZN141A, you must download now so you can verify inputs and outputs.
6 To verify each input's operation, force each sensor to a known value, then compare it to the Value shown on the Properties page on the I/O Points tab.
7 To verify each output's operation, lock each output to a known condition on the I/O Points tab, then verify that the equipment operates correctly.
### Input values

<table>
<thead>
<tr>
<th>Input</th>
<th>I/O Type</th>
<th>Sensor/Actuator Type</th>
<th>Min/Max</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Analog (BAI)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0-5 Vdc</td>
<td>0–5 Volt</td>
<td>Linear Full Range</td>
<td>Engineering values associated with 0 Vdc (Min) and 5 Vdc (Max) ¹</td>
</tr>
<tr>
<td>Thermistor</td>
<td>Thermistor</td>
<td>Select your Thermistor type or set up and select a Non-Linear, Custom Table ²</td>
<td>N/A</td>
</tr>
<tr>
<td><strong>Pulse to Analog (BPTA)</strong> ³</td>
<td>Pulse Counter</td>
<td><strong>Counter Input</strong></td>
<td>N/A</td>
</tr>
<tr>
<td><strong>Digital (Binary) (BBI)</strong></td>
<td>Dry Contact</td>
<td><strong>Dry Contact</strong></td>
<td>N/A</td>
</tr>
<tr>
<td>Special (BI) ⁴</td>
<td>Special</td>
<td>Online flow sensor status</td>
<td>N/A</td>
</tr>
</tbody>
</table>

¹ The sensor reads a value and sends a corresponding signal (Volt, mA, or psi) to the ZN141A’s physical input. The Analog Input microblock uses the **Min** and **Max** values to linearly translate the signal into the engineering value used in subsequent control logic. For example, set **Min** to 0 and **Max** to 10 for a 4–20 mA sensor that measures velocity from 0.0 to 10.0 inches/second so that when the input reads 4 mA, the microblock outputs a value of 0. Similarly, when the input reads 8 mA, the microblock outputs a value of 2.5.

² You can set up a custom translation table (page 24) on the driver’s Custom Translation Tables pages in the WebCTRL® interface.

³ The control program must have one Pulse to Analog Input microblock for each pulse counting input.

⁴ The special binary input indicates a communication loss to the airflow sensor. You can use this in your control program to select the actuator movement in the case of flow sensor fault. Sensor reconnection is detected automatically and a power cycle is not required. In the microblock popup, under **Hardware Configuration**, set **Expander** to 0, **Input Number** to 110, and **I/O Type** to **Special**. To detect a flow sensor fault on the ZASF-A, use **Input Number 111**.
Output values

<table>
<thead>
<tr>
<th>Output</th>
<th>I/O Type</th>
<th>Sensor/Actuator Type</th>
<th>Min/Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Analog (BA0)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0-10 Vdc</td>
<td>Electrical 0–10 Volt</td>
<td>Linear Full Range</td>
<td>Engineering values associated with 0 Vdc (Min) and 10 Vdc (Max) ¹</td>
</tr>
<tr>
<td>2-10 Vdc</td>
<td>Electrical 0–10 Volt</td>
<td>Linear w/Offset, 2–10 Volts</td>
<td>Engineering values associated with 2 Vdc (Min) and 10 Vdc (Max) ¹</td>
</tr>
<tr>
<td>Binary (BBO)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Relay</td>
<td>Relay/Triac Output</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>

1 The Analog Output microblock uses the Min and Max values to linearly translate its EIKON® wire value into a physical output signal (Volt, mA, or psi) sent from the ZN141A to an actuator. For example, set Min to 0 and Max to 100 for an Analog Output microblock that receives a 0 to 100% open signal from a PID microblock and that controls a 0–10 Vdc actuator so that when the PID signal is 100%, the ZN141A output is 10 Vdc. Similarly, when the PID signal is 50%, the ZN141A output is 5 Vdc.

Resolution values

Resolution is not particular to a type of input or output, but the driver handles analog and digital (binary) inputs and outputs differently. To set these values appropriately, you should understand how the driver uses them.

<table>
<thead>
<tr>
<th>Resolution</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Analog Input (BAI)</td>
<td>The driver truncates the microblock's present value according to the resolution.</td>
</tr>
<tr>
<td></td>
<td><strong>EXAMPLE</strong> If the calculated present value is 13.789 and you set the Resolution to 0.1, the control program uses 13.7 for any calculations downstream from the microblock.</td>
</tr>
<tr>
<td>Analog Output (BAO)</td>
<td>The driver truncates the wire input value to the microblock before performing any scaling calculations.</td>
</tr>
<tr>
<td></td>
<td><strong>EXAMPLE</strong> If the wire input value is 13.789 and you set the Resolution to 0.1, the microblock uses 13.7 for any scaling calculations.</td>
</tr>
<tr>
<td>Digital (Binary) Inputs and Outputs</td>
<td>N/A</td>
</tr>
</tbody>
</table>
### Offset/Polarity values

**Offset/Polarity** is not particular to a type of input or output, but the driver handles analog and digital (binary) inputs and outputs differently. To set these values appropriately, you should understand how the driver uses them.

<table>
<thead>
<tr>
<th>Offset/Polarity</th>
<th>Notes</th>
</tr>
</thead>
</table>
| Analog Input (BAI) | **Offset** value (positive or negative) adds a fine adjustment to a sensor reading after all scaling for calibration.  
                      *EXAMPLE* If a sensor reads 74.9°F when the actual measured value is 73.6°F, enter an **Offset** of –1.3 to calibrate the sensor to the measured value. |
| Analog Output (BAO) | You can use the **Offset** value (positive or negative) to calibrate an output, but you generally do not need to. If used, the driver adds the offset value to the wire input value before performing any scaling calculations to determine the ZN141A's output. |
| Digital (Binary) Input (BBI) | **Polarity** determines the microblock's present value when no signal is received from the equipment.  
                                      When no signal is received from the equipment, if **Polarity** is set to:  
                                      - *normal*—present value is off  
                                      - *reversed*—present value is on |
| Digital (Binary) Output (BBO) | **Polarity** determines the ZN141A's output based on the control program's signal to the microblock.  
                                      When the control program's signal to the microblock is *on*, if **Polarity** is set to:  
                                      - *normal*—output is on  
                                      - *reversed*—output is off  
                                      **NOTE** Regardless of **Polarity**, the output will be off if the ZN141A loses power. |
Using flow sensors

In a single duct system, the ZN141A controls airflow using the built-in flow sensor and separate actuator.

In a dual duct system, the ZN141A controls airflow for one duct using the built-in flow sensor and separate actuator. For the other duct, the ZN141A uses a ZASF-A, which has its own flow sensors and actuator. Connect both the ZN141A actuator and the ZASF-A actuator to the ZN141A Act Net port.

To connect duct tubes to the flow sensors

**NOTE** Tubing should be at least 2 ft (.61 meters) long for stable airflow measurement. The combined high and low tubing length should not exceed 16.4 ft. (5 meters) in order to ensure accurate measurements.

**For a single duct system**

1. Turn off the ZN141A's power.
2. Connect the tube to the ZN141A's High connector and the Low connector. Then connect those tubes to the duct's high and low pressure tubes. Avoid sharp bends in the tubing.

**For a dual duct system**

1. Follow the single duct procedure above to connect the ZN141A to the cold duct's tubes.
2. To connect the ZASF-A to the second duct's tubes, turn off the ZASF-A's power.
3. Connect the secondary tubes to the duct's high and low pressure tubes. Avoid sharp bends in the tubing.
To wire the ZASF-A to the ZN141A

1. Wire the ZN141A actuator cable to the ZN141A Act Net port.
2. Wire the ZASF-A actuator cable to the ZASF-A Act Net port and to the ZN141A Act Net port.

**NOTE** Use an 18 AWG wire, maximum length 300 feet (91.4 meters).

<table>
<thead>
<tr>
<th>Terminal number</th>
<th>Wire this terminal on the controller...</th>
<th>Terminal number</th>
<th>To this terminal on the ZN141A</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Pwr</td>
<td>1</td>
<td>Pwr</td>
</tr>
<tr>
<td>2</td>
<td>Data</td>
<td>2</td>
<td>Data</td>
</tr>
<tr>
<td>3</td>
<td>Gnd</td>
<td>3</td>
<td>Gnd</td>
</tr>
</tbody>
</table>

**WARNING** Attaching any ARCNET or MS/TP network to the Act Net port damages BT485s, DIAG485s, or terminating resistors on that network.
To set up the Airflow Control microblock

The ZN141A's control program must include one Airflow Control microblock for a single duct system or two of the microblocks for a dual duct system. You must set up the Airflow Control microblock for each flow sensor when creating a program in Snap.

In a single duct system
1. In the WebCTRL® interface on the control program's Logic page, select the Airflow Control microblock.
2. On the Details tab in the Flow Sensor field under Hardware Configuration, select Integral - onboard (ZN+ Built In).
3. In the Damper Actuator field, select Integral - onboard.

In a dual duct system
1. In the WebCTRL® interface on the control program's Logic page, select the Airflow Control microblock for Flow #1.
2. On the Details tab under Hardware in the Flow Sensor field, select Integral - onboard.
3. In the Damper Actuator field, select Built-in actuator.
4. On the Logic page, select the Airflow Control microblock for Flow #2.
5. On the Details tab under Hardware in the Flow Sensor field, select Integral - remote.
6. In the Damper Actuator field, select Integral - remote.

NOTES
• When performing test and balance, follow the steps under Test and Balance on the Airflow Control microblock's Properties page Details tab.
• If you are using a version of the EIKON® application that is prior to v7.0, you must change the Damper Motor Travel Time to 154 seconds.

See Input values (page 14) for information on the Special Binary input that indicates a communication loss to the airflow sensor.

To set up the driver

After you download the driver and control program to the ZN141A, you may want to change the driver's properties in the WebCTRL® interface to suit your application.

1. On the WebCTRL® Network tree, click ⬠ to the left of your ZN141A.
2. Click ⬠ to the left of Driver to see its children.
3. Make changes as needed on the Properties page for Driver and any of its children.
**Driver**

On the **Driver** page, you can change the following properties:

- Module clock synchronization and failure. See table below.
- Network Input microblock communication properties.

| Module Clock |  
| --- | --- |
| **Clock Fail Date and Time** | Date and time the control program uses when controller's time is invalid.  
  **TIP** Use an occupied date and time (such as a Tuesday at 10 a.m.) so the equipment does not operate in unoccupied mode if the controller loses power during occupancy. |

| Network Microblocks |  
| --- | --- |
| **Number of poll retries before Network Input Microblocks Indicate Failure** | The maximum number of retries after the initial attempt that a Network microblock will attempt to communicate with its target device. If unsuccessful, the point will transition to an idle state for 30 seconds before attempting to communicate again. Change this field only if directed by Technical Support. |
| **Periodic rebinding interval** | If a microblock uses a wildcard in its address, this timer determines how often the microblock will attempt to find the nearest instance of its target. For example, if an outside air temperature address uses a wildcard, a VAV application will look for the outside air temperature on the same network segment or on the nearest device containing that object. |

**BACnet COV Throttling**

| **Enable COV Throttling** | Under normal circumstances, COV Throttling should be enabled to prevent excessive network traffic if an object's COV Increment is set too low. See EXCEPTION below.  
  When enabled, if an object generates excessive COV broadcasts (5 updates in 3 seconds), the driver automatically throttles the broadcasts to 1 per second. Also, if the object's value updates excessively for 30 seconds, an alarm is sent to the WebCTRL® application listing all objects that are updating excessively. A Return-to-normal alarm is sent only after all objects have stopped updating excessively.  
  EXCEPTION: In rare circumstances, such as process control, a subscribing object may require COV updates more frequently than once per second. For these situations, clear this checkbox, but make sure that your network can support the increased traffic. You will also need to disable the Excessive COV alarms under the driver's Common Alarms. |

**Trend Sampling**

| **Collect a daily midnight sample for all points in this controller that are sampling on COV** | For values that change infrequently, select to verify at midnight daily that the point is still able to communicate trend values. |
**TouchScreen Control**

**TouchScreen Schedule Edit Enable**

- Check this field to allow a user to edit this controller's schedules from an Equipment Touch's Schedules screen.

**NOTE** Schedules edited on an Equipment Touch are not uploaded to the WebCTRL® application. This could result in the controller operating on a schedule that differs from the one you see in the WebCTRL® interface.

---

**Device**

On the **Device** page, you can change the following properties:

- BACnet device object properties for the ZN141A
- ZN141A network communication

**Configuration**

- **NOTE** The three APDU fields refer to all networks over which the ZN141A communicates.

**Max Masters and Max Info Frames**

- Apply only if the ZN141A is on an MS/TP network.

---

**Notification Classes**

A BACnet alarm's Notification Class defines:

- Alarm priority for Alarm, Fault, and Return to Normal states
- Options for BACnet alarm acknowledgment
- Where alarms should be sent (recipients)

Alarms in the WebCTRL® application use Notification Class #1. The WebCTRL® application is automatically a recipient of these alarms.

**Priorities**

- **NOTE** BACnet defines the following Network message priorities for Alarms and Events.

<table>
<thead>
<tr>
<th>Priority range</th>
<th>Network message priority</th>
</tr>
</thead>
<tbody>
<tr>
<td>00–63</td>
<td>Life Safety</td>
</tr>
<tr>
<td>64–127</td>
<td>Critical Equipment</td>
</tr>
<tr>
<td>128–191</td>
<td>Urgent</td>
</tr>
<tr>
<td>192–255</td>
<td>Normal</td>
</tr>
</tbody>
</table>

**Priority of Off-Normal**

- BACnet priority for Alarms.

**Priority of Fault**

- BACnet priority for Fault messages.

**Priority of Normal**

- BACnet priority for Return-to-normal messages.
Ack Required for Off-Normal, Fault, and Normal

Specifies whether alarms associated with this Notification Class require a BACnet Acknowledgment for Off-Normal, Fault, or Normal alarms.

**TIP** You can require operator acknowledgment for an Alarm or Return-to-normal message (stored in the WebCTRL® database). In the WebCTRL® interface on the Alarm > Enable/Disable tab, change the acknowledgment settings for an alarm source or an alarm category.

### Recipient List

<table>
<thead>
<tr>
<th><strong>Recipients</strong></th>
<th>The first row in this list is from the WebCTRL® application. Do not delete this row. Click Add if you want other BACnet devices to receive alarms associated with this Notification Class.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Recipient Description</strong></td>
<td>Name that appears in the Recipients table.</td>
</tr>
</tbody>
</table>
| **Recipient Type** | Use Address (static binding) for either of the following:  
  - Third-party BACnet device recipients that do not support dynamic binding  
  - When you want alarms to be broadcast (you must uncheck Issue Confirmed Notifications). This use is rare. |
| **Days and times** | The days and times during which the recipient will receive alarms. |
| **Recipient Device Object Identifier** | Type the Device Instance from SiteBuilder (or from the network administrator for third-party devices) in the # field. |
| **Process Identifier** | Change for third-party devices that use a BACnet Process Identifier other than 1. The WebCTRL® application processes alarms for any 32-bit Process Identifier. |
| **Issue Confirmed Notifications** | Select to have a device continue sending an alarm message until it receives delivery confirmation from the recipient. |
| **Transitions to Send** | Uncheck the types of alarms you do not want the recipient to get. |

### Calendars

Calendars are provided in the driver for BACnet compatibility only. Instead, use the Schedules feature in the WebCTRL® interface.

### Common Alarms

On these pages, you can enable/disable, change BACnet alarm properties, or set delays for the following BACnet alarms:

**Common alarms:**
- Module Halted
- All Programs Stopped
- Duplicate Address
- Locked I/O
- Control Program
- Program Stopped
- Excessive COV
NOTE To set up alarm actions for controller generated alarms, see Setting up alarm actions in WebCTRL® Help.

<table>
<thead>
<tr>
<th>Module Generated Alarm</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description</strong></td>
</tr>
<tr>
<td><strong>Events</strong></td>
</tr>
<tr>
<td><strong>Alarm Category and Alarm Template</strong></td>
</tr>
<tr>
<td><strong>Enable</strong></td>
</tr>
<tr>
<td><strong>Notification Class</strong></td>
</tr>
</tbody>
</table>

**Specific Events**

On these pages, you can enable/disable, change BACnet alarm properties, or set delays for the following BACnet alarms:

**Specific alarms:**
- Flow Control Alarm
- Reheat Valve Alarm (future use)

**NOTES**
- To set up alarm actions for controller generated alarms, see Setting up alarm actions in WebCTRL® Help.
- Reheat Valve Alarms are for future use.
Custom Translation Tables

You can set up a translation table that an analog input will use to translate the raw data from a non-linear sensor to the engineering units you want it to output on the wire. In the Network tree, select Custom Translation Table #1, #2, or #3. The Properties page has instructions. For the input to use the translation table, navigate to the input in the Geographic tree, select the Details tab, then set Sensor Type (Scaling Method) to Non-Linear, Custom Table #__.

Switches, Jumpers, Options

The Switches, Jumpers, Options page shows the current physical settings on the ZN141A.

Flow Calibration Archive

The Flow Calibration Archive page shows measured flow and sensor readings that were entered in the WebCTRL® interface Test and Balance or through the stand-alone Airflow Test and Balance Utility. Editing Airflow microblock properties outside of Test and Balance will not change the values on this page.

Act Net Network Details

Act Net Statistics

The actuator serial numbers are automatically read and filled in by the WebCTRL® application. Only those devices that are physically connected or in the control program will show in the table.

NOTE  See To get the Automated Logic® ZN141A serial number (page 29) for the controller serial number.

The Act Net network can have the 3 devices listed below with the following addresses:
Address 1:  The ZN141A’s actuator
Address 2:  A ZASF-A’s actuator
Address 3:  A ZASF-A sensor

⚠️ CAUTION  If you see Duplicate address on network or No communication with device under Device Status, contact Technical Support. Do not use Act Net Address Setting unless directed by Technical Support.
To communicate through the Local Access port

Using a computer and a USB Link Kit, you can communicate locally with the ZN141A to download or to troubleshoot.

**PREREQUISITES**

- A computer with a USB port
- A USB Link Kit. See the **USB Link Kit Technical Instructions**.

**NOTE** The USB Link Kit driver is installed with a WebCTRL® v5 or later system. But if needed, you can get the latest driver from [http://www.silabs.com/products/mcu/Pages/USBtoUARTBridgeVCPDrivers.aspx](http://www.silabs.com/products/mcu/Pages/USBtoUARTBridgeVCPDrivers.aspx). Install the driver before you connect the USB Link Kit to your computer.

- v1.70 or later controller driver

⚠️ **CAUTION** If multiple controllers share power but polarity was not maintained when they were wired, the difference between the controller’s ground and the computer’s AC power ground could damage the USB Link Kit and the controller. If you are not sure of the wiring polarity, use a USB isolator between the computer and the USB Link Kit. Purchase a USB isolator online from a third-party manufacturer.

Connect the USB Link Kit to the computer and to the controller’s Local Access port.

![USB Link Kit connection diagram](image)

**NOTE** If using a USB isolator, plug the isolator into your computer’s USB port, and then plug the USB Link Kit cable into the isolator.

**To set up a Local Access connection in the WebCTRL® interface**

For the WebCTRL® application to communicate with the Local Access port, you must do the following:

1. On the **System Configuration** tree, select **Connections**.
2. On the **Configure** tab, click **Add**.
3. From the **Type** drop-down list, select **BACnet Local Access**.
4. Optional: Edit the **Description**.
5 Type the computer's **Port** number that the USB cable is connected to.
   
   **NOTE** To find the port number, plug the USB cable into the computer's USB port, then select **Start > Control Panel > System > Device Manager > Ports (Com & LPT)**. The COM port number is beside **Silicon Labs CP210x USB to UART Bridge**.

6 Set the **Baud** rate to **115200**.

7 Click **Accept**.

8 On the **View** tab, click the button next to the BACnet/IP network, then select **BACnet Local Access**.

9 Click **Accept**.

10 On the **Configure** tab, select **BACnet Local Access**, then click **Start**.
   
   **NOTE** If an error message appears, make sure the COM port you selected is not in use. For example, PuTTY may be open and is holding the port open.

11 On the **Network** tree, select the controller that you are connected to.

12 Click ![Network](image), then select **Manual Command**.

13 Type `rnet here` in the dialog box, then click **OK**.

14 On the **Properties** page, click **Module Status**. If a Modstat report appears, the WebCTRL® application is communicating with the controller.
Troubleshooting

If you have problems mounting, wiring, or addressing the ZN141A, contact Automated Logic® Technical Support.

LED's

The LED's on the ZASF-A show the status of certain functions.

<table>
<thead>
<tr>
<th>If this LED is on...</th>
<th>Status is...</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pwr</td>
<td>The ZN141A has power.</td>
</tr>
<tr>
<td>RX</td>
<td>The ZN141A is receiving data from the network segment</td>
</tr>
<tr>
<td>TX</td>
<td>The ZN141A is transmitting data over the network segment</td>
</tr>
<tr>
<td>Run</td>
<td>See table below.</td>
</tr>
<tr>
<td>Err</td>
<td>See table below.</td>
</tr>
<tr>
<td>B01</td>
<td>The binary output is active</td>
</tr>
<tr>
<td>CW</td>
<td>The actuator motor is turning clockwise</td>
</tr>
<tr>
<td>CCW</td>
<td>The actuator motor is turning counterclockwise</td>
</tr>
</tbody>
</table>

The Run and Error LED's indicate controller and network status.

<table>
<thead>
<tr>
<th>If Run LED shows...</th>
<th>And Error LED shows...</th>
<th>Status is...</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 flashes per second</td>
<td>Off</td>
<td>Normal</td>
</tr>
<tr>
<td>2 flashes per second</td>
<td>2 flashes, alternating with Run LED</td>
<td>Five minute auto-restart delay after system error</td>
</tr>
<tr>
<td>2 flashes per second</td>
<td>3 flashes, then off</td>
<td>The controller has just been formatted</td>
</tr>
<tr>
<td>2 flashes per second</td>
<td>4 flashes, then pause</td>
<td>Two or more devices on this network have the same ARC156 network address</td>
</tr>
<tr>
<td>2 flashes per second</td>
<td>1 flash per second</td>
<td>The controller is alone on the network</td>
</tr>
</tbody>
</table>
| 2 flashes per second| On                    | Obtain a Module Status Report (Modstat) to determine which of the following occurred:  
|                     |                        | • Exec halted after frequent system errors                           |
|                     |                        | • Control programs halted                                             |
|                     |                        | • ZN141A stopped communicating with the ZASF-A                       |
| 5 flashes per second| On                    | Exec start-up aborted, Boot is running                               |
| 5 flashes per second| Off                   | Firmware transfer in progress, Boot is running                       |
If Run LED shows... | And Error LED shows... | Status is...
---|---|---
7 flashes per second | 7 flashes per second, alternating with Run LED | Ten second recovery period after brownout
14 flashes per second | 14 flashes per second, alternating with Run LED | Brownout
On | On | Failure. Try the following solutions:
   • Turn the ZN141A off, then on.
   • Format the ZN141A.
   • Download the ZN141A.
   • Replace the ZN141A.

NOTE If you resolve the issue but the Error LED does not turn off, cycle power to the controller.

Possible delay before control program starts

- When you first apply power to the ZN141A, it waits for up to 3 minutes to receive a time/date broadcast from its BACnet router. The ZN141A begins to run the control program only after it receives the time/date or when the 3 minute waiting period expires. If the ZN141A does not receive a time/date broadcast, it keeps the default setting of 6/12/2002 10:00:00 (am).

- The damper actuators' automatic full-range calibration on startup is staggered to prevent system high pressure. This calibration delay is based on rotary switch addresses.
  Delay = 20 x (rotary address mod 16) seconds. The minimum delay is 0 and the maximum is 300 seconds.

To format the controller

If you cannot communicate with a controller after downloading it, as a last resort, you can manually format the controller to erase its memory.

1 Pull the screw terminal connector from the controller's power terminals labeled Gnd and 24 Vac.
2 Short the Format jumper's pins and maintain the short for steps 3 and 4.
3 Insert the power screw terminal connector into the ZN141A's power terminals.
4 Continue to short the jumper until the Error LED flashes three times in sync with the Run LED.
5 Remove the short.
6 Download the ZN141A.
To get the Automated Logic® ZN141A's serial number

If you need the Automated Logic® ZN141A's controller serial number when troubleshooting, the number is on:

- the back of the main controller board

  NOTE  The number on the side of the actuator is not the Automated Logic® serial number.

- a Module Status report (Modstat) under Core (or Main) board hardware

To obtain a modstat in the WebCTRL® interface:

1  Select the ZN141A in the Network tree.
2  On the Properties page, click Module Status.

 Recovering from a power outage

The ZN141A has a 10-year Lithium CR2032 battery that retains the following data for a maximum of 10,000 hours during power outages.

- Control programs
- Editable properties
- Trends
- Schedules

If the above data is lost after power returns, replace the battery and then download the ZN141A. See instructions below.

To replace the ZN141A's battery

If the ZN141A experiences a power outage and the control program stops functioning, replace the battery.

1  Verify that the ZN141A's power is on.
2  Remove the ZN141A's cover.
3  Remove the battery from the controller, making note of the battery's polarity.
4  Insert the new battery, matching the battery's polarity with the polarity indicated on the controller's cover.
5  Replace the ZN141A's cover.
6  Download the ZN141A.
To clean the airflow sensor orifice

In less than .02% of installations, small particulates (micron/submicron-level) can build up in the airflow sensor's internal orifice causing airflow restriction. Symptoms of airflow restriction are:

- Diffuser noise increases over time
- Space overcools at minimum airflow
- Frequency of dampers opening to maintain flow setpoint increases over time
- AHU fan speed increases over time

To check for these symptoms, set up trending of:

- Damper position to look for long term increase
- AHU fan speed for maintaining static pressure

If you see these symptoms, you should clean the flow sensor.

To clean the flow sensor

You can use a can of compressed air to clean the sensors while the controller is installed or on a repair bench.

1. Disconnect the **High** and **Low** flow sensor tubes.
2. Insert the compressed air straw 1/4" into the controller's **High** connector.

WARNING  The compressed air can MUST be upright. It will damage the flow sensors by producing ice crystals if the can is on its side.

3. Press the air can's trigger twice for no more than 2 seconds each time.
4  Reconnect tubing to the **High** and **Low** flow sensor tubes.

**To take the ZN141A out of service**

If needed for troubleshooting or start-up, you can stop communication between the WebCTRL® application and the ZN141A.

1  On the WebCTRL® **Network** tree, select the ZN141A.
2  On the **Properties** page, check **Out of Service**.
3  Click **Accept**.
Compliance

FCC Compliance

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

1. This device may not cause harmful interference.
2. This device must accept any interference received, including interference that may cause undesired operation.

![important] **IMPORTANT** Any changes or modifications not expressly approved by manufacturer could void the user's authority to operate the equipment.

**NOTE** This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a residential installation. This equipment generates, uses, and can radiate radio frequency energy, and if it is not installed and used in accordance with this document, it may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

CE Compliance

![warning] **WARNING** This is a Class B product. In a light industrial environment, this product may cause radio interference in which case the user may be required to take adequate measures.

BACnet Compliance

Compliance of listed products to requirements of ASHRAE Standard 135 is the responsibility of BACnet International. BTL® is a registered trademark of BACnet International.
# Document revision history

Important changes to this document are listed below. Minor changes such as typographical or formatting errors are not listed.

<table>
<thead>
<tr>
<th>Date</th>
<th>Topic</th>
<th>Change description</th>
<th>Code*</th>
</tr>
</thead>
<tbody>
<tr>
<td>8/31/18</td>
<td>Wiring Inputs and Outputs &gt; Wiring specifications</td>
<td>Removed RS sensor from Input wiring table, and added OptiPoint™ Interface.</td>
<td>X-D</td>
</tr>
<tr>
<td>8/23/18</td>
<td>Specifications</td>
<td>Reworded Rnet port specification and added power supplied by Rnet port.</td>
<td>X-H-JS-O</td>
</tr>
<tr>
<td></td>
<td>Zone sensors</td>
<td>Complete revision</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Touchscreen devices</td>
<td>Changed title from Equipment Touch to Touchscreen devices.</td>
<td>X-D</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Added OptiPoint™ Interface and restructured topic.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Wiring devices to the ZN141A's Rnet port</td>
<td>Added OptiPoint™ Interface. Removed sub-topics and directed user to see each device's Technical Instructions.</td>
<td></td>
</tr>
</tbody>
</table>

* For internal use only
ZN141A VAV Controllers
Zone Controllers with Actuators

The ZN141A is a fully programmable, native BACnet Advanced Application Controller that provides zone level temperature and air quality control for pressure-independent VAV applications. Sophisticated pre-engineered control algorithms reduce energy consumption, extend actuator life, and increase occupant comfort. It communicates on an EIA-485 LAN using BACnet MS/TP or BACnet over ARCNET communications and connects seamlessly to the WebCTRL® building automation system.

Key Features and Benefits

Application Features

- Versatile controller suitable for a variety of applications, including fan coil units, lighting, and exhaust fan control
- Standard library of control programs available for most zoning applications
- Supports Eikon® graphical programming software, an object oriented tool that provides complete flexibility for any custom control sequence that you need
- Supports Automated Logic® communicating sensors, which are available in a variety of zone sensing combinations and support setpoint adjustment and occupancy overrides
- Supports Automated Logic touchscreen interfaces for managing and troubleshooting the connected equipment easily
- Supports live, visual displays of control logic, which uses real time operational data and aids in optimizing and troubleshooting system operations
- Quick & easy test and balancing process

Hardware Features

- Separable actuator with a 45 inch-pound (5 Nm) torque rating that can be mounted up to a maximum distance of 300 feet from the controller
- Controls up to 6 points (1 binary output, 4 universal inputs and 1 analog output)
- Precision differential pressure sensor and advanced VAV algorithm increase occupant comfort at both minimum and maximum design air flows, while also extending actuator life
- High-speed, native BACnet over ARC156 communications delivers high speed response when you need it. BACnet over MS/TP communications is also supported
- Fast, powerful, and fully distributed control allows complete independence from any other devices in the system
- Large termination strips will improve ease of installation
- Firmware upgrades can be performed remotely

System Benefits

- Connects seamlessly to the WebCTRL building automation system

The WebCTRL® building automation system gives you the ability to understand your building operations and analyze the results. The WebCTRL system integrates environmental, energy, security and safety systems into one powerful management tool that allows you to reduce energy consumption, increase occupant comfort, and achieve sustainable building operations. Our web-based platform allows building managers to control and access information about their HVAC, lighting, central plant and critical processes on premises or remotely at any time of day.
ZN141A VAV Controllers

Specifications

BACnet support: Conforms to the BACnet Advanced Application Controller (B-AAC) Standard Device Profile as defined in ANSI/ASHRAE Standard 135-2012 (BACnet) Annex L, Protocol Revision 9

Power:
- 24 Vac ±10%, 50–60 Hz, 14 VA
- 26 Vdc (25 V min, 28.8 V max)

Actuator: Belimo brushless DC motor, torque 45 inch-pounds (5 Nm), runtime 154 seconds

Act Net port: To connect the actuator cable and the ZASF-A

BACnet port: For communication with the controller network using ARC156 or MS/TP (9600 bps–76.8 kbps)

Rnet port: Supports:
- Up to 5 ZS sensors
- One Wireless Adapter that communicates with up to 5 wireless sensors
- One Equipment Touch

Local Access port: For system start-up and troubleshooting

Inputs:
- 4 inputs configurable for thermistor or dry contact. Inputs 1 and 2 are also configurable for 0–5 Vdc
- Input resolution: 10 bit A/D
- Input pulse frequency: 10 pulses per second. Minimum pulse width (on or off time) required for each pulse is 50 msec

Outputs:
- Binary output: 1 binary output, relay contact rated at 1 A max. @ 24 Vac/Vdc. Configured normally open
- Analog output: 1 analog output, 0–10 Vdc (5 mA max)
- Output resolution: 8 bit D/A

Integral airflow sensor: Precision differential pressure sensor 0–2 in. H2O, sensitive down to ±0.001 in. H2O. Barbed tapered airflow connections accept 3/16 in. (4.75 mm) I.D. tubing. Allows for readings across the 0–2 in. H2O range, accurate to ±5% of full flow at 2 in. H2O

Microprocessor: High speed 16-bit microprocessor with ARCNET communication co-processor

Memory: 512 kB non-volatile battery-backed RAM, 1 MB Flash memory, 16-bit memory bus

Battery: 10-year Lithium CR2032 battery retains the following data for a maximum of 10,000 hours during power outages: control programs, editable properties, schedules, and trends

Protection: Incoming power and network connections are protected by non-replaceable internal solid-state polyswitches that reset themselves when the condition that causes a fault returns to normal

BT485 connector: You attach a BT485 (not included) to a controller at the beginning and end of a network segment to add bias and to terminate a network segment

Status indicators: LED’s indicate status of communications, running, errors, power, and binary outputs

Environmental op.range: 32 to 130°F (0 to 54.4°C), 10–90% relative humidity, non-condensing

Physical: UL94-5VA plenum rated enclosure for installation in plenum (or other space for environmental air) in accordance with NEC Section 300.22 (c) and (d)

 Listed by: UL-916 (PAZX), cUL-916 (PAZX7), FCC Part 15-Subpart B, Class B, CE

Weight: 1.8 lbs (0.82 kg)

Controller overall dimensions:
- Width: 6.4 in. (16.3 cm)
- Height: 5.7 in. (14.5 cm)
- Depth: 2.1 in. (5.3 cm)

Actuator overall dimensions:
- Width: 3.0 in. (7.6 cm)
- Height: 5.9 in. (15.0 cm)
- Depth: 2.5 in. (6.4 cm)

All trademarks used herein are the property of their respective owners.

1150 Roberts Boulevard, Kennesaw, Georgia 30144
770-429-3000   Fax 770-429-3001   www.automatedlogic.com
Verify that you have the most current version of this document. Go to https://accounts.automatedlogic.com, then select Support > Download > Documents. Important changes are listed in Document revision history at the end of this document.

© 2018 Automated Logic Corporation. All rights reserved throughout the world. Automated Logic, WebCTRL, EIKON, Eco-Screen, and BACview are registered trademarks of Automated Logic Corporation. EnergyReports, Environmental Index, and OptiFlex are trademarks of Automated Logic Corporation. All other trademarks are the property of their respective owners.
Contents

What is the ZN341A? ......................................................... 1
   Driver and control program ........................................... 1
   Specifications ............................................................... 1
   Inputs ........................................................................... 3
   Binary outputs ............................................................ 4
   Analog outputs ........................................................... 4
   Zone sensors .............................................................. 4
   Touchscreen devices .................................................... 4

To mount the ZN341A ...................................................... 5

Wiring for power ............................................................. 7
   To wire for power ......................................................... 7

To address the ZN341A .................................................. 8

Wiring for communications ............................................. 8
   Wiring specifications .................................................. 8
   To wire the ZN341A for communications ......................... 9

Wiring inputs and outputs ................................................ 9
   Wiring specifications .................................................. 9
   To wire inputs and outputs ............................................ 10

Wiring devices to the ZN341A’s Rnet port ......................... 11

Downloading the ZN341A ................................................ 12
   To download from the WebCTRL® interface ................. 12

To assign inputs or outputs to points ............................... 13
   Input values .............................................................. 13
   Output values ........................................................... 14
   Resolution values ..................................................... 15
   Offset/Polarity values ................................................ 15

Using flow sensors .......................................................... 16
   To connect duct tubes to the flow sensors ..................... 16
   To wire the ZASF-A to the ZN341A ............................. 17
   To set up the Airflow Control microblock ..................... 18

To set up the driver ......................................................... 18
   Driver ....................................................................... 19
   Device ...................................................................... 20
   Notification Classes .................................................. 20
   Calendars .................................................................. 21
   Common Alarms ....................................................... 21
   Specific Events ......................................................... 22
   Custom Translation Tables ....................................... 23
   Switches, Jumpers, Options ...................................... 23
   Flow Calibration Archive ........................................... 23
   Act Net Network Details ............................................. 23

To communicate through the Local Access port ............... 24
   To set up a Local Access connection in the WebCTRL® interface ........................................... 24

Troubleshooting .............................................................. 26
   LED’s ....................................................................... 26
   Possible delay before control program starts ............... 27
   To format the controller .............................................. 27
   To get the Automated Logic® ZN341A’s serial number ......................................................... 28
   Recovering from a power outage ............................... 28
   To replace the ZN341A’s battery ................................. 28
   To clean the airflow sensor orifice ............................. 29
   To take the ZN341A out of service ............................. 30
What is the ZN341A?

The ZN341A is used for zone control. It has a built-in flow sensor and detachable actuator, uses a patented flow control algorithm, and mounts directly on the VAV terminal damper shaft. You can disconnect the actuator from the controller and mount them separately, connecting them with just the actuator cable or using an additional extension cable, up to a maximum distance of 300 feet.

Driver and control program

<table>
<thead>
<tr>
<th>Driver</th>
<th>drv_zna</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum number of control programs</td>
<td>1</td>
</tr>
<tr>
<td>Maximum number of BACnet objects *</td>
<td>300</td>
</tr>
</tbody>
</table>

* Depends on available memory.

Specifications

| Power                  | 24 Vac ±10%, 50–60 Hz, 14 VA  
|                        | 26 Vdc (25 V min, 28.8 V max) |
| Actuator              | Belimo brushless DC motor, torque 45 inch-pounds (5 Nm), runtime 154 seconds |
| Act Net port          | To connect the actuator cable and the ZASF-A |
| BACnet port           | For communication with the controller network using ARC156 or MS/TP (9600 bps–76.8 kbps) |
| Rnet port             | • Supports up to 5 wireless and/or ZS sensors, and one Equipment Touch or OptiPoint™ Interface  
|                       | • Supplies 12 Vdc/200 mA power to the Rnet at an ambient temperature of 77°F (25°C) with a 24 Vac nominal power source.*  
|                       | **NOTE** If the total power required by the sensors on the Rnet exceeds the power supplied by the Rnet port, use an external power source. The Wireless Adapter, Equipment Touch, or OptiPoint™ Interface must be powered by an external power source. See the specifications in each device’s Technical Instructions to determine the power required.  
<p>|                       | *Ambient temperature and power source fluctuations may reduce the power supplied by the Rnet port. |
| Local Access port     | For system start-up and troubleshooting |</p>
<table>
<thead>
<tr>
<th>Inputs</th>
<th>4 inputs configurable for thermistor or dry contact. Inputs 1 and 2 are also configurable for 0–5 Vdc.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input resolution</td>
<td>10 bit A/D</td>
</tr>
<tr>
<td>Input pulse frequency</td>
<td>10 pulses per second. Minimum pulse width (on or off time) required for each pulse is 50 msec.</td>
</tr>
<tr>
<td>Binary outputs</td>
<td>3 binary outputs, relay contact rated at 1 A max. @ 24 Vac/Vdc. Configured normally open.</td>
</tr>
<tr>
<td>Analog output</td>
<td>1 analog output, 0–10 Vdc (5 mA max)</td>
</tr>
<tr>
<td>Output resolution</td>
<td>8 bit D/A</td>
</tr>
<tr>
<td>Integral airflow sensor</td>
<td>Precision differential pressure sensor 0–2 in. H2O, sensitive down to ±0.001 in. H2O. Barbed tapered airflow connections accept 3/16 in. (4.75 mm) I.D. tubing. Allows for readings across the 0–2 in. H2O range, accurate to ±5% of full flow at 2 in. H2O.</td>
</tr>
<tr>
<td>Microprocessor</td>
<td>High speed 16-bit microprocessor with ARCNET communication co-processor</td>
</tr>
<tr>
<td>Memory</td>
<td>512 kB non-volatile battery-backed RAM, 1 MB Flash memory, 16-bit memory bus</td>
</tr>
<tr>
<td>Battery</td>
<td>10-year Lithium CR2032 battery retains the following data for a maximum of 10,000 hours during power outages: control programs, editable properties, schedules, and trends.</td>
</tr>
<tr>
<td>Protection</td>
<td>Built-in surge and transient protection circuitry for power, communications, inputs and outputs in compliance with EN61000-6-1. Incoming power and network connections are protected by non-replaceable internal solid-state polyswitches that reset themselves when the condition that causes a fault returns to normal. The power, network, input, and output connections are also protected against transient excess voltage/surge events lasting no more than 10 msec.</td>
</tr>
<tr>
<td>BT485 connector</td>
<td>You attach a BT485 (not included) to a controller at the beginning and end of a network segment to add bias and to terminate a network segment.</td>
</tr>
<tr>
<td>Status indicators</td>
<td>LEDs indicate status of communications, running, errors, power, and binary outputs</td>
</tr>
<tr>
<td>Environmental operating range</td>
<td>32 to 130 °F (0 to 54.4 °C), 10–90% relative humidity, non-condensing</td>
</tr>
<tr>
<td>Physical</td>
<td>UL94-5VA plenum rated enclosure for installation in plenum (or other space for environmental air) in accordance with NEC Section 300.22 (c) and (d)</td>
</tr>
<tr>
<td>Controller and actuator overall dimensions</td>
<td>Width: 8.9 in. (22.7 cm)  Height: 5.9 in. (15.0 cm)</td>
</tr>
<tr>
<td>Controller and actuator mounting dimensions</td>
<td>7.1 in. (18.0 cm) from left side controller mounting hole centerline to actuator mounting hole centerline</td>
</tr>
<tr>
<td>Controller overall dimensions</td>
<td>Width: 6.4 in. (16.3 cm)  Height: 5.7 in. (14.5 cm)  Depth: 2.1 in. (5.3 cm)</td>
</tr>
</tbody>
</table>
Controller mounting dimensions
5.3 in. (13.4 cm) from left side controller mounting hole centerline to right side controller mounting hole centerline

Actuator overall dimensions
Width: 3.0 in. (7.6 cm)
Height: 5.9 in. (15.0 cm)
Depth: 2.5 in. (6.4 cm)

Actuator mounting dimensions
4.4 in. (11.2 cm) from shaft centerline to actuator mounting hole centerline

Weight
1.8 lbs (0.82 kg)

BACnet support
Conforms to the BACnet Advanced Application Controller (B-AAC) Standard Device Profile as defined in ANSI/ASHRAE Standard 135-2012 (BACnet) Annex L, Protocol Revision 9

Listed by
UL-916 (PAZX), cUL-916 (PAZX7), FCC Part 15-Subpart B, Class B, CE

Inputs

The ZN341A has 4 inputs that accept the following signal types.

<table>
<thead>
<tr>
<th>These Inputs...</th>
<th>Support this signal type...</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>All</td>
<td>Thermistor</td>
<td>Precon type 2 (10 kOhm at 77 °F) Input voltage: 0.33 to 2.52 Vdc</td>
</tr>
<tr>
<td>All</td>
<td>Dry contact</td>
<td>A 3.3 Vdc wetting voltage detects contact position, resulting in a 0.3 mA maximum sense current when the contacts are closed.</td>
</tr>
<tr>
<td>IN-1, IN-2</td>
<td>0–5 Vdc</td>
<td>The output impedance of a 0–5 Vdc source must not exceed 100 Ohms. The input impedance of the ZN341A is approximately 30 kOhm.</td>
</tr>
<tr>
<td>All</td>
<td>Timed local override</td>
<td>A momentary contact switch that overrides a schedule and turns equipment on for a defined period of time. The override time added for each push of the button and the maximum allowable On time are software adjustable.</td>
</tr>
<tr>
<td>All</td>
<td>Pulse counter ¹</td>
<td>Pulse counting up to 10 pulses per second. Minimum pulse width (on or off time) required for each pulse is 50 msec.</td>
</tr>
<tr>
<td>IN-3, IN-4</td>
<td>Thermistor</td>
<td>Thermistor</td>
</tr>
<tr>
<td></td>
<td>Dry contact</td>
<td>Dry contact</td>
</tr>
</tbody>
</table>

¹ The ZN341A can perform pulse counting for dry contact or voltage inputs if you assign the input to a Pulse to Analog Input microblock. See To assign inputs or outputs to points (page 13).
Binary outputs

The ZN341A has three normally open binary outputs rated at 1A, 24 Vac/Vdc. See To wire inputs and outputs for more information (page 10).

Analog outputs

The ZN341A has 1 analog output that supports voltage devices from 0-10 Vdc. The controlled device must have a minimum of 2000 Ohms resistance measured from its input to ground and must share the same ground as the controller.

Zone sensors

You can wire ZS sensors and/or a Wireless Adapter that communicates with wireless sensors to the ZN341A's Rnet port. You can have up to 5 ZS and/or wireless sensors.

NOTES
- ZS and wireless sensors can share the Rnet with an Equipment Touch or OptiPoint™ Interface.
- An Rnet with the above devices cannot have RS sensors.

Touchscreen devices

You can wire an Equipment Touch or OptiPoint™ Interface to the ZN341A's Rnet port to view or change the controller's property values, schedule equipment, view trends and alarms, and more, without having to access the system's server. The Rnet can have one Equipment Touch or OptiPoint™ Interface, plus ZS sensors and/or a Wireless Adapter that communicates with wireless sensors.

NOTE These touchscreen devices are not powered by the Rnet.
- The OptiPoint™ Interface requires a 24 Vdc external power source.
- The Equipment Touch requires a 24 Vac external power source.

CAUTION A touchscreen device can share a power supply with the Automated Logic® controller as long as:
- The power source shared by the controller and Equipment Touch is AC power.
- The power source shared by the controller and OptiPoint™ Interface is DC power.
- You maintain the same polarity.
- You use the power source only for Automated Logic® controllers.
To mount the ZN341A

To disconnect and mount the controller and actuator separately

Disconnect the actuator from the controller by inserting a screw driver in the slot on the back of the ZN341A and pressing the tab. The actuator cable or an attached extension cable must connect to the controller’s Act Net port.

Adding an extension cable

If you need to mount the actuator more than 14 in. from the controller, you can use an 18 AWG wire for an extension cable. The maximum distance that the actuator and controller can be separated is 300 feet (91.4 m). Connect the extension cable to the end of the actuator cable. You can use connectors or splice the wires. Terminate the extension cable in the Act Net port on the controller.
To mount the ZN341A

1. Turn the damper shaft to fully close the damper.

2. Mount the ZN341A to the VAV terminal by sliding the ZN341A's clamp assembly onto the damper shaft.

3. Insert screws through the mounting brackets to attach the ZN341A to the VAV terminal.

4. Hold down the ZN341A's actuator release button and rotate the actuator clamp in the same direction that closed the damper. Rotate the clamp until it stops, then rotate it back one notch.

5. Release the button.

6. Tighten the actuator clamp to the damper shaft by tightening the two M5 nuts.

7. Hold down the actuator release button and rotate the damper from fully closed to fully open. If the damper traveled less than 90 degrees, do the following to prevent the damper opening past fully open:
   a) Loosen the appropriate stop clamp screw.
   b) Move the stop clamp until it contacts the edge of the actuator cam.
   c) Tighten the screw.

8. Hold down the actuator release button, rotate the damper to verify that it opens and closes, then release the button.
Wiring for power

⚠️ WARNING  Do not apply line voltage (mains voltage) to the controller's ports and terminals.

⚠️ CAUTIONS
- The ZN341A is powered by a Class 2 power source. Take appropriate isolation measures when mounting it in a control panel where non-Class 2 circuits are present.
- Automated Logic® controllers can share a power supply as long as you:
  - Maintain the same polarity.
  - Use the power supply only for Automated Logic® controllers.

To wire for power

1. To remove the cover, pull up on the tabs located on both sides of the left mounting bracket on the controller.

2. Remove power from the power supply.
3. Pull the screw terminal connector from the controller's power terminals labeled Gnd and 24 Vac.
4. Connect the transformer wires to the screw terminal connector.
5. Apply power to the power supply.
6. Measure the voltage at the ZN341A’s power input terminals to verify that the voltage is within the operating range of 21.6–26.4 Vac.
7. Connect a 4-inch (10.2 cm) wire from Gnd to the control panel.
8. Insert the screw terminal connector into the ZN341A's power terminals.
9. Verify that the Pwr LED is on and the Run LED is blinking.
To address the ZN341A

You must give the ZN341A an address that is unique on the network. You can address the ZN341A before or after you wire it for power.

1 If the ZN341A has been wired for power, pull the screw terminal connector from the controller's power terminals labeled Gnd and 24 Vac. The controller reads the address each time you apply power to it.

2 Using the rotary switches, set the controller's address to match the Address in the controller's properties dialog box in SiteBuilder. Set the Tens (10's) switch to the tens digit of the address, and set the Ones (1's) switch to the ones digit.

EXAMPLE If the controller’s address is 25, point the arrow on the Tens (10's) switch to 2 and the arrow on the Ones (1's) switch to 5.

Wiring for communications

The ZN341A communicates using BACnet on the following types of network segments:

- ARC156 communicating at 156 kbps
- MS/TP communicating at 9600 bps, 19.2 kbps, 38.4 kbps, or 76.8 kbps

NOTE ARC156 is a unique implementation of the industry standard ARCNET. For a summary of differences between ARCNET and ARC156, see the ARC156 Wiring Technical Instructions.

Wiring specifications

<table>
<thead>
<tr>
<th>For...</th>
<th>Use...</th>
<th>Maximum Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>ARC156 1 and MS/TP 2</td>
<td>22 AWG, low-capacitance, twisted, stranded, shielded copper wire</td>
<td>2000 feet (610 meters)</td>
</tr>
</tbody>
</table>

1 See the ARC156 Wiring Technical Instructions.
2 See the MS/TP Networking and Wiring Technical Instructions.

⚠️ WARNING Do not apply line voltage (mains voltage) to the controller's ports and terminals.
To wire the ZN341A for communications

**WARNING** Attaching any ARCNET or MS/TP network to the Act Net port damages BT485s, DIAG485s, or terminating resistors on that network.

1. Pull the screw terminal connector from the controller's power terminals labeled **Gnd** and **24 Vac**.
2. Check the communications wiring for shorts and grounds.
3. Connect the communications wiring to the controller's screw terminals labeled **Net +**, **Net -**, and **Shield**.
   
   **NOTE** Use the same polarity throughout the network segment.
4. Set the communication type and baud rate.

<table>
<thead>
<tr>
<th>For...</th>
<th>Set ARC156/MSTP jumper to...</th>
<th>Set DIP switches 1 and 2 to...</th>
</tr>
</thead>
<tbody>
<tr>
<td>ARC156</td>
<td>ARC156</td>
<td>N/A. Baud rate will be 156 kbps regardless of the DIP switch settings.</td>
</tr>
<tr>
<td>MS/TP</td>
<td>MSTP</td>
<td>The appropriate baud rate. See the MSTP Baud diagram on the controller.</td>
</tr>
</tbody>
</table>

**NOTE** Use the same baud rate for all controllers on the network segment.

5. If the ZN341A is at either end of a network segment, connect a BT485 to the ZN341A.
6. Insert the power screw terminal connector into the ZN341A's power terminals.
7. Verify communication with the network by viewing a Module Status report in the WebCTRL® interface.

### Wiring Inputs and outputs

### Wiring specifications

#### Input wiring

<table>
<thead>
<tr>
<th>Input</th>
<th>Maximum length</th>
<th>Minimum gauge</th>
<th>Shielding</th>
</tr>
</thead>
<tbody>
<tr>
<td>0–5 Vdc</td>
<td>1000 feet (305 meters)</td>
<td>26 AWG</td>
<td>Shielded</td>
</tr>
<tr>
<td>Thermistor</td>
<td>1000 feet (305 meters)</td>
<td>22 AWG</td>
<td>Shielded</td>
</tr>
<tr>
<td>Dry contact</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ZS sensor</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wireless Adapter for wireless sensors</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Equipment Touch</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OptiPoint™ Interface</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

See *Wiring devices to the ZN341A's Rnet port* (page 11).
Output wiring
To size output wiring, consider the following:

- Total loop distance from the power supply to the controller, and then to the controlled device
  NOTE: Include the total distance of actual wire. For 2-conductor wires, this is twice the cable length.
- Acceptable voltage drop in the wire from the controller to the controlled device
- Resistance (Ohms) of the chosen wire gauge
- Maximum current (Amps) the controlled device requires to operate

To wire inputs and outputs

WARNING: Do not apply line voltage (mains voltage) to the controller's ports and terminals.

1. Verify that the ZN341A's power and communications connections work properly.
2. Pull the screw terminal connector from the controller's power terminals labeled Gnd and 24 Vac.
3. Connect the input wiring to the screw terminals on the ZN341A.

NOTES
- Connect the shield wire to the Gnd terminal with the ground wire.
- IN-3 and IN-4 share the Gnd terminal beside IN-3.

4. To use IN-1 or IN-2, set jumpers IN-1 or IN-2 to the type of signal the input will receive (thermistor/dry contact, or 0–5 Vdc).
5 Connect the binary output wiring to the screw terminals on the ZN341A and to the controlled device.

![Diagram of binary output wiring]

6 Connect the analog output wiring to the screw terminals on the ZN341A and to the controlled device.

![Diagram of analog output wiring]

7 Insert the power screw terminal connector into the ZN341A's power terminals.

---

**Wiring devices to the ZN341A's Rnet port**

You can wire the following devices to the ZN341A's Rnet port in a daisy-chain or star configuration:

- ZS sensors
- Wireless Adapter that communicates with wireless sensors
- Equipment Touch
- OptiPoint™ Interface

See the device's Technical Instructions for complete wiring instructions.

**NOTES**

- ZS sensors, a Wireless Adapter, and an Equipment Touch can share the same Rnet, but not RS sensors.
- The Rnet communicates at a rate of 115 kbps.
## Downloading the ZN341A

Download the following items to the ZN341A's battery-backed memory:

<table>
<thead>
<tr>
<th>Item</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control program</td>
<td>Must be in <strong>WebCTRL.x\webroot&lt;system_name&gt;\programs.</strong></td>
</tr>
<tr>
<td>drv_zna driver</td>
<td>Must be in <strong>WebCTRL.x\webroot&lt;system_name&gt;\drivers.</strong>. <strong>NOTE</strong> To verify that you have the driver's latest version, go to <a href="http://accounts.automatedlogic.com/download">http://accounts.automatedlogic.com/download</a>, then select <strong>Drivers &gt; ExecB.</strong> Compare the latest version to the ZN341A's driver in SiteBuilder.</td>
</tr>
</tbody>
</table>

**Editable properties**

**Schedules**

If you change any of the above items or the ZN341A's address after the initial download, you must download again. The first download takes longer than subsequent downloads.

⚠️ **CAUTIONS**

- The ZN341A will lose stored data when you download.
- Equipment controlled by the ZN341A will shut down and restart when you download.

## To download from the WebCTRL® interface

If your network is complete, you can download from any network browser. If not complete, connect a laptop with a local copy of the system database to the ZN341A's local access port. See To communicate through the local access port (page 24).

1. On the WebCTRL® Network tree, select the controller.
2. Click Downloads.
3. Do one of the following:
   - If the controller is in the Downloads list, go to step 4.
   - If the controller is not in the list:
     a. Click Add.
     b. In the pop-up, select the controller.
     c. Select All Content.
     d. Click Add.
     e. Click Close.
4. Select the controller in the Downloads list.
5. Click Start.

**NOTES**

- If the download fails, locate and resolve the problem, then retry the download.
- You can also download a controller from the Devices page.
To assign inputs or outputs to points

An input or output must be assigned to its corresponding point in the control program. This is typically done when the control program is created, but you can adjust the settings at the time of installation in the WebCTRL® interface.

1. In the WebCTRL® Geographic tree, select the equipment controlled by the ZN341A.
2. On the Properties page, select the I/O Points tab.
3. In each point's Num field, type the number of the controller's corresponding input or output. For example, if you use BO1 on the ZN341A for the point Fan S/S, type 1 in the Num field for Fan S/S.

NOTES
○ Exp (expander number) is 00 for the ZN341A.
○ Do not assign the same output number to more than one point.

4. Enter the appropriate values for each input and output in the remaining columns. See Input values, Output values, Resolution values and Offset/Polarity values below.
NOTE You can also enter these values in the EIKON® application.
5. If you have not performed the initial download to the ZN341A, you must download now so you can verify inputs and outputs.
6. To verify each input's operation, force each sensor to a known value, then compare it to the Value shown on the Properties page on the I/O Points tab.
7. To verify each output's operation, lock each output to a known condition on the I/O Points tab, then verify that the equipment operates correctly.

### Input values

<table>
<thead>
<tr>
<th>Input</th>
<th>I/O Type</th>
<th>Sensor/Actuator Type</th>
<th>Min/Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Analog (BAI)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0-5 Vdc</td>
<td>0–5 Volt</td>
<td>Linear Full Range</td>
<td>Engineering values associated with 0 Vdc (Min) and 5 Vdc (Max)</td>
</tr>
<tr>
<td>Thermistor</td>
<td>Thermistor</td>
<td>Select your Thermistor type or set up and select a Non-Linear, Custom Table</td>
<td></td>
</tr>
<tr>
<td>Pulse to Analog (BPTA)</td>
<td>Pulse Counter</td>
<td>Counter Input</td>
<td>N/A</td>
</tr>
<tr>
<td>Digital (Binary) (BBI)</td>
<td>Dry Contact</td>
<td>Dry Contact</td>
<td>N/A</td>
</tr>
<tr>
<td>Special (BI)</td>
<td>Special</td>
<td>Online flow sensor status</td>
<td>N/A</td>
</tr>
</tbody>
</table>

1. The sensor reads a value and sends a corresponding signal (Volt, mA, or psi) to the ZN341A's physical input. The Analog Input microblock uses the Min and Max values to linearly translate the signal into the engineering value used in subsequent control logic. For example, set Min to 0 and Max to 10 for a 4–20 mA sensor that measures...
velocity from 0.0 to 10.0 inches/second so that when the input reads 4 mA, the microblock outputs a value of 0. Similarly, when the input reads 8 mA, the microblock outputs a value of 2.5.

2 You can set up a custom translation table (page 23) on the driver's Custom Translation Tables pages in the WebCTRL® interface.

3 The control program must have one Pulse to Analog Input microblock for each pulse counting input.

4 The special binary input indicates a communication loss to the airflow sensor. You can use this in your control program to select the actuator movement in the case of flow sensor fault. Sensor reconnection is detected automatically and a power cycle is not required. In the microblock popup, under Hardware Configuration, set Expander to 0, Input Number to 110, and I/O Type to Special. To detect a flow sensor fault on the ZASF-A, use Input Number 111.

### Output values

<table>
<thead>
<tr>
<th>Output</th>
<th>I/O Type</th>
<th>Sensor/Actuator Type</th>
<th>Min/Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Analog (BAO)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0-10 Vdc</td>
<td>Electrical 0–10 Volt</td>
<td>Linear Full Range</td>
<td>Engineering values associated with 0 Vdc (Min) and 10 Vdc (Max) ¹</td>
</tr>
<tr>
<td>2-10 Vdc</td>
<td>Electrical 0–10 Volt</td>
<td>Linear with Offset, 2–10 Volts</td>
<td>Engineering values associated with 2 Vdc (Min) and 10 Vdc (Max) ¹</td>
</tr>
<tr>
<td>Binary (BB0)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Relay</td>
<td>Relay/Triac Output</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>

¹ The Analog Output microblock uses the Min and Max values to linearly translate its EIKON® wire value into a physical output signal (Volt, mA, or psi) sent from the ZN341A to an actuator. For example, set Min to 0 and Max to 100 for an Analog Output microblock that receives a 0 to 100% open signal from a PID microblock and that controls a 0–10 Vdc actuator so that when the PID signal is 100%, the ZN341A output is 10 Vdc. Similarly, when the PID signal is 50%, the ZN341A output is 5 Vdc.
Resolution values

Resolution is not particular to a type of input or output, but the driver handles analog and digital (binary) inputs and outputs differently. To set these values appropriately, you should understand how the driver uses them.

<table>
<thead>
<tr>
<th>Resolution</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Analog Input (BAI)</td>
<td>The driver truncates the microblock's present value according to the resolution.</td>
</tr>
<tr>
<td></td>
<td><strong>EXAMPLE</strong> If the calculated present value is 13.789 and you set the Resolution to 0.1, the control program uses 13.7 for any calculations downstream from the microblock.</td>
</tr>
<tr>
<td>Analog Output (BAO)</td>
<td>The driver truncates the wire input value to the microblock before performing any scaling calculations.</td>
</tr>
<tr>
<td></td>
<td><strong>EXAMPLE</strong> If the wire input value is 13.789 and you set the Resolution to 0.1, the microblock uses 13.7 for any scaling calculations.</td>
</tr>
<tr>
<td>Digital (Binary)</td>
<td>N/A</td>
</tr>
<tr>
<td>Inputs and Outputs</td>
<td></td>
</tr>
</tbody>
</table>

Offset/Polarity values

Offset/Polarity is not particular to a type of input or output, but the driver handles analog and digital (binary) inputs and outputs differently. To set these values appropriately, you should understand how the driver uses them.

<table>
<thead>
<tr>
<th>Offset/Polarity</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Analog Input (BAI)</td>
<td>Offset value (positive or negative) adds a fine adjustment to a sensor reading after all scaling for calibration.</td>
</tr>
<tr>
<td></td>
<td><strong>EXAMPLE</strong> If a sensor reads 74.9°F when the actual measured value is 73.6°F, enter an Offset of –1.3 to calibrate the sensor to the measured value.</td>
</tr>
<tr>
<td>Analog Output (BAO)</td>
<td>You can use the Offset value (positive or negative) to calibrate an output, but you generally do not need to. If used, the driver adds the offset value to the wire input value before performing any scaling calculations to determine the ZN341A's output.</td>
</tr>
<tr>
<td>Digital (Binary)</td>
<td>Polarity determines the microblock's present value when no signal is received from the equipment.</td>
</tr>
<tr>
<td>Input (BBI)</td>
<td>When no signal is received from the equipment, if Polarity is set to:</td>
</tr>
<tr>
<td></td>
<td>normal—present value is off</td>
</tr>
<tr>
<td></td>
<td>reversed—present value is on</td>
</tr>
<tr>
<td>Digital (Binary)</td>
<td>Polarity determines the ZN341A's output based on the control program's signal to the microblock.</td>
</tr>
<tr>
<td>Output (BBO)</td>
<td>When the control program's signal to the microblock is on, if Polarity is set to:</td>
</tr>
<tr>
<td></td>
<td>normal—output is on</td>
</tr>
<tr>
<td></td>
<td>reversed—output is off</td>
</tr>
<tr>
<td></td>
<td><strong>NOTE</strong> Regardless of Polarity, the output will be off if the ZN341A loses power.</td>
</tr>
</tbody>
</table>
Using flow sensors

In a single duct system, the ZN341A controls airflow using the built-in flow sensor and separate actuator.

In a dual duct system, the ZN341A controls airflow for one duct using the built-in flow sensor and separate actuator. For the other duct, the ZN341A uses a ZASF-A, which has its own flow sensors and actuator. Connect both the ZN341A actuator and the ZASF-A actuator to the ZN341A Act Net port.

To connect duct tubes to the flow sensors

**NOTE** Tubing should be at least 2 ft (.61 meters) long for stable airflow measurement. The combined high and low tubing length should not exceed 16.4 ft. (5 meters) in order to ensure accurate measurements.

**For a single duct system**
1. Turn off the ZN341A's power.
2. Connect the tube to the ZN341A's High connector and the Low connector. Then connect those tubes to the duct's high and low pressure tubes. Avoid sharp bends in the tubing.

**For a dual duct system**
1. Follow the single duct procedure above to connect the ZN341A to the cold duct's tubes.
2. To connect the ZASF-A to the second duct's tubes, turn off the ZASF-A's power.
3. Connect the secondary tubes to the duct's high and low pressure tubes. Avoid sharp bends in the tubing.
To wire the ZASF-A to the ZN341A

1 Wire the ZN341A actuator cable to the ZN341A **Act Net** port.
2 Wire the ZASF-A actuator cable to the ZASF-A **Act Net** port and to the ZN341A **Act Net** port.

**NOTE** Use an 18 AWG wire, maximum length 300 feet (91.4 meters).

<table>
<thead>
<tr>
<th>Terminal number</th>
<th>Wire this terminal on the controller...</th>
<th>Terminal number</th>
<th>To this terminal on the ZN341A</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Pwr</td>
<td>1</td>
<td>Pwr</td>
</tr>
<tr>
<td>2</td>
<td>Data</td>
<td>2</td>
<td>Data</td>
</tr>
<tr>
<td>3</td>
<td>Gnd</td>
<td>3</td>
<td>Gnd</td>
</tr>
</tbody>
</table>

**WARNING** Attaching any ARCNET or MS/TP network to the **Act Net** port damages BT485s, DIAG485s, or terminating resistors on that network.
To set up the Airflow Control microblock

The ZN341A's control program must include one Airflow Control microblock for a single duct system or two of the microblocks for a dual duct system. You must set up the Airflow Control microblock for each flow sensor when creating a program in Snap.

In a single duct system

1. In the WebCTRL® interface on the control program’s Logic page, select the Airflow Control microblock.
2. On the Details tab in the Flow Sensor field under Hardware Configuration, select Integral - onboard (ZN+ Built In).
3. In the Damper Actuator field, select Integral - onboard.

In a dual duct system

1. In the WebCTRL® interface on the control program’s Logic page, select the Airflow Control microblock for Flow #1.
2. On the Details tab under Hardware in the Flow Sensor field, select Integral - onboard.
3. In the Damper Actuator field, select Built-in actuator.
4. On the Logic page, select the Airflow Control microblock for Flow #2.
5. On the Details tab under Hardware in the Flow Sensor field, select Integral - remote.
6. In the Damper Actuator field, select Integral - remote.

NOTES

- When performing test and balance, follow the steps under Test and Balance on the Airflow Control microblock’s Properties page Details tab.
- If you are using a version of the EIKON® application that is prior to v7.0, you must change the Damper Motor Travel Time to 154 seconds.

See Input values (page 13) for information on the Special Binary input that indicates a communication loss to the airflow sensor.

To set up the driver

After you download the driver and control program to the ZN341A, you may want to change the driver's properties in the WebCTRL® interface to suit your application.

1. On the WebCTRL® Network tree, click ▶ to the left of your ZN341A.
2. Click ▶ to the left of Driver to see its children.
3. Make changes as needed on the Properties page for Driver and any of its children.
Driver

On the Driver page, you can change the following properties:

- Module clock synchronization and failure. See table below.
- Network Input microblock communication properties.

<table>
<thead>
<tr>
<th>Module Clock</th>
<th>Date and time the control program uses when controller's time is invalid.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clock Fail Date and Time</td>
<td>Use an occupied date and time (such as a Tuesday at 10 a.m.) so the equipment does not operate in unoccupied mode if the controller loses power during occupancy.</td>
</tr>
<tr>
<td>Time Synch Sensitivity (seconds)</td>
<td>When the controller receives a time sync request, if the difference between the controller's time and the time sync's time is greater than this field's value, the controller's time is immediately changed. If the difference is less than this field's value, the controller's time is slowly adjusted until the time is correct.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Network Microblocks</th>
<th>The maximum number of retries after the initial attempt that a Network microblock will attempt to communicate with its target device. If unsuccessful, the point will transition to an idle state for 30 seconds before attempting to communicate again. Change this field only if directed by Technical Support.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of poll retries before Network Input Microblocks indicate failure</td>
<td>If a microblock uses a wildcard in its address, this timer determines how often the microblock will attempt to find the nearest instance of its target. For example, if an outside air temperature address uses a wildcard, a VAV application will look for the outside air temperature on the same network segment or on the nearest device containing that object.</td>
</tr>
</tbody>
</table>

| BACnet COV Throttling | Under normal circumstances, COV Throttling should be enabled to prevent excessive network traffic if an object's COV Increment is set too low. See EXCEPTION below. When enabled, if an object generates excessive COV broadcasts (5 updates in 3 seconds), the driver automatically throttles the broadcasts to 1 per second. Also, if the object's value updates excessively for 30 seconds, an alarm is sent to the WebCTRL® application listing all objects that are updating excessively. A Return-to-normal alarm is sent only after all objects have stopped updating excessively. EXCEPTION: In rare circumstances, such as process control, a subscribing object may require COV updates more frequently than once per second. For these situations, clear this checkbox, but make sure that your network can support the increased traffic. You will also need to disable the Excessive COV alarms under the driver's Common Alarms. |

<table>
<thead>
<tr>
<th>Trend Sampling</th>
<th>For values that change infrequently, select to verify at midnight daily that the point is still able to communicate trend values.</th>
</tr>
</thead>
</table>
TouchScreen Control

TouchScreen Schedule Edit Enable
Check this field to allow a user to edit this controller's schedules from an Equipment Touch's Schedules screen.

**NOTE** Schedules edited on an Equipment Touch are not uploaded to the WebCTRL® application. This could result in the controller operating on a schedule that differs from the one you see in the WebCTRL® interface.

---

**Device**

On the **Device** page, you can change the following properties:

- BACnet device object properties for the ZN341A
- ZN341A network communication

**Configuration**

**NOTE** The three APDU fields refer to all networks over which the ZN341A communicates.

Max Masters and Max Info Frames
Apply only if the ZN341A is on an MS/TP network.

---

**Notification Classes**

A BACnet alarm's Notification Class defines:

- Alarm priority for Alarm, Fault, and Return to Normal states
- Options for BACnet alarm acknowledgment
- Where alarms should be sent (recipients)

Alarms in the WebCTRL® application use Notification Class #1. The WebCTRL® application is automatically a recipient of these alarms.

**Priorities**

**NOTE** BACnet defines the following Network message priorities for Alarms and Events.

<table>
<thead>
<tr>
<th>Priority range</th>
<th>Network message priority</th>
</tr>
</thead>
<tbody>
<tr>
<td>00–63</td>
<td>Life Safety</td>
</tr>
<tr>
<td>64–127</td>
<td>Critical Equipment</td>
</tr>
<tr>
<td>128–191</td>
<td>Urgent</td>
</tr>
<tr>
<td>192–255</td>
<td>Normal</td>
</tr>
</tbody>
</table>

**Priority of Off-Normal**
BACnet priority for Alarms.

**Priority of Fault**
BACnet priority for Fault messages.

**Priority of Normal**
BACnet priority for Return-to-normal messages.
Ack Required for Off-Normal, Fault, and Normal

Specifies whether alarms associated with this Notification Class require a BACnet Acknowledgment for Off-Normal, Fault, or Normal alarms.

**TIP** You can require operator acknowledgment for an Alarm or Return-to-normal message (stored in the WebCTRL® database). In the WebCTRL® interface on the Alarm > Enable/Disable tab, change the acknowledgment settings for an alarm source or an alarm category.

**Recipient List**

<table>
<thead>
<tr>
<th>Recipients</th>
<th>The first row in this list is from the WebCTRL® application. Do not delete this row. Click Add if you want other BACnet devices to receive alarms associated with this Notification Class.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recipient Description</td>
<td>Name that appears in the Recipients table.</td>
</tr>
<tr>
<td>Recipient Type</td>
<td>Use <strong>Address</strong> (static binding) for either of the following:</td>
</tr>
<tr>
<td></td>
<td>• Third-party BACnet device recipients that do not support dynamic binding</td>
</tr>
<tr>
<td></td>
<td>• When you want alarms to be broadcast (you must uncheck Issue Confirmed Notifications). This use is rare.</td>
</tr>
<tr>
<td>Days and times</td>
<td>The days and times during which the recipient will receive alarms.</td>
</tr>
<tr>
<td>Recipient Device Object Identifier</td>
<td>Type the Device Instance from SiteBuilder (or from the network administrator for third-party devices) in the # field.</td>
</tr>
<tr>
<td>Process Identifier</td>
<td>Change for third-party devices that use a BACnet Process Identifier other than 1. The WebCTRL® application processes alarms for any 32-bit Process Identifier.</td>
</tr>
<tr>
<td>Issue Confirmed Notifications</td>
<td>Select to have a device continue sending an alarm message until it receives delivery confirmation from the recipient.</td>
</tr>
<tr>
<td>Transitions to Send</td>
<td>Uncheck the types of alarms you do not want the recipient to get.</td>
</tr>
</tbody>
</table>

**Calendars**

Calendars are provided in the driver for BACnet compatibility only. Instead, use the Schedules feature in the WebCTRL® interface.

**Common Alarms**

On these pages, you can enable/disable, change BACnet alarm properties, or set delays for the following BACnet alarms:

**Common alarms:**
- Module Halted
- All Programs Stopped
- Duplicate Address
- Locked I/O
- Control Program
- Program Stopped
- Excessive COV
NOTE To set up alarm actions for controller generated alarms, see Setting up alarm actions in WebCTRL® Help.

### Module Generated Alarm

<table>
<thead>
<tr>
<th>Description</th>
<th>Short message shown on the WebCTRL® Alarms page or in an alarm action when this type of alarm is generated.</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Events</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alarm Category and Alarm Template</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Enable</th>
<th>Clear these checkboxes to disable Alarm or Return to normal messages of this type from this controller.</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Notification Class</th>
<th>Do not change this field.</th>
</tr>
</thead>
</table>

### Specific Events

On these pages, you can enable/disable, change BACnet alarm properties, or set delays for the following BACnet alarms:

**Specific alarms:**
- Flow Control Alarm
- Reheat Valve Alarm (future use)

NOTES
- To set up alarm actions for controller generated alarms, see Setting up alarm actions in WebCTRL® Help.

<table>
<thead>
<tr>
<th>Module Generated Alarm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description</td>
</tr>
<tr>
<td>Events</td>
</tr>
<tr>
<td>Alarm Category and Alarm Template</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Enable</th>
<th>Clear these checkboxes to disable Alarm or Return to normal messages of this type from this controller.</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Notification Class</th>
<th>Do not change this field.</th>
</tr>
</thead>
</table>

- Reheat Valve Alarms are for future use.
Custom Translation Tables

You can set up a translation table that an analog input will use to translate the raw data from a non-linear sensor to the engineering units you want it to output on the wire. In the Network tree, select Custom Translation Table #1, #2, or #3. The Properties page has instructions. For the input to use the translation table, navigate to the input in the Geographic tree, select the Details tab, then set Sensor Type (Scaling Method) to Non-Linear, Custom Table #__.

Switches, Jumpers, Options

The Switches, Jumpers, Options page shows the current physical settings on the ZN341A.

Flow Calibration Archive

The Flow Calibration Archive page shows measured flow and sensor readings that were entered in the WebCTRL® interface Test and Balance or through the stand-alone Airflow Test and Balance Utility. Editing Airflow microblock properties outside of Test and Balance will not change the values on this page.

Act Net Network Details

Act Net Statistics

The actuator serial numbers are automatically read and filled in by the WebCTRL® application. Only those devices that are physically connected or in the control program will show in the table.

NOTE See To get the Automated Logic® ZN341A serial number (page 28) for the controller serial number.

The Act Net network can have the 3 devices listed below with the following addresses:
Address 1: The ZN341A’s actuator
Address 2: A ZASF-A’s actuator
Address 3: A ZASF-A sensor

⚠️ CAUTION If you see Duplicate address on network or No communication with device under Device Status, contact Technical Support. Do not use Act Net Address Setting unless directed by Technical Support.
To communicate through the Local Access port

Using a computer and a USB Link Kit, you can communicate locally with the ZN341A to download or to troubleshoot.

**PREREQUISITES**

- A computer with a USB port
- A USB Link Kit. See the *USB Link Kit Technical Instructions.*

**NOTE** The USB Link Kit driver is installed with a WebCTRL® v5 or later system. But if needed, you can get the latest driver from [http://www.silabs.com/products/mcu/Pages/USBtoUARTBridgeVCPDrivers.aspx](http://www.silabs.com/products/mcu/Pages/USBtoUARTBridgeVCPDrivers.aspx). Install the driver before you connect the USB Link Kit to your computer.
- v1.70 or later controller driver

⚠️ **CAUTION** If multiple controllers share power but polarity was not maintained when they were wired, the difference between the controller’s ground and the computer’s AC power ground could damage the USB Link Kit and the controller. If you are not sure of the wiring polarity, use a USB isolator between the computer and the USB Link Kit. Purchase a USB isolator online from a third-party manufacturer.

Connect the USB Link Kit to the computer and to the controller’s Local Access port.

![USB Link Kit diagram]

**NOTE** If using a USB isolator, plug the isolator into your computer’s USB port, and then plug the USB Link Kit cable into the isolator.

To set up a Local Access connection in the WebCTRL® interface

For the WebCTRL® application to communicate with the Local Access port, you must do the following:

1. On the **System Configuration** tree, select **Connections**.
2. On the **Configure** tab, click **Add**.
3. From the **Type** drop-down list, select **BACnet Local Access**.
4. Optional: Edit the **Description**.
5 Type the computer's Port number that the USB cable is connected to.

NOTE To find the port number, plug the USB cable into the computer's USB port, then select Start > Control Panel > System > Device Manager > Ports (Com & LPT). The COM port number is beside Silicon Labs CP210x USB to UART Bridge.

6 Set the Baud rate to 115200.

7 Click Accept.

8 On the View tab, click the button next to the BACnet/IP network, then select BACnet Local Access.

9 Click Accept.

10 On the Configure tab, select BACnet Local Access, then click Start.

NOTE If an error message appears, make sure the COM port you selected is not in use. For example, PuTTY may be open and is holding the port open.

11 On the Network tree, select the controller that you are connected to.

12 Click , then select Manual Command.

13 Type rnet here in the dialog box, then click OK.

14 On the Properties page, click Module Status. If a Modstat report appears, the WebCTRL® application is communicating with the controller.
Troubleshooting

If you have problems mounting, wiring, or addressing the ZN341A, contact Automated Logic® Technical Support.

LED's

The LED's on the ZASF-A show the status of certain functions.

<table>
<thead>
<tr>
<th>If this LED is on</th>
<th>Status is...</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pwr</td>
<td>The ZN341A has power.</td>
</tr>
<tr>
<td>RX</td>
<td>The ZN341A is receiving data from the network segment</td>
</tr>
<tr>
<td>TX</td>
<td>The ZN341A is transmitting data over the network segment</td>
</tr>
<tr>
<td>Run</td>
<td>See table below.</td>
</tr>
<tr>
<td>Err</td>
<td>See table below.</td>
</tr>
<tr>
<td>BO1</td>
<td>The binary output is active</td>
</tr>
<tr>
<td>BO2</td>
<td>The binary output is active</td>
</tr>
<tr>
<td>BO3</td>
<td>The binary output is active</td>
</tr>
<tr>
<td>CW</td>
<td>The actuator motor is turning clockwise</td>
</tr>
<tr>
<td>CCW</td>
<td>The actuator motor is turning counterclockwise</td>
</tr>
</tbody>
</table>

The Run and Error LED's indicate controller and network status.

<table>
<thead>
<tr>
<th>If Run LED shows...</th>
<th>And Error LED shows...</th>
<th>Status is...</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 flashes per second</td>
<td>Off</td>
<td>Normal</td>
</tr>
<tr>
<td>2 flashes per second</td>
<td>2 flashes, alternating with Run LED</td>
<td>Five minute auto-restart delay after system error</td>
</tr>
<tr>
<td>2 flashes per second</td>
<td>3 flashes, then off</td>
<td>The controller has just been formatted</td>
</tr>
<tr>
<td>2 flashes per second</td>
<td>4 flashes, then pause</td>
<td>Two or more devices on this network have the same ARC156 network address</td>
</tr>
<tr>
<td>2 flashes per second</td>
<td>1 flash per second</td>
<td>The controller is alone on the network</td>
</tr>
<tr>
<td>2 flashes per second</td>
<td>On</td>
<td>Obtain a Module Status Report (Modstat) to determine which of the following occurred:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Exec halted after frequent system errors</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Control programs halted</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• ZN341A stopped communicating with the ZASF-A</td>
</tr>
</tbody>
</table>
### If Run LED shows... And Error LED shows... Status is...

<table>
<thead>
<tr>
<th>If Run LED shows...</th>
<th>And Error LED shows...</th>
<th>Status is...</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 flashes per second</td>
<td>On</td>
<td>Exec start-up aborted, Boot is running</td>
</tr>
<tr>
<td>5 flashes per second</td>
<td>Off</td>
<td>Firmware transfer in progress, Boot is running</td>
</tr>
<tr>
<td>7 flashes per second</td>
<td>7 flashes per second, alternating with Run LED</td>
<td>Ten second recovery period after brownout</td>
</tr>
<tr>
<td>14 flashes per second</td>
<td>14 flashes per second, alternating with Run LED</td>
<td>Brownout</td>
</tr>
<tr>
<td>On</td>
<td>On</td>
<td>Failure. Try the following solutions:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Turn the ZN341A off, then on.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Format the ZN341A.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Download the ZN341A.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Replace the ZN341A.</td>
</tr>
</tbody>
</table>

**NOTE** If you resolve the issue but the Error LED does not turn off, cycle power to the controller.

### Possible delay before control program starts

- When you first apply power to the ZN341A, it waits for up to 3 minutes to receive a time/date broadcast from its BACnet router. The ZN341A begins to run the control program only after it receives the time/date or when the 3 minute waiting period expires. If the ZN341A does not receive a time/date broadcast, it keeps the default setting of 6/12/2002 10:00:00 (am).

- The damper actuators' automatic full-range calibration on startup is staggered to prevent system high pressure. This calibration delay is based on rotary switch addresses.
  Delay = 20 x (rotary address mod 16) seconds. The minimum delay is 0 and the maximum is 300 seconds.

### To format the controller

If you cannot communicate with a controller after downloading it, as a last resort, you can manually format the controller to erase its memory.

1. Pull the screw terminal connector from the controller's power terminals labeled Gnd and 24 Vac.

   **⚠️** Make sure the address switches are not set to 0, 0.

2. Short the Format jumper's pins and maintain the short for steps 3 and 4.

3. Insert the power screw terminal connector into the ZN341A's power terminals.

4. Continue to short the jumper until the Error LED flashes three times in sync with the Run LED.

5. Remove the short.

6. Download the ZN341A.
To get the Automated Logic® ZN341A's serial number

If you need the Automated Logic® ZN341A's controller serial number when troubleshooting, the number is on:

- the back of the main controller board
  
  **NOTE**  The number on the side of the actuator is not the Automated Logic® serial number.

- a Module Status report (Modstat) under **Core** (or **Main**) **board hardware**

To obtain a modstat in the WebCTRL® interface:

1. Select the ZN341A in the **Network** tree.
2. On the **Properties** page, click **Module Status**.

Recovering from a power outage

The ZN341A has a 10-year Lithium CR2032 battery that retains the following data for a maximum of 10,000 hours during power outages.

- Control programs
- Editable properties
- Trends
- Schedules

If the above data is lost after power returns, replace the battery and then download the ZN341A. See instructions below.

To replace the ZN341A's battery

If the ZN341A experiences a power outage and the control program stops functioning, replace the battery.

1. Verify that the ZN341A's power is on.
2. Remove the ZN341A's cover.
3. Remove the battery from the controller, making note of the battery's polarity.
4. Insert the new battery, matching the battery's polarity with the polarity indicated on the controller's cover.
5. Replace the ZN341A's cover.
6. Download the ZN341A.
To clean the airflow sensor orifice

In less than .02% of installations, small particulates (micron/submicron-level) can build up in the airflow sensor's internal orifice causing airflow restriction. Symptoms of airflow restriction are:

- Diffuser noise increases over time
- Space overcools at minimum airflow
- Frequency of dampers opening to maintain flow setpoint increases over time
- AHU fan speed increases over time

To check for these symptoms, set up trending of:

- Damper position to look for long term increase
- AHU fan speed for maintaining static pressure

If you see these symptoms, you should clean the flow sensor.

To clean the flow sensor

You can use a can of compressed air to clean the sensors while the controller is installed or on a repair bench.

1. Disconnect the High and Low flow sensor tubes.
2. Insert the compressed air straw 1/4" into the controller's High connector.

⚠️ **WARNING** The compressed air can MUST be upright. It will damage the flow sensors by producing ice crystals if the can is on its side.
3 Press the air can's trigger twice for no more than 2 seconds each time.
4 Reconnect tubing to the High and Low flow sensor tubes.

To take the ZN341A out of service

If needed for troubleshooting or start-up, you can stop communication between the WebCTRL® application and the ZN341A.

1 On the WebCTRL® Network tree, select the ZN341A.
2 On the Properties page, check Out of Service.
3 Click Accept.
Compliance

FCC Compliance

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

1. This device may not cause harmful interference.
2. This device must accept any interference received, including interference that may cause undesired operation.

⚠️ IMPORTANT Any changes or modifications not expressly approved by manufacturer could void the user's authority to operate the equipment.

NOTE This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a residential installation. This equipment generates, uses, and can radiate radio frequency energy, and if it is not installed and used in accordance with this document, it may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

CE Compliance

⚠️ WARNING This is a Class B product. In a light industrial environment, this product may cause radio interference in which case the user may be required to take adequate measures.

BACnet Compliance

Compliance of listed products to requirements of ASHRAE Standard 135 is the responsibility of BACnet International. BTL® is a registered trademark of BACnet International.
## Document revision history

Important changes to this document are listed below. Minor changes such as typographical or formatting errors are not listed.

<table>
<thead>
<tr>
<th>Date</th>
<th>Topic</th>
<th>Change description</th>
<th>Code*</th>
</tr>
</thead>
<tbody>
<tr>
<td>8/31/18</td>
<td>Wiring Inputs and Outputs &gt; Wiring specifications</td>
<td>Removed RS sensor from Input wiring table, and added OptiPoint™ Interface.</td>
<td>X-D</td>
</tr>
<tr>
<td>8/23/18</td>
<td>Specifications</td>
<td>Reworded Rnet port specification and added power supplied by Rnet port. Added first paragraph to Protection specification.</td>
<td>X-H-JS-O</td>
</tr>
<tr>
<td></td>
<td>Zone sensors</td>
<td>Complete revision</td>
<td>X-D</td>
</tr>
<tr>
<td></td>
<td>Touchscreen devices</td>
<td>Changed title from Equipment Touch to Touchscreen devices. Added OptiPoint™ Interface and restructured topic.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Wiring devices to the ZN341A's Rnet port</td>
<td>Added OptiPoint™ Interface. Removed sub-topics and directed user to see each device's Technical Instructions.</td>
<td></td>
</tr>
</tbody>
</table>

* For internal use only
ZN341A VAV Controllers
Zone Controllers with Actuators

The ZN341A is a fully programmable, native BACnet Advanced Application Controller that provides zone level temperature and air quality control for pressure-independent VAV applications. Sophisticated pre-engineered control algorithms reduce energy consumption, extend actuator life, and increase occupant comfort. It communicates on an EIA-485 LAN using BACnet MS/TP or BACnet over ARCNET communications and connects seamlessly to the WebCTRL® building automation system.

Key Features and Benefits

Application Features

• Versatile controller suitable for a variety of applications, including fan coil units, lighting, and exhaust fan control
• Standard library of control programs available for most zoning applications
• Supports EIKON® graphical programming software, an object oriented tool that provides complete flexibility for any custom control sequence that you need
• Supports Automated Logic® communicating sensors, which are available in a variety of zone sensing combinations and support setpoint adjustment and occupancy overrides
• Supports Automated Logic touchscreen interfaces for managing and troubleshooting the connected equipment easily
• Supports live, visual displays of control logic, which uses real time operational data and aids in optimizing and troubleshooting system operations
• Quick & easy test and balancing process

Hardware Features

• Separable actuator with a 45 inch-pound (5 Nm) torque rating that can be mounted up to a maximum distance of 300 feet from the controller
• Controls up to 8 points (3 binary outputs, 4 universal inputs and 1 analog output)
• Precision differential pressure sensor and advanced VAV algorithm increase occupant comfort at both minimum and maximum design air flows, while also extending actuator life
• High-speed, native BACnet over ARC156 communications delivers high speed response when you need it. BACnet over MS/TP communications is also supported
• Fast, powerful, and fully distributed control allows complete independence from any other devices in the system
• Large termination strips will improve ease of installation
• Firmware upgrades can be performed remotely

System Benefits

• Connects seamlessly to the WebCTRL building automation system

The WebCTRL® building automation system gives you the ability to understand your building operations and analyze the results. The WebCTRL system integrates environmental, energy, security and safety systems into one powerful management tool that allows you to reduce energy consumption, increase occupant comfort, and achieve sustainable building operations. Our web-based platform allows building managers to control and access information about their HVAC, lighting, central plant and critical processes on premises or remotely at any time of day.
# ZN341A VAV Controllers

## Specifications

<table>
<thead>
<tr>
<th>Feature</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>BACnet support</strong></td>
<td>Conforms to the BACnet Advanced Application Controller (B-AAC) Standard Device Profile as defined in ANSI/ASHRAE Standard 135-2012 (BACnet Annex L, Protocol Revision 9</td>
</tr>
</tbody>
</table>
| **Power**                       | 24 Vac ±10%, 50–60 Hz, 14 VA  
                                      26 Vdc (25 V min, 28.8 V max)                                      |
| **Actuator**                    | Bellimo brushless DC motor, torque 45 inch-pounds (5 Nm), runtime 154 seconds |
| **Actuator port**               | To connect the actuator cable and the ZASF-A                                 |
| **BACnet port**                 | For communication with the controller network using ARC156 or MS/TP (9600 bps–76.8 kbps) |
| **Rnet port**                   | Supports:  
                                      • Up to 5 ZS sensors  
                                      • One Wireless Adapter that communicates with up to 5 wireless sensors  
                                      • One Equipment Touch |
| **Local Access port**           | For system start-up and troubleshooting                                        |
| **Inputs**                      | 4 inputs configurable for thermistor or dry contact. Inputs 1 and 2 are also configurable for 0–5 Vdc  
                                      Input resolution: 10 bit A/D  
                                      Input pulse frequency: 10 pulses per second. Minimum pulse width (on or off time) required for each pulse is 50 msec |
| **Outputs**                     | 3 binary output, relay contact rated at 1 A max. @ 24 Vac/Vdc. Configured normally open  
                                      1 analog output, 0–10 Vdc (5 mA max)  
                                      8 bit D/A |
| **Integral airflow sensor**     | Precision differential pressure sensor 0–2 in. H2O, sensitive down to ±0.001 in. H2O. Barbed tapered airflow connections accept 3/16” (4.75 mm) I.D. tubing. Allows for readings across the 0–2in. H2O range, accurate to ±5% of full flow at 2 in. H2O |
| **Microprocessor**              | High speed 16-bit microprocessor with ARCNET communication co-processor       |
| **Memory**                      | 512 kB non-volatile battery-backed RAM, 1 MB Flash memory, 16-bit memory bus |
| **Battery**                     | 10-year Lithium CR2032 battery retains the following data for a maximum of 10,000 hours during power outages: control programs, editable properties, schedules, and trends |
| **BT485 connector**             | Attach a BT485 (not included) to a controller at the beginning and end of a network segment to add bias and to terminate a network segment |
| **Status indicators**           | LED’s indicate status of communications, running, errors, power, and binary outputs |
| **Environmental op.range**      | 32 to 130°F (0 to 54.4°C), 10–90% relative humidity, non-condensing |
| **Physical**                    | UL94-5VA plenum rated enclosure for installation in plenum (or other space for environmental air) in accordance with NEC Section 300.22 (c) and (d) |
| **Listed by**                   | UL-916 (PAZX), cUL-916 (PAZX7), FCC Part 15-Subpart B, Class B, CE             |
| **Weight**                      | 1.8 lbs (0.82 kg)                                                            |

![Controller and Actuator Dimensions](image.png)

All trademarks used herein are the property of their respective owners.

1150 Roberts Boulevard, Kennesaw, Georgia 30144  
770-429-3000  Fax 770-429-3001  |  www.automatedlogic.com
ZN551 Zone Controller

Zone Controller

The ZN551 is a fully programmable, native BACnet Advanced Application Controller (AAC) designed for controlling a single zone in a building. The ZN551 is well suited for VAV, heat pump, unit ventilator and other packaged HVAC applications. It communicates on an EIA-485 LAN using BACnet MS/TP or BACnet over ARCNET communications and connects seamlessly to the WebCTRL® building automation system.

Key Features and Benefits

Application Features

- Versatile controller suitable for a variety of applications, including fan coil units, lighting, and exhaust fan control
- Standard library of control programs available for most zoning applications
- Supports EIKON® graphical programming software, an object-oriented tool that provides complete flexibility for any custom control sequence that you need
- Supports Automated Logic® communicating sensors, which are available in a variety of zone sensing combinations and support setpoint adjustment and occupancy overrides
- Supports Automated Logic touchscreen interfaces for managing and troubleshooting the connected equipment easily
- Supports live, visual displays of control logic, which uses real time operational data and aids in optimizing and troubleshooting system operations
- Quick & easy test and balancing process

Hardware Features

- Controls up to 11 points (5 binary outputs, 5 universal inputs and 1 analog output)
- High-speed, native BACnet over ARC156 communications delivers high speed response when you need it
- Supports native BACnet over MS/TP communications when required
- Fast, powerful, and fully distributed control allows complete independence from any other devices in the system
- Firmware upgrades can be performed remotely
- Easy startup and commissioning using the WebCTRL system user interfaces
- Battery-backed real time-clock keeps time in the event of power failure or network interruption

System Benefits

- Connects seamlessly to the WebCTRL building automation system
- Supports demand limiting and optimal start for maximum energy savings

The WebCTRL® building automation system gives you the ability to understand your building operations and analyze the results. The WebCTRL system integrates environmental, energy, security and safety systems into one powerful management tool that allows you to reduce energy consumption, increase occupant comfort, and achieve sustainable building operations. Our web-based platform allows building managers to control and access information about their HVAC, lighting, central plant and critical processes on premises or remotely at any time of day.

WebCTRL®
# ZN551 Zone Controller

## Specifications

<table>
<thead>
<tr>
<th>Feature</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Communication Ports</td>
<td>The following ports are available:</td>
</tr>
<tr>
<td></td>
<td>EIA-485 port for ARCNET 156 Kbps or MS/TP (9600 bps – 76.8 Kbps)</td>
</tr>
<tr>
<td></td>
<td>Local access port for system start-up and troubleshooting</td>
</tr>
<tr>
<td></td>
<td>Rnet port for sensors and local operator interfaces</td>
</tr>
<tr>
<td>Binary Outputs</td>
<td>Five binary outputs, relay contact rated at 1A max @ 24V-ac, configured normally open.</td>
</tr>
<tr>
<td>Analog Outputs</td>
<td>One analog output, 0-10 V-dc with 8-bit resolution.</td>
</tr>
<tr>
<td>Universal Inputs</td>
<td>Five inputs with 10-bit A/D resolution for dry contact or Type 2 thermistors.</td>
</tr>
<tr>
<td>Microprocessor</td>
<td>High-speed 16-bit microprocessor with ARCNET communication co-processor</td>
</tr>
<tr>
<td>Memory</td>
<td>512 KByte non-volatile battery-backed RAM, 1 MByte flash memory, 16-bit memory bus (Shelf life of the battery is 10 years with 10,000 hours of continuous operation.)</td>
</tr>
<tr>
<td>Status Indicators</td>
<td>LED status indicators for EIA-485 communication, running, error, power and all binary outputs</td>
</tr>
<tr>
<td>Module Addressing</td>
<td>Rotary dip switches for intuitive network addressing of modules</td>
</tr>
<tr>
<td>Listed by</td>
<td>UL916 (Canadian Std C22.2 No. 205-M1983), CE, FCC Part 15 - Subpart B - Class A</td>
</tr>
<tr>
<td>Environmental Operating Range</td>
<td>-0°F to 130°F (-17.8C to 54.4°C); 10 to 90% relative humidity, non-condensing Plenum rated. NOTE: Control modules must be installed within the building.</td>
</tr>
<tr>
<td>Power Requirements</td>
<td>24 V-ac ± 10%, 26 V-dc (25 V min, 30 V max), 50 to 60Hz, 15 VA.</td>
</tr>
<tr>
<td></td>
<td>NOTE: Power consumption will increase when other accessories are attached.</td>
</tr>
<tr>
<td>Physical</td>
<td>Rugged GE C2950 Cycoloy plastic</td>
</tr>
<tr>
<td>Weight</td>
<td>0.6 lb. (0.27 kg)</td>
</tr>
<tr>
<td>Dimensions</td>
<td>Overall Width: 5-1/16&quot; (129mm)</td>
</tr>
<tr>
<td></td>
<td>Height: 5-11/16&quot; (144mm)</td>
</tr>
<tr>
<td></td>
<td>Depth: 1-1/2&quot; (38mm) min. panel depth</td>
</tr>
<tr>
<td>Mounting*</td>
<td>Two mounting holes center line as at left with 5-5/16&quot; (135mm) spacing (height).</td>
</tr>
<tr>
<td></td>
<td>For indoor use only</td>
</tr>
</tbody>
</table>

All trademarks used herein are the property of their respective owners.

1150 Roberts Boulevard, Kennesaw, Georgia 30144
770-429-3000  Fax 770-429-3001  |  www.automatedlogic.com

01292019

WE MAKE BUILDINGS BETTER.
Next level building automation engineered to help you make smart decisions.
Features & Options

- 10 Field Selectable Pressure Ranges and 5 Field Selectable Outputs
- Optional Display Shows Pressure Over the Entire Operational Range Regardless of Which Pressure Range is Selected
- Standard, Low and High Range Units
- Ranges and Outputs Can Be Set Without Power
- Free NIST Certificate Included with Each Unit

BAPI’s Zone Pressure Multi-Sensor is the most flexible pressure sensor on the market. Output, range, units, directionality, and response time are quickly set in the field with no tools, no power and no small components.

The optional LCD display helps with troubleshooting because it displays the actual differential pressure over the entire operational range regardless of which individual pressure range is selected for output to the system controller. Three LEDs on the face of the unit indicate when the pressure is “Out of Range Low”, “In Range” or “Out of Range High”.

Specifications

Power:
7 to 40 VDC (4 to 20 mA Output)
7 to 40 VDC or 18 to 32 VAC (0 to 5 or 1 to 5 V Output)
13 to 40 VDC or 18 to 32 VAC (0 to 10 or 2 to 10 V Output)

Power Consumption:
20 mA max, DC only at 4 to 20 mA Output
4.9 mA max DC at 0 to 5 VDC or 0 to 10 VDC Output
0.12 VA max AC at 0 to 5 VDC or 10 VDC Output

Load Resistance:
4 to 20 mA Output 850 Ω Maximum @ 24 VDC
0 to 5 V or 0 to 10 V output 6K to 10KΩ minimum

Accuracy for Standard Pressure Ranges at 72°F:
±0.25% of range

Accuracy for Low Pressure Ranges at 72°F:
±0.5% of range for the three lowest unidirectional and bidirectional ranges, ±0.25% of range all other ranges

Accuracy for High Pressure Ranges at 72°F:
±0.25% on all ranges

Stability: ±0.25% F.S. per year

Environmental Op. Range: -4 to 140°F (-20 to 60°C)

Storage Temperature: -40 to 203°F (-40 to 95°C)

Temperature Error Low Range:
0.04% FS/°F (0.07% FS/°C)
(±1.0” W.C @-4 to 140°F (-20 to 60°C)

Temperature Error Standard Range:
0.01% FS/°F (0.02% FS/°C)
(±5.0” W.C @-4 to 140°F (-20 to 60°C)

Overpressure:
Proof: 300.1 WC (10.83 PSI)
Burst: 512.6 WC (18.5 PSI)

Wiring:
2 wires (4 to 20mA Current loop)*
3 wires (AC or DC powered, Voltage out)*

Humidity: 0 to 95% RH, non-condensing

Port Size: 1/4” tubing (1/8” to 3/16” I.D.)

Encl. Material: UV-resistant Polycarb., UL94, V-0

Enclosure Rating: IP44, NEMA 2

*BAPI recommends that you do not run wiring for the pressure transmitter in the same conduit as line voltage wiring or with wiring used to supply highly inductive loads such as motors, generators and coils.
Ordering Information

**STANDARD RANGE UNITS**

<table>
<thead>
<tr>
<th>PART NUMBER</th>
<th>DESCRIPTION</th>
<th>LIST PRICE</th>
</tr>
</thead>
<tbody>
<tr>
<td>BA/ZPM-SR-NT-D</td>
<td>ZPM Standard Range Unit, No Tube or Probe included, with Display</td>
<td>$320</td>
</tr>
<tr>
<td>BA/ZPM-SR-ST-D</td>
<td>ZPM Standard Range Unit, with Static Pressure Tube, with Display</td>
<td>$320</td>
</tr>
<tr>
<td>BA/ZPM-SR-AT-D</td>
<td>ZPM Standard Range Unit, with Attached Static Tube, with Display</td>
<td>$320</td>
</tr>
<tr>
<td>BA/ZPM-SR-NT-ND</td>
<td>ZPM Standard Range Unit, No Tube or Probe included, No Display</td>
<td>$320</td>
</tr>
<tr>
<td>BA/ZPM-SR-ST-ND</td>
<td>ZPM Standard Range Unit, with Static Pressure Tube, No Display</td>
<td>$320</td>
</tr>
<tr>
<td>BA/ZPM-SR-AT-ND</td>
<td>ZPM Standard Range Unit, with Attached Static Tube, No Display</td>
<td>$320</td>
</tr>
</tbody>
</table>

**LOW RANGE UNITS**

<table>
<thead>
<tr>
<th>PART NUMBER</th>
<th>DESCRIPTION</th>
<th>LIST PRICE</th>
</tr>
</thead>
<tbody>
<tr>
<td>BA/ZPM-LR-NT-D</td>
<td>ZPM Low Range Unit, No Tube or Probe included, with Display</td>
<td>$320</td>
</tr>
<tr>
<td>BA/ZPM-LR-ST-D</td>
<td>ZPM Low Range Unit, with Static Pressure Tube, with Display</td>
<td>$320</td>
</tr>
<tr>
<td>BA/ZPM-LR-AT-D</td>
<td>ZPM Low Range Unit, with Attached Static Tube, with Display</td>
<td>$320</td>
</tr>
<tr>
<td>BA/ZPM-LR-NT-ND</td>
<td>ZPM Low Range Unit, No Tube or Probe included, No Display</td>
<td>$320</td>
</tr>
<tr>
<td>BA/ZPM-LR-ST-ND</td>
<td>ZPM Low Range Unit, with Static Pressure Tube, No Display</td>
<td>$320</td>
</tr>
<tr>
<td>BA/ZPM-LR-AT-ND</td>
<td>ZPM Low Range Unit, with Attached Static Tube, No Display</td>
<td>$320</td>
</tr>
</tbody>
</table>

**HIGH RANGE UNITS**

<table>
<thead>
<tr>
<th>PART NUMBER</th>
<th>DESCRIPTION</th>
<th>LIST PRICE</th>
</tr>
</thead>
<tbody>
<tr>
<td>BA/ZPM-HR-NT-D</td>
<td>ZPM High Range Unit, No Tube or Probe included, with Display</td>
<td>$320</td>
</tr>
<tr>
<td>BA/ZPM-HR-ST-D</td>
<td>ZPM High Range Unit, with Static Pressure Tube, with Display</td>
<td>$320</td>
</tr>
<tr>
<td>BA/ZPM-HR-AT-D</td>
<td>ZPM High Range Unit, with Attached Static Tube, with Display</td>
<td>$320</td>
</tr>
<tr>
<td>BA/ZPM-HR-NT-ND</td>
<td>ZPM High Range Unit, No Tube or Probe included, No Display</td>
<td>$320</td>
</tr>
<tr>
<td>BA/ZPM-HR-ST-ND</td>
<td>ZPM High Range Unit, with Static Pressure Tube, No Display</td>
<td>$320</td>
</tr>
<tr>
<td>BA/ZPM-HR-AT-ND</td>
<td>ZPM High Range Unit, with Attached Static Tube, No Display</td>
<td>$320</td>
</tr>
</tbody>
</table>

Pressure Range, Output Range and Inches of Water Column or Pascal Operation will be selected in the field for these units. Ranges and Outputs shown below:

**Field Selectable Ranges and Outputs**

**STANDARD RANGES**

<table>
<thead>
<tr>
<th>Inches WC</th>
<th>Pascals</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 to 1.00</td>
<td>0 to 250</td>
</tr>
<tr>
<td>0 to 2.00</td>
<td>0 to 300</td>
</tr>
<tr>
<td>0 to 2.50</td>
<td>0 to 500</td>
</tr>
<tr>
<td>0 to 3.00</td>
<td>0 to 1,000</td>
</tr>
<tr>
<td>0 to 5.00</td>
<td>0 to 2,500</td>
</tr>
<tr>
<td>-1.00 to 1.00</td>
<td>-250 to 250</td>
</tr>
<tr>
<td>-2.00 to 2.00</td>
<td>-300 to 300</td>
</tr>
<tr>
<td>-2.50 to 2.50</td>
<td>-500 to 500</td>
</tr>
<tr>
<td>-3.00 to 3.00</td>
<td>-1,000 to 1,000</td>
</tr>
<tr>
<td>-5.00 to 5.00</td>
<td>-1,250 to 1,250</td>
</tr>
</tbody>
</table>

**LOW RANGES**

<table>
<thead>
<tr>
<th>Inches WC</th>
<th>Pascals</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 to 0.10</td>
<td>0 to 30</td>
</tr>
<tr>
<td>0 to 0.25</td>
<td>0 to 50</td>
</tr>
<tr>
<td>0 to 0.50</td>
<td>0 to 100</td>
</tr>
<tr>
<td>0 to 0.75</td>
<td>0 to 175</td>
</tr>
<tr>
<td>0 to 1.00</td>
<td>0 to 250</td>
</tr>
<tr>
<td>-0.10 to 0.10</td>
<td>-30 to 30</td>
</tr>
<tr>
<td>-0.25 to 0.25</td>
<td>-50 to 50</td>
</tr>
<tr>
<td>-0.50 to 0.50</td>
<td>-100 to 100</td>
</tr>
<tr>
<td>-0.75 to 0.75</td>
<td>-175 to 175</td>
</tr>
<tr>
<td>-1.00 to 1.00</td>
<td>-250 to 250</td>
</tr>
</tbody>
</table>

**HIGH RANGES**

<table>
<thead>
<tr>
<th>Inches WC</th>
<th>Pascals</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 to 5</td>
<td>0 to 1,250</td>
</tr>
<tr>
<td>0 to 10</td>
<td>0 to 2,500</td>
</tr>
<tr>
<td>0 to 15</td>
<td>0 to 4,000</td>
</tr>
<tr>
<td>0 to 25</td>
<td>0 to 6,000</td>
</tr>
<tr>
<td>0 to 30</td>
<td>0 to 7,400</td>
</tr>
</tbody>
</table>

**OUTPUTS AVAILABLE**

| 4 to 20 mA |
| 0 to 5 V   |
| 0 to 10 V  |
| 2 to 10 V  |
| 1 to 5 V   |

Datasheets without List Prices are available on our website at www.bapihvac.com

Custom Ranges are also available. Contact your BAPI representative for ordering information.

Your Number: BA/ZPM-
ZS Sensors

Intelligent Room Sensors

The Automated Logic® ZS room sensors are an integral component of the WebCTRL® building automation system. These sensors provide the function and flexibility you need to manage the conditions important to the comfort, productivity, and sustainability of your facility, and are designed to work with ZN, SE, and ME line controllers.

The ZS sensors measure room temperature, relative humidity, carbon dioxide, motion and VOCs (volatile organic compounds), and are available in a variety of zone-sensing combinations to address your specific control requirements.

Features

<table>
<thead>
<tr>
<th>Feature</th>
<th>ZS Standard</th>
<th>ZS Plus</th>
<th>ZS Pro</th>
<th>ZS Pro-M</th>
<th>ZS Pro-F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temp, CO₂, and Humidity Options</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Addressable / supports daisy-chaining</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Hidden communication port</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Occupancy status indicator</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Push-button occupancy override</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Setpoint adjust</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Large, easy-to-read LCD</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Alarm indicator</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Motion Sensing</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Fan speed control</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Cooling / Heating / Fan Only - Mode Control</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>°F to °C conversion button</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>IAQ, Volatile Organic Compound Sensing</td>
<td>●</td>
<td>●</td>
<td></td>
<td>●</td>
<td>●</td>
</tr>
</tbody>
</table>

The WebCTRL® building automation system gives you the ability to understand your building operations and analyze the results. The WebCTRL system integrates environmental, energy, security and safety systems into one powerful management tool that allows you to lower energy consumption, increase occupant comfort, and achieve sustainable building operations. Our web-based platform allows building managers to control and access information about their HVAC, lighting, central plant and critical processes on premises or remotely at any time of day.
# ZS Sensors

## Specifications

<table>
<thead>
<tr>
<th>Sensing Element</th>
<th>Range</th>
<th>Accuracy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature with any Option (excluding Humidity)</td>
<td>-4° to 122° F (-20° C to 50° C)</td>
<td>±0.35° F (0.2° C)</td>
</tr>
<tr>
<td>Temperature with Humidity and any Option</td>
<td>50° F to 104° F (10° C to 40° C)</td>
<td>±0.5° F (0.3° C)</td>
</tr>
<tr>
<td>Humidity</td>
<td>20% to 80%</td>
<td>±2% typical</td>
</tr>
<tr>
<td>CO₂</td>
<td>400 to 1250 PPM</td>
<td>±30PPM or +/-3% (greater of two)</td>
</tr>
<tr>
<td></td>
<td>1250 to 2000 PPM</td>
<td>±5% of reading plus 30 PPM</td>
</tr>
<tr>
<td>VOC</td>
<td>0 to 2,000 PPM</td>
<td>±100 PPM</td>
</tr>
</tbody>
</table>

### Motion Sensing

- **Sensor Type:** PIR
- **Distance:** 16.4 feet, (5 m)
- **Detection range:** (HxV) 100° x 82°
- **Movement speed:** 2.62 to 3.94 ft/s (0.8 to 1.2 m/s)
- **Detection object:** 27.56 x 9.84 in. (700 x 250 mm)

### Power Requirements

<table>
<thead>
<tr>
<th>Sensor Type</th>
<th>Power Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature Only</td>
<td>12 Vdc @ 8 mA</td>
</tr>
<tr>
<td>Temperature with Humidity</td>
<td>12 Vdc @ 60 mA</td>
</tr>
<tr>
<td>Temp with VOC, or Temp/VOC/Humidity</td>
<td>12 Vdc @ 15 mA (idle) to 190 mA (CO₂ measurement cycle)</td>
</tr>
<tr>
<td>Temp with CO₂, or Temp/CO₂/Humidity</td>
<td></td>
</tr>
</tbody>
</table>

### Power Supply

A controller supplies the Rnet sensor network with 12 Vdc @ 210 mA. Additional power may be required. See sensor power requirements above.

### Communication

115 kbps Rnet connection between sensor(s) and controller
15 sensors max per Rnet network; 5 sensors max per control program

### Local Access Port

For connecting a laptop computer to the local equipment or WebCTRL® network for maintenance and commissioning

### Environmental Operating Range

32° to 122° F (0° - 50° C), 10% to 90% relative humidity, non-condensing

### Mounting Dimensions

Standard 4” x 2” electrical box using provided 6/32” x 1/2” mounting screws

### Overall Dimensions

- **Width:** 2.75” (6.99 cm)
- **Height:** 4.75” (12.07 cm)
- **Depth:** 13/16” (2.01 cm)

### Options & Part Numbers

<table>
<thead>
<tr>
<th>Options &amp; Part Numbers</th>
<th>ZS Standard</th>
<th>ZS Plus</th>
<th>ZS Pro</th>
<th>ZS Pro-F</th>
<th>ZS Pro-M</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature Only</td>
<td>ZS2-ALC</td>
<td>ZS2PL-ALC</td>
<td>ZS2P-ALC</td>
<td>ZS2PF-ALC</td>
<td>ZS2P-M-ALC</td>
</tr>
<tr>
<td>Temp with CO₂</td>
<td>ZS2-C-ALC</td>
<td>ZS2PL-C-ALC</td>
<td>ZS2P-C-ALC</td>
<td>ZS2PF-C-ALC</td>
<td>ZS2P-CM-ALC</td>
</tr>
<tr>
<td>Temp, Humidity, CO₂</td>
<td>ZS2-HC-ALC</td>
<td>ZS2PL-HC-ALC</td>
<td>ZS2P-HC-ALC</td>
<td>ZS2PF-HC-ALC</td>
<td>ZS2P-HCM-ALC</td>
</tr>
<tr>
<td>Temp, IAQ</td>
<td>VOC</td>
<td>ZS2-V-BNK</td>
<td>ZS2PL-V-BNK</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Temp, Humidity, IAQ</td>
<td>VOC</td>
<td>ZS2-HV-BNK</td>
<td>ZS2PL-HV-BNK</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

---

**1150 Roberts Boulevard, Kennesaw, Georgia 30144**

**770-429-3000**  **Fax 770-429-3001**  |  **www.automatedlogic.com**

---

*We make data big.™*

Next level building automation engineered to help you make smart decisions.
The Automated Logic® ZS line of communicating outdoor air sensors are designed to measure the air temperature and/or humidity outdoors. Designed for outdoor mounting, the UV-resistant plastic shield keeps the sensor out of the sunlight and allows for excellent air circulation. These outdoor sensors have etched Teflon® lead wires and can withstand high humidity and condensation environments. They are made to perform in a wide range of temperature and moisture conditions.

The ZS duct sensors connect directly to the dedicated sensor network (Rnet) of an Automated Logic controller. This communicating sensor network supports up to 15 ZS sensors through a single port, eliminating the need to consume multiple inputs on the controller.

The WebCTRL® building automation system gives you the ability to understand your building operations and analyze the results. The WebCTRL system integrates environmental, energy, security and safety systems into one powerful management tool that allows you to reduce energy consumption, increase occupant comfort, and achieve sustainable building operations. Our web-based platform allows building managers to control and access information about their HVAC, lighting, central plant and critical processes on premises or remotely at any time of day.
# ZS Outdoor Air Sensors

## Specifications

<table>
<thead>
<tr>
<th>Sensing Element</th>
<th>Range</th>
<th>Accuracy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature</td>
<td>-40°F to 158°F (-40°C to 70°C)</td>
<td>±1.3°F (0.72°C)</td>
</tr>
<tr>
<td>Humidity</td>
<td>10% to 90%</td>
<td>±2.0% typical at less than 0.5% drift per year. Calibrated at 73.4°F (23°C).</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Power Requirements</th>
<th>Power Supply</th>
<th>Communication</th>
<th>Local Access Port</th>
<th>Enclosure</th>
<th>Mounting</th>
<th>Listed By</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>12 Vdc @ 6mA</td>
<td>115 kbps Rnet connection between sensor(s) and controller</td>
<td>For connecting a laptop computer to the local equipment for maintenance and commissioning</td>
<td>Material: Polycarbonate, UL94V-0</td>
<td>Rating: NEMA 4, IP66, UV rated</td>
<td>Wall mount with #8 sheet metal screws</td>
</tr>
</tbody>
</table>

### Temperature Sensor

- **Enclosure Dimensions:** W = 5.0" (12.7 cm) H = 4-3/32" (10.4 cm) D = 2-1/2" (6.35 cm)
- **Rating:** NEMA 4, IP66, UV rated
- **Sensing:** Temp
- **Probe Length:** 2" (inches)

### Temperature/Humidity Sensor

- **Enclosure Dimensions:** W = 5.0" (12.7 cm) H = 4-3/32" (10.4 cm) D = 2-1/2" (6.35 cm)
- **Rating:** NEMA 4, IP66, UV rated
- **Sensing:** Temp/Humidity
- **Probe Length:** 4" (inches)

All trademarks used herein are the property of their respective owners.

1150 Roberts Boulevard, Kennesaw, Georgia 30144  
770-429-3000  Fax 770-429-3001  |  www.automatedlogic.com
**Security Details**

- Concealed covered junction box located near door above ceiling accessible to secure side (Provided and installed by Div. 26).
- Door position switch (3/4" dia.) with DPDT contacts (Provided and installed by security contractor).
- Door mounted magnets switch (3/4" dia.) (Provided and installed by security contractor).

**Elevator Details**

- Elevator traveling cable category cable from elevator machine room (security camera).
- Category patch cord from elevator machine room panel (phone handset).
- Category cable from elevator cabin (security camera) back to closest telecom room.
- Category cable from elevator control panel (phone handset).
- Category patch cord.

- Elevator camera detail - ceiling mount.
- Elevator camera detail - wall mount.
- Elevator camera detail - typical door contact switch.

- Category cable from elevator machine room (security camera) to nearest telecom enclosure.
- Category cable from elevator machine room (phone handset) to closest telecom room.
- Category patch cord.

- Support secured from ceiling bracket.
- Bolt support assembly.
SUBMITTAL TRANSMITTAL & REVIEW SHEET

191604. - UNT Dining Hall

To: Linda Camacho
Kirksey Architecture

From: Kevin Copher
Rogers-O'Brien Construction

For: George/McKenna Electrical Inc.

Submittal #: 270500-01
Submittal Title: COMMON WORK RESULTS FOR COMMUNICATIONS SYSTEMS

Revision #: 1
Submittal Detail: Product Data

Due Date: 08/26/2020
Status: Submitted for Approval

Rogers-O'Brien Construction

SUBMITTAL REVIEW

Submittal Number: 270500-01 - 1
This submittal is reviewed for conformance with the design intent of the project and requirements of the contract documents. This does not relieve the supplier of the responsibility of furnishing work and materials of the quantity and quality required by the contract nor authorizes any changes herein. The supplier shall be responsible for the accuracy of dimensions and conditions at the job site.

This submittal: Conforms as Noted
Reviewed by: Kevin Copher on 08/12/2020

Consultants

8/21/20
UNTS reviewed the submittal as they met with RO and made changes that differ from WJHW documents. UNTS reviewed the submitted information. WJHW did not review submittal as they were not included nor part of the meetings between RO and UNTS. WJHW are not aware of what items/products were revised. RO needs to confirm that the information discussed those meetings were documented accordingly. Kirksey too was not part of these conversations.

4B reviewed the items that pertain to their scope of work. Review their comments and revise accordingly.

LINDA CAMACHO
KIRKSEY

Other

Re-submittal reflecting submittal review party between RO, UNT & KA.
Please see the substituted camera approved by UNT per attached email coordination.
Linda Camacho

From: Carrigan, Edwin <Edwin.Carrigan@untsystem.edu>
Sent: Thursday, August 20, 2020 6:14 PM
To: Linda Camacho
Cc: Vail, Jeannine; Henson, Jay; Fenton, Matthew; McMullen, Jason; Oliver, Frank; White, Chuck
Subject: RE: [EXT] UNT - pending submittal

Linda,

UNT has no comments on the submittal. Accept as submitted.

When I reviewed the submittal in adobe Cloud there were no comments noted. There have been numerous meetings and discussions regarding this submittal. It is possible UNT concerns have been picked up and included on this submittal.

Thank you,
Ed Carrigan
Construction Manager
Facilities Design and Construction
940-367-4951
Office 940-369-6160
UNT System
1155 Union Circle
Denton Texas 75203-5017

From: Linda Camacho <LindaC@kirksey.com>
Sent: Tuesday, August 18, 2020 1:19 PM
To: Carrigan, Edwin <Edwin.Carrigan@untsystem.edu>; Fenton, Matthew <Matthew.Fenton@unt.edu>; McMullen, Jason <Jason.McMullen@unt.edu>
Cc: Vail, Jeannine <Jeannine.Vail@untsystem.edu>; Henson, Jay <Jay.Henson@untsystem.edu>
Subject: RE: [EXT] UNT - pending submittal

Hi Ed, here are 4B comments to only the security surveillance items.

R. Linda Camacho, Intl. Assoc. AIA
Senior Associate

Kirksey | Architecture
6909 Portwest Drive | Houston Texas 77024 | www.kirksey.com
o 713 426 7488 | lindac@kirksey.com

Houston + Austin
From: Carrigan, Edwin [mailto:Edwin.Carrigan@untsystem.edu]
Sent: Monday, August 17, 2020 2:42 PM
To: Linda Camacho <LindaC@kirksey.com>; Fenton, Matthew <Matthew.Fenton@unt.edu>; McMullen, Jason
Linda,

I believe I received it on 13th.
I uploaded to Adobe Cloud for comments which are due back this coming Thursday.

Just confirmed with Matthew and the team is reviewing. ITSS is awesome at getting things back to the project.
Is there a particular item you are needing to have addressed before Thursday?

Ed Carrigan
Construction Manager
Facilities Design and Construction
940-367-4951
Office 940-369-6160
UNT System
1155 Union Circle
Denton Texas 75203-5017

Good afternoon all,

Last week, August 12th, the following submittal: 270500-01-01_Common Work Results For Communication
Systems_Product Data_20200812_SAPP, was forward to you. Have you had time to review it and are there any
comments? Please provide an update.

Thank you,

R. Linda Camacho, Intl. Assoc. AIA
Senior Associate

Kirksey | Architecture
6909 Portwest Drive | Houston Texas 77024 | www.kirksey.com
o 713 426 7488 | lindac@kirksey.com

Houston + Austin
Submittal Review

Date: Monday, August 17, 2020
Client: Kirksey Architecture-Linda Camacho
Project: UNT Denton Dining Hall
From: 4B Technology Group-Nicholas Barrera
Submittal Number: 27 05 00-01-1
Submittal Item(s): Common Work Results for Communications Systems-PD (Video Surveillance)

THIS SUBMITTAL HAS BEEN REVIEWED FOR GENERAL CONFORMANCE ONLY. REVIEW AND COMMENTS DO NOT RELIEVE THE CONTRACTOR FROM COMPLYING WITH EVERY REQUIREMENT OF THE CONTRACT DRAWINGS AND SPECIFICATIONS, NATIONAL AND LOCAL CODES, UNLESS THE CONTRACTOR HAS CALLED ATTENTION, IN WRITING, TO ANY DEVIATIONS CONTAINED IN THIS SUBMITTAL, AND THESE DEVIATIONS ARE REVIEWED SPECIFICALLY HEREON.

☐ No Exceptions ☒ As Indicated
☐ Exceptions Noted - Resubmit
☐ Rejected – Resubmit

Review Comments:

- 4B only reviewed product data sheets regarding video surveillance.
- Advidia camera model E-46-V approved by UNT to replace both model E-37-V & A-37-FW.
- Material list quantities should change.
- Mounting kit will be required for Axis P3717-PLE.
SUBMITTAL REVIEW

Submittal Number: 270500-01 - 1

This submittal is reviewed for conformance with the design intent of the project and requirements of the contract documents. This does not relieve the supplier of the responsibility of furnishing work and materials of the quantity and quality required by the contract nor authorizes any changes herein. The supplier shall be responsible for the accuracy of dimensions and conditions at the job site.

This submittal: Conforms as Noted

Reviewed by:
Kevin Copher on 08/12/2020

Re-submittal reflecting submittal review party between RO, UNT & KA.
Please see the substituted camera approved by UNT per attached email coordination.
# UNT Denton – Dining Hall

## Section 28 2300 – Video Surveillance System

### Material List

<table>
<thead>
<tr>
<th>Material Description</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Camera A: Indoor Outdoor Wide Fixed – Advidia E-37-V</td>
<td>19</td>
</tr>
<tr>
<td>Camera B: Outdoor Indoor Fixed – Advidia A-37-FW</td>
<td>5</td>
</tr>
<tr>
<td>Camera C: Indoor 360 – Axis P3717</td>
<td>8</td>
</tr>
<tr>
<td>Wall mount Arm for Camera B – Advidia A-MD-WM</td>
<td>5</td>
</tr>
<tr>
<td>Flush Mount for Camera A – Advidia E-B200-FM</td>
<td>19</td>
</tr>
<tr>
<td>Surge Suppressor for outdoor camera – Ditek – MRJ-POE</td>
<td>5</td>
</tr>
<tr>
<td>Ethernet over Coax kit - Axis T8640 – 5026-401</td>
<td>1</td>
</tr>
</tbody>
</table>
E-37-V
Dome Camera

**Overview**
- 3 megapixel resolution
- H.264 & MJPEG dual-stream encoding
- WDR with Day/Night (ICR), 3DNR, AWB, AGC, BLC
- 2.7-12mm Auto focus motorized lens
- 3-axis positioning
- IP67, IK10, PoE
- Micro SD card slot, up to 128GB
- IR LEDs Length 30m
- Video Insight VMS License Included

**Technical Specifications**

<table>
<thead>
<tr>
<th>Device</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Image Sensor:</td>
<td>1/3” 3Megapixel progressive scan CMOS</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Scanning System:</th>
<th>Progressive</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electronic Shutter Speed:</td>
<td>Auto/Manual, 1/2(4)~1/100000s</td>
</tr>
<tr>
<td>Min. Illumination:</td>
<td>0.1Lux/F1.4 (Color), &lt;0.1Lux/F1.4(IR on)</td>
</tr>
<tr>
<td>Wide Dynamic Range:</td>
<td>WDR (&gt;50dB)</td>
</tr>
<tr>
<td>3-Axis:</td>
<td>Yes</td>
</tr>
</tbody>
</table>

**Camera Features**

<table>
<thead>
<tr>
<th>Max. IR LEDs Length:</th>
<th>30m</th>
</tr>
</thead>
<tbody>
<tr>
<td>Day/Night:</td>
<td>Auto(ICR)/Color/B/W</td>
</tr>
<tr>
<td>Backlight Compensation:</td>
<td>BLC / HLC / DWDR</td>
</tr>
<tr>
<td>White Balance /Gain Control:</td>
<td>Auto/Manual</td>
</tr>
<tr>
<td>Noise Reduction:</td>
<td>3D</td>
</tr>
<tr>
<td>Privacy Masking:</td>
<td>Up to 4 areas</td>
</tr>
</tbody>
</table>

**Lens**

<table>
<thead>
<tr>
<th>Focal Length:</th>
<th>2.7mm~12mm F1.4 : H: 92°~28°</th>
</tr>
</thead>
<tbody>
<tr>
<td>Focus:</td>
<td>Auto</td>
</tr>
<tr>
<td>Lens Type:</td>
<td>Motorized/Fixed Iris</td>
</tr>
<tr>
<td>Mount Type:</td>
<td>Board-in Type</td>
</tr>
</tbody>
</table>

**Video**

<table>
<thead>
<tr>
<th>Compression:</th>
<th>H.264, MJPEG, MPEG4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resolution:</td>
<td>3M(2304x1296) 2MP(1920x1080) 1.3MP (1280x960) 3M&amp; 2MP/1080P(20fps) (1.3MP/25/30fps)</td>
</tr>
</tbody>
</table>

Replaced by model E-46-V per email coordination with UNT
## Technical Specifications

### Network

<table>
<thead>
<tr>
<th>Ethernet:</th>
<th>RJ-45 (10/100Base-T)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wi-Fi:</td>
<td>NO</td>
</tr>
<tr>
<td>Compatibility:</td>
<td>ONVIF, CGI</td>
</tr>
</tbody>
</table>

### Interface

<table>
<thead>
<tr>
<th>Memory Slot:</th>
<th>Micro SD slot: up to (128GB)</th>
</tr>
</thead>
<tbody>
<tr>
<td>RS485:</td>
<td>N/A</td>
</tr>
<tr>
<td>Alarm:</td>
<td>Motion detection</td>
</tr>
</tbody>
</table>

### General

<table>
<thead>
<tr>
<th>Power Supply:</th>
<th>DC12V, PoE (802.3af)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power Consumption</td>
<td>&lt;8.5W</td>
</tr>
<tr>
<td>Working Environment</td>
<td>-30°C~+60°C, Less than 95% RH</td>
</tr>
<tr>
<td>Ingress Protection</td>
<td>IP67</td>
</tr>
<tr>
<td>Vandal Resistance</td>
<td>IK10</td>
</tr>
<tr>
<td>Dimensions:</td>
<td>φ122mm×89mm</td>
</tr>
<tr>
<td>Weight:</td>
<td>0.5kg</td>
</tr>
<tr>
<td>Audio:</td>
<td>NO</td>
</tr>
<tr>
<td>Warranty:</td>
<td>4 Year Advanced Replacement</td>
</tr>
</tbody>
</table>

### Accessories:

- E-A137-JB
- E-B200-FM
- E-B203-WM
- E-A152-PM
- E-A152-CM
**Overview**

- 3 megapixel resolution
- 3D DNR
- WDR of 120dB
- PoE (Power over Ethernet)
- IR Range up to 30m
- Weather Proof Rating: IP67
- Analytics: Line Cross & intrusion detection
- Vandal Proof: IK 10 Rated
- Built-in Micro SD card slot
- Video Insight VMS license included

**Technical Specifications**

<table>
<thead>
<tr>
<th>Device</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Image Sensor</td>
<td>1/3&quot; Progressive Scan CMOS</td>
</tr>
<tr>
<td>Min Illumination</td>
<td>0.01 lux@F1.2: AGC ON</td>
</tr>
<tr>
<td>Shutter Time</td>
<td>1/30s ~ 1/100,000s</td>
</tr>
<tr>
<td>Lens</td>
<td>2.8mm @ F2.0</td>
</tr>
<tr>
<td>Wide Dynamic Range</td>
<td>WDR 120dB</td>
</tr>
<tr>
<td>Angle of View</td>
<td>106°</td>
</tr>
<tr>
<td>Lens Mount</td>
<td>M12</td>
</tr>
<tr>
<td>Angle Adjustment</td>
<td>Pan: 0° ~ 355°, tilt: 0° ~ 75°</td>
</tr>
<tr>
<td>3-Axis Adjustment</td>
<td>Yes</td>
</tr>
<tr>
<td>Day &amp; Night</td>
<td>IR cut filter with auto switch</td>
</tr>
</tbody>
</table>

**Compression Standard**

- Video Compression: H.264, MJPEG, H.264+
- Bit Rate: 32 Kbps - 16 Mbps
- Dual Stream: Yes
- Analytics: Line Cross and Intrusion detection

**Image**

- Max. Image Resolution: 2304 x 1296
- Frame Rate: 20fps(2304×1296), 25fps(1920×1080), 25fps(1280×720)
- ROI Codec: Supported
- Image Setting: BLC, Rotate Mode, Saturation, Brightness, Contrast, Sharpness adjustable by VI software or Camera Firmware

**Network**

- Alarm Trigger: Tampering alarm, Network disconnect, IP address conflict, Storage exception
- Protocols: TCP/IP, HTTP, DHCP, DNS, DDNS, RTP, RTSP, PPoE, SMTP, NTP, SNMP, HTTPS, FTP, 802.1x, Qos (SIP, SRTP, IPv6, Bonjour)
- Security: User authentication, watermark

**Interface**

- Communication Interface: 1 RJ45 10 M/100 M Ethernet interface
- System Compatibility: ONVIF, PSIA
- Local Storage: Built-in Micro SD card slot, up to 256GB

**General**

- Operating Conditions: -22° F – 140° F (-30°C ~ 60°C) Humidity 95% or less
- Power Consumption: MAX: 5 W

---

*Replaced by model E-46-V per email coordination with UNT*
**Technical Specifications:**

<table>
<thead>
<tr>
<th>Feature</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Impact Protection:</td>
<td>IK10</td>
</tr>
<tr>
<td>Power Supply:</td>
<td>12 VDC ± 25%, PoE (802.3af)</td>
</tr>
<tr>
<td>IR Range:</td>
<td>65-98 ft (20-30 meters)</td>
</tr>
<tr>
<td>Dimensions:</td>
<td>Φ111 × 82 (4.4&quot; × 3.2&quot;)</td>
</tr>
<tr>
<td>Weight:</td>
<td>1.3 lbs (600g)</td>
</tr>
<tr>
<td>Software:</td>
<td>Includes Video Insight VMS License</td>
</tr>
<tr>
<td>Warranty:</td>
<td>4 Year Advanced Replacement</td>
</tr>
<tr>
<td></td>
<td>A-34-Cap Metal, A-MD-GBA, A-Pole Mount</td>
</tr>
</tbody>
</table>

*Replaced by model E-46-V per email coordination with UNT*
Overview

- 4-megapixel resolution
- H.265 & H.264
- WDR of 120dB
- PoE (Power over Ethernet)
- Weather Proof Rating: IP67
- Analytics: Line Cross & intrusion detection
- Vandal Proof: IK 10 Rated
- Built-in Micro SD card slot
- Video Insight VMS license included

Technical Specifications

<table>
<thead>
<tr>
<th>Device</th>
</tr>
</thead>
<tbody>
<tr>
<td>Image Sensor:</td>
</tr>
<tr>
<td>1/3” Progressive Scan CMOS</td>
</tr>
<tr>
<td>Min Illumination:</td>
</tr>
<tr>
<td>0.03 lux@F1.4; Color</td>
</tr>
<tr>
<td>Shutter Time:</td>
</tr>
<tr>
<td>1/30s ~ 1/100,000s</td>
</tr>
<tr>
<td>Lens:</td>
</tr>
<tr>
<td>2.7-13.5mm</td>
</tr>
<tr>
<td>Wide Dynamic Range:</td>
</tr>
<tr>
<td>WDR 120dB</td>
</tr>
<tr>
<td>Angle of View:</td>
</tr>
<tr>
<td>H:104°- 28°; V:55°- 16°</td>
</tr>
<tr>
<td>Lens Mount:</td>
</tr>
<tr>
<td>Auto Focus Vari-Focal</td>
</tr>
<tr>
<td>Angle Adjustment:</td>
</tr>
<tr>
<td>0 to +355 deg (pan) 0 to +65 deg (tilt)</td>
</tr>
<tr>
<td>3-Axis Adjustment :</td>
</tr>
<tr>
<td>Yes</td>
</tr>
<tr>
<td>Day &amp; Night:</td>
</tr>
<tr>
<td>IR cut filter with auto switch + IR</td>
</tr>
</tbody>
</table>

Compression Standard

- Video Compression: H.265, H.264+, H.264
- Bit Rate: H.264: 24~9472Kbps H.265: 14~5632Kbps
- Dual-Stream: Yes
- Analytics: Line Cross and Intrusion detection

Image

- Max. Image Resolution: 2688 x 1520
- Frame Rate: 20fps @ 60Hz (2688 x 1520)
- ROI Codec: Supported
- Image Setting: BLC, Rotate Mode, Saturation, Brightness, Contrast, Sharpness adjustable by Vi software or Camera Firmware

Network

- Alarm Channels: 1 channel In: 5mA 5VDC
- 1 channel Out: 300mA 12VDC
- Protocols: HTTP; HTTPS; TCP; ARP; RTSP; RTP; UDP; SMTP, FTP; DHCP; DNS; DDNS; PPPoE; IPv6/IPv6; QoS; UPnP; NTP; Bonjour; 802.1x; Multicast; ICMP; IGMP; SNMP
- Audio: 0 Channel In/ 0 Channel out

Interface

- Communication Interface: 1 RJ45 10/100 Base T. Ethernet interface
- System Compatibility: ONVIF, PSIA, CGI
- Local Storage: Built-in Micro SD card slot, up to 128GB

General

- Operating Conditions: -22° F – 140° F (-30°C ~ 60°C ) Humidity 95% or less
- Power Consumption: MAX: <9W
# Technical Specifications

<table>
<thead>
<tr>
<th>Specification</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Impact Protection:</td>
<td>IK10</td>
</tr>
<tr>
<td>Power Supply:</td>
<td>DC12V, AC24V, PoE (802.3af)(Class 0), P.I.U (&lt;6.5W)</td>
</tr>
<tr>
<td>Dimensions:</td>
<td>φ122mm×88.9mm (4.80”x3.50”)</td>
</tr>
<tr>
<td>Weight:</td>
<td>1.19lbs (0.54kg)</td>
</tr>
<tr>
<td>Software:</td>
<td>Includes Video Insight VMS License</td>
</tr>
<tr>
<td>Warranty:</td>
<td>4 Year Advanced Replacement</td>
</tr>
<tr>
<td>Accessories:</td>
<td><img src="image" alt="E-203-WM" />  <img src="image" alt="E-A138-JB" />  <img src="image" alt="E-A152E-PM" />  <img src="image" alt="E-200-FM" />  <img src="image" alt="E-302S-WM" /></td>
</tr>
</tbody>
</table>
The camera submitted is accepted.

Hey Ed,

Confirmed on this camera model. This will work to replace the discontinued E-37-V and A-37-FW discontinued models.

Thanks!

jason

Jason,

Revisiting this camera for confirmation. Contractor was old cameras chosen previously are no longer available for purchase.
Please confirm the E-46-V camera is acceptable to UNT for use in the dining hall locations.

Thank you,
Ed Carrigan
Construction Manager
Facilities Design and Construction
940-367-4951
Office 940-369-6160
UNT System
1155 Union Circle
Denton Texas 75203-5017
From: Kevin Copher <KCopher@r-o.com>
Sent: Monday, August 10, 2020 3:53 PM
To: Carrigan, Edwin <Edwin.Carrigan@untsystem.edu>
Cc: Andrew Goessler <agoessler@r-o.com>; Todd Clay <TClay@r-o.com>; Brandon Young <BYoung@r-o.com>; Garrett Diehl <gdiehl@r-o.com>
Subject: RE: [EXT] UNT Dining Hall Discontinued Cameras

Ed,

Can you please confirm this is the camera model they are referring to before I send through Newforma.

Thanks,

Kevin Copher
Office Engineer

Rogers-O’Brien Construction | Since 1969
Main: (214) 962-3000 | Cell: (224) 595-3740
kcopher@r-o.com | r-o.com

---

From: Carrigan, Edwin <Edwin.Carrigan@untsystem.edu>
Sent: Monday, August 3, 2020 2:58 PM
To: Kevin Copher <KCopher@r-o.com>
Subject: FW: [EXT] UNT Dining Hall Discontinued Cameras

fyi

---

From: McMullen, Jason <Jason.McMullen@unt.edu>
Sent: Thursday, July 30, 2020 4:36 PM
To: Carrigan, Edwin <Edwin.Carrigan@untsystem.edu>
Cc: Henson, Jay <Jay.Henson@untsystem.edu>
Subject: Re: [EXT] UNT Dining Hall Discontinued Cameras

The advidia e-46 should suffice as a replacement for both discontinued models. Will that work?

jason

---

From: McMullen, Jason <Jason.McMullen@unt.edu>
Sent: Thursday, July 30, 2020 4:20:36 PM
To: Carrigan, Edwin <Edwin.Carrigan@untsystem.edu>
Sure thing,

Give me a few.

jason

---

Need assistance quickly.
See email below but we are being told some of the cameras we requested are no longer available. Let us know if you all can accept the substitute.

Thank you,
Ed Carrigan
Construction Manager
Facilities Design and Construction
940-367-4951
Office 940-369-6160
UNT System
1155 Union Circle
Denton Texas 75203-5017

---

Ed,

We were informed by our AV & Security subcontractor that the specified cameras, E-37-V and A-37-FW, have been discontinued and are no longer available for purchase. Please see the attached products our subcontractor has requested as a substitute. I will send these in via Newforma with substitution request forms completed if UNT finds these acceptable.
Thank you sir,

Kevin Copher  
Office Engineer

Rogers-O’Brien Construction | Since 1969  
1901 Regal Row, Dallas, Texas 75235  
Main: (214) 962-3000 | Cell: (224) 595-3740  
kcopher@r-o.com | r-o.com
Austin | Dallas | Houston | San Antonio
**AXIS P3717-PLE Network Camera**

8 MP multidirectional camera with IR for 360° coverage

AXIS P3717-PLE Network Camera is a compact 8-megapixel camera with four varifocal lenses enabling overview and detailed surveillance. With one IP address and one network cable, the four-camera-in-one unit provides a flexible, cost-effective solution for multidirectional surveillance. 360° IR illumination, Forensic WDR and Lightfinder technology provides excellent video quality in any light conditions. Each camera head can be individually positioned (pan, tilt, roll and twist) along a circular track. Remote zoom and focus makes it easy to install and the clear cover, with no sharp edges, ensures undistorted views in all directions. The camera comes with an integrated weathershield.

- 8 MP, 360° multidirectional camera, one IP address
- 360° IR illumination and remote zoom and focus
- Axis Lightfinder and Forensic WDR
- Flexible positioning of four varifocal camera heads
- Axis Zipstream for reduced bandwidth and storage needs
## AXIS P3717-PLE Network Camera

### Camera
- **Image sensor**: 4 x 1/2.8" progressive scan RGB CMOS

### Lens
- **Varifocal**: 3.6–6 mm, F1.8–2.6
- **4x1080p capture mode**
  - Horizontal field of view: 96°–49°
  - Vertical field of view: 53°–27°
  - Diagonal field of view: 113°–55°
  - Motorized focus, motorized zoom

### Day and night
- **Automatically removable infrared-cut filter**

### Minimum illumination
- **Color**: 0.17 lux at 50 IRE F1.8
- **B/W**: 0.04 lux at 50 IRE F1.8, 0 lux with IR illumination on

### Shutter time
- 1/32500 s to 2 s with 50 Hz
- 1/32500 s to 2 s with 60 Hz

### Camera angle adjustment
- Pan ±90°, tilt ±25° to +95°, rotation –5° to +95°, twist ±20°

### Video
#### Compression
- **H.264 (MPEG-4 Part 10/AVC) Baseline, Main and High Profiles**
- **Motion JPEG**

#### Resolution
- 4 x 1920x1080 (4 x HDV 1080p) to 1600x90

#### Frame rate
- Up to 25/30 fps (50/60 Hz)

### Video streaming
- Multiple, individually configurable streams in H.264 and Motion JPEG
- **Axis Zipstream technology in H.264**
- **Controllable frame rate and bandwidth**
- **VBR/ABR/MBR**: H.264

### Image settings
- Saturation, contrast, brightness, sharpness, Forensic WDR, white balance, exposure control, exposure zone, fine tuning of behavior at low light, rotation: 0°, 90°, 180°, 270° including corridor format, dynamic text and image overlay, Polygon privacy mask, compression

### Audio
- **Two-way audio connectivity via AXIS T61 Audio and I/O Interfaces with portcast technology**

#### Input/output
- A 30 W midspan or higher between AXIS T61 Audio and I/O Interfaces and AXIS P3717-PLE is required.

### Network
- **IP address**: One IP address for all channels

#### Security
- **Password protection**, IP address filtering, HTTPS encryption, IEEE 802.1X, EAP-TLS network access control, digest authentication, user access log, centralized certificate management, brute force delay protection, signed firmware, secure boot

#### Supported protocols
- IPv4, IPv6, USGv6, HTTP, HTTPS, SSL/TLS, GoS Layer 3 DiffServ, FTP, CIFS/SMB, SMTP, Bonjour, UPnP, SNMP v1/v2c/v3 (MIB-II), DNS, DynDNS, NTP, RTSP, RTP, SFTP, TCP, UDP, IGMP, RTCP, ICMP, DHCP, ARP, SOCKS, SSH, LLDP, MQTT

### System integration
#### Application Programming Interface
- **Open API** for software integration, including VAPIX® and AXIS Camera Application Platform; specifications at axis.com

#### Analytics
- **Included**
- **AXIS Video Motion Detection**, active tampering alarm
- **Supported**
- **AXIS Motion Guard, AXIS Fence Guard, AXIS Loitering Guard**
- **Support for AXIS Camera Application Platform enabling installation of third-party applications**, see axis.com/ocap

#### Event triggers
- **Detectors**, hardware input, signal, storage, system, time, analytics, edge storage events

#### Event actions
- **Day/night vision mode**, overlay text, record video, send images, send notification, send SNMP trap, send video clip, status LED 
  - File upload: FTP, HTTP, HTTPS, network share, SFTP and email
  - Notification: email, HTTP, HTTPS, TCP and SNMP trap

### Data streaming
- **Event data**

### Built-in installation aids
- **Pixel counter**, focus assistant, remote focus, remote zoom

### General
#### Casing
- IP66–IP67, NEMA 4X-rated, IK09 impact-resistant, aluminum and plastic casing with polycarbonate hard-coated dome, sunshield (PC/ASA)
- **Color**: white NCS S 1002B
  - For repainting instructions of casing and impact on warranty, contact your Axis partner.

#### Mounting
- **Mounting bracket with junction box holes** (double gang box, single gang box, 4" octagon junction box and 4" square junction box)
  - ½" (M20) conduit side entry
  - ¼" (M25) conduit adapter included

#### Sustainability
- **PVC free**

#### Memory
- 1024 MB RAM, 512 MB Flash

#### Power
- **Power over Ethernet (PoE)** IEEE 802.3at Type 2 Class 4
- **IR illumination on**: class 4, typical: 11.1 W, max: 17.0 W
  - **IR illumination off**: class 3, typical: 8.6 W, max: 11.0 W

#### Connectors
- **Shielded RJ45 10BASE-T/100BASE-TX PoE**
- **Audio and I/O connectivity via AXIS T61 Audio and I/O Interfaces with portcast technology**

#### IR illumination
- Four individually controllable IR with power-efficient, long-life 850 nm IR LEDs
  - Range of reach 15 m (50 ft) or more depending on the scene

#### Storage
- **Support for microSD/microSDHC/microSDXC card**
- **Dual SD cards**
  - **Support for SD card encryption**
  - **Support for recording to network-attached storage (NAS)**
  - For SD card and NAS recommendations see axis.com

#### Operating conditions
- **–30 °C to 50 °C** (-22 °F to 122 °F)
- **Humidity**: 10–100% RH (condensing)

#### Storage conditions
- **–40 °C to 65 °C** (-40 °F to 149 °F)

#### Approvals
- **EMC**
  - EN 55032 Class A, EN 50121-4, IEC 62236-4, EN 61000-3-2, EN 61000-3-3, EN 55024, EN 61000-6-1, EN 61000-6-2, FCC Part 15 Subpart B Class A, ICES-003 Class A, VCCI Class A, RoHS 2011/65, CEC 32 Class A, KC KN53 Class A, KC KN53
- **Safety**
  - IEC/EN/UL 62368-1, IEC/EN/UL 60950-22, IEC 62471, IS 13252
- **Environment**
  - IEC 60688-2-1, IEC 60668-2-2, IEC 60688-2-6, IEC 60688-2-14, IEC 60688-2-27, IEC 60688-2-28, IEC/EN 60529 IP66/67, IEC/EN 62262 IK09, NEMA 250 Type 4X, NEMA TS 2 (2.7.7-2.9.9)
- **Network**
  - **NIST SP500-267**

#### Dimensions
- **Height**: 91.5 mm (3.6 in)
  - **Width**: 255 mm (10.04 in)

#### Weight
- 2.0 kg (4.4 lb)

#### Included accessories
- **RJ45 mounting tool**, screw bit T20, Installation guide, Windows® decoder 1-user license

#### Optional accessories
- **AXIS T940N01D Pendant Kit**, Axis mounts and cabinets
  - For more accessories, see axis.com

#### Video management software
- **AXIS Companion**, AXIS Camera Station, video management software from Axis® Application Development Partners available at axis.com/vms

#### Languages
- **English**, Simplified Chinese, Traditional Chinese, German, Italian, Japanese, Korean, Polish, Portuguese, Russian, Spanish

#### Warranty
- **Axis 3-year warranty**, see axis.com/warranty

---

©2018 - 2020 Axis Communications AB. AXIS COMMUNICATIONS, AXIS, and VAPIX are registered trademarks or trademark applications of Axis AB in various jurisdictions. All other company names and products are trademarks or registered trademarks of their respective companies. We reserve the right to introduce modifications without notice.
## A-MD-WM (A Series Mini Dome Wall Mount)

<table>
<thead>
<tr>
<th>Model Number</th>
<th>A-MD-WM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model Name</td>
<td>A Series Mini Dome Wall Mount</td>
</tr>
<tr>
<td>Use</td>
<td>Wall Mounting A Series Mini Dome cameras</td>
</tr>
<tr>
<td>Construction</td>
<td>ABS Plastic</td>
</tr>
<tr>
<td>Dimensions</td>
<td>80×120×161.5mm</td>
</tr>
<tr>
<td></td>
<td>(3.14 ×4.72” ×6.36” )</td>
</tr>
<tr>
<td>Weight</td>
<td>3.69 oz.</td>
</tr>
</tbody>
</table>

### Dimensions

![Dimensions Diagram](image-url)
In-ceiling Mount Bracket

Features
• Material: SECC & PC
• Junction Box Neat &
• Integrated design

Specifications

<table>
<thead>
<tr>
<th>Model</th>
<th>E-B200-FM</th>
</tr>
</thead>
<tbody>
<tr>
<td>General</td>
<td></td>
</tr>
<tr>
<td>Material</td>
<td>SECC &amp; PC</td>
</tr>
<tr>
<td>Dimension</td>
<td>Φ166.0x75.8mm</td>
</tr>
<tr>
<td>Inch Thread</td>
<td>G3/4&quot;</td>
</tr>
<tr>
<td>Operating Temperature</td>
<td>-40°C ~60°C</td>
</tr>
<tr>
<td>Humidity</td>
<td>0~90% RH</td>
</tr>
<tr>
<td>Load Bearing</td>
<td>1.0Kg</td>
</tr>
<tr>
<td>Weight</td>
<td>0.32Kg</td>
</tr>
<tr>
<td>Color</td>
<td>White</td>
</tr>
<tr>
<td>Applicable Model</td>
<td>Please see &quot;Accessory Selection&quot;</td>
</tr>
</tbody>
</table>
Dimensions (mm)

Application
DITEK’s DTK-MRJPOE protects circuits that use state-of-the-art Power over Ethernet connections. This point of use surge protector is compatible with CAT5e, CAT6 and CAT6A cabling infrastructure, and can be installed either at the equipment end, or ahead of injectors or midspan devices. Its multi-stage, hybrid design provides superior protection for PoE applications.

**Product Features**
- Uses SAD and GDT technologies for optimal protection
- Data speeds up to 10GbE without signal degradation
- PoE Plus, HiPoE ready for high-wattage applications
- RJ45 connections with external grounding screw
- Complies with IEEE Std. 802.3af and 802.3at for PoE

**Applications**
- PoE IP Camera, NVR’s
- Wireless Access Points
- Audio/Video Touch Pads and Screens
- Access Control

**Accessories**
- DIN Rail Mounting Kit – Part Number DTK-DRK

**Technical Specifications**

<table>
<thead>
<tr>
<th>Service Voltage:</th>
<th>&lt;60V</th>
</tr>
</thead>
<tbody>
<tr>
<td>Protection Modes:</td>
<td>L-G (All), L-L (All)</td>
</tr>
<tr>
<td>Clamping Voltage Common Mode (L-G):</td>
<td>75V</td>
</tr>
<tr>
<td>Clamping Voltage Differential Mode (L-L):</td>
<td>72V</td>
</tr>
<tr>
<td>Surge Current Rating:</td>
<td>20kA/Pair</td>
</tr>
<tr>
<td>Max. Continuous Current:</td>
<td>1.5 Amps</td>
</tr>
<tr>
<td>Power Handling:</td>
<td>144 Watts</td>
</tr>
<tr>
<td>Data Rate:</td>
<td>Up To 10GbE</td>
</tr>
</tbody>
</table>

**Mechanical Characteristics**

- Connection Method: RJ45 In/Out
- Housing: ABS
- Operating Temperature: -40°F – 158°F (-40C – 70C)
- Maximum Humidity: 95% non-condensing
- Dimensions: 3.0”L X 1.7”W x 1.2”H (76mm x 43mm x 30mm)
- Weight: 4oz (113g)

**Quality, Standards & Approval**

- Agency Approvals: UL497B
- Standards Compliance: CAT5e, EIA/TIA568A, EIA/TIA568B
- Warranty: Ten Year Limited Warranty

---

*DITEK’s DTK-MRJPOE protects circuits that use state-of-the-art Power over Ethernet connections. This point of use surge protector is compatible with CAT5e, CAT6 and CAT6A cabling infrastructure, and can be installed either at the equipment end, or ahead of injectors or midspan devices. Its multi-stage, hybrid design provides superior protection for PoE applications.*

---

**Category** | **Max Data Transmission Speed** | **Max Bandwidth** | **Typical Distance**
--- | --- | --- | ---
CAT5e | 1 Gbps | 100 MHz | 100 m
CAT6 | 1 Gbps | 250 MHz | 100 m
CAT6A | 10 Gbps | 500 MHz | 100 m

* Cabling information obtained from TIA-568-C.2

POE modules will not be needed for security cameras per returned submittal on 6/24/2020. AE please confirm.
AXIS T8640
Upgrade to IP but keep the coax

AXIS T8640 PoE+ over Coax Adaptor Kit enables legacy coax cabling to be kept when converting an analog system to digital, and comprises AXIS T8641 PoE+ Over Coax Base and AXIS T8642 PoE+ over Coax Device. It delivers standard Power over Ethernet (PoE) and centrally-sourced power through existing coax cabling. Suitable for long-range installations, local power can be added to the device unit for maximum power efficiency. For ease of installation and guaranteed performance, the kit components feature an intuitive LED display that gives confirmation of network and power status through the cable.

> No need for re-cabling, keep the coax
> Single-channel solution
> PoE and PoE+ over the coax cable
> Ease of installation
> Supports Axis network video products
UNT Denton – Dining Hall

1416 Maple Street
Denton, Texas 76201

July 7, 2020
Job #: C0930

Equipment Submittal
A/V System
Video Surveillance System
UNT Denton – Dining Hall

Table of Contents

TAB 1.......................General Information
  • HISTORY AND VISION
  • COMPANY QUALIFICATIONS
  • PRODUCTS AND SERVICES

TAB 2.........................Section 27 4116 – A/V System
  • MATERIAL LIST
  • MANUALS

TAB 3.........................Section 28 2300 – Video Surveillance System
  • MATERIAL LIST
  • MANUALS
HISTORY and VISION

George-McKenna Electrical Contractors, Inc. has been striving to be “Your Safe Contractor of Choice” since 1981. The management of GME has served the industry for over 30 years, with experience ranging from major construction projects to service. The GME team has been involved with virtually every facet of the construction industry.

GME is an Electrical, Security, Audio Visual and Structured Cabling Contractor with the capability of providing, design and installation of turnkey systems in Commercial, Industrial, and Service applications. The individuals of GME pride themselves on innovative, freethinking, cost effective construction, and utilizing state-of-the-art products. A satisfied customer is the quoin of our business philosophy.

VISION

George-McKenna will be the electrical contractor of choice by consistently exceeding our customer expectations and delivering superior value.

MISSION

Determine customer expectations and deliver. Provide operational excellence through collaboration, superb quality, exemplary customer solutions, and a working environment focused on employee safety, training, appreciation, an opportunity to grow and to serve the industry and community.

VALUES

In its dealings with its customers, employees, and suppliers, George-McKenna will conduct itself with integrity, honesty, accountability, dependability, and professionalism.
COMPANY QUALIFICATIONS

BUSINESS COMPETENCIES

ELECTRICAL DESIGN AND INTEGRATION SERVICES
▪ Design/Build, Design/Assist for Commercial and Industrial applications
▪ Conceptual, for design, to hard take-off estimates
▪ BIM Integration and 3D Modeling
▪ Best in class management and QA/QC techniques

LOW VOLTAGE DESIGN AND INTEGRATION SERVICES
▪ Security, CCTV and Access Control Solutions
▪ Audiovisual Systems, Video Conferencing
▪ Structured Cabling and Data Center
▪ Lighting design

PROJECT MANAGEMENT ASSETS
150 FULL-TIME EMPLOYEES
▪ Professional Account Managers
▪ Dedicated Project Managers, Site Supervisors, Design and Network Engineers

IN-HOUSE SERVICES
▪ Integrated Electrical, Security, Audiovisual, and Structured Cabling
▪ Integrated System Programming, Testing and Commissioning
▪ Dedicated Service Department
▪ CAD Design Services

PROJECT CAPABILITIES
▪ Average project management of 20 – 30 projects per month
▪ Typical Projects range from $40,000 to $2 Million+
INDUSTRY AFFILIATIONS
The Construction Association (TEXO)
International Facility Manager’s Association (IFMA)
Building Owners and Managers Association (BOMA)

BUSINESS AND COMMUNITY AFFILIATIONS
Dallas Regional Chamber of Commerce
Irving Chamber of Commerce
Southlake Chamber of Commerce
Colleyville Chamber of Commerce

INDUSTRY CERTIFICATIONS OR AFFILIATIONS
BICSI – Building Industry Consulting Service International
NSCA – National Systems Contractor’s Association
NSCA - Advanced Sound Design and Estimating
CTS (Certified Technology Specialist) – InfoComm and ICIA
Crestron Programming and Installation
AMX Programming and Installation
Extron Programming and Installation
HDMI Certification
ISF – Certified Video Display Calibration
OSHA Safety Training Certifications
Forklift Operator
Hilti Connectivity Hardware (various)
PRODUCTS AND SERVICES

ELECTRICAL

George-McKenna is an Award Winning contractor providing Service and New construction services for since 1981.

Our services include Conceptual to finished designs and design assists of new commercial and industrial applications as well as upgrades and repairs to existing electrical systems, providing reliable and value added solutions for customers within the greater Dallas, Ft. Worth and North Texas area.

Our team of highly skilled and professionally licensed employees, brings a wealth of education, training and experience to every project.

RECENT ACHIEVEMENT

• 2011 TEXO Distinguished Building Award

SECURITY ♦ ACCESS CONTROL ♦ CCTV

George-McKenna specializes in the design, installation, maintenance, monitoring and support of Security Systems, Access Control, and CCTV for a variety of commercial organizations.

SECURITY / ACCESS CONTROL

Evaluate your access patterns, develop a system approach
Customize your individual system software monitoring usage and functionality
Provide long-term service and upgrades
IP based system control and monitoring available
24/7 Dispatching and intrusion detection

CCTV / VIDEO SURVEILLANCE

• Design a system to monitor and record activity
• Remote access to digital recorded information
• Indoor, outdoor and common areas coverage
• IP based gate and traffic cameras
A U D I O V I S U A L

Flat panel monitors, projection screens, high-resolution projectors, automated environment controls and quality sound systems are all integrated components enabling professional presentation solutions for conference rooms, churches, training centers, classrooms, universities, event centers and digital signage. To ensure that all products work together to form a cohesive and easily operable system, George-McKenna assists with space planning, environmental assessments for acoustics, lighting, structured communications and cable designs. Ultimately, George-McKenna presents you with a design and installation solution that is reliable, easy to use and with an impressive ROI that meets and exceeds your objectives.

S T R U C T U R E D  W I R E  &  C A B L I N G

George-McKenna Communications offers cabling services for voice/data network, audio video, and security. Cable types include: Category 5e, Category 6, coaxial, wireless LAN/WAN and fiber-optic cables. George-McKenna’s experienced on-staff personnel have RCDD certifications (Registered Communication Distribution Design) and enhanced CTS certifications (Certified Technology Specialists), to ensure the professional engineering of your project. Prior to providing a recommended solution, we will work to evaluate existing and potential cross connects and changes, existing electronic components integrated into your main equipment room (MER), telecommunications closets, workstation density/stability, and workstation applications and solutions architecture. Ultimately, our objective is to visualize and offer a solution design that matches your vision with your budget, and complies with EIA/TIA standards and local building regulations.

George-McKenna is a Certified Installer for: BeldenCDT, Ortronics, Berk-Tek, and Leviton.

George-McKenna is a corporate member of BICSI.
**Section 27 4116 – A/V System - Material**

<table>
<thead>
<tr>
<th>Material Description</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type 1 PA Microphone – Shure 552</td>
<td>1</td>
</tr>
<tr>
<td>Audio Input Interface – RDL D-CIJ3D</td>
<td>4</td>
</tr>
<tr>
<td>DSP Type 1 Option 1 – Biamp Tesira Forte</td>
<td>1</td>
</tr>
<tr>
<td>Amplifier PA Type 1 – QSC – CXD4.3</td>
<td>1</td>
</tr>
<tr>
<td>Amplifier PA Type 2 – QSC – SPA2-60</td>
<td>1</td>
</tr>
<tr>
<td>Speaker Type 1 – JBL – Control 47C/T WHITE</td>
<td>82</td>
</tr>
<tr>
<td>Speaker Type 3 – Atlas – SD72WV</td>
<td>5</td>
</tr>
<tr>
<td>65&quot; Monitor – LG – 65UT640S0UA</td>
<td>4</td>
</tr>
<tr>
<td>43&quot; Monitor – LG – 43UT640S0UA</td>
<td>5</td>
</tr>
<tr>
<td>55&quot; Monitor – LG – 55UT640S0UA</td>
<td>7</td>
</tr>
<tr>
<td>49&quot; Monitor – LG – 49UT640S0UA</td>
<td>1</td>
</tr>
<tr>
<td>Flat Panel Wall Mount – Chief – LSM1U</td>
<td>8</td>
</tr>
<tr>
<td>Flat Panel Wall Mount – Chief – TS118SU</td>
<td>5</td>
</tr>
<tr>
<td>Flat Panel Pole Mount- Chief – LCM1U</td>
<td>3</td>
</tr>
<tr>
<td>Flat Panel Pole Mount- Chief – MCM1U</td>
<td>1</td>
</tr>
<tr>
<td>In-wall Storage – Chief – PAC526FC</td>
<td>4</td>
</tr>
<tr>
<td>In-wall Storage – Chief – PAC525FC</td>
<td>5</td>
</tr>
<tr>
<td>Chief CMA115 Ceiling plate</td>
<td>4</td>
</tr>
<tr>
<td>CMA640</td>
<td>4</td>
</tr>
<tr>
<td>CMA152 Coupler</td>
<td>4</td>
</tr>
<tr>
<td>Chief FMSCAO offset</td>
<td>2</td>
</tr>
<tr>
<td><strong>Equipment Rack</strong></td>
<td></td>
</tr>
<tr>
<td>a. Middle Atlantic ERK-44-20</td>
<td>1</td>
</tr>
<tr>
<td>b. Middle Atlantic PD-915R Rackmount Power</td>
<td>1</td>
</tr>
<tr>
<td>c. Middle Atlantic UQFP-2 Fan Panel w/Thermostatic Fan Controller</td>
<td>1</td>
</tr>
<tr>
<td>d. Middle Atlantic SSL Rackshelf</td>
<td>1</td>
</tr>
<tr>
<td>e. Middle Atlantic D2 Drawer</td>
<td>1</td>
</tr>
<tr>
<td>f. Middle Atlantic UFA-14.5 Rackshelf</td>
<td>1</td>
</tr>
<tr>
<td>g. Ace Backstage 3RU (custom)</td>
<td>1</td>
</tr>
<tr>
<td>h. Middle Atlantic EB2 2ru Blank Panel</td>
<td>14</td>
</tr>
<tr>
<td>i. Middle Atlantic EB1 1ru Blank Panel</td>
<td>4</td>
</tr>
<tr>
<td>70 Volt Speaker Cable 14 gauge speaker – Beldon 5100UP</td>
<td>2,000</td>
</tr>
<tr>
<td>70 Volt Speaker Cable 16 gauge speaker – Beldon 5200UP</td>
<td>1,000</td>
</tr>
<tr>
<td>Ethernet UTP Cable for LAN Category 5e Plenum – Berk Tek</td>
<td>250</td>
</tr>
<tr>
<td>West Penn 291</td>
<td>200</td>
</tr>
</tbody>
</table>
MODEL 522 UNIDIRECTIONAL DYNAMIC BASE STATION MICROPHONE

The Model 522 is a dynamic base station microphone designed especially for radio communications, paging, and dispatching systems. Its cardioid (unidirectional) pickup pattern suppresses unwanted background noise—the type of noise generated by other dispatchers working nearby, by ventilating equipment, or by office machines in the same area. It also eliminates or reduces feedback in public address paging applications. The 522 can be converted to Monitor/Transmit switching with the Shure RK199S Split-Bar Conversion Kit.

FEATURES

- Dual impedance (19 to 300 ohms or High)
- Impedance change switch for convenient change-over
- Finger-tip control bar (locking or non-locking action) to actuate microphone circuit and an external relay or control circuit
- Long-life switch to satisfy rigorous requirements of communications and paging systems
- Sturdy, high impact ARMO-DUR® base and micro-phone case
- Adjustable microphone height
- Dependability - under all operating conditions
- Conversion kit available for Monitor/Transmit switching

PRESS-TO-TALK SWITCH OPERATION

The finger-tip control bar can be used as a locking or non-locking switch. To use as a non-locking switch, simply depress the control bar and release after transmission. To use as a locking switch, depress the control bar and pull it forward. To unlock the switch, move the bar back and release.

IMPEDANCE SELECTION

Use the switch located on the under side of the microphone base, near the cable entry, to select high or low impedance. The microphone is shipped with the switch in the “HI” position.

Use the low-impedance position for long cable lengths under conditions of severe hum disturbance. Unlimited cable lengths are possible without appreciably affecting response or level. Use Shure Model A95 Series Line Matching Transformers when using a low-impedance microphone line with a high-impedance amplifier input. These transformers provide a proper impedance match between a 19 to 300 ohm microphone line and a high-impedance input and are available with various input and output connectors.

AUDIO CONNECTIONS (See Table 1)

Unbalanced high-impedance operation:

Set the impedance switch to the “HI” position (as shipped). Connect the GREEN cable lead and the shield to the amplifier or chassis ground. The WHITE cable lead is the “hot” conductor.

Balanced-line low-impedance operation:

Set the impedance switch to the “LO” position. Connect the shield to the amplifier or chassis ground. The WHITE and GREEN cable leads are the “hot” conductors.

LOGIC CONNECTIONS

The RED and BLACK leads may be used to control an external relay or switching circuit.

INTERNAL CONNECTIONS

OPTIONAL CONVERSION

A split-bar Transmit/Monitor Switch is available for use with transceivers with a receiver squelch circuit. Depressing the Monitor bar disables the receiver squelch circuit so that the operator can...
determine the presence of signals below the squelch threshold before transmitting. The Monitor switch is either momentary or locking; and the switch can be wired either to ground or to unground the squelch circuit. The Transmit switch bar can be depressed only while the Monitor bar is depressed, thus requiring the operator to verify that the channel is idle before transmitting. The Transmit switch is momentary only and cannot be locked. The Transmit/Monitor Switch Kit is Shure Model RK199S. General microphone wiring instructions are supplied with the kit, but specific transceiver wiring details must be obtained from the transceiver schematic and/or the manufacturer of the unit.

SPECIFICATIONS

Type
Dynamic

Frequency Response
60 to 11,000 Hz (see Figure 2)

Polar Pattern
Cardioid (unidirectional) - uniform with frequency, symmetrical about axis (see Figure 3)

Impedance
Dual. Microphone rating impedance is 150 ohms (260 ohms actual) for connection to microphone inputs rated at 19 to 300 ohms and "High" for connection to high-impedance microphone inputs. Switch is in high-impedance position as supplied. To change impedance, see sections on Impedance Selection and Connections.

SENSITIVITY (AT 1,000 HZ):

Open Circuit Voltage*

Low: -57.5 dB -38.5 dB
High: (1.3 mV) (12 mV)

*(1 Pa = 94 dB SPL)

Switch
Press-to-Talk Switch - locking or nonlocking operation to actuate microphone circuit and an external relay or control circuit. Microphone circuit normally shorted in both high and low impedance.

Impedance Selection Switch - double-pole double-throw slide switch in microphone base to provide either high- or low-impedance operation.

Cartridge Shock Mount
Internal rubber vibration-isolator.

Cable
2.1 m (7 ft) four-conductor, two conductors shielded non-detachable.

Case
Two-tone gray ARMO-DUR® with dull-chrome-plated steel screen.

Dimensions
See Figure 4.

Overall Dimensions

Net Weight
736 grams (1 lb 10 oz)

Shipping Weight
1020 grams (2 lb 4 oz)

Replacement Parts

Cartridge .................................................. R89
Cable.......................................................... C31C
On-Off Switch ............................................. RK141S

Optional Conversion Part

Transmit/Monitor Split-Bar Switch Kit................. RK199S

For additional service or parts information, please contact Shure's Service department at 1-800-516-2525. Outside the United States, please contact your authorized Shure Service Center.

SHURE Incorporated  http://www.shure.com
United States, Canada, Latin America, Caribbean:
5800 W. Touhy Avenue, Niles, IL 60714-4608, U.S.A.
Phone: 847-600-2000  U.S. Fax: 847-600-1212  Intl Fax: 847-600-6446
Europe, Middle East, Africa:
Shure Europe GmbH, Phone: 49-7131-72140  Fax: 49-7131-721414
Asia, Pacific:
Shure Asia Limited, Phone: 852-2893-4290  Fax: 852-2893-4055
ACCESSORIES
Models D-CIJ3, DB-CIJ3, DS-CIJ3
Consumer Input Jacks – Mono

Models D-CIJ3D, DB-CIJ3D, DS-CIJ3D
Consumer Input Jacks – Stereo

- Stereo Inputs to Stereo Outputs (D SERIES-CIJ3D)
- Stereo Inputs to Mono Output (D SERIES-CIJ3)
- Stereo Inputs on RCA Jacks and Stereo Mini-Jack
- Unbalanced to Balanced Conversion Without Gain
- Transformer Isolation for Unbalanced Line Inputs
- Hum Cancellation on Unbalanced Line Inputs
- Line-Level Output to Feed 10 kΩ Equipment Inputs
- Output Connections on Detachable Terminal Block
- Mix Stereo Inputs to Mono Balanced (D SERIES-CIJ3)
- Available in Stainless Steel, Black and White

The D-CIJ3 and D-CIJ3D are Decora®-compatible audio input accessories from Radio Design Labs. All metal enclosures are attractively finished in white, black or brushed stainless steel to complement the decor encountered in commercial environments. Custom labeling is available at www.rdlnet.com.

D SERIES-CIJ3: The -CIJ3 is the ideal choice in installations requiring the passive mixing of two unbalanced line-level audio sources to feed a mono balanced (or unbalanced) audio line.

The -CIJ3 is a complete unbalanced line-level audio input module. The front panel features two gold plated phono jacks and a single stereo mini-jack, intended for mono or stereo consumer level sources. An input signal may be connected to either the phono jacks or to the mini-jack. The left and right signal inputs are combined and balanced through audio transformers configured to reject induced hum. A mono line-level output is provided on the rear-panel detachable terminal block for connection to a 10 kΩ or higher input impedance line-level module or equipment input.

D SERIES-CIJ3D: The -CIJ3D is the ideal choice in installations requiring stereo unbalanced line-level audio sources to feed stereo balanced (or unbalanced) audio lines.

The -CIJ3D is a complete unbalanced line-level audio input module. The front panel features two gold plated phono jacks and a single stereo mini-jack, intended for mono or stereo consumer level sources. An input signal may be connected to either the phono jacks or to the mini-jack. The inputs are balanced through audio transformers configured to reject induced hum. A stereo line-level output is provided on the rear-panel detachable terminal block for connection to 10 kΩ or higher input impedance line-level module or equipment inputs.

Wherever consumer format audio signals need to be connected to a professional audio system, the -CIJ3 and -CIJ3D are the ideal choices. Use them individually or in conjunction with other RDL products as part of a complete audio/video system.
ACCESSORIES

Models D-CIJ3, DB-CIJ3, DS-CIJ3

Consumer Input Jacks – Mono

Models D-CIJ3D, DB-CIJ3D, DS-CIJ3D

Consumer Input Jacks – Stereo

TYPICAL PERFORMANCE

Input connectors (3): Phono jacks with gold contacts (Left and Right), Mini-jack 3.5 mm (Stereo)

Frequency response (line level): 50 Hz to 20 kHz (±1 dB); 30 Hz to 20 kHz (±2 dB)

Crosstalk (D SERIES-CIJ3D): <-80 dB (1 kHz); <-60 dB (10 Hz to 20 kHz)

THD: <0.2% (1 kHz)

Output connector: Detachable terminal block

Dimensions:

- Height: 4.13 in. 10.49 cm
- Width: 1.7 in. 4.32 cm
- Depth: 2.15 in. 5.47 cm

Mounting Box Minimum Dimensions:

- Width: 1.80 in. 4.57 cm
- Depth: 1.75 in. 4.45 cm

Radio Design Labs Technical Support Centers

U.S.A. (800) 933-1780, (928) 778-3554; Fax: (928) 778-3506

Europe [NH Amsterdam] (++31) 20-6238 983; Fax: (++31) 20-6225-287

Installation/Operation

Declaration of Conformity available from rdlnet.com. Sole EMC specifications provided on product package. Specifications are subject to change without notice.
The TesiraFORTÉ VI is a digital audio server with 12 analog inputs and 8 analog outputs and includes Acoustic Echo Cancellation (AEC) technology on all 12 inputs. It also includes up to 8 channels of configurable USB audio, and a 2-channel VoIP interface via a RJ-45 connector. USB audio allows TesiraFORTÉ to interface directly with USB audio hosts, as well as to take full advantage of today’s most sophisticated conferencing solutions. TesiraFORTÉ AVB VI adds Audio Video Bridging (AVB) digital audio networking. The AVB model can be used as a standalone device or can be combined with other TesiraFORTÉ devices and Tesira servers, expanders, and controllers. TesiraFORTÉ VI also provides extensive audio processing, including but not limited to: AEC technology, signal routing and mixing, equalization, filtering, dynamics, and delay, as well as control, monitoring, and diagnostic tools; all configured through the Tesira configuration software. TesiraFORTÉ VI is best-suited for small- to medium-sized rooms that require high-quality audio solutions using VoIP, voice lift, mix-minus, and AEC such as board rooms or distance training facilities.

**BENEFITS**

- Allows integrators to choose which model works best for the installation environment.
- Application-specific models make system design, configuration, and installation easier and faster.
- Included default configuration file allows for plug-and-play usage.
- Highly scalable and cost-effective solution that can grow over time with the needs of the customer.
- Acoustic Echo Cancellation (AEC) technology on all 12 inputs.
- SpeechSense™ technologies to enhance speech processing.
- Integrates directly with soft codecs and other USB audio hosts.

**FEATURES**

- 128 x 128 channels of AVB (AVB model only)
- 12 mic/line level inputs with AEC, 8 mic/line level outputs
- Gigabit Ethernet port
- Up to 8 channels of configurable USB audio
- RS-232 serial port
- 4-pin GPIO
- 2-line OLED display with capacitive-touch navigation
- Rack mountable (1RU)
- System configuration and control via Ethernet
- Internal universal power supply
- SIP VoIP interface via a RJ-45 connector
- Fully compatible with Tesira servers, endpoints, expanders, and controllers (AVB model)
- Signal processing via intuitive software allows configuration and control for signal routing, mixing, equalization, filtering, delay and much more
- CE marked, UL listed, and RoHS compliant
- Covered by Biamp Systems’ 5-year warranty
TESIRAFORTÉ AVB VI & TESIRAFORTÉ VI: VOIP CONFERENCING SOLUTION

ARCHITECTS & ENGINEERS SPECIFICATION

The digital audio network server shall be designed exclusively for use with Tesira systems. The AVB model server shall support Audio Video Bridging (AVB) digital audio networking that shall allow up to 128 x 128 channels. The AVB Networking connection shall be implemented on a RJ-45 connector on the AVB model. The server shall support Ethernet connection for programming and control on a RJ-45 connector. The server shall have internal DSP processing. The server shall include 4 channels of General Purpose Input and Output connection (GPIO) for sending or receiving logic signals. The programming of the GPIO ports shall be software configurable. The server shall include a RS-232 connection for control data transmission into or out of the server and such operation shall be software programmable. The server shall include a Universal Serial Bus (USB) connection on a standard USB-B type connector. The server shall be software configurable to stream up to 8 channels of digital USB Audio Class 1 transmission either into or out of the server or simultaneous input and output. The server shall provide 12 balanced input connections for receiving of microphone or line level analog audio signals on screw-down, removable connectors. The input connections shall include Acoustic Echo Cancellation (AEC) hardware and firmware, the parameters, routing and operation of which shall be software programmable. The server shall provide 8 balanced output channels for the transmission of microphone or line level analog audio signals on screw-down, removable connectors. Each individual channel shall have its own dedicated connection. The server shall be rack mountable (1RU) and feature software-configurable signal processing, including but not limited to: signal routing and mixing, equalization, filtering, dynamics, and delay, as well as control, monitoring, and diagnostic tools. The server shall control and proxy all Tesira expander-class devices (AVB model only) and Tesira control devices. The server shall be CE marked, UL listed and shall be compliant with the RoHS directive. Warranty shall be five years. The server shall be TesiraFORTÉ AVB VI (for AVB model) or TesiraFORTÉ VI (for non-AVB model).

SERVER SPECIFICATIONS

<table>
<thead>
<tr>
<th>Specification</th>
<th>AVB VI</th>
<th>VI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency Response:</td>
<td>20Hz to 20kHz, +4dBu output</td>
<td>+0.25dB/-0.5dB</td>
</tr>
<tr>
<td>THD+N (22Hz to 22kHz):</td>
<td>0dB gain, +4dBu input</td>
<td>&lt; 0.006%</td>
</tr>
<tr>
<td></td>
<td>54dB gain, -50dBu input</td>
<td>&lt; 0.04%</td>
</tr>
<tr>
<td>EIN (no weighting, 22Hz to 22kHz):</td>
<td>&gt; -125dBu</td>
<td></td>
</tr>
<tr>
<td>Dynamic Range (in presence of signal):</td>
<td>22Hz to 22kHz, OdB gain</td>
<td>&gt; 108dB</td>
</tr>
<tr>
<td>Input Impedance (balanced):</td>
<td>8kΩ</td>
<td></td>
</tr>
<tr>
<td>Output Impedance (balanced):</td>
<td>207Ω</td>
<td></td>
</tr>
<tr>
<td>Maximum Input:</td>
<td>+24dBu</td>
<td></td>
</tr>
<tr>
<td>Maximum Output (selectable):</td>
<td>+24dBu, +18dBu, +12dBu, +6dBu, 0dBu, -31dBu</td>
<td>+24dBu, +18dBu, +12dBu, +6dBu, 0dBu, -31dBu</td>
</tr>
<tr>
<td>Input Gain Range: (6dB steps):</td>
<td>0dB to 66dB</td>
<td></td>
</tr>
<tr>
<td>Overall Dimensions/Weight:</td>
<td>Height: 1.75 inches (44 mm)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Width: 19.0 inches (483 mm)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Depth: 10.5 inches (267 mm)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Weight: 8 lbs (3.63 kg)</td>
<td></td>
</tr>
<tr>
<td>Phantom Power:</td>
<td>+48 VDC (7mA/input)</td>
<td></td>
</tr>
<tr>
<td>Crosstalk, channel to channel,</td>
<td>1kHz:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>0dB gain, +4dBu input</td>
<td>&lt; -85dB</td>
</tr>
<tr>
<td></td>
<td>54dB gain, -50dBu input</td>
<td>&lt; -75dB</td>
</tr>
<tr>
<td>Sampling Rate:</td>
<td>48kHz</td>
<td></td>
</tr>
<tr>
<td>A/D – D/A Converters:</td>
<td>24-bit</td>
<td></td>
</tr>
<tr>
<td>Power Consumption</td>
<td>(100-240VAC 50/60Hz):</td>
<td>&lt; 35W</td>
</tr>
<tr>
<td>USB:</td>
<td>Bit Depth:</td>
<td>16- or 24-bit</td>
</tr>
<tr>
<td></td>
<td>Number of Channels:</td>
<td>up to 8</td>
</tr>
<tr>
<td></td>
<td>Sample Rate:</td>
<td>48kHz</td>
</tr>
<tr>
<td>Compliance:</td>
<td>FCC Part 15B (USA)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Industry Canada CS-03 (Canada)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>CE marked (Europe)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>UL and C-UL listed (USA &amp; Canada)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>RCM (Australia)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>EAC (Eurasian Customs Union)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>RoHS Directive (Europe)</td>
<td></td>
</tr>
</tbody>
</table>

TESIRAFORTÉ AVB VI BACK PANEL

TESIRAFORTÉ VI BACK PANEL
The TesiraFORTÉ DAN VI is a digital audio server with 32 bi-directional channels of Dante™ digital audio, 12 analog inputs with Acoustic Echo Cancellation (AEC), and 8 analog outputs. It also includes up to 8 channels of configurable USB audio, and a 2-channel SIP VoIP interface via a RJ-45 connector. USB audio allows TesiraFORTÉ to interface directly with USB audio hosts, as well as to take full advantage of today’s most sophisticated conferencing solutions. TesiraFORTÉ DAN VI provides extensive audio processing, including but not limited to: signal routing and mixing, equalization, filtering, dynamics, and delay; as well as control, monitoring, and diagnostic tools; all configured through the Tesira configuration software. TesiraFORTÉ DAN VI is best suited for room requiring AEC, voice lift, and mix-minus, such as conference rooms or distance learning environments that use VoIP.

**BENEFITS**
- Efficient system design, configuration, and installation with application-specific models
- Superior call quality with Acoustic Echo Cancellation
- Enhanced speech detection and processing
- Seamless integration with soft codec conferencing technologies via USB audio input
- Simpler installation process using the default configuration file

**FEATURES**
- 32x32 channels of digital audio networking via the Dante protocol
- 12 mic/line level inputs with AEC, 8 mic/line level outputs
- 2 Gigabit Ethernet ports: Dante digital audio and Tesira control
- Up to 8 channels of configurable USB audio
- RS-232 serial port
- 4-pin GPIO
- 2-line OLED display with capacitive-touch navigation
- Rack mountable (1RU)
- System configuration and control via Ethernet
- Internal universal power supply
- SIP VoIP interface via a RJ-45 connector
- Signal processing via intuitive software allows configuration and control for signal routing, mixing, equalization, filtering, delay, and much more
- CE marked, UL listed, and RoHS compliant
- Covered by Biamp Systems’ 5-year warranty
ARCHITECTS & ENGINEERS SPECIFICATION

The digital audio network server shall be designed exclusively for use with Tesira systems. The server shall support Dante™ digital audio networking that shall allow up to 32 x 32 channels. The Dante Networking connection shall be implemented on a RJ-45 connector. The server shall support Ethernet connection for programming and control on a RJ-45 connector. The server shall have internal DSP processing. The server shall include 4 channels of General Purpose Input and Output connection (GPIO) for sending or receiving logic signals. The programming of the GPIO ports shall be software configurable. The server shall include a RS-232 connection for control data transmission into or out of the server and such operation shall be software programmable. The server shall include a Universal Serial Bus (USB) connection on a standard USB-B type connector. The server shall be software configurable to stream up to 8 channels of digital USB Class 1 Audio transmission either into or out of the server or simultaneous input and output. The server shall provide 12 balanced input connections for receiving of microphone or line level analog audio signals on screw-down, removable connectors. The input connections shall include Acoustic Echo Cancellation (AEC) hardware and firmware, the parameters, routing and operation of which shall be software programmable. Each individual channel shall have its own dedicated connection. Each individual channel shall have its own dedicated connection. The server shall integrate to Voice Over Internet Protocol (VoIP) systems on a RJ-45 connector for two lines of VoIP communication and shall support Session Initiation Protocol (SIP) v2.0 or later. The server shall provide front panel OLED identification of server power, status, alarm, and activity as well as system-wide alarm. The server shall be rack mountable (1RU) and feature software-configurable signal processing, including but not limited to: signal routing and mixing, equalization, filtering, dynamics, and delay, as well as control, monitoring, and diagnostic tools. The server shall be CE marked, UL listed and shall be compliant with the RoHS directive. Warranty shall be five years. The server shall be TesiraFORTÉ DAN VI.

SERVER SPECIFICATIONS

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency Response</td>
<td>20Hz to 20kHz, +4dBu output +0.25dB/-0.5dB</td>
</tr>
<tr>
<td>THD+N (22Hz to 22kHz):</td>
<td>0dB gain, +4dBu input &lt; 0.006%</td>
</tr>
<tr>
<td></td>
<td>54dB gain, -50dBu input &lt; 0.040%</td>
</tr>
<tr>
<td>EIN (no weighting, 22Hz to 22kHz):</td>
<td>&lt; -125dBu</td>
</tr>
<tr>
<td>Dynamic Range (in presence of signal):</td>
<td>22Hz to 22kHz, 0dB gain &gt; 108dB</td>
</tr>
<tr>
<td>Input Impedance (balanced):</td>
<td>8kΩ</td>
</tr>
<tr>
<td>Output Impedance (balanced):</td>
<td>207Ω</td>
</tr>
<tr>
<td>Maximum Input:</td>
<td>+24dBu</td>
</tr>
<tr>
<td>Maximum Output (selectable):</td>
<td>+24dBu, +18dBu, +12dBu, +6dBu, 0dBu, -3dBu</td>
</tr>
<tr>
<td>Input Gain Range: (6dB steps):</td>
<td>0dB to 66dB</td>
</tr>
<tr>
<td>Overall Dimensions/Weight:</td>
<td>Height: 1.75 inches (44 mm) Width: 19.0 inches (483 mm) Depth: 10.5 inches (267 mm) Weight: 8 lbs (3.63 kg)</td>
</tr>
</tbody>
</table>

Phantom Power: +48 VDC (7mA/input)

Crosstalk, channel to channel, 1kHz:
0dB gain, +4dBu input < -85dB
54dB gain, -50dBu input < -75dB

Sampling Rate: 48kHz

A/D – D/A Converters: 24-bit

Power Consumption
(100-240VAC 50/60Hz): < 35W

USB:
Bit Depth: 16- or 24-bit
Number of Channels: up to 8
Sample Rate: 48kHz

Compliance:
FCC Part 15B (USA)
Industry Canada CS-03 (Canada)
CE marked (Europe)
UL and C-UL listed (USA & Canada)
RCM (Australia)
RoHS Directive (Europe)

TESIRAFORTÉ DAN VI BACK PANEL

![TESIRAFORTÉ DAN VI Back Panel](image-url)
The QSC CXD Series represents a revolutionary advancement in amplifier technology and innovation. Designed specifically for the needs of integrators, CXD provides efficient, robust and extraordinarily high fidelity power to drive multiple channels and configurations of loudspeakers while simultaneously deploying sophisticated digital processing—all with optimal energy and rack space efficiency. The CXD Series consists of three powerful, four-channel amplifiers, each with onboard DSP, and the capability to configure and combine channels in various ways to drive a wide range of loudspeaker systems including 70V and 100V without the use of transformers. These amplifiers not only provide the power and processing to make your system perform better, they offer outstanding efficiency ensuring that energy costs will be kept to a minimum over the life of the installation.

**Flexible Amplifier Summing Technology™ (FAST)**

CXD amplifiers feature Flexible Amplifier Summing Technology™ (FAST) that actively distributes the total amplifier power in various configurations across one, two, three or all four outputs. This flexibility allows CXD Series amplifiers to drive (for example) two full-range surface mounted speakers along with a subwoofer and one 100V distributed speaker line; or a high-power subwoofer and a bi-amplified full-range loudspeaker; three 70V distributed speaker lines and a low impedance surface mount speaker line; or a single high-power channel driving monster subwoofers.

**Power Efficiency**

CXD Series amplifiers use QSC’s next generation class-D power amp design in combination with a custom power stage utilizing a new output device. These purpose built MOSFET devices provide high voltage operation without needing a full bridge output and offer better audio quality and thermal performance due to co-location of the semiconductors. CXD amplifiers benefit from the proven PowerLight power supply, made even better with Power Factor Correction (PFC) that aligns the current waveform with the AC mains voltage waveform. PFC enables CXD Series amps to draw current from the wall in a more efficient and controlled manner resulting in incredible power from a single standard AC breaker. CXD amplifiers also incorporate several energy conservation and efficiency strategies. One such tool is the unique multi-stage sleep mode that saves energy when possible without sacrificing performance.

**System Processing**

A single CXD Series amplifier is more than just an amplifier. It is also a capable and sophisticated loudspeaker processor. Integration of DSP and amplification means that the processor knows exactly what the amplifier is doing, allowing the dynamics processing and protection circuitry to be far more accurate and effective. This synergistic approach employs both RMS and Peak Limiters that provide the amplifier and loudspeaker combination to produce more output without being pushed to distortion or destruction.

The onboard DSP offers four channels of crossover filters, parametric EQ, alignment delay and dynamics processing—everything needed to optimize a loudspeaker system. Additionally, when using QSC loudspeakers, the CXD amplifiers offer Intrinsic Correction™, a combination of Filtering, Limiting and speaker processing first developed for our WideLine line array loudspeakers, that compensates for the non-linearities in array and horn design, resulting in exceptional performance.

**Space Efficient**

With four channels of amplification plus signal processing in just 2RU, the CXD series replaces equipment taking up as much as three times the rack-space.

**Simplicity and Control**

The on-board processing is managed and stored as presets, with 20 modifiable factory presets for the most common applications. A Preset Wizard is also available that simplifies amplifier setup and enables selection of loudspeakers. With an intuitive front panel UI, programming is a breeze. The CXD amplifiers also offer GPIO for system supervision and the ability to utilize contact closures to set the amps into standby or recall specific presets. With a host of integration features the CXD amplifiers are perfect for your application.
**CXD Details**

<table>
<thead>
<tr>
<th>4 Independent Channels</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>A, B, C, D</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>70 V</td>
<td>N/A</td>
<td>500 W</td>
<td>1000 W</td>
</tr>
<tr>
<td>100 V</td>
<td>N/A</td>
<td>625 W</td>
<td>1250 W</td>
</tr>
<tr>
<td>8Ω</td>
<td>500 W</td>
<td>900 W</td>
<td>1200 W</td>
</tr>
<tr>
<td>4Ω</td>
<td>700 W</td>
<td>1400 W</td>
<td>2000 W</td>
</tr>
<tr>
<td>2Ω</td>
<td>625 W</td>
<td>1200 W</td>
<td>1600 W</td>
</tr>
</tbody>
</table>

| 2 Channels BTL Bridged |  |  |  |
| A+B or C+D             |  |  |  |
| Doubles Voltage        |  |  |  |
| 8Ω                     | **1200 W** | **2400 W** | **4000 W** |
| 4Ω                     | **1500 W** | NR* | NR* |
| 2Ω                     | NR* | NR* | NR* |

| 2 Channels Parallel    |  |  |  |
| AB or CD               |  |  |  |
| Doubles Current        |  |  |  |
| 8Ω                     | 500 W | 1300 W | 1250 W |
| 4Ω                     | 950 W | **2000 W** | **2400 W** |
| 2Ω                     | **1200 W** | **2500 W** | **4000 W** |

| 1 Channel 3CH Parallel |  |  |  |
| ABC                    |  |  |  |
| Triples Current        |  |  |  |
| 8Ω                     | 500 W | 1400 W | 1400 W |
| 4Ω                     | 950 W | 2400 W | 2500 W |
| 2Ω                     | 1800 W | 3500 W | 4500 W |

| 1 Channel Bridged/Parallel |  |  |  |
| AB+CD                    |  |  |  |
| Doubles Current and Voltage |  |  |  |
| 8Ω                     | **1600 W** | **3500 W** | **4500 W** |
| 4Ω                     | **2500 W** | **5000 W** | **7500 W** |
| 2Ω                     | NR* | NR* | NR* |

| 1 Channel 4CH Parallel |  |  |  |
| ABCD                   |  |  |  |
| Quadruples Current     |  |  |  |
| 8Ω                     | 500 W | 1400 W | 1600 W |
| 4Ω                     | 1000 W | 3000 W | 3000 W |
| 2Ω                     | **1700 W** | **5000 W** | **5300 W** |

*NR* = Not Recommended due to excessive current draw

*BOLD* = Optimal configuration for the load and channel count
## CXD Details

<table>
<thead>
<tr>
<th>Specifications</th>
<th>CXD4.2</th>
<th>CXD4.3</th>
<th>CXD4.5</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Typical Distortion</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8Ω</td>
<td>0.01 - 0.03%</td>
<td>0.01 - 0.03%</td>
<td>0.01 - 0.03%</td>
</tr>
<tr>
<td>4Ω</td>
<td>0.03 - 0.06%</td>
<td>0.03 - 0.06%</td>
<td>0.03 - 0.06%</td>
</tr>
<tr>
<td><strong>Maximum Distortion</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4Ω - 8Ω</td>
<td>1.0%</td>
<td>1.0%</td>
<td>1.0%</td>
</tr>
<tr>
<td><strong>Frequency response (8Ω)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20 Hz - 15 kHz +/- 0.2 dB</td>
<td>20 Hz - 15 kHz +/- 0.2 dB</td>
<td>20 Hz - 15 kHz +/- 0.2 dB</td>
<td></td>
</tr>
<tr>
<td>20 Hz - 20 kHz +0.2 dB / -0.7 dB</td>
<td>20 Hz - 20 kHz +0.2 dB / -0.7 dB</td>
<td>20 Hz - 20 kHz +0.2 dB / -0.7 dB</td>
<td></td>
</tr>
<tr>
<td><strong>Noise</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unweighted Output Unmuted</td>
<td>-101 dB</td>
<td>-101 dB</td>
<td>-101 dB</td>
</tr>
<tr>
<td>Weighted Output Muted</td>
<td>-109 dB</td>
<td>-109 dB</td>
<td>-109 dB</td>
</tr>
<tr>
<td><strong>Gain (1.2V setting)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>34.0 dB</td>
<td>38.4 dB</td>
<td>38.4 dB</td>
<td></td>
</tr>
<tr>
<td><strong>Damping factor</strong></td>
<td>&gt;150</td>
<td>&gt;150</td>
<td>&gt;150</td>
</tr>
<tr>
<td><strong>Input impedance</strong></td>
<td>&gt;10k, balanced or unbalanced</td>
<td>&gt;10k, balanced or unbalanced</td>
<td>&gt;10k, balanced or unbalanced</td>
</tr>
<tr>
<td><strong>Maximum input level</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(3.9V setting)</td>
<td>12.28V (+24 dBu)</td>
<td>12.28V (+24 dBu)</td>
<td>12.28V (+24 dBu)</td>
</tr>
<tr>
<td>(1.2V setting)</td>
<td>3.88V (+14 dBu)</td>
<td>3.88V (+14 dBu)</td>
<td>3.88V (+14 dBu)</td>
</tr>
<tr>
<td><strong>Controls and indicators (front)</strong></td>
<td>Power ● Channel MUTE Buttons ● Channel SELECT Buttons ● Channel Input Signal and CLIP LED Indicators ● HOME, ENTER, EXIT, GAIN Navigation Buttons ● Control Knob</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Controls and indicators (rear)</strong></td>
<td>AC Power Disconnect</td>
<td>AC Power Disconnect</td>
<td>AC Power Disconnect</td>
</tr>
<tr>
<td><strong>Input connectors</strong></td>
<td>3-pin Euroblock</td>
<td>3-pin Euroblock</td>
<td>3-pin Euroblock</td>
</tr>
<tr>
<td><strong>Output connectors</strong></td>
<td>2-pin Euroblock Speaker</td>
<td>2-pin Euroblock Speaker</td>
<td>2-pin Euroblock Speaker</td>
</tr>
<tr>
<td><strong>Amplifier and load protection</strong></td>
<td>Short circuit, open circuit, thermal, RF protection. On/Off muting, DC fault shutdown, active inrush limiting, input current limiting</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>AC Power Input</strong></td>
<td>Universal Power Supply 100 - 240 VAC, 50 - 60 Hz</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Dimensions (HWD)</strong></td>
<td>3.5” x 19” x 12” (89mm x 482mm x 305mm)</td>
<td>3.5” x 19” x 16” (89mm x 482mm x 406mm)</td>
<td>3.5” x 19” x 16” (89mm x 482mm x 406mm)</td>
</tr>
<tr>
<td><strong>Weight, Net / Shipping</strong></td>
<td>18.5 lb (8.4 kg) / 22 lb (10.0 kg)</td>
<td>21.0 lb (9.5 kg) / 25 lb (11.3 kg)</td>
<td>22.0 lb (10.0 kg) / 26 lb (11.8 kg)</td>
</tr>
<tr>
<td><strong>Agency approvals</strong></td>
<td>UL, CE, RoHS/WEEE compliant, FCC Class A (conducted and radiated emissions)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Carton contents</strong></td>
<td>Locking IEC Cable, Quick Start Guide, USB Cable</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Burst Power - 20 ms 1 kHz sine burst, all channels driven*  
*Continuous Power - EIA 1 kHz 1% THD, all channels driven*
SPA Series

Features

• **Up to 200 watts per channel into 4 and 8 ohms** - the outputs of the SPA2 and SPA4-60 models are designed to provide up to 60 watts per channel while the SPA4-100 will provide up to 100 watts and the SPA2-200 will provide up to 200 watts per channel into 8 Ω loads.

• **ENERGY STAR qualified amplifier** - The ENERGY STAR qualified SPA Series employ an efficient class-D design to conserve energy and reduce operational costs.

• **Bridgeable outputs for higher power** - Bridging the outputs of the SPA-60 amplifiers provide up to 250 watts, while the SPA2-200 and the SPA4-100 will deliver up to 175 watts into 70 V or 100 V when bridged.

• **Auto-Ramp provides quiet startup and power-down** - The ENERGY STAR auto-ramp circuitry ensures quiet and fast power up from standby and seamless power-down following 25 minutes of inactivity, dramatically reducing power consumption.

• **Rack-mountable 1U, half rack width enclosure** - The SPA Series can be mounted in 1 RU, 1/2 rack space, and their clever joining brackets enable easy under-table and wall-mounting.

The SPA Series amplifiers from QSC are four, half-rack RU, convection cooled power amplifiers delivering two or four channels of up to 200 watts per channel into 4 Ω and 8 Ω. These amps can also be bridged to supply up to 400 watts into 4 Ω and 8 Ω, and up to 350 watts into 70 V or 100 V loads making them extremely flexible for Low-Z or High-Z applications. Utilizing an advanced Class-D amplifier design and Universal Power Supply, the SPA Series are efficient, allowing them to be convection cooled and are ENERGY STAR qualified with quiet auto-ramp standby functionality. The SPA Series are housed in an unobtrusive black painted 1/2 RU chassis with unique mounting hardware enabling rack, table and wall mounting capabilities.

Efficient Amplifier with Auto-Ramp

The SPA Series amplifiers utilize a highly efficient class-D design that conserves energy to reduce operational costs and requires no active cooling. They are ENERGY STAR qualified with auto-ramp circuitry that seamlessly transitions to/from Standby with no audible pops.

Amplifier Protection

All amplifiers in the SPA Series feature rms and thermal limiting, as well as protection against over current, short circuit, and under/over voltage.

Protection, Control and Mounting

The SPA Series provide rms and thermal limiting as well as over-current and short-circuit protection so you can employ them with confidence. They also come with multiple mounting options. Every SPA Series comes with a complete mounting kit allowing it to be rack mounted by itself or with a second unit in a 1RU space. Included connecting brackets provide additional strength when rack mounting two amps together, but also make for simple under-table or wall mounting (like behind a TV). The SPA Series can also be mounted in plenum spaces when used with the Plenum Kit accessory.
## SPA Series

### SPA2-60 | SPA4-60 | SPA2-200 | SPA4-100
---|---|---|---
**Channels** | 2 | 4 | 2 | 4

### Stereo Mode (all channels driven)
- **8 Ω**
- **4 Ω**

### Bridged Outputs (all channels driven)
- **8 Ω & 4 Ω**
- **70 V**
- **100 V**

<table>
<thead>
<tr>
<th>Frequency response (4 Ω and 8 Ω)</th>
<th>20 Hz - 20 KHz</th>
<th>+/- 0.1 dB</th>
</tr>
</thead>
<tbody>
<tr>
<td>Signal to noise (20 Hz - 20 KHz)</td>
<td>&gt;100 dB</td>
<td></td>
</tr>
<tr>
<td>Input sensitivity</td>
<td>1.23 V (+4 dBu)</td>
<td></td>
</tr>
<tr>
<td>Gain at 8 Ω</td>
<td>25.0 dB</td>
<td></td>
</tr>
<tr>
<td>Output circuitry</td>
<td>Class D</td>
<td></td>
</tr>
<tr>
<td>Input impedance</td>
<td>&gt;10k, balanced or unbalanced</td>
<td></td>
</tr>
<tr>
<td>Maximum input level</td>
<td>12.3 V (+24 dBu)</td>
<td></td>
</tr>
<tr>
<td>Cooling</td>
<td>Convection</td>
<td></td>
</tr>
<tr>
<td><strong>Input connectors</strong></td>
<td>3.5 mm Euro, 5 position (green)</td>
<td>3.5 mm Euro, 10 position (green)</td>
</tr>
<tr>
<td><strong>Remote connectors</strong></td>
<td>3.5 mm Euro, 5 position (black)</td>
<td>3.5 mm Euro, 10 position (black)</td>
</tr>
<tr>
<td><strong>Output connectors</strong></td>
<td>5 mm Euro, 4 position (green)</td>
<td></td>
</tr>
<tr>
<td><strong>Front panel indicators</strong></td>
<td>Power, per channel</td>
<td>Signal, per channel</td>
</tr>
<tr>
<td><strong>Rear panel indicators</strong></td>
<td>Bi-Color LED Signal/Protect/Limit per channel</td>
<td></td>
</tr>
<tr>
<td><strong>Controls</strong></td>
<td>4 Ω/8 Ω/70 V Bridged Highpass On/100 V Bridged Highpass (per channel pair)</td>
<td></td>
</tr>
<tr>
<td><strong>General purpose inputs</strong></td>
<td>Remote volume included</td>
<td>remote standby, on 3.5 mm connectors (10k potentiometer is not included)</td>
</tr>
<tr>
<td><strong>Highpass filter</strong></td>
<td>80 Hz in Bridged 70 V &amp; 100 V</td>
<td></td>
</tr>
<tr>
<td><strong>Dimensions</strong></td>
<td>1.7” x 8.7” x 9.5” (43 mm x 220 mm x 241 mm)</td>
<td></td>
</tr>
<tr>
<td><strong>Net weight</strong></td>
<td>3.5 lb (1.1 kg)</td>
<td>4.0 lb (1.4 kg)</td>
</tr>
<tr>
<td><strong>Shipping weight</strong></td>
<td>6 lb (2.3 kg)</td>
<td>6.5 lb (2.5 kg)</td>
</tr>
<tr>
<td><strong>Power requirements</strong></td>
<td>Universal Power Supply 100 - 240 VAC, 50 - 60 Hz with active power factor correction</td>
<td></td>
</tr>
<tr>
<td><strong>Agency approvals</strong></td>
<td>UL, CE, Energy emissions, FCC Class B (Conducted and Radiated emissions), UL 2043 with plenum kit accessory</td>
<td></td>
</tr>
<tr>
<td><strong>Carton contents</strong></td>
<td>IEC Cable, quick start guide, connector pack, rack mount ears, mounting brackets</td>
<td></td>
</tr>
</tbody>
</table>

Specifications subject to change without notice.

*Peak Power – 250 W
Control® 47C/T
Professional Series – Two-Way 6.5” Coaxial Ceiling Loudspeaker with Extended Bass

Key Features:

- Extremely consistent 120° broadband pattern control featuring JBL’s exclusive conical Radiation Boundary Integrator® (RBI™) technology:
  - Provides very consistent coverage of listening area
  - Wide coverage requires fewer speakers, reducing the cost of the installed system without sacrificing performance
- Coaxial design:
  - 165 mm (6.5 in) woofer with butyl rubber surround
  - 25 mm (1 in) soft-dome tweeter on 250 mm (10 in) diameter wave guide
- Bass extension to 55 Hz
- 8 ohm and 70V/100V operation
- Integrated backcan for easy “blind-mount” install
- Packaged with grille and tile rails for easy installation

Description:

The Control 47C/T is a premium in-ceiling professional loudspeaker designed for applications that require extremely wide bandwidth along with very consistent coverage.

Featuring JBL’s exclusive conical Radiation Boundary Integrator® (RBI™), the RBI provides a large waveguide for the tweeter while low-frequency sound projects through specially-designed apertures in the RBI, allowing for a seamless integration of coverage between the two coaxially mounted drivers. The result is extremely consistent sound character with very little variation throughout the listening space. The wide coverage allows for the use of fewer loudspeakers compared to speakers with less consistent coverage control, while at the same time providing better coverage of the area.

Specifications:

System

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency Range (-10 dB)</td>
<td>55 Hz – 20 kHz</td>
</tr>
<tr>
<td>Frequency Response (+/- 3 dB)</td>
<td>75 Hz – 17 kHz</td>
</tr>
<tr>
<td>Power Capacity</td>
<td>150W Continuous Program Power</td>
</tr>
<tr>
<td></td>
<td>75W Continuous Pink Noise</td>
</tr>
<tr>
<td>Nominal Sensitivity</td>
<td>91 dB</td>
</tr>
<tr>
<td>Nominal Coverage Angle</td>
<td>120° conical coverage</td>
</tr>
<tr>
<td>Directivity Factor (Df)</td>
<td>6.5</td>
</tr>
<tr>
<td>Directivity Index (DI)</td>
<td>7.9 dB</td>
</tr>
<tr>
<td>Rated Maximum SPL</td>
<td>110 dB @ 1 m (3.3 ft) average, 116 dB peak</td>
</tr>
<tr>
<td>Rated Impedance</td>
<td>8 ohms (in bypass mode)</td>
</tr>
<tr>
<td>Transformer Taps</td>
<td>60W, 30W, 15W, &amp; 7.5W @ 70 V</td>
</tr>
<tr>
<td>Transformer Insertion Loss</td>
<td>0.76 dB @ 60W, 0.70 dB @ 30W, 0.61 dB @ 15W, 0.58 dB @ 7.5W</td>
</tr>
</tbody>
</table>

Transducers

<table>
<thead>
<tr>
<th>Driver Type</th>
<th>Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>LF Driver</td>
<td>165 mm (6.5 in) with polypropylene cone, butyl rubber surround, copper-clad coil, vented aluminum former</td>
</tr>
<tr>
<td>HF Driver</td>
<td>25 mm (1 in) soft dome w/ dampening, ferrofluid-cooled</td>
</tr>
</tbody>
</table>

Enclosure

<table>
<thead>
<tr>
<th>Input Connectors</th>
<th>Two removable locking 2-pin connectors with screw-down terminals, max wire size 12 AWG (2.5 mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knockouts</td>
<td>Two (top and side)</td>
</tr>
</tbody>
</table>
Control® 47C/T
Professional Series – Two-Way 6.5” Coaxial Ceiling Loudspeaker with Extended Bass

Beamwidth:

![Beamwidth Diagram]

Frequency Response:

![Frequency Response Diagram]

Directivity Index:

![Directivity Index Diagram]

Off-Axis Frequency Response:

![Off-Axis Frequency Response Diagram]

Mounting Dimensions:

Dimensions in mm (inches)

SD72 Series

8” Preassembled Speaker Package

Features
• 10 oz Dual Cone Speaker Provides Familiar Response & Performance
• Quality 5 Watt Dual Voltage Transformer
• Individually Packaged for Stocking & Ordering Convenience

Applications
The SD72 is an aggressively priced, high quality speaker/transformer package suitable for almost any paging or background application including retail stores, restaurants, schools, and other institutional facilities.

General Description
The speaker used in the SD72 is the next generation of high performance cone loudspeakers, very similar to the preceding C-Series speakers. The similarity in the sonic qualities ensures that contractors and designers who have worked with the Atlas Sound C-Series in the past will know exactly what to expect when they use the SD72. Model SD72 is a dual cone, 25 Watts 8” (205mm) loudspeaker with a 10 oz. (260g) ceramic magnet. It includes a curvelinear, treated paper cone for lower harmonic distortion. The loudspeaker is also equipped with a full 1” diameter copper voice coil with a black anodized aluminum former for better power dissipation. Model SD72 operates within a frequency response range of 55Hz – 8kHz (±5dB) with a sensitivity of 97dB and a dispersion angle of 105°. Package includes factory installed 25V/70.7V line matching transformer with tap selections ranging from .25 to 5 Watts. It mounts a wide variety of Atlas Sound round and square baffles and enclosures to meet functional and aesthetic application requirements.

Specifications

<table>
<thead>
<tr>
<th>Model</th>
<th>SD72</th>
<th>SD72W</th>
<th>SD72WV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Size</td>
<td>8” (205mm)</td>
<td>8” (205mm)</td>
<td>8’ (205mm)</td>
</tr>
<tr>
<td>Power Taps</td>
<td>.25, .5, 1, 2, &amp; 5 Watts</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sensitivity</td>
<td>97dB Average</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Frequency Response</td>
<td>55Hz-19kHz (±5dB)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dispersion</td>
<td>105° (2kHz Octave Band, -6dB Points)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diameter</td>
<td>8¼’ (205mm)</td>
<td>12¼’ (206mm)</td>
<td>12¼’ (206mm)</td>
</tr>
<tr>
<td>Depth</td>
<td>2¼’ (73mm)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Architect and Engineer Specifications
Unit shall be Atlas Sound 8” loudspeaker Model SD72 utilizing line matching transformer. It shall have a (10oz.) ceramic magnet and a seamless cone. Frequency response range shall be 55Hz–8kHz (±5dB). Sensitivity shall be 97dB 1W/1M. Voice coil shall be black anodized aluminum to help dissipate heat, have an impedance of 8Ω and a diameter of 1” (25mm). Transformer primary voltage shall be 25V/70.7V with a frequency response range of 100Hz–10kHz (±1.5dB). Insertion loss shall not exceed 1.5dB.

All models feature standard mounting holes to accommodate the majority of Atlas Sound 8” baffles. All mounting screws are included in the package.
SD72 Polars (Normalized to Zero on Axis) (-6dB)

SD72 Harmonic Distortion
SD72 Impedance

Frequency (Hz) Octave Smoothing = 30.0%
UHD Commercial TV with Essential Smart Function

Commercial TV | UT640S Series

The UT640S Series is specifically designed for diverse business environments. By providing compatibility with AV Control systems and DPM (Display Power Management) as well as its smart connectivity, simple user friendly interface, and UHD picture quality, the UT640S series enhances ease of use while facilitating communications between businesses and their target audiences.

- Simple Content Management
- High Visibility
- Excellent Usability
**SIMPLE CONTENT MANAGEMENT**

**Embedded Content & Group Management**

The embedded Content and Group Management System allows you to edit and play content, schedule playlists and groups, and control Signage via remote control, mouse and mobile phone without the use of separate PC or software. This makes content management much easier and more user-friendly.

**SuperSign Control**

SuperSign Control is free, basic LG control software that can manage up to 100 displays through a single account and server. Power, volume, and scheduling can be remotely adjusted, and firmware updates supported.

**USB Data Cloning**

USB data cloning increases efficiency when managing multiple displays, since installers don’t have to set up each display one by one. Once installers copy data to a USB device from one display, it can be easily imported on other displays of the same model through the USB port.

*These images are provided for illustrative purposes, and the actual GUI may differ.
*All displays must be connected to the same network.
Real-Time Remote Monitoring

Malfunctions or errors can be easily handled through real-time remote care. When an error occurs, notifications can be sent via SNMP (Simple Network Management Protocol).

Easy Remote Power-On

WOL (Wake-on-LAN) enables users to turn on displays* by sending messages through the network.

* TV must be plugged into traditional AC power.
True Color, Immersive View

The large size and Ultra HD resolution of the UT640S series enhances the visibility of content and captivates viewers. The LG IPS panel provides a wide range of viewing angles so that content can be clearly seen, regardless of the viewer’s position. Each pixel in the IPS panel reproduces true-to-life colors without distorting images.

Amazing Picture Quality and Color

Enjoy Full HD content in 4K Ultra HD quality, optimized by the 4K Upscaler. The 4K upscaler automatically upgrades Full HD content to Ultra HD through several upscaling processes so that images look crisp and clear in any viewing situation. This LG TV can also express intense highlights, vivid colors, and deep black hues on the screen through HDR10.
Compatibility with AV Control Systems

The UT640S series has been certified Crestron Connected®, proving that it has a higher level of compatibility with professional AV controls. This results in seamless integration and automated control*, boosting business management efficiency.

DPM (Display Power Management)

Display Power Management (DPM) can be configured to only be On when there is a TV signal present to manage power more efficiently.

* Network-based control system. May differ by region.
DIMENSIONS

Commercial TV | UT640S Series

* Dimensions & Jack Panels (Rear/Side) may differ from the above images, so please contact LG sales team to verify before ordering.
* UT640S models ship with a 2 Pole stand (attachable feet). See also VESA spec for wall mounting.
* Dimensions & Jack Panels (Rear/Side) may differ from the above images, so please contact LG sales team to verify before ordering.
# Specifications

## Commercial TV | UT640S Series

### UT640S Series

<table>
<thead>
<tr>
<th></th>
<th>86UT640S</th>
<th>75UT640S</th>
<th>65UT640S</th>
<th>55UT640S</th>
<th>49UT640S</th>
<th>43UT640S</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Design</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stand Type</td>
<td>2 Pole</td>
<td>2 Pole</td>
<td>2 Pole</td>
<td>2 Pole</td>
<td>2 Pole</td>
<td>2 Pole</td>
</tr>
<tr>
<td>Front Color</td>
<td>Dark Matte Titan</td>
<td>Dark Matte Titan</td>
<td>Ceramic Black</td>
<td>Ceramic Black</td>
<td>Ceramic Black</td>
<td>Ceramic Black</td>
</tr>
<tr>
<td><strong>Display</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diagonal Class</td>
<td>86&quot;</td>
<td>75&quot;</td>
<td>65&quot;</td>
<td>55&quot;</td>
<td>49&quot;</td>
<td>43&quot;</td>
</tr>
<tr>
<td>Resolution</td>
<td>3840 x 2160 (UHD)</td>
<td>3840 x 2160 (UHD)</td>
<td>3840 x 2160 (UHD)</td>
<td>3840 x 2160 (UHD)</td>
<td>3840 x 2160 (UHD)</td>
<td>3840 x 2160 (UHD)</td>
</tr>
<tr>
<td>Brightness (nits)</td>
<td>350</td>
<td>350</td>
<td>400</td>
<td>400</td>
<td>400</td>
<td>300</td>
</tr>
<tr>
<td><strong>Broadcasting System</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Digital</td>
<td>NTSC / ATSC / clear QAM</td>
<td>NTSC / ATSC / clear QAM</td>
<td>NTSC / ATSC / clear QAM</td>
<td>NTSC / ATSC / clear QAM</td>
<td>NTSC / ATSC / clear QAM</td>
<td>NTSC / ATSC / clear QAM</td>
</tr>
<tr>
<td>Video</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HF (1.0 m / 0.1G)</td>
<td>Yes / Yes</td>
<td>Yes / Yes</td>
<td>Yes / Yes</td>
<td>Yes / Yes</td>
<td>Yes / Yes</td>
<td>Yes / Yes</td>
</tr>
<tr>
<td><strong>Audio</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Audio Output</td>
<td>10W + 10W</td>
<td>10W + 10W</td>
<td>10W + 10W</td>
<td>10W + 10W</td>
<td>10W + 10W</td>
<td>10W + 10W</td>
</tr>
<tr>
<td><strong>Mechanical</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>W x H x D / Weight (without stand)</td>
<td>76.5&quot; x 43.8&quot; x 3.7&quot; / 97.4 lbs</td>
<td>76.5&quot; x 43.8&quot; x 3.7&quot; / 97.4 lbs</td>
<td>76.5&quot; x 43.8&quot; x 3.7&quot; / 97.4 lbs</td>
<td>76.5&quot; x 43.8&quot; x 3.7&quot; / 97.4 lbs</td>
<td>76.5&quot; x 43.8&quot; x 3.7&quot; / 97.4 lbs</td>
<td>76.5&quot; x 43.8&quot; x 3.7&quot; / 97.4 lbs</td>
</tr>
<tr>
<td>W x H x D / Weight (with stand)</td>
<td>300 x 300</td>
<td>300 x 300</td>
<td>300 x 300</td>
<td>300 x 300</td>
<td>300 x 300</td>
<td>300 x 300</td>
</tr>
<tr>
<td><strong>Electrical</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Voltage</td>
<td>AC 120 V - 50 / 60 Hz</td>
<td>AC 120 V - 50 / 60 Hz</td>
<td>AC 120 V - 50 / 60 Hz</td>
<td>AC 120 V - 50 / 60 Hz</td>
<td>AC 120 V - 50 / 60 Hz</td>
<td>AC 120 V - 50 / 60 Hz</td>
</tr>
<tr>
<td>Power Consumption (Typical)</td>
<td>221W</td>
<td>180.3W</td>
<td>145W</td>
<td>104W</td>
<td>99.1W</td>
<td>99.1W</td>
</tr>
<tr>
<td>Standby Power</td>
<td>Under 0.5W</td>
<td>Under 0.5W</td>
<td>Under 0.5W</td>
<td>Under 0.5W</td>
<td>Under 0.5W</td>
<td>Under 0.5W</td>
</tr>
<tr>
<td><strong>Other</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Warranty</td>
<td>3 Year Parts and Labor</td>
<td>3 Year Parts and Labor</td>
<td>3 Year Parts and Labor</td>
<td>3 Year Parts and Labor</td>
<td>3 Year Parts and Labor</td>
<td>3 Year Parts and Labor</td>
</tr>
<tr>
<td>Accessories</td>
<td>S-Con Remote, 2.0m Built-in Power Cord</td>
<td>S-Con Remote, 2.0m Built-in Power Cord</td>
<td>S-Con Remote, 3.0m Built-in Power Cord</td>
<td>S-Con Remote, 3.0m Built-in Power Cord</td>
<td>S-Con Remote, 3.0m Built-in Power Cord</td>
<td>S-Con Remote, 3.0m Built-in Power Cord</td>
</tr>
<tr>
<td>UPC</td>
<td>719192633223</td>
<td>719192633216</td>
<td>719192633209</td>
<td>719192633103</td>
<td>719192633186</td>
<td>7191926331186</td>
</tr>
</tbody>
</table>

*Specifications are subject to change without notice, so please contact LG sales team to verify before ordering.*

---

http://www.facebook.com/LGCommercialDisplays  
http://www.youtube.com/LGCommercialDisplays  

Copyright 2020™ LG Electronics USA, Inc., 2000 Midbrook Drive Lincolnhurst, IL 60069, USA.  
All rights reserved. LG and the LG logo are registered trademarks of LG Corp. All other products and brand names are trademarks or registered trademarks of their respective companies.  
Designs, features, and specifications are subject to change without notice. All screen images are simulated.
LARGE FUSION MICRO-ADJUSTABLE FIXED WALL DISPLAY MOUNT

<table>
<thead>
<tr>
<th>Specifications</th>
<th>Data Sheet</th>
</tr>
</thead>
<tbody>
<tr>
<td>Certifications</td>
<td>UL Listed</td>
</tr>
<tr>
<td>Color</td>
<td>Black</td>
</tr>
<tr>
<td>Lateral Shift</td>
<td>44.1 cm</td>
</tr>
<tr>
<td>Manual Height Adjustment</td>
<td>2.5 cm</td>
</tr>
<tr>
<td>Minimum Depth</td>
<td>5.1 cm</td>
</tr>
<tr>
<td>Mounting Pattern Compatibility (Universal Versions)</td>
<td>100 x 100 mm - 880 x 400 mm</td>
</tr>
<tr>
<td>Orientation</td>
<td>Landscape</td>
</tr>
<tr>
<td>Overall Dimensions (HxWxD)</td>
<td>464 x 883 x 51 mm</td>
</tr>
<tr>
<td>Shipping Weight</td>
<td>8.8 kg</td>
</tr>
<tr>
<td>Solution Type</td>
<td>Universal</td>
</tr>
<tr>
<td>Typical Screen Sizes*</td>
<td>37 - 80&quot;</td>
</tr>
<tr>
<td>Weight Capacity</td>
<td>91 kg</td>
</tr>
</tbody>
</table>

*Always check compatibility with the Chief mountfinder on the Chief website.

SPECIFICATIONS

- 250mm post installation micro-zone height and levelling.
- Pull cord release system offsets the bottom of the display and mount 15 degrees
- Open wall plate design for mounting over electrical outlets
- Post installation lateral shift of minimum 44.1 cm lateral shift left and right
- Compatible accessories for media, camera and codec storage can be connected to the mount system.
- VESA compatible: 100 x 100 – 880 x 400
- Orientation: Landscape
- Overall Dimensions (HxWxD): 464 x 883 x 51 mm
- Weight capacity: 91 kg
- Color: Black
- Certifications: UL

RECOMMENDED ACCESSORIES

FCA112
Fits CPUs up to 41 mm thick behind Chief’s FUSION mounts

FCA800
20 cm wide shelf sits above or below display to hold AV components

FCA113
Holds a CPU or other components on the configurable shelf up to 13.6 kg

FCA801
35 cm wide shelf sits above or below display to hold AV components

*Always check compatibility with the Chief mountfinder on the Chief website.
CAD DRAWINGS / DESIGN ESSENTIALS

CAD Drawings, installation instructions, BIM files are online available at www.chiefmfg.com/design.

TECHNICAL DRAWINGS
Dimensions in mm.

MINIMUM WALL UPRIGHT SPACING

RAILS CAN BE SLID LEFT OR RIGHT FOR OFFSET
**FEATURES**

1. **ULTRA LOW PROFILE**
   Slender design collapses to 1.5” (38 mm), providing an ultra-low profile for all types of TVs, including LED, LCD and Plasma.

2. **EXTENDS UP TO 18” (457 mm)**
   Full extension maximizes viewing potential.

3. **CENTRIS’ LOW-PROFILE TILT**
   Provides up to 12˚ of effortless fingertip tilt to achieve optimal viewing angles.

4. **INTEGRATED CABLE MANAGEMENT**
   Enclosed, tool-less cable covers and a wide open wall plate make it easy to route power and signal cables, and connect to the wall for a seamless installation.

**SPECIFICATIONS**

<table>
<thead>
<tr>
<th>Feature</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Depth from Wall</td>
<td>1.5” (38 mm)</td>
</tr>
<tr>
<td>Extension</td>
<td>18” (457 mm)</td>
</tr>
<tr>
<td>Tilt</td>
<td>-12˚</td>
</tr>
<tr>
<td>Max Mounting Pattern (H,W)</td>
<td>7.87” (200 mm)</td>
</tr>
<tr>
<td>Color</td>
<td>Black</td>
</tr>
<tr>
<td>Weight Capacity</td>
<td>35 lbs (15.9 kg)</td>
</tr>
</tbody>
</table>

**WHAT YOU NEED TO KNOW**

**EASY INSTALLATION**

Adjustable depth and home positioning clicks when the TV is safely and securely against the wall.

**COMPATIBILITY**

Suitable for screens up to 5” (127 mm) deep. See MountFinder™ PRO at chiefmfg.com to ensure compatibility.

**OTHER PRODUCT OPTIONS**

- **TS110SU**
  10 - 32” Thinstall Single Stud Mount
  Extends 9.82” (250 mm)

**TECHNICAL DRAWINGS**

**RECOMMENDED ACCESSORIES**

- **TA110** Thinstall Series Component Shelf
  - Below and Above

- **TA502** In-Wall Accessory Box

For a complete list of Thinstall accessories see page 88 - 89.
24.25 [616.0]
MAX MOUNTING PATTERN

MIN MOUNTING PATTERN

5.56 [141.3]

5.32 [135.1]

4.25 [108.0]

6.37 [161.7]

5.38 [136.5]

26.81 [681.0]

0.50 [12.7]

5.90 [108.0]

3.95 [100.2]

15.75 [400.0]

16.50 [419.1]

7.94 [201.6]

THE INFORMATION AND DESIGNS CONTAINED IN THIS DRAWING ARE CONFIDENTIAL AND THE PROPRIETARY PROPERTY OF MILESTONE AV TECHNOLOGIES. NEITHER THIS DESIGN NOR ANY INFORMATION CONTAINED IN THIS DRAWING MAY BE REPRODUCED OR DISCLOSED TO OTHERS WITHOUT THE EXPRESS WRITTEN CONSENT OF MILESTONE AV TECHNOLOGIES.
Chief engineers talked to customers like you about in-wall boxes and your biggest headaches on the construction site. Then they designed all new in-wall boxes to solve those headaches with multiple depth and ordering options.

**IN-WALL BOX FEATURES**

- Break away edges to change box depth for 3.5” or 2.5” stud bays (89 or 64 mm)
- Separate and/or pre-configured ordering options for box, flange and cover to coincide with the timing of installation in the field, and at no additional MSRP or list pricing cost
- Ample space to hold big components such as commonly used video scalers
- Packaging that also serves as a wall template and temporary construction cover
- Easier knockouts to quickly customize the box to specific needs on site
- Integrated universal zip tie anchor points
- Cover includes breakaway knockouts for cable routing and ventilation as well as tamper proof security
- Black or white flanges and covers, paintable to blend with any environment
- In-wall boxes are stud mountable and can be mounted to drywall with the addition of optional flange
- Compatible with any Chief dual stud wall mount
ORDERING OPTIONS

You can order boxes, flanges and covers in various pre-configured combinations or separately at no additional MSRP or list pricing cost. You asked us to help provide you with the pieces you need, when you need them. You got it. See your ordering options below.

**PAC525 - 9 x 14.25 x 3.9” (229 x 362 x 99 mm)**

<table>
<thead>
<tr>
<th>Model</th>
<th>In-Wall Box</th>
<th>Black Flange</th>
<th>Black Cover</th>
<th>White Flange</th>
<th>White Cover</th>
</tr>
</thead>
<tbody>
<tr>
<td>PAC525</td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PAC525F</td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PAC525FW</td>
<td>x</td>
<td></td>
<td></td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>PAC525FC</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PAC525FCW</td>
<td>x</td>
<td></td>
<td>x</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>PAC525F-KIT</td>
<td></td>
<td></td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PAC525FW-KIT</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>PAC525CVR-KIT</td>
<td></td>
<td></td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PAC525CVRW-KIT</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>x</td>
</tr>
</tbody>
</table>

**PAC526 - 14.25 x 14.25 x 3.9” (362 x 362 x 99 mm)**

<table>
<thead>
<tr>
<th>Model</th>
<th>In-Wall Box</th>
<th>Black Flange</th>
<th>Black Cover</th>
<th>White Flange</th>
<th>White Cover</th>
</tr>
</thead>
<tbody>
<tr>
<td>PAC526</td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PAC526F</td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PAC526FW</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PAC526FC</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PAC526FCW</td>
<td>x</td>
<td></td>
<td>x</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>PAC526F-KIT</td>
<td></td>
<td></td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PAC526FW-KIT</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>PAC526CVR-KIT</td>
<td></td>
<td></td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PAC526CVRW-KIT</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>x</td>
</tr>
</tbody>
</table>

©2014 Milestone AV Technologies. 140069A 4/14 Chief is a registered trademark of Milestone AV Technologies. All other brand names or marks are used for identification purposes and are trademarks of their respective owners. All patents are protected under existing designations. Other patents pending.
RECOMMENDED ELECTRICAL BOX:
RACO 560 3" X 2" BOX, 2 3/4" DEEP
GANGLABLE OR EQUIVALENT.

RECOMMENDED ELECTRICAL BOX COVER:
RACO 864 SINGLE DUPLEX

TRADE CONDUIT SIZE 1-1/4"
METRIC CONDUIT SIZE 35mm

TRADE CONDUIT SIZE 1"
METRIC CONDUIT SIZE 27mm

TRADE CONDUIT SIZE 1/2"
METRIC CONDUIT SIZE 16mm

THE INFORMATION AND DESIGNS CONTAINED IN THIS DRAWING ARE CONFIDENTIAL AND THE PROPRIETARY PROPERTY OF MILESTONE AV TECHNOLOGIES. NEITHER THIS DESIGN NOR ANY INFORMATION CONTAINED IN THIS DRAWING MAY BE REPRODUCED OR DISCLOSED TO OTHERS WITHOUT THE EXPRESS WRITTEN CONSENT OF MILESTONE AV TECHNOLOGIES.
RECOMMENDED ELECTRICAL BOX:
RACO 560 3" X 2" BOX, 2 3/4" DEEP GANGLABLE OR EQUIVALENT.

RECOMMENDED ELECTRICAL BOX COVER: RACO 864 SINGLE DUPLEX
ERK SERIES RACK, 44 RU, 20"D

An economical standalone rack with solid sides, the ERK series can also be ganged to create partitioned multi-bay installations for thermal management control, future growth or other purposes. Seismic certified to protect your components.

- Fully welded construction for strength
- Enclosure sides include top and bottom venting
- Convenient lacing points and slotted rail brackets for cable management
- Standard front adjustable 10-32 threaded rackrail with numbered spaces
- Includes standard configurable rear door

GENERAL INFO

Finish: Textured Black Powder Coat
UL Standards Tested: UL2416

LISTING AGENCIES/THIRD PARTY CERTIFICATIONS

ASCE: 7-10
RoHS: No
Greenguard: Yes
UL Listing No: E173107

DIMENSIONS

Usable Depth: 18.47
Usable Height: 77.125
Panel Width: 19
An economical standalone rack with solid sides, the ERK series can also be ganged to create partitioned multi-bay installations for thermal management control, future growth or other purposes. Seismic certified to protect your components.

Fully welded construction for strength
Enclosure sides include top and bottom venting
Convenient lacing points and slotted rail brackets for cable management
Standard front adjustable 10-32 threaded rackrail with numbered spaces
Includes standard configurable rear door

GENERAL INFO
Finish: Textured Black Powder Coat
UL Standards Tested: UL2416

LISTING AGENCIES/THIRD PARTY CERTIFICATIONS
ASCE: 7-10
RoHS: No
Greenguard: Yes
UL Listing No: E173107

DIMENSIONS
Usable Depth: 18.47
Usable Height: 77.125
Panel Width: 19
Capacity Weight (US): 10000
Depth (US): 20
Height (US): 81.125
Width (US): 22
Rack Units: 44

TECHNICAL INFORMATION
Rackrail Type: 10-32
Seismic Load Capacity: 600
Static Load Capacity: 10000
UL Load Capacity: 2500
Material: Steel
Mounting: Horizontal
Seismic Rating: Yes
RACKMOUNT POWER, 9 OUTLET, 15A, BASIC SURGE

PD-915R

FEATURES & BENEFITS

- Rear distribution outlets with one front convenience outlet
- Includes surge and spike protection, as well as EMI filtering
- Occupies one rackspace
- 9 foot cord, with front power switch

SPECIFICATIONS

GENERAL INFO
Cable Type: Corded
Finish: Black Powder Coat
UL Standards Tested: 1419, 60950-1 & 60065
Termination: 5-15P
Surge Protected: Basic

ASSEMBLY/INSTALLATION INFORMATION
Mounting Points: 2

LISTING AGENCIES/THIRD PARTY CERTIFICATIONS
RoHS: Yes
Greenguard: Yes

DIMENSIONS
Depth (US): 9.625
Height (US): 1.75
Width (US): 19
Rack Units: 1
CORD INFORMATION
Cord Length US: 9

TECHNICAL INFORMATION
Amps: 15 Amps
Material: Steel
Mounting: Horizontal
Volts: 120
Number Of Circuits: 1
Number Of Outlets: 9
UQFP Series
ultra quiet fan panels

features:
- Quiet operation, 27dB at full speed for 4 fan models, 24dB at full speed for 2 fan models
- Overtemp and fan failure notification
- 100 CFM in 4 fan units, 50 CFM in 2 fan units
- Available with commercial and designer inspired aesthetic treatments
- Fan speeds proportional to temperature of enclosure to extend fan life, reduce dust and maintenance
- Model available with intake and exhaust units
- Temperature probe with 9’’ cord and wire ties included
- Compact design occupies only 2 rackspaces

specifications:
Model #s UQFP-2, UQFP-4
EIA compliant 19” Ultra Quiet Fan Panel shall be Middle Atlantic Products model # UQFP-__(2,4). Panel shall be constructed of 16-gauge steel, finished in a durable black powder coat and shall occupy 2 rackspaces. Fans shall activate at 81°F (27°C), reach full speed at 90°F (32°C) and switch off at 79°F (26°C). Fans shall displace ___CFM (50,100) with a maximum decibel level of ___ (24,27) dB (measurements made 1 meter from source, centered horizontally and vertically). Overtemp alarm set point shall be 100°F (37°C). Panel shall provide local status notification of power (green LED), fan speed (yellow LED) and overtemp (red LED). Fan LED light shall blink relative to fan speed. Rear, normally open dry switch closure shall provide overtemp alarm signal to compatible, customer supplied monitoring device. Fan panel shall be RoHS EU Directive 2002/95/EC compliant. Fan panel shall be manufactured by an ISO 9001 and ISO 14001 registered company. Fan panel shall be warranted to be free from defects in materials and workmanship under normal use and conditions for a period of 3 years. Panel shall include a UL Listed 5V DC power supply with 6’ cord and temperature probe with a 9’’ cord.

Model #s UQFP-2D, UQFP-4D (with display)
Model #s UQFP-2D, UQFP-4D (with display) shall be Middle Atlantic Products model # UQFP-__(2,4)D. Panel shall be constructed of 16-gauge steel, finished in a durable black powder coat and shall occupy 2 rackspaces. Fans shall activate at 81°F (27°C), reach full speed at 90°F (32°C) and switch off at 79°F (26°C). Fans shall displace ___CFM (50,100) with a maximum decibel level of ___ (24,27) dB (measurements made 1 meter from source, centered horizontally and vertically). Panel shall provide local status notification of power (green LED), fan speed (yellow LED) and overtemp (red LED). Fan LED light shall blink relative to fan speed. Rear, normally open dry switch closure shall provide overtemp alarm signal to compatible, customer supplied monitoring device. Overtemp alarm set point shall be user definable from 95°-115°F (35°-46°C). Unit shall remember settings when unplugged or during power outage. Front display shall provide notification of overtemp and fan fault conditions. Rear, normally open dry switch closure shall provide fan fault alarm signal to compatible, customer supplied monitoring device. Alarm set point button shall control Fahrenheit/Celsius setting and overtemp alarm threshold in 1-degree increments. Fan panel shall be RoHS EU Directive 2002/95/EC compliant. Fan panel shall be manufactured by an ISO 9001 and ISO 14001 registered company. Fan panel shall be warranted to be free from defects in materials and workmanship under normal use and conditions for a period of 3 years. Panel shall include a UL Listed 5V DC power supply with 6’ cord and temperature probe with a 9’’ cord.

Model #s UQFP-4RA, UQFP-4RA-I/O, UQFP-4DRA, UQFP-4RIS, UQFP-4RA-INT (Designer Inspired)
Model #s UQFP-4RA, UQFP-4RA-I/O, UQFP-4DRA, UQFP-4RIS, UQFP-4RA-INT (Designer Inspired) shall be Middle Atlantic Products model # UQFP-4RA, UQFP-4RA-I/O, UQFP-4DRA, UQFP-4RIS or UQFP-4RA-INT). UQFP-4RA-I/O shall include an intake and exhaust fan. UQFP-4RIS shall be intake only, and connect with an ethernet cable. Overtemp alarm output shall be normally open dry contact closure for use with customer supplied monitoring system. Unit shall remember settings when unplugged or during power outage. Fans shall activate at 81°F (27°C) and operate at speeds proportional to temperature inside enclosure. Fans shall displace 100 CFM with a maximum decibel level of 27dB (measurements made 1 meter from source, centered horizontally and vertically). Fan panel shall occupy two rackspaces. Chassis shall be constructed of 20-gauge steel with 16-gauge aluminum face. Fan panel shall provide local sensor fault notification (not available on UQFP-4RA or UQFP-4RA-I/O). Fan panel shall be RoHS EU Directive 2002/95/EC compliant. Fan panel shall be manufactured by an ISO 9001 and ISO 14001 registered company. Fan panel shall be warranted to be free from defects in materials and workmanship under normal use and conditions for a period of 3 years. Panel shall include a UL Listed 5V DC power supply with 6’ cord and temperature probe with a 9’’ cord.

Customizable specification clips available at middleatlantic.com

EIA/TIA COMPLIANT

Middle Atlantic Products
middleatlantic.com | middleatlantic.ca
96-01037 / rev g / 10-5-15
UQFP Series
basic dimensions

dimension in inches unless otherwise noted (all dimensions in brackets are in millimeters)

<table>
<thead>
<tr>
<th>Part #</th>
<th># of Fans</th>
<th>Local LED</th>
<th>Local Display Remote</th>
<th>Overtemp Notification</th>
<th>User Definable Overtemp Setting</th>
<th>Fan Failure Notification Local &amp; Remote Display</th>
<th>Sensor Fault Notification Local</th>
<th>Current Draw at 5 Volts DC</th>
<th>Airflow at Full Speed</th>
<th>dB level at Full Speed</th>
<th>Finish</th>
<th>Racking Height</th>
</tr>
</thead>
<tbody>
<tr>
<td>UQFP-2D</td>
<td>2</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>550 mA</td>
<td>50 CFM</td>
<td>24 dB</td>
<td>black powder coat</td>
<td>2 space</td>
</tr>
<tr>
<td>UQFP-2D</td>
<td>2</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>1.1 A</td>
<td>100 CFM</td>
<td>27 dB</td>
<td>black powder coat</td>
<td>2 space</td>
</tr>
<tr>
<td>UQFP-4</td>
<td>4</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>550 mA</td>
<td>50 CFM</td>
<td>24 dB</td>
<td>black powder coat</td>
<td>2 space</td>
</tr>
<tr>
<td>UQFP-4</td>
<td>4</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>1.1 A</td>
<td>100 CFM</td>
<td>27 dB</td>
<td>black powder coat</td>
<td>2 space</td>
</tr>
<tr>
<td>UQFP-4DRA</td>
<td>4</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>560 mA</td>
<td>100 CFM</td>
<td>27 dB</td>
<td>black brushed anodized</td>
<td>2 space</td>
</tr>
<tr>
<td>UQFP-4RA</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>510 mA</td>
<td>100 CFM</td>
<td>27 dB</td>
<td>black brushed anodized</td>
<td>2 space</td>
</tr>
<tr>
<td>UQFP-4RA-40</td>
<td>8</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1.1 A</td>
<td>100 CFM</td>
<td>30 dB</td>
<td>black brushed anodized</td>
<td>4 space</td>
</tr>
<tr>
<td>UQFP-4RA-INT*</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>560 mA</td>
<td>100 CFM</td>
<td>27 dB</td>
<td>black brushed anodized</td>
<td>2 space</td>
</tr>
<tr>
<td>UQFP-4RR*</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>510 mA</td>
<td>100 CFM</td>
<td>27 dB</td>
<td>black brushed anodized</td>
<td>2 space</td>
</tr>
</tbody>
</table>

*The UQFP-4RS is an intake panel and can only be used in conjunction with the UQFP-4RA and UQFP-4DRA
**UQFP-4RA-INT is a standalone intake unit without display (cannot be controlled by other models)
SLIDING RACKSHELF, 1 RU, LAMINATED

SSL |

FEATURES & BENEFITS

Filling just a single rackspace, SSL sliding shelf extends 11-3/8" on nylon roller slides equipped with positive-stop lockouts. A telescopic rear support mounts to any rack (rear rackrail required in steel racks). The shelf itself is made with an attractive black laminate material. NOTE: Fits in racks with a minimum 15-1/8" from front to rear rail.

- 35 lb. capacity, with 11-3/8" extension nylon roller slides
- Occupies one rackspace
- Adjustable rear support to mount in most racks (15.1” to 23.9” range)
- Steel construction with black laminate shelf

SPECIFICATIONS

GENERAL INFO

Finish: Black Laminate
UL Standards Tested: 1678

ASSEMBLY/INSTALLATION INFORMATION

Mounting Points: 4

LISTING AGENCIES/THIRD PARTY CERTIFICATIONS

RoHS: No
Greenguard: Yes

DIMENSIONS

Mounting Depth Max: 23.9
Mounting Depth Min: 15.1
Usable Depth: 13.75
Usable Width: 16
Filling just a single rackspace, SSL sliding shelf extends 11-3/8" on nylon roller slides equipped with positive-stop lockouts. A telescopic rear support mounts to any rack (rear rackrail required in steel racks). The shelf itself is made with an attractive black laminate material. NOTE: Fits in racks with a minimum 15-1/8" from front to rear rail.

---

**TECHNICAL INFORMATION**

Static Load Capacity: 200
Material: Steel

---

Capacity Weight (US): 35
Depth (US): 15.1
Height (US): 1.75
Width (US): 19
Rack Units: 1
EIA compliant 19” rackmount drawer shall be Middle Atlantic Products model # DX or TDX (X = # of rackspaces required, refer to chart). Drawer shall have an overall height of __” (refer to chart), and useable depth of 14-1/2”. Drawer base shall be 20-gauge steel, top and sides shall be 16-gauge steel. Drawer faceplate shall be .090” thick aluminum with a ____ (black brushed & anodized or black textured powder coat) finish (refer to chart). Drawer shall use full extension, ball bearing slides. Grommet shall be provided for safely passing cables through the cable entry point at the rear of the drawer on 2, 3 and 4 space models. 2, 3 and 4 space drawers shall include a no-slip drawer mat. Drawer shall have a 50 lb. weight capacity. Drawer shall be warranted to be free from defects in materials or workmanship under normal use and conditions for a period of three years. Drawer shall be UL Listed in the US and Canada. Drawer shall be RoHS EU Directive 2011/65/ EU compliant. Drawer shall be manufactured by an ISO 9001 and ISO 14001 registered company.

Customizable specification clips available at middleatlantic.com
D & TD Series

BASIC DIMENSIONS

All dimensions in inches unless otherwise noted [All dimensions in brackets are millimeters]

FRONT VIEW

SIDE VIEW

<table>
<thead>
<tr>
<th>Part #</th>
<th>Racking Height/ Rackspace</th>
<th>Finish</th>
</tr>
</thead>
<tbody>
<tr>
<td>D2</td>
<td>3.50 [89]/ 2 SP</td>
<td>black brushed &amp; anodized</td>
</tr>
<tr>
<td>D3</td>
<td>5.25 [133]/ 3 SP</td>
<td></td>
</tr>
<tr>
<td>D4</td>
<td>7.00 [178]/ 4 SP</td>
<td></td>
</tr>
<tr>
<td>D5</td>
<td>8.75 [222]/ 5 SP</td>
<td></td>
</tr>
<tr>
<td>TD2</td>
<td>3.50 [89]/ 2 SP</td>
<td>black textured power coat</td>
</tr>
<tr>
<td>TD3</td>
<td>5.25 [133]/ 3 SP</td>
<td></td>
</tr>
<tr>
<td>TD4</td>
<td>7.00 [178]/ 4 SP</td>
<td></td>
</tr>
<tr>
<td>TD5</td>
<td>8.75 [222]/ 5 SP</td>
<td></td>
</tr>
<tr>
<td>TD8FLK*</td>
<td>14.00 [356]/ 8 SP</td>
<td></td>
</tr>
</tbody>
</table>

*Includes file hanging kit and installed keylock

WHAT GREAT SYSTEMS ARE BUILT ON.”
FEATURES & BENEFITS

“Universal Face-After” shelves designed to mount small items conveniently in the front or rear of a rack while providing outstanding cable management and small device tie down points. These shelves feature the unique ability to mount a faceplate after the shelf is installed and populated, providing an attractive and secure covering.

- Universal Face-After design holds small items in front or rear of rack
- Accepts mounting of a covering faceplate after installation and population
- Steel construction with black powder coat finish
- Note: must be installed using standard 10-32 or 6mm rack screws into rackrail

SPECIFICATIONS

GENERAL INFO

Finish: Black
Component Type: Vertical Inside

ASSEMBLY/INSTALLATION INFORMATION

Mounting Points: 2

LISTING AGENCIES/THIRD PARTY CERTIFICATIONS

RoHS: Yes
Greenguard: Yes
DIMENSIONS
Capacity Weight (US): 25
Depth (US): 14.5
Height (US): 1.07
Width (US): 19
Rack Units: 1

TECHNICAL INFORMATION
Static Load Capacity: 25
Material: Steel
MATERIAL: 1/8" ALUMINUM
FINISH: BLACK POWDER COAT

CONNECTOR MOUNT: N/A
LABEL: N/A

LEAD TIME: 2 WEEKS
DRAWN BY: JM

REV 1

1 of 1
Blank Panels

Blank panels cover open areas on an installed rack face, providing a clean, professional appearance.

BL Series
- Highest Aesthetics
- Aluminum, Flanged Style
- Lightweight, Easy to Machine
- Available in 1 Through 4 Space Sizes
- 1/2 and 1/3 Space Blank Panels Also Available
- Black Brushed and Anodized Finish

EB/FEB Series
- Economical Steel Blank Panel
- Flat (FEB) or Flanged (EB) Styles
- 1/2 and 1/3 Space Blank Panels Also Available (EB style only)
- Available in 1 Through 6 Space Sizes
- Durable Black Powder Coat Finish

HBL Series
- Highest Aesthetics
- Aluminum
- Lightweight, Easy to Machine
- Available in 1 Through 4 Space Sizes
- Black Brushed and Anodized

PBL Series
- Lightweight, Easy to Machine
- Aluminum
- Flanged for Strength
- Available in 1 Through 4 Space Sizes
- Durable Black Powder Coat Finish
- Also available in 1/2 rack width (HRBL Series)
Blank Panels

Blank panels cover open areas on an installed rack face, providing a clean, professional appearance.

specifications:

Blank panels shall be Middle Atlantic Products model # __ (refer to chart). Blank panels shall be ___ rackspaces in height with a ___ finish (refer to chart). Blank panels shall be __” wide (refer to chart). Blank panels shall be constructed of aluminum (BL, PBL, HRBL, HBL, PHBL), or steel (FEB, EB, SB, WSB). Blank panels shall be manufactured by an ISO 9001 and ISO 14001 registered company. Blank panels shall be warrantied to be free from defects in material or workmanship under normal use and conditions for the lifetime of the panel.

™

what great systems are built on.
Blank Panels
basic dimensions

what great systems are built on.
## Blank Panels

**basic dimensions**

![Diagram of blank panels with dimensions and parts listed](image)

### Parts Dimensions

<table>
<thead>
<tr>
<th>PARTS</th>
<th>DIM &quot;A&quot;</th>
<th>DIM &quot;B&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>HBL1, PHBL1, FEB1</td>
<td>1.735 [44]</td>
<td>1.25 [32]</td>
</tr>
<tr>
<td>HBL2, PHBL2, FEB2</td>
<td>3.485 [89]</td>
<td>3.00 [76]</td>
</tr>
<tr>
<td>HBL3, PHBL3, FEB3</td>
<td>5.235 [133]</td>
<td>2.25 [57]</td>
</tr>
<tr>
<td>HBL4, PHBL4, FEB4</td>
<td>6.985 [177]</td>
<td>4.00 [10]</td>
</tr>
<tr>
<td>HBL5, FEB5</td>
<td>8.735 [222]</td>
<td>5.75 [146]</td>
</tr>
<tr>
<td>HBL6, FEB6</td>
<td>10.485 [266]</td>
<td>7.50 [191]</td>
</tr>
</tbody>
</table>

### Parts Finish

<table>
<thead>
<tr>
<th>PARTS</th>
<th>HBL</th>
<th>PHBL</th>
<th>FEB</th>
</tr>
</thead>
<tbody>
<tr>
<td>FINISH</td>
<td>BLACK BRUSHED &amp; ANODIZED</td>
<td>BLACK POWDER COAT</td>
<td>BLACK POWDER COAT</td>
</tr>
</tbody>
</table>

**Note:**

*Dimension format shown in inches [mm]*

---

**what great systems are built on.**

Middle Atlantic Products

middleatlantic.com | middleatlantic.ca

4
Technical Data Sheet
Communication Cables

PART NUMBER: 291

DESCRIPTION: 22/2 Stranded bare copper conductors, shielded with an overall jacket.

NEC RATING: CMR, NEC Article 800

APPROVALS: (UL) C(UL) Listed or c(ETL)us Listed


Construction Parameters:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conductor</td>
<td>22 AWG Bare Copper</td>
</tr>
<tr>
<td>Stranding</td>
<td>7x30</td>
</tr>
<tr>
<td>Insulation Material</td>
<td>Polypropylene</td>
</tr>
<tr>
<td>Insulation Thickness</td>
<td>0.007&quot; Nom.</td>
</tr>
<tr>
<td>Number of Conductors</td>
<td>2</td>
</tr>
<tr>
<td>Shield</td>
<td>100% Aluminum Polyester Foil</td>
</tr>
<tr>
<td>Drain</td>
<td>Stranded Tinned Copper</td>
</tr>
<tr>
<td>Jacket Material</td>
<td>PVC</td>
</tr>
<tr>
<td>Jacket Thickness</td>
<td>0.017&quot; Nom.</td>
</tr>
<tr>
<td>Overall Cable Diameter</td>
<td>0.127&quot; Nom.</td>
</tr>
<tr>
<td>Approximate Cable Weight</td>
<td>10.4 Lbs/1M' Nom.</td>
</tr>
<tr>
<td>Flame Rating</td>
<td>UL 1666 Riser Flame Test</td>
</tr>
</tbody>
</table>

Electrical & Environmental Properties:

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature Rating</td>
<td>-20°C To +60°C</td>
</tr>
<tr>
<td>Operating Voltage</td>
<td>300 V RMS</td>
</tr>
<tr>
<td>Max. Capacitance Between Conductors @ 1 KHz</td>
<td>34 pf/ft Nom.</td>
</tr>
<tr>
<td>Capacitance Between Conductors to Shield @ 1 KHz</td>
<td>67 pf/ft Nom.</td>
</tr>
<tr>
<td>DC Resistance per Conductor @ 20deg C</td>
<td>17 Ohms/1M' Nom.</td>
</tr>
<tr>
<td>Insulation Colors</td>
<td>Black, Red</td>
</tr>
<tr>
<td>Jacket Color</td>
<td>Gray, Black, Green, Brown, Orange, Red, Yellow, Violet, Blue</td>
</tr>
<tr>
<td>RoHS Compliant</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Mechanical Properties:

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max. Recommended Pull Tension</td>
<td>23.7 lbs.</td>
</tr>
<tr>
<td>Min. Bend Radius (Install)</td>
<td>1.3”</td>
</tr>
</tbody>
</table>

Specification Issue Date: 7/14

This document is the property of West Penn Wire. The information contained herein is considered Proprietary and not to be reproduced by any means Without written consent of West Penn Wire.

Standard Lengths are 1000ft. The Jacket is sequentially footmarked. The information presented here is, to the best of our knowledge, is true and accurate. However, since conditions of use are beyond our control, all recommendations or suggestions are presented without guarantee or responsibility on our part. We disclaim all liability in connection with the use of information contained herein or otherwise.
Product: **5100UP**

Audio Cable, 2 Conductor 14 AWG, BC, Unshielded, CM

**Product Description**

Commercial Audio Cable, Rated-CL3, 2-14 AWG highly flexible stranded bare copper conductors with PVC insulation, PVC jacket with ripcord

**Technical Specifications**

**Physical Characteristics (Overall)**

<table>
<thead>
<tr>
<th>Element</th>
<th>AWG</th>
<th>Stranding</th>
<th>Material</th>
<th>No. of Conductors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conductor(s)</td>
<td>14</td>
<td>42x30</td>
<td>BC - Bare Copper</td>
<td>2</td>
</tr>
<tr>
<td>Conductor Count</td>
<td></td>
<td></td>
<td></td>
<td>2</td>
</tr>
</tbody>
</table>

**Insulation**

<table>
<thead>
<tr>
<th>Element</th>
<th>Material</th>
<th>Nominal Wall Thickness</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conductor(s)</td>
<td>PVC - Polyvinyl Chloride</td>
<td>0.02 in</td>
</tr>
</tbody>
</table>

**Color Chart**

- Black
- White

**Outer Shield Material**

- No Shield

**Outer Jacket Material**

<table>
<thead>
<tr>
<th>Material</th>
<th>Nominal Diameter</th>
<th>Nominal Wall Thickness</th>
<th>Ripcord</th>
</tr>
</thead>
<tbody>
<tr>
<td>PVC - Polyvinyl Chloride</td>
<td>0.266 in</td>
<td>0.018 in</td>
<td>Yes</td>
</tr>
</tbody>
</table>

**Construction and Dimensions**

**Cabling**

- Twists: 3.4 twist/ft

**Electrical Characteristics**

**Conductor DCR**

<table>
<thead>
<tr>
<th>Nominal Conductor DCR</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.42 Ohm/1000ft</td>
</tr>
</tbody>
</table>

**Capacitance**

<table>
<thead>
<tr>
<th>Nom. Capacitance Conductor to Conductor</th>
</tr>
</thead>
<tbody>
<tr>
<td>29 pF/ft</td>
</tr>
</tbody>
</table>

**Inductance**

| Nominal Inductance |
0.17 \mu\text{H/ft}

**Current**

**Max. Recommended Current [A]**
22 Amps per conductor @ 25°C

**Voltage**

**UL Voltage Rating**
300 V RMS

**Temperature Range**

UL Temp Rating: 75°C
Operating Temp Range: -20°C to +75°C

**Mechanical Characteristics**

Bulk Cable Weight: 39 lbs/1000ft
Max Recommended Pulling Tension: 109.2 lbs
Min Bend Radius/Minor Axis: 2.625 in

**Standards**

NEC/(UL) Specification: CL3
CPR Euroclass: Eca

**Applicable Environmental and Other Programs**

Environmental Space: Indoor (Not Riser or Plenum)
EU Directive 2003/96/EC (BFR): Yes
EU Directive 2011/65/EU (ROHS II): Yes
EU Directive 2012/19/EU (WEEE): Yes
EU CE Mark: Yes
EU RoHS Compliance Date (yyyy-mm-dd): 2005-04-01
Mill Order #39 (China RoHS): Yes

**Flammability, LS0H, Toxicity Testing**

UL Flammability: UL1685 UL Loading
ISO/IEC Flammability: IEC 60332-1-2
UL voltage rating: 300 V RMS

**Plenum/Non-Plenum**

Plenum (Y/N): No

**Part Number**

<table>
<thead>
<tr>
<th>Item #</th>
<th>Color</th>
<th>Putup Type</th>
<th>Length</th>
<th>UPC</th>
</tr>
</thead>
<tbody>
<tr>
<td>5100UP 010500</td>
<td>Black</td>
<td>Reel</td>
<td>500 ft</td>
<td>612825156529</td>
</tr>
<tr>
<td>5100UP 010U500</td>
<td>Black</td>
<td>UnReel</td>
<td>500 ft</td>
<td>612825433484</td>
</tr>
<tr>
<td>5100UP 0101000</td>
<td>Black</td>
<td>Reel</td>
<td>1,000 ft</td>
<td>612825156550</td>
</tr>
<tr>
<td>5100UP 010U1000</td>
<td>Black</td>
<td>UnReel</td>
<td>1,000 ft</td>
<td>612825156536</td>
</tr>
<tr>
<td>5100UP 010Z1000</td>
<td>Black</td>
<td>ReelTuff Box</td>
<td>1,000 ft</td>
<td>612825156611</td>
</tr>
<tr>
<td>5100UP 008U500</td>
<td>Gray</td>
<td>UnReel</td>
<td>500 ft</td>
<td>612825156505</td>
</tr>
<tr>
<td>5100UP 0081000</td>
<td>Gray</td>
<td>Reel</td>
<td>1,000 ft</td>
<td>612825156451</td>
</tr>
<tr>
<td>5100UP 008U1000</td>
<td>Gray</td>
<td>UnReel</td>
<td>1,000 ft</td>
<td>612825156468</td>
</tr>
<tr>
<td>5100UP 005500</td>
<td>Green, Dark</td>
<td>Reel</td>
<td>500 ft</td>
<td>612825156413</td>
</tr>
<tr>
<td>5100UP 005U500</td>
<td>Green, Dark</td>
<td>UnReel</td>
<td>500 ft</td>
<td>612825156475</td>
</tr>
<tr>
<td>5100UP 0051000</td>
<td>Green, Dark</td>
<td>Reel</td>
<td>1,000 ft</td>
<td>612825156444</td>
</tr>
<tr>
<td>5100UP 005U1000</td>
<td>Green, Dark</td>
<td>UnReel</td>
<td>1,000 ft</td>
<td>612825156420</td>
</tr>
<tr>
<td>5100UP 009500</td>
<td>White</td>
<td>Reel</td>
<td>500 ft</td>
<td>612825156482</td>
</tr>
<tr>
<td>5100UP 009U500</td>
<td>White</td>
<td>UnReel</td>
<td>500 ft</td>
<td>612825156543</td>
</tr>
<tr>
<td>5100UP 0091000</td>
<td>White</td>
<td>Reel</td>
<td>1,000 ft</td>
<td>612825156512</td>
</tr>
</tbody>
</table>
General Description:
Commercial Audio Cable, Rated-CM, 2-16 AWG highly flexible stranded bare copper conductors with PVC insulation, PVC jacket with ripcord

Physical Characteristics (Overall)

<table>
<thead>
<tr>
<th>Conductor</th>
<th>AWG:</th>
</tr>
</thead>
<tbody>
<tr>
<td># Conductors</td>
<td>AWG</td>
</tr>
<tr>
<td>2</td>
<td>16</td>
</tr>
</tbody>
</table>

Total Number of Conductors: 2

Insulation

<table>
<thead>
<tr>
<th>Insulation Material</th>
<th>Wall Thickness (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>PVC - Polyvinyl Chloride</td>
<td>0.381</td>
</tr>
</tbody>
</table>

Outer Shield

<table>
<thead>
<tr>
<th>Outer Shield Material</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unshielded</td>
</tr>
</tbody>
</table>

Outer Jacket

<table>
<thead>
<tr>
<th>Outer Jacket Material</th>
<th>Nom. Wall Thickness (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>PVC - Polyvinyl Chloride</td>
<td>0.381</td>
</tr>
</tbody>
</table>

Outer Jacket Ripcord: Yes

Overall Cable

<table>
<thead>
<tr>
<th>Overall Cabling Lay Length &amp; Direction:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length (mm)</td>
</tr>
<tr>
<td>69.849725</td>
</tr>
</tbody>
</table>

Overall Cabling Color Code Chart:

<table>
<thead>
<tr>
<th>Color</th>
</tr>
</thead>
<tbody>
<tr>
<td>Black</td>
</tr>
<tr>
<td>White</td>
</tr>
</tbody>
</table>

Overall Nominal Diameter: 5.283 mm

Mechanical Characteristics (Overall)

<table>
<thead>
<tr>
<th>Operating Temperature Range:</th>
</tr>
</thead>
<tbody>
<tr>
<td>-20°C To +75°C</td>
</tr>
</tbody>
</table>

UL Temperature Rating: 75°C

<table>
<thead>
<tr>
<th>Bulk Cable Weight:</th>
</tr>
</thead>
<tbody>
<tr>
<td>38.247 Kg/Km</td>
</tr>
</tbody>
</table>

Max. Recommended Pulling Tension: 289.133 N

Min. Bend Radius/Minor Axis: 50.800 mm

Applicable Specifications and Agency Compliance (Overall)

| Applicable Standards & Environmental Programs |
5200UP Multi-Conductor - Commercial Audio Systems - 2 Conductors Cabled

**NEC/(UL) Specification:** CM

**EU Directive 2011/65/EU (ROHS II):** Yes

**EU CE Mark:** Yes

**EU Directive 2000/53/EC (ELV):** Yes

**EU Directive 2002/95/EC (RoHS):** Yes

**EU RoHS Compliance Date (mm/dd/yyyy):** 04/01/2005

**EU Directive 2002/96/EC (WEEE):** Yes

**EU Directive 2003/11/EC (BFR):** Yes

**CA Prop 65 (CJ for Wire & Cable):** Yes

**MII Order #39 (China RoHS):** Yes

**Flame Test**

**UL Flame Test:** UL1685 UL Loading

**Plenum/Non-Plenum**

**Plenum (Y/N):** No

**Electrical Characteristics (Overall)**

**Nom. Inductance:**

| Inductance (µH/m) | 0.52496 |

**Nom. Capacitance Conductor to Conductor:**

| Capacitance (pF/m) | 98.43 |

**Nom. Conductor DC Resistance:**

| DCR @ 20°C (Ohm/km) | 13.2881 |

**Max. Operating Voltage - UL:**

| Voltage | 300 V RMS |

**Max. Recommended Current:**

| Current | 15.7 Amps per conductor @ 26°C |

**Put Ups and Colors:**

<table>
<thead>
<tr>
<th>Item #</th>
<th>Putup</th>
<th>Ship Weight</th>
<th>Color</th>
<th>Notes</th>
<th>Item Desc</th>
</tr>
</thead>
<tbody>
<tr>
<td>5200UP D16U1000</td>
<td>1,000 FT</td>
<td>29.000 LB</td>
<td>BLUE</td>
<td></td>
<td>2 #16 PVC FRPVC</td>
</tr>
<tr>
<td>5200UP D15U500</td>
<td>500 FT</td>
<td>15.000 LB</td>
<td>BLUE</td>
<td></td>
<td>2 #16 PVC FRPVC</td>
</tr>
<tr>
<td>5200UP D15Z1000</td>
<td>1,000 FT</td>
<td>30.000 LB</td>
<td>BLUE</td>
<td></td>
<td>2 #16 PVC FRPVC</td>
</tr>
<tr>
<td>5200UP D151000</td>
<td>1,000 FT</td>
<td>28.000 LB</td>
<td>BLUE</td>
<td></td>
<td>2 #16 PVC FRPVC</td>
</tr>
<tr>
<td>5200UP D15500</td>
<td>500 FT</td>
<td>14.500 LB</td>
<td>BLUE</td>
<td></td>
<td>2 #16 PVC FRPVC</td>
</tr>
<tr>
<td>5200UP 005500</td>
<td>500 FT</td>
<td>14.500 LB</td>
<td>GREEN, DARK</td>
<td></td>
<td>2 #16 PVC FRPVC</td>
</tr>
<tr>
<td>5200UP 008U1000</td>
<td>1,000 FT</td>
<td>29.000 LB</td>
<td>GRAY</td>
<td></td>
<td>2 #16 PVC FRPVC</td>
</tr>
<tr>
<td>5200UP 008U500</td>
<td>500 FT</td>
<td>15.000 LB</td>
<td>GRAY</td>
<td></td>
<td>2 #16 PVC FRPVC</td>
</tr>
<tr>
<td>5200UP 008Z1000</td>
<td>1,000 FT</td>
<td>30.000 LB</td>
<td>GRAY</td>
<td></td>
<td>2 #16 PVC FRPVC</td>
</tr>
<tr>
<td>5200UP 0081000</td>
<td>1,000 FT</td>
<td>28.000 LB</td>
<td>GRAY</td>
<td></td>
<td>2 #16 PVC FRPVC</td>
</tr>
<tr>
<td>5200UP 009U1000</td>
<td>1,000 FT</td>
<td>29.000 LB</td>
<td>WHITE</td>
<td></td>
<td>2 #16 PVC FRPVC</td>
</tr>
<tr>
<td>5200UP 009U500</td>
<td>500 FT</td>
<td>15.000 LB</td>
<td>WHITE</td>
<td></td>
<td>2 #16 PVC FRPVC</td>
</tr>
<tr>
<td>5200UP 009Z1000</td>
<td>1,000 FT</td>
<td>30.000 LB</td>
<td>WHITE</td>
<td></td>
<td>2 #16 PVC FRPVC</td>
</tr>
<tr>
<td>5200UP 0091000</td>
<td>1,000 FT</td>
<td>28.000 LB</td>
<td>WHITE</td>
<td></td>
<td>2 #16 PVC FRPVC</td>
</tr>
<tr>
<td>5200UP 010U1000</td>
<td>1,000 FT</td>
<td>29.000 LB</td>
<td>BLACK</td>
<td></td>
<td>2 #16 PVC FRPVC</td>
</tr>
<tr>
<td>5200UP 010U500</td>
<td>500 FT</td>
<td>15.000 LB</td>
<td>BLACK</td>
<td></td>
<td>2 #16 PVC FRPVC</td>
</tr>
<tr>
<td>5200UP 010Z1000</td>
<td>1,000 FT</td>
<td>30.000 LB</td>
<td>BLACK</td>
<td></td>
<td>2 #16 PVC FRPVC</td>
</tr>
<tr>
<td>5200UP 0101000</td>
<td>1,000 FT</td>
<td>28.000 LB</td>
<td>BLACK</td>
<td></td>
<td>2 #16 PVC FRPVC</td>
</tr>
</tbody>
</table>
## Detailed Specifications & Technical Data

### METRIC MEASUREMENT VERSION

#### 5200UP Multi-Conductor - Commercial Audio Systems - 2 Conductors Cabled

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>5200UP 010500</td>
<td>500 FT</td>
</tr>
<tr>
<td>14.500 LB</td>
<td>BLACK</td>
</tr>
<tr>
<td>C</td>
<td></td>
</tr>
<tr>
<td>2 #16 PVC FRPVC</td>
<td></td>
</tr>
</tbody>
</table>

**Notes:**

C = CRATE REEL PUT-UP.

Revision Number: 1      Revision Date: 03-13-2013

© 2019 Belden, Inc
All Rights Reserved.

Although Belden makes every reasonable effort to ensure their accuracy at the time of this publication, information and specifications described herein are subject to error or omission and to change without notice, and the listing of such information and specifications does not ensure product availability.

Belden provides the information and specifications herein on an "AS IS" basis, with no representations or warranties, whether express, statutory or implied. In no event will Belden be liable for any damages (including consequential, indirect, incidental, special, punitive, or exemplary damages) whatsoever, even if Belden has been advised of the possibility of such damages, whether in an action under contract, negligence or any other theory, arising out of or in connection with the use, or inability to use, the information or specifications described herein.

All sales of Belden products are subject to Belden's standard terms and conditions of sale.

Belden believes this product to be in compliance with EU RoHS (Directive 2002/95/EC, 27-Jan-2003). Material manufactured prior to the compliance date may be in stock at Belden facilities and in our Distributor's inventory. The information provided in this Product Disclosure, and the identification of materials listed as reportable or restricted within the Product Disclosure, is correct to the best of Belden’s knowledge, information, and belief at the date of its publication. The information provided in this Product Disclosure is designed only as a general guide for the safe handling, storage, and any other operation of the product itself or the one that it becomes a part of. This Product Disclosure is not to be considered a warranty or quality specification. Regulatory information is for guidance purposes only. Product users are responsible for determining the applicability of legislation and regulations based on their individual usage of the product.

Belden declares this product to be in compliance with EU LVD (Low Voltage Directive 2014/35/EU).
## Product Detail:

<table>
<thead>
<tr>
<th>Manufacturer</th>
<th>Berk-Tek</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manufacturer #</td>
<td>5EP4P24-BL-P-BER-AP</td>
</tr>
<tr>
<td>Cable Type</td>
<td>Indoor</td>
</tr>
<tr>
<td>Color</td>
<td>Blue</td>
</tr>
<tr>
<td>Category</td>
<td>Cat 5e</td>
</tr>
<tr>
<td>UNSPSC</td>
<td>26121609</td>
</tr>
<tr>
<td>Alternate Manufacturer Part No.</td>
<td>10032227</td>
</tr>
<tr>
<td>Flammability Rating</td>
<td>Plenum</td>
</tr>
</tbody>
</table>

## Product Overview:

Blue Hyper Plus 5e plenum 4-pair UTP cable.
- Supports most data and voice applications
- 24 AWG bare copper wire insulated with thermoplastic
- Characterized to 350 MHz, 250 MHz greater than the standard
- Universally accepted design for global commercial network installations
<table>
<thead>
<tr>
<th>24 AWG</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flame-Retardant PVC</td>
</tr>
<tr>
<td>4</td>
</tr>
<tr>
<td>Non-Shielded</td>
</tr>
<tr>
<td>1000 Foot Box</td>
</tr>
<tr>
<td>EAR99</td>
</tr>
<tr>
<td>US - USA</td>
</tr>
</tbody>
</table>
# Material List

<table>
<thead>
<tr>
<th>Material Description</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Camera A: Indoor Outdoor Wide Fixed – Advidia E-37-V</td>
<td>19</td>
</tr>
<tr>
<td>Camera B: Outdoor Indoor Fixed – Advidia A-37-FW</td>
<td>5</td>
</tr>
<tr>
<td>Camera C: Indoor 360 – Axis P3717</td>
<td>8</td>
</tr>
<tr>
<td>Wall mount Arm for Camera B – Advidia A-MD-WM</td>
<td>5</td>
</tr>
<tr>
<td>Flush Mount for Camera A – Advidia E-B200-FM</td>
<td>19</td>
</tr>
<tr>
<td>Surge Suppressor for outdoor camera – Ditek – MRJ-POE</td>
<td>5</td>
</tr>
<tr>
<td>Ethernet over Coax kit - Axis T8640 – 5026-401</td>
<td>1</td>
</tr>
</tbody>
</table>
**Overview**
- 3 megapixel resolution
- H.264 & MJPEG dual-stream encoding
- WDR with Day/Night (ICR), 3DNR, AWB, AGC, BLC
- 2.7-12mm Auto focus motorized lens
- 3-axis positioning
- IP67, IK10, PoE
- Micro SD card slot, up to 128GB
- IR LEDs Length 30m
- Video Insight VMS License Included

**Technical Specifications**

<table>
<thead>
<tr>
<th>Device</th>
<th>1/3” 3Megapixel progressive scan CMOS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scanning System</td>
<td>Progressive</td>
</tr>
<tr>
<td>Electronic Shutter Speed</td>
<td>Auto/Manual, 1/3(4)~1/100000s</td>
</tr>
<tr>
<td>Min. Illumination</td>
<td>0. 1Lux/F1.4 (Color), 0Lux/F1.4(IR on)</td>
</tr>
<tr>
<td>Wide Dynamic Range</td>
<td>WDR (&gt;50dB)</td>
</tr>
<tr>
<td>3-Axis</td>
<td>Yes</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Camera Features</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Max. IR LEDs Length</td>
<td>30m</td>
</tr>
<tr>
<td>Day/Night</td>
<td>Auto(ICR)/Color/B/W</td>
</tr>
<tr>
<td>Backlight Compensation</td>
<td>BLC / HLC / DWDR</td>
</tr>
<tr>
<td>White Balance /Gain Control</td>
<td>Auto/Manual</td>
</tr>
<tr>
<td>Noise Reduction</td>
<td>3D</td>
</tr>
<tr>
<td>Privacy Masking</td>
<td>Up to 4 areas</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Lens</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Focal Length</td>
<td>2.7mm~12mm F1.4 : H: 92°~28°</td>
</tr>
<tr>
<td>Focus</td>
<td>Auto</td>
</tr>
<tr>
<td>Lens Type</td>
<td>Motorized/Fixed Iris</td>
</tr>
<tr>
<td>Mount Type</td>
<td>Board-in Type</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Video</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Compression</td>
<td>H.264, MJPEG, MPEG4</td>
</tr>
<tr>
<td>Resolution</td>
<td>3M(2304x1296) 2M(1920x1080) 1.3MP (1280x960) 3M &amp; 2MP/1080P(20fps) (1.3MP/25/30fps)</td>
</tr>
</tbody>
</table>
## Technical Specifications

### Network

<table>
<thead>
<tr>
<th>Feature</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ethernet</td>
<td>RJ-45 (10/100Base-T)</td>
</tr>
<tr>
<td>Wi-Fi</td>
<td>NO</td>
</tr>
<tr>
<td>Compatibility</td>
<td>ONVIF, CGI</td>
</tr>
</tbody>
</table>

### Interface

<table>
<thead>
<tr>
<th>Feature</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Memory Slot</td>
<td>Micro SD slot: up to (128GB)</td>
</tr>
<tr>
<td>RS485</td>
<td>N/A</td>
</tr>
<tr>
<td>Alarm</td>
<td>Motion detection</td>
</tr>
</tbody>
</table>

### General

<table>
<thead>
<tr>
<th>Feature</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power Supply</td>
<td>DC12V, PoE (802.3af)</td>
</tr>
<tr>
<td>Power Consumption</td>
<td>&lt;8.5W</td>
</tr>
<tr>
<td>Working Environment</td>
<td>-30°C~+60°C, Less than 95% RH</td>
</tr>
<tr>
<td>Ingress Protection</td>
<td>IP67</td>
</tr>
<tr>
<td>Vandal Resistance</td>
<td>IK10</td>
</tr>
<tr>
<td>Dimensions</td>
<td>Ø122mm×89mm</td>
</tr>
<tr>
<td>Weight</td>
<td>0.5kg</td>
</tr>
<tr>
<td>Audio</td>
<td>NO</td>
</tr>
<tr>
<td>Warranty</td>
<td>4 Year Advanced Replacement</td>
</tr>
</tbody>
</table>

### Accessories

<table>
<thead>
<tr>
<th>Accessory</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>E-A137-JB</td>
<td></td>
</tr>
<tr>
<td>E-B200-FM</td>
<td></td>
</tr>
<tr>
<td>E-B203-WM</td>
<td></td>
</tr>
<tr>
<td>E-A152-PM</td>
<td></td>
</tr>
<tr>
<td>E-A152-CM</td>
<td></td>
</tr>
</tbody>
</table>

Replaced by model E-46-V per email coordination with UNT.
Overview
- 3 megapixel resolution
- 3D DNR
- WDR of 120dB
- PoE (Power over Ethernet)
- IR Range up to 30m
- Weather Proof Rating: IP67
- Analytics: Line Cross & intrusion detection
- Vandal Proof: IK 10 Rated
- Built-in Micro SD card slot
- Video Insight VMS license included

Technical Specifications

<table>
<thead>
<tr>
<th>Device</th>
<th>1/3&quot; Progressive Scan CMOS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Image Sensor</td>
<td></td>
</tr>
<tr>
<td>Min Illumination</td>
<td>0.01 lux@F1.2: AGC ON</td>
</tr>
<tr>
<td>Shutter Time</td>
<td>1/30s ~ 1/100,000s</td>
</tr>
<tr>
<td>Lens</td>
<td>2.8mm @ F2.0</td>
</tr>
<tr>
<td>Wide Dynamic Range</td>
<td>WDR 120dB</td>
</tr>
<tr>
<td>Angle of View</td>
<td>106°</td>
</tr>
<tr>
<td>Lens Mount</td>
<td>M12</td>
</tr>
<tr>
<td>Angle Adjustment</td>
<td>Pan: 0° ~ 355°, tilt: 0° ~ 75°</td>
</tr>
<tr>
<td>3-Axis Adjustment</td>
<td>Yes</td>
</tr>
<tr>
<td>Day &amp; Night</td>
<td>IR cut filter with auto switch</td>
</tr>
<tr>
<td>Compression Standard</td>
<td></td>
</tr>
<tr>
<td>Video Compression</td>
<td>H.264, MJPEG, H.264+</td>
</tr>
<tr>
<td>Bit Rate</td>
<td>32 Kbps</td>
</tr>
<tr>
<td>Dual Stream</td>
<td>Yes</td>
</tr>
<tr>
<td>Analytics</td>
<td>Line Cross and Intrusion detection</td>
</tr>
</tbody>
</table>

Image
- Max. Image Resolution: 2304 × 1296
- Frame Rate: 20fps(2304×1296),25fps(1920×1080), 25fps(1280×720)
- ROI Codec: Supported
- Image Setting: BLC, Rotate Mode, Saturation, Brightness, Contrast, Sharpness adjustable by VI software or Camera Firmware

Network
- Alarm Trigger: Tampering alarm, Network disconnect, IP address conflict, Storage exception
- Protocols: TCP/IP, HTTP, DHCP, DNS, DDNS, RTP, RTSP, PPPoE, SMTP, NTP, SNMP, HTTPS, FTP, 802.1x, Qos (SIP, SRTP, IPv6, Bonjour)
- Security: User authentication, watermark

Interface
- Communication Interface: 1 RJ45 10 M/100 M Ethernet interface
- System Compatibility: ONVIF, PSIA
- Local Storage: Built-in Micro SD card slot, up to 256GB

General
- Operating Conditions: -22° F ~ 140° F (-30°C ~ 60°C) Humidity 95% or less
- Power Consumption: MAX: 5 W
<table>
<thead>
<tr>
<th>Technical Specifications</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Impact Protection</td>
<td>IK10</td>
</tr>
<tr>
<td>Power Supply</td>
<td>12 VDC ± 25%, PoE (802.3af)</td>
</tr>
<tr>
<td>IR Range</td>
<td>65-98 ft (20-30 meters)</td>
</tr>
<tr>
<td>Dimensions</td>
<td>Φ111 × 82 (4.4&quot; × 3.2&quot;)</td>
</tr>
<tr>
<td>Weight</td>
<td>1.3 lbs (600g)</td>
</tr>
<tr>
<td>Software</td>
<td>Includes Video Insight VMS License</td>
</tr>
<tr>
<td>Warranty</td>
<td>4 Year Advanced Replacement</td>
</tr>
<tr>
<td>Accessories</td>
<td></td>
</tr>
<tr>
<td>A-MD-ICM</td>
<td></td>
</tr>
<tr>
<td>A-MD-WM</td>
<td></td>
</tr>
<tr>
<td>A-MWM-Mini</td>
<td></td>
</tr>
<tr>
<td>A-34-Cap Metal</td>
<td></td>
</tr>
<tr>
<td>A-MD-GBA</td>
<td></td>
</tr>
<tr>
<td>A-Pole Mount</td>
<td></td>
</tr>
</tbody>
</table>

Replaced by model E-46-V per email coordination with UNT
Overview

- 4-megapixel resolution
- H.265 & H.264
- WDR of 120dB
- PoE (Power over Ethernet)
- Weather Proof Rating: IP67
- Analytics: Line Cross & intrusion detection
- Vandal Proof: IK 10 Rated
- Built-in Micro SD card slot
- Video Insight VMS license included

Technical Specifications

<table>
<thead>
<tr>
<th>Device</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Image Sensor:</td>
<td>1/3” Progressive Scan CMOS</td>
</tr>
<tr>
<td>Min Illumination:</td>
<td>0.03 lux@F1.4; Color</td>
</tr>
<tr>
<td>Shutter Time:</td>
<td>1/30s ~ 1/100,000s</td>
</tr>
<tr>
<td>Lens:</td>
<td>2.7-13.5mm</td>
</tr>
<tr>
<td>Wide Dynamic Range:</td>
<td>WDR 120dB</td>
</tr>
<tr>
<td>Angle of View:</td>
<td>H:104° - 28°, V:55° - 16°</td>
</tr>
<tr>
<td>Lens Mount:</td>
<td>Auto Focus Vari-Focal</td>
</tr>
<tr>
<td>Angle Adjustment:</td>
<td>0 to +355 deg (pan)</td>
</tr>
<tr>
<td>3-Axis Adjustment:</td>
<td>Yes</td>
</tr>
<tr>
<td>Day &amp; Night:</td>
<td>IR cut filter with auto switch + IR</td>
</tr>
</tbody>
</table>

Compression Standard

- Video Compression: H.265, H.264+, H.264
- Bit Rate: H.264: 24~9472Kbps H.265: 14~5632Kbps
- Dual-Stream: Yes
- Analytics: Line Cross and Intrusion detection

Image

- Max. Image Resolution: 2688 x 1520
- Frame Rate: 20fps @ 60Hz (2688 x 1520)
- ROI Codec: Supported
- Image Setting: BLC, Rotate Mode, Saturation, Brightness, Contrast, Sharpness adjustable by VI software or Camera Firmware

Network

- Alarm Channels: 1 channel In: 5mA 5VDC
  1 channel Out: 300mA 12VDC
- Protocols: HTTP; HTTPS; TCP; ARP; RTSP; RTP; UDP; SMTP; FTP; DHCP; DNS; DDNS; PPPoE; IPv6/4; QoS; UPnP; NTP; Bonjour; 802.1x; Multicast; ICMP; IGMP; SNMP
- Audio: 0 Channel In/ 0 Channel out

Interface

- Communication Interface: 1 RJ45 10/100 Base T Ethernet interface
- System Compatibility: ONVIF, PSIA, CGI
- Local Storage: Built-in Micro SD card slot, up to 128GB

General

- Operating Conditions: -22° F ~ 140° F (-30°C ~ 60°C) Humidity 95% or less
- Power Consumption: MAX: <9W
## Technical Specifications

<table>
<thead>
<tr>
<th>Feature</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Impact Protection</td>
<td>IK10</td>
</tr>
<tr>
<td>Power Supply</td>
<td>DC12V, AC24V, PoE (802.3af)(Class 0) P.I.U (&lt;6.5W)</td>
</tr>
<tr>
<td>Dimensions</td>
<td>φ122mm×88.9mm(4.80”x3.50”)</td>
</tr>
<tr>
<td>Weight</td>
<td>1.19lbs (0.54kg)</td>
</tr>
<tr>
<td>Software</td>
<td>Includes Video Insight VMS License</td>
</tr>
<tr>
<td>Warranty</td>
<td>4 Year Advanced Replacement</td>
</tr>
</tbody>
</table>

**Accessories:**

- E-B203-WM
- E-B200-FM
- E-A138-JB
- E-8302S-WM
- E-A152E-PM
The camera submitted is accepted.

Hey Ed,

Confirmed on this camera model. This will work to replace the discontinued E-37-V and A-37-FW discontinued models.

Thanks!

jason

Jason,

Revisiting this camera for confirmation. Contractor was old cameras chosen previously are no longer available for purchase.
Please confirm the E-46-V camera is acceptable to UNT for use in the dining hall locations.

Thank you,
Ed Carrigan
Construction Manager
Facilities Design and Construction
940-367-4951
Office 940-369-6160
UNT System
1155 Union Circle
Denton Texas 75203-5017
From: Kevin Copher <KCopher@r-o.com>
Sent: Monday, August 10, 2020 3:53 PM
To: Carrigan, Edwin <Edwin.Carrigan@untsystem.edu>
Cc: Andrew Goessler <agoessler@r-o.com>; Todd Clay <TClay@r-o.com>; Brandon Young <BYoung@r-o.com>; Garrett Diehl <gdiehl@r-o.com>
Subject: RE: [EXT] UNT Dining Hall Discontinued Cameras

Ed,

Can you please confirm this is the camera model they are referring to before I send through Newforma.

Thanks,

Kevin Copher
Office Engineer

Rogers-O’Brien Construction | Since 1969
Main: (214) 962-3000 | Cell: (224) 595-3740
kcopher@r-o.com | r-o.com

From: Carrigan, Edwin <Edwin.Carrigan@untsystem.edu>
Sent: Monday, August 3, 2020 2:58 PM
To: Kevin Copher <KCopher@r-o.com>
Subject: FW: [EXT] UNT Dining Hall Discontinued Cameras

fyi

From: McMullen, Jason <Jason.McMullen@unt.edu>
Sent: Thursday, July 30, 2020 4:36 PM
To: Carrigan, Edwin <Edwin.Carrigan@untsystem.edu>
Cc: Henson, Jay <Jay.Henson@untsystem.edu>
Subject: Re: [EXT] UNT Dining Hall Discontinued Cameras

The advidia e-46 should suffice as a replacement for both discontinued models. Will that work?

jason
Sure thing,

Give me a few.

jason

Jason,

Need assistance quickly.
See email below but we are being told some of the cameras we requested are no longer available. Let us know if you all can accept the substitute.

Thank you,
Ed Carrigan
Construction Manager
Facilities Design and Construction
940-367-4951
Office 940-369-6160
UNT System
1155 Union Circle
Denton Texas 75203-5017

Ed,

We were informed by our AV & Security subcontractor that the specified cameras, E-37-V and A-37-FW, have been discontinued and are no longer available for purchase. Please see the attached products our subcontractor has requested as a substitute. I will send these in via Newforma with substitution request forms completed if UNT finds these acceptable.
Thank you sir,

Kevin Copher
Office Engineer

Rogers-O’Brien Construction | Since 1969
1901 Regal Row, Dallas, Texas 75235
Main: (214) 962-3000 | Cell: (224) 595-3740
kcopher@r-o.com | r-o.com
Austin | Dallas | Houston | San Antonio
**AXIS P3717-PLE Network Camera**
8 MP multidirectional camera with IR for 360° coverage

AXIS P3717-PLE Network Camera is a compact 8-megapixel camera with four varifocal lenses enabling overview and detailed surveillance. With one IP address and one network cable, the four-camera-in-one unit provides a flexible, cost-effective solution for multidirectional surveillance. 360° IR illumination, Forensic WDR and Lightfinder technology provides excellent video quality in any light conditions. Each camera head can be individually positioned (pan, tilt, roll and twist) along a circular track. Remote zoom and focus makes it easy to install and the clear cover, with no sharp edges, ensures undistorted views in all directions. The camera comes with an integrated weathershield.

- 8 MP, 360° multidirectional camera, one IP address
- 360° IR illumination and remote zoom and focus
- Axis Lightfinder and Forensic WDR
- Flexible positioning of four varifocal camera heads
- Axis Zipstream for reduced bandwidth and storage needs
**AXIS P3717-PLE Network Camera**

### Camera
- **Image sensor**: 4 x 1/2.8" progressive scan RGB CMOS

### Lens
- **Varifocal, 3.6 mm, F1.8–2.6**
- **4x1080p capture mode**: Horizontal field of view: 96°–49°, Vertical field of view: 53°–27°, Diagonal field of view: 113°–55°
- **Motorized focus, motorized zoom**

### Day and night
- **Automatically removable infrared-cut filter**

### Minimum illumination
- **B/W**: 0.04 lux at 50 IRE F1.8, 0 lux with IR illumination on
- **Illumination**: 0.17 lux at 50 IRE F1.8

### Shutter time
- 1/32500 s to 2 s with 50 Hz
- 1/32500 s to 2 s with 60 Hz

### Camera angle adjustment
- **Pan ±90°, tilt +25° to +95°, rotation –5° to +95°, twist ±20°**

### Video
- **Video compression**: H.264 (MPEG-4 Part 10 (AVC) Baseline, Main and High Profiles), Motion JPEG
- **Resolution**: 4 x 1920x1080 (4 x HDV 1080p) to 160x90
- **Frame rate**: Up to 25/30 fps (50/60 Hz)

### Video streaming
- **Multiple, individually configurable streams in H.264 and Motion JPEG**
- **Axis Zipstream technology in H.264**
- **Controlable frame rate and bandwidth**

### Image settings
- **Saturation, contrast, brightness, sharpness, Forensic WDR, white balance, exposure control, exposure zone, fine tuning of behavior at low light, rotation**: 0°, 90°, 180°, 270° including Corridor Format, dynamic text and image overlay, Polygon privacy mask, compression

### Audio
- **Two-way audio connectivity via AXIS T61 Audio and I/O Interfaces with portcast technology**
- **A 30 W midspan or higher between AXIS T61 Audio and I/O Interfaces and AXIS P3717-PLE is required.**

### Network
- **IP address**: One IP address for all channels

### Security
- **Password protection, IP address filtering, HTTPS encryption, IEEE 802.1X [EAP-TLS] network access control, digest authentication, user access log, centralized certificate management, brute force delay protection, signed firmware, secure boot**

### Supported protocols
- **IPv4, IPv6, USGv6, HTTP, HTTPS, SSU/TSL, GoS Layer 3 DiffServ, FTP, CIFS/SMB, SMTP, Bonjour, UpnP(R), SNMP v1/v2c/v3 (MIB-II), DNS, DynDNS, NTP, RTSP, RTP, SFTP, TCP, UDP, IGMP, RTCP, ICMP, DHCP, ARP, SOCKS, SSH, LLDP, MQTT**

### System integration
- **Application Programming Interface**: Open API for software integration, including VAPIX® and AXIS Camera Application Platform; specifications at axis.com
- **AVHS with One-Click Connection ONVIF Profile G and ONVIF® Profile S, specification at onvif.org**

### Analytics
- **Included**: AXIS Video Motion Detection, active tampering alarm
- **Supported**: AXIS Motion Guard, AXIS Fence Guard, AXIS Loitering Guard

### Event triggers
- **Detectors, hardware, input signal, storage, system, time, analytics, edge storage events**

### Event actions
- **Day/night vision mode, overlay text, record video, send images, send notification, send SNMP trap, send video clip, status LED File upload**: FTP, HTTP, HTTPS, network share, SFTP and email Notification: email, HTTP, HTTPS, TCP and SNMP trap

### Data streaming
- **Event data**

### Built-in installation aids
- **Pixel counter, focus assistant, remote focus, remote zoom**

### General
- **Casing**: IP66-, IP67-, NEMA 4X-rated, IK09 impact-resistant, aluminum and plastic casing with polycarbonate hard-coated dome, sunshield (PC/ASA)
- **Color**: white NCS S 1002-B
- **For repainting instructions of casing and impact on warranty, contact your Axis partner.**

### Mounting
- **Mounting bracket with junction box holes (double gang box, single gang box, 4" octagon junction box and 4" square junction box)**
- **1/4" (M20) conduit side entry**
- **1/4" (M25) conduit adapter included**

### Sustainability
- **PVC free**
- **Memory**: 1024 MB RAM, 512 MB Flash
- **Power**: Power over Ethernet (PoE) IEEE 802.3at Type 2 Class 4
- **IR illumination on**: class 4, typical 11.1 W, max 17.0 W
- **IR illumination off**: class 3, typical 8.6 W, max 11.0 W

### Connectors
- **Shielded RJ45 10BASE-T/100BASE-TX PoE**
- **Audio and I/O connectivity via AXIS T61 Audio and I/O Interfaces with portcast technology**
- **IR illumination**: Four individually controllable IR with power-efficient, long-life 850 nm IR LEDs
- **Range of 15 m (50 ft) or more depending on the scene**

### Storage
- **Support for microSD/microSDHC/microSDXC card**
- **Dual SD cards**
- **Support for SD card encryption**
- **Support for recording to network-attached storage (NAS)**
- **For SD card and NAS recommendations see axis.com**

### Operating conditions
- **-30 °C to 50 °C (-22 °F to 122 °F)**
- **Humidity**: 10–100% RH (condensing)
- **Storage conditions**: -40 °C to 65 °C ((-40 °F to 149 °F)

### Approvals
- **EMC**: EN 55032 Class A, EN 50121-4, IEC 62236-4, EN 61000-3-2, EN 61000-3-3, EN 55024, EN 61000-6-1, EN 61000-6-2, FCC Part 15 Subpart B Class A, ICES-003 Class A, VCCI Class A, RCM AS/NZS C1042 32 Class A, KC KN32 Class A, KC KC35
- **Safety**: IEC/EN/UL 62368-1, IEC/EN/UL 60950-22, IEC 62471, IEC 13252
- **Environment**: IEC 60608-2-2, IEC 60608-2-2, IEC 60608-2-2-14, IEC 60608-2-27, IEC 60608-2-78, IEC/EN 60529 IP66/67, IEC/EN 62262 IK09, NEMA 250 Type 4X, NEMA TS 2 (2.2.7-2.2.9)
- **Network**
  - IEC 62262 IK09, NEMA 250 Type 4X, NEMA TS 2 (2.2.7-2.2.9)
  - Network
  - IEC 62262 IK09, NEMA 250 Type 4X
  - NEMA TS 2 (2.2.7-2.2.9)
  - Network
  - IEC 62262 IK09, NEMA 250 Type 4X
  - NEMA TS 2 (2.2.7-2.2.9)
  - Network
  - IEC 62262 IK09, NEMA 250 Type 4X
  - NEMA TS 2 (2.2.7-2.2.9)
  - Network
  - IEC 62262 IK09, NEMA 250 Type 4X
  - NEMA TS 2 (2.2.7-2.2.9)
  - Network
  - IEC 62262 IK09, NEMA 250 Type 4X
  - NEMA TS 2 (2.2.7-2.2.9)

### Dimensions
- **Height**: 91.5 mm (3.6 in)
- **Width**: 255 mm (10.0 in)

### Weight
- **2.0 kg [4.4 lb]**

### Included accessories
- **RIAS mounting tool, screw bit T20, Installation guide, Windows® decoder 1-user license**

### Optional accessories
- **AXIS T940101D Pendant Kit, Axis mounts and cabinets**

### Video management software
- **AXIS Companion, AXIS Camera Station, video management software from AXIS Camera Application Platform partners available at axis.com/vms**

### Languages
- **English, Simplified Chinese, Traditional Chinese, French, German, Italian, Japanese, Korean, Polish, Portuguese, Russian, Spanish**

### Warranty
- **Axis 3-year warranty, see axis.com/warranty**
  - This product includes software developed by the OpenSSL Project for use in the OpenSSL toolkit (openssl.org), and cryptographic software written by Eric Young (eay@cryptsoft.com).

### Environmental responsibility:
- axis.com/environmental-responsibility
A-MD-WM (A Series Mini Dome Wall Mount)

<table>
<thead>
<tr>
<th>Model Number</th>
<th>A-MD-WM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model Name</td>
<td>A Series Mini Dome Wall Mount</td>
</tr>
<tr>
<td>Use</td>
<td>Wall Mounting A Series Mini Dome cameras</td>
</tr>
<tr>
<td>Construction</td>
<td>ABS Plastic</td>
</tr>
<tr>
<td>Dimensions</td>
<td>80×120×161.5mm (3.14 ×4.72” ×6.36”)</td>
</tr>
<tr>
<td>Weight</td>
<td>3.69 oz.</td>
</tr>
</tbody>
</table>

Dimensions

Unit: mm
In-ceiling Mount Bracket

Features
• Material: SECC & PC
• Junction Box Neat &
• Integrated design

Specifications

<table>
<thead>
<tr>
<th>Model</th>
<th>E-B200-FM</th>
</tr>
</thead>
<tbody>
<tr>
<td>General</td>
<td></td>
</tr>
<tr>
<td>Material</td>
<td>SECC &amp; PC</td>
</tr>
<tr>
<td>Dimension</td>
<td>Φ166.0x75.8mm</td>
</tr>
<tr>
<td>Inch Thread</td>
<td>G3/4&quot;</td>
</tr>
<tr>
<td>Operating Temperature</td>
<td>-40°C ~60°C</td>
</tr>
<tr>
<td>Humidity</td>
<td>0~90% RH</td>
</tr>
<tr>
<td>Load Bearing</td>
<td>1.0Kg</td>
</tr>
<tr>
<td>Weight</td>
<td>0.32Kg</td>
</tr>
<tr>
<td>Color</td>
<td>White</td>
</tr>
<tr>
<td>Applicable Model</td>
<td>Please see &quot;Accessory Selection&quot;</td>
</tr>
</tbody>
</table>
Dimensions (mm)

Application
DTK’s DTK-MRJPOE protects circuits that use state-of-the-art Power over Ethernet connections. This point of use surge protector is compatible with CAT5e, CAT6 and CAT6A cabling infrastructure, and can be installed either at the equipment end, or ahead of injectors or midspan devices. Its multi-stage, hybrid design provides superior protection for PoE applications.

Technical Specifications

| Service Voltage: | <60V |
| Protection Modes: | L-G (All), L-L (All) |
| Clamping Voltage Common Mode (L-G): | 75V |
| Clamping Voltage Differential Mode (L-L): | 72V |
| Surge Current Rating: | 20kA/Pair |
| Max. Continuous Current: | 1.5 Amps |
| Power Handling: | 144 Watts |
| Data Rate: | Up To 10GbE |

Mechanical Characteristics

| Connection Method: | RJ45 In/Out |
| Housing: | ABS |
| Operating Temperature: | -40F – 158F (-40C – 70C) |
| Maximum Humidity: | 95% non-condensing |
| Dimensions: | 3.0”L x 1.7”W x 1.2”H (76mm x 43mm x 30mm) |
| Weight: | 4oz (113g) |

Quality, Standards & Approval

| Agency Approvals: | UL497B |
| Standards Compliance: | CAT5e, EIA/TIA568A, EIA/TIA568B |
| Warranty: | Ten Year Limited Warranty |

Product Features

- Uses SAD and GDT technologies for optimal protection
- Data speeds up to 10GbE without signal degradation
- PoE Plus, HiPoE ready for high-wattage applications
- RJ45 connections with external grounding screw
- Complies with IEEE Std. 802.3af and 802.3at for PoE

Applications

- PoE IP Camera, NVR’s
- Wireless Access Points
- Audio/Video Touch Pads and Screens
- Access Control

Accessories

- DIN Rail Mounting Kit – Part Number DTK-DRK

Category | Max Data Transmission Speed | Max Bandwidth | Typical Distance |
---------|-----------------------------|----------------|-----------------|
CAT5e    | 1 Gbps                      | 100 MHz        | 100 m           |
CAT6     | 1 Gbps                      | 250 MHz        | 100 m           |
CAT6A    | 10 Gbps                     | 500 MHz        | 100 m           |

* Cabling information obtained from TIA-568-C.2
**AXIS T8640**

Upgrade to IP but keep the coax

AXIS T8640 PoE+ over Coax Adaptor Kit enables legacy coax cabling to be kept when converting an analog system to digital, and comprises AXIS T8641 PoE+ Over Coax Base and AXIS T8642 PoE+ over Coax Device. It delivers standard Power over Ethernet (PoE) and centrally-sourced power through existing coax cabling. Suitable for long-range installations, local power can be added to the device unit for maximum power efficiency. For ease of installation and guaranteed performance, the kit components feature an intuitive LED display that gives confirmation of network and power status through the cable.

- **No need for re-cabling, keep the coax**
- **Single-channel solution**
- **PoE and PoE+ over the coax cable**
- **Ease of installation**
- **Supports Axis network video products**
| Models | AXIS T8641 PoE+ over Coax Base Unit  
|        | AXIS T8642 PoE+ over Coax Device Unit  |

| Data & power |  |
| Data rate | Coaxial cable: 100+100 Mbps symmetrical to full range  
|           | Ethernet cable: 100 Base-TX Full Duplex  |
| Connectors | Coaxial: BNC 75 Ohm  
|           | Ethernet: Shielded RJ45, EIA 568A and 568B  |
| Network cables | Coaxial: Any 75 Ohm coaxial (other impedances supported), to 500 m /1600 ft at full rate. See range table on www.axis.com  
|           | Ethernet: patch or crossover, auto-detected shielded category 5 (or higher)  |
| Output | AXIS T8641: PoE over Coax with safe auto-detection and auto-cutout  
|        | AXIS T8642: PoE (IEEE 802.3af/at) enabled to detected devices up to 25.5 W  |
| Input | AXIS T8641: PoE (IEEE 802.3at Class 4 powered device) or DC power supply  
|        | AXIS T8642: PoE over Coax or DC power supply  
|        | DC Power supply: AXIS T8003 PS57 or 44–57 V DC Class 2 isolated supply (max. 0.7 amps)  
|        | Device power: 1.5 W  |

| Installation and management | Plug-and-play installation; automatically detects PoE and High PoE-enabled devices and supplies in-line power  
|                           | Local LED management display  |

| General |  |
| Casing | Plastic  
|        | Color: white NCS S 1002-B  |

| Display and indicators | LED indicators are located on the top panel and RJ45 connector  
|                       | Network indicators: Coax link, Ethernet link/activity x2  
|                       | Power indicators: PoE over Coax, PoE to camera, maximum PoE power available for camera  |

| Compliance | IEEE 802.3af, IEEE 802.3at, RoHS, WEEE, CE  |
| Mounting | AXIS T8641: Wall, rack or Din Rail  |
| Environment | Indoor  |
| Operating conditions | -10 °C to 50 °C (14 °F to 122 °F)  
|                     | Humidity max. 95% RH (non-condensing)  |
| Storage conditions | -40 °C to 74 °C (-40 °F to 165 °F)  |

| Approvals | EN 55022 Class A, EN 55022 Class B, EN 55024,  
|           | FCC Part 15 Subpart B Class B with FTP cabling, ICES-003 Class A,  
|           | VCCI Class A, ITE, IC-Tick AS/NZS 1095212, KCC KN-22 Class A,  
|           | KN-24  |

| Dimensions | 104 x 54 x 24 mm (4.1 x 2.2 x 0.9 in)  |
| Weight | AXIS T8641: 90 g (0.2 lb)  
|        | AXIS T8642: 88 g (0.2 lb)  |

| Warranty | Axis 3-year warranty and AXIS Extended Warranty option, see www.axis.com/warranty  |

Environmental responsibility:  
axis.com/environmental-responsibility
SUBMITTAL TRANSMITTAL & REVIEW SHEET

191604. - UNT Dining Hall

To: Linda Camacho
  Kirksey Architecture

From: Kevin Copher
  Rogers-O'Brien Construction

For: George/McKenna Electrical Inc.

Submittal #: 270500-03

Submittal Title: COMMON WORK RESULTS FOR COMMUNICATIONS SYSTEMS

Revision #: 1

Due Date: 07/16/2020

Status: Submitted for Approval

Rogers-O'Brien Construction

A/E

Consultants

Wrightson, Johnson, Haddon & Williams, Inc

has reviewed the general conformance of this submission’s technical design conformity only, and is of the opinion and recommends the submission be marked:

☐ No Exception Taken  ☐ No Review Action Required
☐ Make Corrections Noted: No Resubmission Required
☑ Make Corrections Noted: Re-Submit Only Corrected Pages/Items
☐ Rejected

Notations do not relieve the Contractor from compliance with requirements of the Contract Documents. The Contractor remains solely responsible for all dimensions, quantities, construction methods and means, techniques, sequences in the work, procedures, and coordination of the Work.

By: ccampbell          Date: 07/10/2020

Other

7/16/20
KIRKSEY COMMENTS NOTED IN MAGENTA.

REVIEW 4B COMMENTS ON THE NEXT PAGE AND COMPLY.

REVIEW ALL ATTACHED EMAIL CORRESPONDENCE AND PREVIOUS MARKED UP PRESUBMITTAL SHOP DWG.

COMPLY WITH TAS REFER TO COMMENTS THROUGHOUT SUBMITTAL.

REVIEWED BY: LINDA CAMACHO KIRKSEY
Submittal Review

Date: Wednesday, July 8, 2020
Client: Kirksey Architecture
Project: UNT Denton Dining Hall
From: 4B Technology Group-Nicholas Barrera
Submittal Number: 27 05 00-03-01
Submittal Item(s): Common Work Results For Communications Systems-SD (Video Surveillance)

THIS SUBMITTAL HAS BEEN REVIEWED FOR GENERAL CONFORMANCE ONLY. REVIEW AND COMMENTS DO NOT RELIEVE
THE CONTRACTOR FROM COMPLYING WITH EVERY REQUIREMENT OF THE CONTRACT DRAWINGS AND
SPECIFICATIONS, NATIONAL AND LOCAL CODES. UNLESS THE CONTRACTOR HAS CALLED ATTENTION, IN WRITING, TO
ANY DEVIATIONS CONTAINED IN THIS SUBMITTAL, AND THESE DEVIATIONS ARE REVIEWED SPECIFICALLY HEREON.

☐ No Exceptions ☑ Exceptions Noted - Resubmit
☐ As Indicated
☐ Rejected – Resubmit

Review Comments:

- 4B only reviewed Video Surveillance Shop Drawings
- All communication pathways shall be sized in accordance with the requirements of BICSI and
  the NEC. No conduit shall be less than 1”.
- Please reference the most recent drawings as changes have been made to locations and
cable counts. (ASI 012)
Thank you Joey

All, we need to be sure that the monitors are not protruding objects and if so, the bottom of the monitor needs to be placed at 6’-8”.

The detail at la mesa and leaf, the monitor is not over the counter, so we need to be sure that the bottom of the monitor is at 6’-8” or you shift the monitor back where it is over the counter.
Sorry, yes that was a labeling error. The mount shown the detail 4 page 2 is the mount for Avenue A, not Leaf. Leaf is to be mounted on the wall as shown in detail 4 page 1.
Thanks,

Joey Barnard | Low Voltage Project CAD Designer
2319 East Grauwyler Irving, TX 75061
TSL#B15459, TECL#17875

From: David Farragut <d.w.farragut@george-mckenna.com>
Sent: Monday, June 22, 2020 12:10 PM
To: Linda Camacho <LindaC@kirksey.com>; Andrew Goessler <AGoessler@r-o.com>; Fenton, Matthew <Matthew.Fenton@unt.edu>; White, Chuck <Chuck.White@unt.edu>; McMullen, Jason <Jason.McMullen@unt.edu>
Joey Barnard <jbarnard@george-mckenna.com>
CC: Brandon Young <BYoung@r-o.com>; Kevin Copher <KCopher@r-o.com>; Todd Clay <TClay@r-o.com>; 'Carrigan, Edwin' <Edwin.Carrigan@untsystem.edu>; Jeannine Vail (Jeannine.Vail@untsystem.edu)
<Jeannine.Vail@untsystem.edu>; Henson, Jay <Jay.Henson@untsystem.edu>
Subject: Re: UNT Dining Hall - Servery Display Sizes

Team,
I am attaching our Drafting designer to this.

Joey,
Can you please take a look at the comments below and let us know what you think, or if we mislabeled something on the drawings.
I know the drawings were not ready, but I sent them to the team for review so we can make the changes to the submittals prior to formally resubmitting them.

Thanks.

From: Linda Camacho <LindaC@kirksey.com>
Sent: Monday, June 22, 2020 11:54 AM
To: Andrew Goessler <AGoessler@r-o.com>; Fenton, Matthew <Matthew.Fenton@unt.edu>; White, Chuck <Chuck.White@unt.edu>; McMullen, Jason <Jason.McMullen@unt.edu>
Cc: David Farragut <d.w.farragut@george-mckenna.com>; Brandon Young <BYoung@r-o.com>; Kevin Copher <KCopher@r-o.com>; Todd Clay <TClay@r-o.com>; 'Carrigan, Edwin' <Edwin.Carrigan@untsystem.edu>; Jeannine Vail (Jeannine.Vail@untsystem.edu) <Jeannine.Vail@untsystem.edu>; Henson, Jay <Jay.Henson@untsystem.edu>
Subject: RE: UNT Dining Hall - Servery Display Sizes

Andrew, I reviewed the attached sheets and have a question, on page 2 detail 4, the title of the detail states leaf pole mount detail. The mounting condition at leaf, wood grill, and cibo are wall mounted. Were they going to provide a wall mounted detail?
Matt & Chuck,

Attached is the display location we discussed this morning. We can use this to coordinate the display sizes we discussed at the OAC. Please provide feedback on sizes and mounting locations by end of day 6/24. Once we receive this we will include in our resubmittal.

Thanks,

Andrew Goessler
Project Manager
Rogers-O'Brien Construction | Since 1969
1901 Regal Row, Dallas, Texas 75235
Main: (214) 962-3000 | Cell: (214) 356-7111
agoessler@r-o.com | r-o.com
Austin | Dallas | Houston | San Antonio
We want to be sure the location of the monitors are in compliance with TAS. I did not know if the information submitted was going to be issued as a submittal and wanted to be sure we captured this. The areas in question are la mesa and Avenue A monitors. There is no height noted on the monitor detail. The bottom would be placed at 6’-8”. I was not sure if UNT was fine with this if not then the monitor mounting location for these two serveries would need to shift into the furrdown area. This is not a matter of aesthetics, we are making sure we are in compliance with TAS. And there might not be any changes. This is a confirmation.

Peter and Derrick, I know you were not copied in the original email correspondence, are you fine with the bottom of the monitors for Avenue A and La mesa to be at 6’-8”? Please review attached pdf file and let us know. All locations are per our monitor meeting we had several months ago.

Thank you,

R. Linda Camacho, Intl. Assoc. AIA
Associate

Kirksey | Architecture
6909 Portwest Drive | Houston Texas 77024 | www.kirksey.com
o 713 426 7488 | lindac@kirksey.com

Houston + Austin

From: Andrew Goessler [mailto:AGoessler@r-o.com]
Sent: Monday, June 22, 2020 3:42 PM
To: Linda Camacho <LindaC@kirksey.com>; Joey Barnard <jbarnard@george-mckenna.com>; David Farragut <d.w.farragut@george-mckenna.com>; Fenton, Matthew <Matthew.Fenton@unt.edu>; White, Chuck <Chuck.White@unt.edu>; McMullen, Jason <Jason.McMullen@unt.edu>
Cc: Brandon Young <BYoung@r-o.com>; Kevin Copher <KCopher@r-o.com>; Todd Clay <TClay@r-o.com>; 'Carrigan, Edwin' <Edwin.Carrigan@untsystem.edu>; Jeannine Vail (Jeannine.Vail@untsystem.edu); Henson, Jay <Jay.Henson@untsystem.edu>
Subject: RE: UNT Dining Hall - Servery Display Sizes

Linda,

The purpose of the document was to coordinate the locations and sizes of the monitors as discussed during this past OAC. RO needs direction from the design team on this. We’re happy to get on a call to review each item and the hope is to resubmit the final locations in the revised AV package. If left up to RO to coordinate we will not be moving displays or changing sizes for aesthetic purposes without cost.

Andrew Goessler
Project Manager

Rogers-O’Brien Construction | Since 1969
1901 Regal Row, Dallas, Texas 75235
Thank you Joey

All, we need to be sure that the monitors are not protruding objects and if so, the bottom of the monitor needs to be placed at 6’-8”.

The detail at la mesa and leaf, the monitor is not over the counter, so we need to be sure that the bottom of the monitor is at 6’-8” or you shift the monitor back where it is over the counter.
Sorry, yes that was a labeling error. The mount shown the detail 4 page 2 is the mount for Avenue A, not Leaf. Leaf is to be mounted on the wall as shown in detail 4 page 1.
Thanks,

Joey Barnard | Low Voltage Project CAD Designer
2319 East Grauwyler Irving, TX 75061
TSL#B15459, TECL#17875

From: David Farragut <d.w.farragut@george-mckenna.com>
Sent: Monday, June 22, 2020 12:10 PM
To: Linda Camacho <LindaC@kirksey.com>; Andrew Goessler <AGoessler@r-o.com>; Fenton, Matthew <Matthew.Fenton@unt.edu>; White, Chuck <Chuck.White@unt.edu>; McMullen, Jason <Jason.McMullen@unt.edu>; Joey Barnard <jbarnard@george-mckenna.com>
Cc: Brandon Young <BYoung@r-o.com>; Kevin Copher <KCopher@r-o.com>; Todd Clay <TClay@r-o.com>; 'Carrigan, Edwin' <Edwin.Carrigan@untsystem.edu>; Jeannine Vail (Jeannine.Vail@untsystem.edu)

Subject: Re: UNT Dining Hall - Servery Display Sizes

Team,
I am attaching our Drafting designer to this.

Joey,
Can you please take a look at the comments below and let us know what you think, or if we mislabeled something on the drawings.
I know the drawings were not ready, but I sent them to the team for review so we can make the changes to the submittals prior to formally resubmitting them.

Thanks.

Andrew, I reviewed the attached sheets and have a question, on page 2 detail 4, the title of the detail states leaf pole mount detail. The mounting condition at leaf, wood grill, and cibo are wall mounted. Were they going to provide a wall mounted detail?
Matt & Chuck,

Attached is the display location we discussed this morning. We can use this to coordinate the display sizes we discussed at the OAC. Please provide feedback on sizes and mounting locations by end of day 6/24. Once we receive this we will include in our resubmittal.

Thanks,

Andrew Goessler
Project Manager
Missing components previously included for touch screen control of system. Provide specified products or submit RFI.

POWER 2319 E. GRAUWYLER RD.

NETWORK CABLING

RF DISTRIBUTION 65" DIGITAL SIGNAGE

DIGITAL AUDIO PROVIDED BY OTHERS

PROVIDED PC LOCAL AREA CABLING BY OTHERS

THE SAFE CHOICE SINCE 1981

ENVIRONMENTAL • COST-EFFECTIVE • DURABLE • CONTROLLED • ACCESSIBLE

CABLE NUMBER ID BEGINNING SEE TABLE BELOW

A/V EQUIPMENT RACK SUPPLIED WITH DEVICE (12"x12"x4" WIRING TROUGH) SEE NOTE 6/AV-0.0 MID ATLANTIC/ERK-44-20

·

TERMINATIONS WHERE SHIELD DRAIN LINE. ON WIRE BACK UNDER HEAT SHRINK TUBING SHIELDED HEAT SHRINK TUBING

DUPLEX RECEPTACLE (BY OTHERS) 1-GANG BOX. 2-1/2" DEEP AS NOTED PANEL CRAFTER/RDL

DISPLAY PASS-THRU PLATE 1-GANG BOX. 2-1/2" DEEP " AS NOTED PANEL CRAFTER/RDL

AUDIO INPUT PLATE 4-GANG BOX. 2-1/2" DEEP FLUSH MOUNTED AT STANDARD BUILDING OUTLET HEIGHT PANEL CRAFTER/RDL

CUSTOM MOUNTED DISPLAY (TYPE 3) 4-GANG BOX. 2-1/2" DEEP CEILING MOUNTED NEAR POLE MOUNT LG/55UT640S0UA/49UT640S0UA

WALL MOUNTED DISPLAY ONE-LINE

COLUMN MOUNTED DISPLAY ONE-LINE

AUDIO SYSTEM ONE-LINE

RF/ANTENNA CABLE RG-8/RG-58 12-16GA 22/2 SHEILDED 22/2 SHEILDED
1. AUDIO INPUT PLATE 4-GANG BOX. 2-1/2" DEEP FLUSH MOUNTED AT STANDARD BUILDING OUTLET HEIGHT PANEL CRAFTED/RDL

2. COLUMN MOUNTED DISPLAY (TYPE 2) CHIEF/PAC525FC FLUSH AT 72" AFF SEE NOTE 5/AV-0.0 LG/43UT640S0UA

3. WALL MOUNTED DISPLAY ONE-LINE

4. AUDIO SYSTEM ONE-LINE

5. CABLE NUMBER ID BEGINNING:
   - 02 FSD
   - 03 FSD

6. SIGNAL TYPE:
   - LINE LEVEL AUDIO

7. INDICATOR:
   - PRE-MADE CABLE
   - STRUCTURED CABLING
   - INPUT PLATE IN
   - OUTPUT PLATE OUT
   - AUDIO IN
   - AUDIO OUT
   - VIDEO
   - HDMI 1
   - HDMI 2
   - HDMI 3
   - NETWORK SWITCH
   - SYSTEM PROVIDED
   - PROVIDE PC
   - OWNED
   - 65" DIGITAL SIGNAGE
   - 43" DIGITAL DISPLAY

8. CABLING BY OTHERS

9. POWER AMPLIFIER

10. TESIRA FORTE AI PROCESSING AMPLIFIER

11. USB-B

12. AUTODD 1 & 2

13. CABLE LABEL UPDATES

14. RO FA CONTRACTOR

15. UNT COMMENTS:
   - Who will be providing this connection and will the cable be running through data conduit?
Hey Linda,

The displays are correct and we do not need the A/V touchscreen control.

Thanks,
Matt Fenton
Cross Functional IT Support Manager
AITS Auxiliary Services
University of North Texas
(940) 369.8230
matthew.fenton@unt.edu

Matt,

Please confirm that we are to proceed per the equipment quote you reviewed with RO and to disregard these two comments from our consultant WJHW. Thank you.
To clarify, the comments we discussed that were old were made by the consultant. We’ve coordinated and priced per our discussions and the submittal reflects those changes.

Hey Linda,

Per the meeting discussion, please disregard contractor comments on page 3 referencing touch screen A/V control.

Thanks,
Matt Fenton
Cross Functional IT Support Manager
AITS Auxiliary Services
University of North Texas
(940) 369.8230
matthew.fenton@unt.edu
Hey Linda,

Per the meeting discussion, please disregard contractor comments on page 3 referencing touch screen A/V control.

Thanks,
Matt Fenton
Cross Functional IT Support Manager
AITS Auxiliary Services
University of North Texas
(940) 369.8230
matthew.fenton@unt.edu

3:30pm will work for us.

Chuck

From: Andrew Goessler <agoessler@r-o.com>
Sent: Wednesday, July 15, 2020 3:25 PM
To: White, Chuck <Chuck.White@unt.edu>; Linda Camacho <LindaC@kirksey.com>; Fenton, Matthew <Matthew.Fenton@unt.edu>; Carrigan, Edwin <Edwin.Carrigan@untsystem.edu>; McMullen, Jason <Jason.McMullen@unt.edu>
Cc: Vail, Jeannine <Jeannine.Vail@untsystem.edu>; Cripps, Derrick <Derrick.Cripps@unt.edu>; Dunlap, Pat <Pat.Dunlap@untsystem.edu>; Henson, Jay <Jay.Henson@untsystem.edu>; Armitage, Daniel <Daniel.Armitage@unt.edu>; Oliver, Frank <Frank.Oliver@unt.edu>; Kevin Copher <KCopher@r-o.com>
Subject: RE: [EXT] FW: unt - telecommunications/security submittal

RE: [EXT] FW: unt - telecommunications/security submittal

From: Andrew Goessler <AGoessler@r-o.com>
Sent: Wednesday, July 15, 2020 3:25 PM
To: White, Chuck <Chuck.White@unt.edu>; Linda Camacho <LindaC@kirksey.com>; Fenton, Matthew <Matthew.Fenton@unt.edu>; Carrigan, Edwin <Edwin.Carrigan@untsystem.edu>; McMullen, Jason <Jason.McMullen@unt.edu>
Cc: Vail, Jeannine <Jeannine.Vail@untsystem.edu>; Cripps, Derrick <Derrick.Cripps@unt.edu>; Dunlap, Pat <Pat.Dunlap@untsystem.edu>; Henson, Jay <Jay.Henson@untsystem.edu>; Armitage, Daniel <Daniel.Armitage@unt.edu>; Oliver, Frank <Frank.Oliver@unt.edu>; Kevin Copher <KCopher@r-o.com>
Subject: RE: [EXT] FW: unt - telecommunications/security submittal
Chuck, I apologize, I missed this email when it came through. Are you available at 9:00 AM tomorrow or anytime after 2 PM?

Thanks,

Andrew Goessler
Project Manager

Rogers-O'Brien Construction  |  Since 1969
1901 Regal Row, Dallas, Texas 75235
Main: (214) 962-3000 | Cell: (214) 356-7111
agoessler@r-o.com | r-o.com
Austin | Dallas | Houston | San Antonio

From: White, Chuck <Chuck.White@unt.edu>
Sent: Wednesday, July 15, 2020 8:29 AM
To: Andrew Goessler <AGoessler@r-o.com>; Linda Camacho <LindaC@kirksey.com>; Fenton, Matthew <Matthew.Fenton@unt.edu>; Carrigan, Edwin <Edwin.Carrigan@untsystem.edu>; McMullen, Jason <Jason.McMullen@unt.edu>
Cc: Vail, Jeannine <Jeannine.Vail@untsystem.edu>; Cripps, Derrick <Derrick.Cripps@unt.edu>; Dunlap, Pat <Pat.Dunlap@untsystem.edu>; Henson, Jay <Jay.Henson@untsystem.edu>; Armitage, Daniel <Daniel.Armitage@unt.edu>; Oliver, Frank <Frank.Oliver@unt.edu>; Kevin Copher <KCopher@r-o.com>
Subject: RE: [EXT] FW: unt - telecommunications/security submittal

Andrew, will 2 to 2:30pm work for today?

From: Andrew Goessler <AGoessler@r-o.com>
Sent: Tuesday, July 14, 2020 7:16 PM
To: White, Chuck <Chuck.White@unt.edu>; Linda Camacho <LindaC@kirksey.com>; Fenton, Matthew <Matthew.Fenton@unt.edu>; Carrigan, Edwin <Edwin.Carrigan@untsystem.edu>; McMullen, Jason <Jason.McMullen@unt.edu>
Cc: Vail, Jeannine <Jeannine.Vail@untsystem.edu>; Cripps, Derrick <Derrick.Cripps@unt.edu>; Dunlap, Pat <Pat.Dunlap@untsystem.edu>; Henson, Jay <Jay.Henson@untsystem.edu>; Armitage, Daniel <Daniel.Armitage@unt.edu>; Oliver, Frank <Frank.Oliver@unt.edu>; Kevin Copher <KCopher@r-o.com>
Subject: RE: [EXT] FW: unt - telecommunications/security submittal

Chuck, GME is only available after 2PM tomorrow. Do you have any times available after then? If not can you send me your availability for Thursday?

Andrew Goessler
Project Manager

Rogers-O'Brien Construction  |  Since 1969
1901 Regal Row, Dallas, Texas 75235
Main: (214) 962-3000 | Cell: (214) 356-7111
agoessler@r-o.com | r-o.com
Austin | Dallas | Houston | San Antonio

From: White, Chuck <Chuck.White@unt.edu>
Sent: Monday, July 13, 2020 2:15 PM
To: Andrew Goessler <AGoessler@r-o.com>; Linda Camacho <LindaC@kirksey.com>; Fenton, Matthew <Matthew.Fenton@unt.edu>; Carrigan, Edwin <Edwin.Carrigan@untsystem.edu>; McMullen, Jason
To clarify, the comments we discussed that were old were made by the consultant. We've coordinated and priced per our discussions and the submittal reflects those changes.

Hey Linda,

Per the meeting discussion, please disregard contractor comments on page 3 referencing touch screen A/V control.

Thanks,
Matt Fenton
Cross Functional IT Support Manager
AITS Auxiliary Services
University of North Texas
(940) 369.8230
matthew.fenton@unt.edu

From: White, Chuck <Chuck.White@unt.edu>
Sent: Thursday, July 16, 2020 8:43 AM
To: Andrew Goessler <agoessler@r-o.com>; Linda Camacho <LindaC@kirksey.com>; Fenton, Matthew <Matthew.Fenton@unt.edu>; Carrigan, Edwin <Edwin.Carrigan@untsystem.edu>; McMullen, Jason <Jason.McMullen@unt.edu>
Cc: Vail, Jeannine <Jeannine.Vail@untsystem.edu>; Cripps, Derrick <Derrick.Cripps@unt.edu>; Dunlap, Pat <Pat.Dunlap@untsystem.edu>; Henson, Jay <Jay.Henson@untsystem.edu>; Armitage, Daniel <Daniel.Armitage@unt.edu>; Oliver, Frank <Frank.Oliver@unt.edu>; Kevin Copher <KCopher@r-o.com>
3:30pm will work for us.

Chuck

Chuck, I apologize, I missed this email when it came through. Are you available at 9:00 AM tomorrow or anytime after 2 PM?

Thanks,

Andrew Goessler
Project Manager

Rogers-O'Brien Construction | Since 1969
1901 Regal Row, Dallas, Texas 75235
Main: (214) 962-3000 | Cell: (214) 356-7111
agoessler@r-o.com | r-o.com
Austin | Dallas | Houston | San Antonio

Andrew, will 2 to 2:30pm work for today?
Chuck, GME is only available after 2PM tomorrow. Do you have any times available after then? If not can you send me your availability for Thursday?

Andrew Goessler  
Project Manager

Rogers-O’Brien Construction | Since 1969  
1901 Regal Row, Dallas, Texas 75235  
Main: (214) 962-3000 | Cell: (214) 356-7111  
agoessler@r-o.com | r-o.com  
Austin | Dallas | Houston | San Antonio

From: White, Chuck <Chuck.White@unt.edu>  
Sent: Monday, July 13, 2020 2:15 PM  
To: Andrew Goessler <AGoessler@r-o.com>; Linda Camacho <LindaC@kirksey.com>; Fenton, Matthew <Matthew.Fenton@unt.edu>; Carrigan, Edwin <Edwin.Carrigan@untsystem.edu>; McMullen, Jason <Jason.McMullen@unt.edu>  
Cc: Vail, Jeannine <Jeannine.Vail@untsystem.edu>; Cripps, Derrick <Derrick.Cripps@unt.edu>; Dunlap, Pat <Pat.Dunlap@untsystem.edu>; Henson, Jay <Jay.Henson@untsystem.edu>; Armitage, Daniel <Daniel.Armitage@unt.edu>; Oliver, Frank <Frank.Oliver@unt.edu>  
Subject: RE: [EXT] FW: unt - telecommunications/security submittal

Hi Andrew,

Best availability for a meeting on Wednesday (7/15) is between 10am and 2pm. If that window of time won’t work for Wednesday then tomorrow or Thursday might work as well.

Thank you,

Chuck White  
Cross Functional IT Support Supervisor  
AITS Auxiliary Services  
University of North Texas  
940.891.6899 | chuck.white@unt.edu

From: Andrew Goessler <AGoessler@r-o.com>  
Sent: Monday, July 13, 2020 9:54 AM  
To: Linda Camacho <LindaC@kirksey.com>; Fenton, Matthew <Matthew.Fenton@unt.edu>; Carrigan, Edwin <Edwin.Carrigan@untsystem.edu>; McMullen, Jason <Jason.McMullen@unt.edu>  
Cc: Vail, Jeannine <Jeannine.Vail@untsystem.edu>; Cripps, Derrick <Derrick.Cripps@unt.edu>; Dunlap, Pat <Pat.Dunlap@untsystem.edu>; Henson, Jay <Jay.Henson@untsystem.edu>; Armitage, Daniel <Daniel.Armitage@unt.edu>; Oliver, Frank <Frank.Oliver@unt.edu>  
Subject: RE: [EXT] FW: unt - telecommunications/security submittal

Matt – I think it would be faster to answer the questions in RO’s court with a quick conference call. Are you available Wednesday to discuss with GME?

Andrew Goessler  
Project Manager
From: Linda Camacho <LindaC@kirksey.com>
Sent: Friday, July 10, 2020 7:02 PM
To: Fenton, Matthew <Matthew.Fenton@unt.edu>; Carrigan, Edwin <Edwin.Carrigan@untsystem.edu>; McMullen, Jason <Jason.McMullen@unt.edu>
Cc: Vail, Jeannine <Jeanine.Vail@untsystem.edu>; Cripps, Derrick <Derrick.Cripps@unt.edu>; Dunlap, Pat <Pat.Dunlap@untsystem.edu>; Henson, Jay <Jay.Henson@untsystem.edu>; Armitage, Daniel <Daniel.Armitage@unt.edu>; Andrew Goessler <AGOESSLER@R-O.COM>; White, Chuck <Chuck.White@unt.edu>; Oliver, Frank <Frank.Oliver@unt.edu>
Subject: RE: [EXT] FW: unt - telecommunications/security submittal

Matt, I have reviewed your comments. There was only one item noted, correct? I will double check as I have not done the thorough review. I have received the consultant comments. I will compare all notes and let you know if there are any questions. I have attached them for your review as well.

Thank you,

R. Linda Camacho, Intl. Assoc. AIA
Senior Associate

Kirksey | Architecture
6909 Portwest Drive | Houston Texas 77024 | www.kirksey.com
o 713 426 7488 | lindac@kirksey.com

Houston + Austin

From: Fenton, Matthew <Matthew.Fenton@unt.edu>
Sent: Friday, July 10, 2020 2:53 PM
To: Linda Camacho <LindaC@kirksey.com>; Carrigan, Edwin <Edwin.Carrigan@untsystem.edu>; McMullen, Jason <Jason.McMullen@unt.edu>
Cc: Vail, Jeannine <Jeanine.Vail@untsystem.edu>; Cripps, Derrick <Derrick.Cripps@unt.edu>; Dunlap, Pat <Pat.Dunlap@untsystem.edu>; Henson, Jay <Jay.Henson@untsystem.edu>; Armitage, Daniel <Daniel.Armitage@unt.edu>; Andrew Goessler <agoessler@r-o.com>; White, Chuck <Chuck.White@unt.edu>; Oliver, Frank <Frank.Oliver@unt.edu>
Subject: RE: [EXT] FW: unt - telecommunications/security submittal

Hi Linda,

I apologize for the delay. Attached is the submittal with our comments. Would you please confirm who will be responsible for installing the security cameras?

Thanks,
Matt Fenton
Cross Functional IT Support Manager
AITS Auxiliary Services
University of North Texas
(940) 369.8230
matthew.fenton@unt.edu
Thank you for sending this over Linda. We will be reviewing this afternoon and should have answers back to you by the end of the day.

Thanks,
Matt Fenton
Cross Functional IT Support Manager
AITS Auxiliary Services
University of North Texas
(940) 369.8230
matthew.fenton@unt.edu

Hi Ed, here is the submittal per our discussion in the OAC meeting. I am also attaching 4B’s comments. I am waiting to hear back from WJHW.

R. Linda Camacho, Intl. Assoc. AIA
Senior Associate

Kirksey | Architecture
6909 Portwest Drive  |  Houston Texas 77024  |  www.kirksey.com
o 713 426 7488  |  lindac@kirksey.com

Houston + Austin

Good morning all,

Just checking in to see if you have any comments on following submittal: 270500-03-01_Common Work Results For Communication Systems_Shop Drawings_20200702_SAPP? This is due on the 10th and would like to incorporate your comments. Let me know if there are any.

Thank you,
THE BOTTOM ELEVATION OF ALL THESE MONITORS NEED TO BE PLACED AT 6'-8"
AUDIO/VIDEO - LEVEL 1 RCP

UNIVERSITY OF NORTH TEXAS DENTON - NEW DINING HALL

ACCESSIBLE CEILING 1" CONDUIT TO ACCESSIBLE CEILING
(3) - 1" CONDUITS TO BETWEEN THE RECESSEDLIGHTING. REFER TO RCP FOR ACCESSIBLE CEILING 1" CONDUIT TO ACCESSIBLE CEILING
(3) - 1" CONDUITS TO (3) - 1" CONDUITS TO For Mounting

THE FINISH COLOR OF EQUIPMENT AND ANY EXPOSED COVER PLATES NEEDS TO BE COORDINATE WITH FINISHES - IF THE COLOR OF CEILING OR WALL IS NOT WHITE THEN THE EQUIPMENT/COVER PLATES NEEDS TO BE BLACK REFER TO UNT STANDARDS
1. **Wood Grill Wall Mounted Display Elevation**

2. **Typical Pole Mount Finished Ceiling Faceplate Detail**

3. **Typical Pole Mount Building Structure Support Detail**

4. **Avenue A Pole Mount Detail**

5. **Typical Pole Mount Detail**

---

**Display Mounting Details**

**University of North Texas Denton - University Dining Hall**

**WJHP**

**04-28-2002**

**05-30-2003**

**Display Mounting Details**

**Scale: 3/8" = 1'**

**1. Wood Grill Wall Mounted Display Elevation**

**2. Typical Pole Mount Finished Ceiling Faceplate Detail**

**3. Typical Pole Mount Building Structure Support Detail**

**4. Avenue A Pole Mount Detail**

**5. Typical Pole Mount Detail**

---

**Display Mounting Details**

**Scale: 3/8" = 1'**

**1. Wood Grill Wall Mounted Display Elevation**

**2. Typical Pole Mount Finished Ceiling Faceplate Detail**

**3. Typical Pole Mount Building Structure Support Detail**

**4. Avenue A Pole Mount Detail**

**5. Typical Pole Mount Detail**
OUTDOOR FIXED DOME CAMERA
SINGLE GANG MASONRY BOX
10' ABOVE FINISHED GRADE
ADVIDIA/E-37-FW/A-MD-WM

INDOOR 360 DOME CAMERA
4"X4"X4" NEMA TYPE 1 BACKBOX WITH COVER IN CEILING
AXIS/P3717

SECURITY SYSTEM SYMBOLS - ABBREVIATIONS
DESCRIPTION SYMBOL REQUIREMENTS BACK-BOX MOUNTING MANUFACTURER
DC C-### 01 DC C-### 02 DC C-### 03

INDOOR FIXED DOME CAMERA
4"X4"X4" NEMA TYPE 1 BACKBOX WITH COVER IN CEILING
ADVIDIA/E-37-V/E-B200-FM

CEILING Tile
4"SQ JUNCTION BOX
BOLT SUPPORT SECURED FROM CEILING BRACKET
CEILING SUPPORT ASSEMBLY
DOUBLE GANG BOX WITH CABLE TERMINATION INSERTS
CONDUIT WITH NETWORK CABLE ROUTE TO NEAREST ACCESSIBLE CEILING AREA.
NETWORK CABLING BY OTHERS
SUPPORT SECURED FROM DECK

ADVIDIA - E-37-FW ULTRA-WIDE VIEW, ULTRA-LOW LIGHT DOME CAMERA
ADVIDIA - A-MD-WM MINI DOME WALL MOUNT

INSTALL DITEK MRJ-POE POE SURGE PROTECTOR AT POINT WHERE CABLE ENTERS BUILDING
CONDUIT WITH NETWORK CABLE ROUTE TO POINT WHERE CABLE ENTERS BUILDING
SUPPORT SECURED FROM DECK

CEILING TRAVELING CABLE (BY OTHERS)
CATEGORY PATCH CORD
POE+ COAX BASE UNIT (AXIS T8641)
CATEGORY CABLE FROM ELEVATOR MACHINE ROOM PANEL FOR ELEVATOR CAB PHONE (BY OTHERS)
12"X12"X6" NEMA ENCLOSURE
POE+ COAX DEVICE UNIT (AXIS T8642)
CATEGORY CABLE BACK TO CLOSEST TELECOM ROOM (BY OTHERS)
2-DATA OUTLET (BY OTHERS)
CATEGORY CABLE FROM ELEVATOR MACHINE ROOM PANEL FOR ELEVATOR CAB PHONE (BY OTHERS)
12"X12"6" OVERHEAD JUNCTION BOX

ELEVATOR CAB CCTV CAMERA MOUNTING DETAIL

OUTDOOR CCTV CAMERA MOUNTING DETAIL
Is this in the two story ceiling?

Need to coordinate final location with UNT.
GENERAL NOTES:

1. 2ND FLOOR DATA ROUTED VIA J-HOOK TO THE MDF 250.

KEYNOTE LEGEND

1. COORDINATE FINAL LOCATION WITH ARCHITECT/AUDIOVISUAL (TA) DRAWINGS.