

Submittal #458

FO-INTEG-PROJECT-PO0001-REV.03 Gestión de Control de Calidad / Quality Management

Information

Status: In Review

P.R.S

Legend

- Overdue
- Issue
- On Time
- Delayed Start
- Inactive

Company: Integ Miami LLC

Project (CDC) - Job Number NORCREST-012920

Customer Name Burke Construction Group Inc

Project (CDC) - Customer Name Burke Construction Group, Inc

Project (CDC) - Location 3591 NE 16TH AVENUE, POMPANO BEACH, Florida 33064

Submittal

Description: HVAC Controls and Instrumentation and Sequence of Operation.

Title: HVAC Controls and Instrumentation and Sequence of Operation.	Spec 15901	Subdivision:	Submittal Type: Data	Submitted On: 22-06-2020	Responsible Contractor: Integ Miami LLC
	Section: 15940				

Submittal Manager: Carlos Godoy

Issue Date: 15-07-2020 12:00 AM Final Due Date: 29-07-2020

Ball in Burke Construction Court: Lead Time 10 Priority: Critical

Attachment

Attachment: 458-15901-15940-HVAC Controls Rev.01.pdf

Linked Drawings:

Notes:

Stamp Info

Stamp Date:

Other Name:

 Show Stamp on PDF:**Submittal WorkFlow**

Add Submittal LOG

Submittal logs

Record ID#	Submittal # - Project (CDC) - CDC (Centro de Costo)	Submittal # - Status:	Submittal Status	Submittal # - Description:	Related Submittal #	Date Submittal REV	Comments:	Attachment Document:
444	491-M-BURKE-NORCREST-012920	In Review	Rev 1	HVAC Controls and Instrumentation and Sequence of Operation.	458	15-07-2020	For review. View comments in attached file.	458-15901-15940-HVAC Controls Rev.01.pdf

Record ID#	Submittal # - Project (CDC) - CDC (Centro de Costo)	Submittal # - Status:	Submittal Status	Submittal # - Description:	Related Submittal #	Date Submittal REV	Comments:	Attachment Document:
426	491-M-BURKE-NORCREST-012920	In Review	Revise and Resubmit	HVAC Controls and Instrumentation and Sequence of Operation.	458	02-07-2020		#458 Submittal 51-15900.001-HVAC Intrumentation and Controls.pdf
406	491-M-BURKE-NORCREST-012920	In Review	Rev 0	HVAC Controls and Instrumentation and Sequence of Operation.	458	23-06-2020	For review.	458-15901-15940-HVAC Controls.pdf

Submittal Approval

Approval

Approvers:

Name/Title:

Signature _____

This submittal has an approval time of 15 days. After this period of time elapses and no response has been provided from the Engineer/GC, Integ reserves the right to assume that the submittal has been approved.

Responsible Genaro Matias

Rp Email General, Project Manager

Created on June 23 at 10:04 AM (PDT). Last updated by [Project M. Asistant](#) today at 7:51 AM (PDT). Owned by [Project M. Asistant](#).



CMC1250259

To: Integ Miami LLC
Attn: Milagros Suarez

Date: July 10, 2020
Re: Norcrest ES

Please see the responses to the returned controls submittal for Norcrest Elementary School dated 06/29/20.

1. **CX-1 Dwg #1: Include an interlocked exhaust fans table for all AHUs included in the control submittal.** None of the new fans are interlocked with AHUs. Any existing fan interlocks will be added to the as built drawings.
2. **CX-2 Dwg #9: Show barometric damper.** Barometric damper is not part of the controls but will be added as a reference only.
3. **CX-3 Dwg #9: Per SBBC requirements, provide condensate overflow safety switch. Typical for all cooling coils.** Switch will be shown as provided, installed and wired by others.
4. **CX-4 Dwg #9: OA flow measuring stations to be approved by Joe Alvarex. Please provide approval supporting documentation.** EOR to render opinion.
5. **CX-5 Dwg #9: Per SBBC request, remove mixed air temperature sensor.** Sensor will be removed.
6. **CX-6 Dwg #11: OA flow measuring stations to be approved by Joe Alvarex. Please provide approval supporting documentation.** EOR to render opinion.
7. **CX-7 Dwg #12: Show barometric damper.** Barometric damper is not part of the controls but will be added as a reference only.
8. **CX-8 Dwg #12: Per SBBC requirements, provide condensate overflow safety switch. Typical for all cooling coils.** Switch will be shown as provided, installed and wired by others.
9. **CX-9 Dwg #12: Indicate why an OA AFMS would be required for a CAV system. OA flow measuring stations to be approved by Joe Alvarex. Please provide approval supporting documentation.** EOR to render opinion.
10. **CX-10 Dwg #12: Per SBBC request, remove mixed air temperature sensor.** Sensor will be removed.
11. **CX-11 Dwg #12: The CCLA temp sensor is shown in the wrong location. It should be located directly downstream of the DX cooling coil as shown on the permitted drawings.** Sensor location to be updated.
12. **CX-12 Dwg #12: The electric reheat is missing.** Per AHU submittal, electric reheat is not required as unit has hot gas reheat for afterhours. See DX Split System AHU submittal for note.
13. **CX-13 Dwg #14: RA Humidity Sequence: EDH should remain disabled. The hot gas reheat enabled as required to maintain temp setpoint.** Sequence to be updated to remove all mention of EDH which is not part of the unit and replaced with hot gas reheat.
14. **CX-14 Dwg #15: Show barometric damper.** Barometric damper is not part of the controls but will be added as a reference only.
15. **CX-15 Dwg #15: Per SBBC request, remove mixed air temperature sensor.** Sensor will be removed.
16. **CX-16 Dwg #15: Per SBBC requirements, provide condensate overflow safety switch. Typical for all cooling coils.** Switch will be shown as provided, installed and wired by others.
17. **CX-17 Dwg #15: Indicate why an OA AFMS would be required for a CAV system. OA flow measuring stations to be approved by Joe Alvarex. Please provide approval supporting documentation.** EOR to render opinion.
18. **CX-18 Dwg #17: Replace the word "SPACE" with "RETURN AIR". The temp sensor is located in the return air duct.** Sequence to be updated.
19. **CX-19 Dwg #23: Explain the function of the two CHW flow meters. The location of only 1 flow meter, if a flow meter is requested by the school, should be in a common CHW line or in the decoupling line to monitor the direction of the CHW flow for chiller staging purposes.** They are flow switches to prove flow of chiller and not flow meters. EOR to render opinion on whether or not they are required.
20. **CX-20 Dwg #23: Primary/secondary piping arrangement shown on the diagram does not make sense. Primary and secondary loops should be separated, other than for a common decoupling line for CHW heat exchange purposes.** EOR to render opinion.
21. **CX-21 Dwg #23: Indicate exact location of the secondary CHW loop differential pressure sensor.** Sensor to be located in Bldg 17.
22. **CX-22 Dwg #25: Secondary CHW loop differential pressure sequence is missing.** SCHWP control is noted in sequence. Will modify sequence to make it clearer.



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23. CX-23 Dwg #25: In the control sequences, describe in more detail the primary CHW pumps control. There are 3 pumps with 1 of the 3 pumps with a different flow rate (capacity). EOR to render opinion.
24. CX-24 Dwg #25: In the control sequences, describe how the CHW decoupling line flow interacts with the control devices ie flow meter, temperature sensor, etc. EOR to render opinion.

Sincerely,

Dale Chung
Roth Southeast
Project Manager



**NORCREST
ELEMENTARY
SCHOOL**

PROJECT LOCATION
3951 NE 16th AVENUE
POMPANO BEACH, FL 33064

SUBMITTED BY:
ROTH SOUTHEAST
2260 S.W. 66TH TERRACE
DAVIE, FL 33317
954-423-6640

6/22/20

MATERIAL LIST

PRODUCT DATA SHEETS

SUBMITTAL DRAWINGS

ROTH SOUTHEAST	Project Information:	NORCREST ELEMENTARY SCHOOL	Project Number:	
2260 SW 66TH TERR.		3951 NE 16th AVE	Project Engineer:	DC
DAVIE, FL 33317		POMPANO BEACH, FL 33064	Date:	6/22/20
954-423-6640				

MATERIAL LIST

PART NUMBER	DESCRIPTION	MANUFACTURER	CUT SHEET #
SXWASPXXX10001	AS-P CONTROLLER	SCHNEIDER	1-6
SXWTBASW100001	AS BASE	SCHNEIDER	7-12
SXWTPS24VX100001	AS POWER SUPPLY	SCHNEIDER	13-16
SXWTBPSW100001	AS POWER SUPPLY BASE	SCHNEIDER	13-16
ESW105	ETHERNET SWITCH	B&B ELECTRIC	17-18
AS-B-24	AS CONTROLLER	SCHNEIDER	19-29
AS-B-36	AS CONTROLLER	SCHNEIDER	19-29
MP-C-24A	IP CONTROLLER	SCHNEIDER	30-46
MP-V-7A	IP CONTROLLER	SCHNEIDER	47-59
ETD500-8	DUCT MOUNTED TEMP SENSOR	SCHNEIDER	60-63
ETA500-8	DUCT MOUNTED AVG TEMP SENSOR	SCHNEIDER	60-63
ETI500-6	IMMERSION TEMP SENSOR	SCHNEIDER	60-63
ETI-WELL-6S	WELL	SCHNEIDER	60-63
EHD110-500	OUTDOOR TEMP SENSOR	SCHNEIDER	64-65
CDE	CO SENSOR	VERIS	66-67
AFS-222	FILTER SWITCH	KELE	68-69
GTC-116-P	AIRFLOW MEASURING STATION	EBTRON	70-71
F-1200	AIRFLOW MEASURING STATION	ONICON	72-73
2301-025PD-2F-2D-B	DIFF. PRESS-> TRANSDUCER	SETRA	74-77
LU28-01-B	FLOW SWITCH	KELE	78-79
PXUXX05S	PRESSURE TRANDUCER	VERIS	80-82
LF24-SR-S	ACTUATOR	BELIMO	83-85
X100CAA	POWER SOURCE	VERIS	86-87
H608	CURRENT SWITCH	VERIS	88-89
CKIT-VM1B-F24	RELAY KIT	VERIS	90-91
HC16124	ENCLOSURE	KELE	92
A-30R2410HCR	ENCLOSURE	KELE	93-94

AS-P



Introduction

At the core of a SmartStruxure solution is a SmartStruxure server device, such as AS-P. AS-P performs key functionality, such as control logic, trend logging, and alarm supervision, and supports communication and connectivity to the I/O and field buses. The distributed intelligence of the SmartStruxure solution ensures fault tolerance in the system and provides a fully featured user interface through WorkStation and WebStation.

Features

AS-P is a powerful device that can act as a standalone server and also control I/O modules and monitor and manage field bus devices. In a small installation, the embedded AS-P device acts as a standalone server, mounted with its I/O modules in a small footprint. In medium and large installations, functionality is distributed over multiple SmartStruxure server devices that communicate over TCP/IP.

Communications hub

Capable of coordinating traffic from above and below its location, AS-P can deliver data directly to you or to other servers throughout the site. AS-P can run multiple control programs, manage local I/O, alarms, and users, handle scheduling and

logging, and communicate using a variety of protocols. Because of this, most parts of the system function autonomously and continue to run as a whole even if communication fails or individual SmartStruxure servers or devices go offline.

Variety of connectivity options

AS-P has numerous ports that enable it to communicate with a wide range of protocols, devices, and servers.

AS-P has the following ports:

- Two 10/100 Ethernet ports
- Two RS-485 ports
- One LonWorks TP/FT port
- One built-in I/O bus port
- One USB host port
- One USB device port

The USB device port allows you to upgrade and interact with AS-P using Device Administrator. The USB host port can be used to provide power and communications for the AD touchscreen display.

The two Ethernet ports are connected to a built-in Ethernet switch. One port should be connected to the site network. The other port can be used to connect a single WorkStation or WebStation, a Modbus TCP unit, or a BACnet/IP device, but not another SmartStruxure server.

Authentication and permissions

A SmartStruxure solution provides a powerful permission system that is easy to manage, flexible, and adapts to all kinds of system sizes. The permission system provides a security level to the highest standards. Authentication is done against the built-in user account management system or against Windows Active Directory Domains. The built-in account management system allows an administrator to set password policies that meet stringent CyberSecurity guidelines. When Windows Active Directory is used, the administration costs are lower because users do not have to be managed in multiple directories.

WorkStation/WebStation interface

Through any client, the user experience is similar regardless of which SmartStruxure server the user is logged on to. The user can log directly on to AS-P to engineer, commission, supervise, and monitor AS-P as well as its attached I/O modules and field bus devices. See the WorkStation and WebStation datasheets for additional information.

Open building protocol support

One of the cornerstones of SmartStruxure solution is support for open standards. AS-P can natively communicate with three of the most popular standards for buildings: BACnet, LonWorks, and Modbus.

Native BTL-listed BACnet support

AS-P communicates directly to BACnet/IP and BACnet MS/TP networks. AS-P is BTL-listed as a BACnet Building Controller (B-BC), the most advanced BACnet Device Profile. This capability provides access to an extensive range of BACnet devices from Schneider Electric and other vendors. See the BTL Product Catalog for up-to-date details on BTL listed firmware revisions on BACnet International's home page. AS-P can also serve as a BACnet Broadcast Management Device (BBMD) to facilitate BACnet systems that span multiple IP networks.

Native LonWorks support

AS-P has a built-in FTT-10 port to communicate to the TP/FT-10 LonWorks network. Integrated LonWorks functionality enables access to LonWorks devices from Schneider Electric and other vendors. LonWorks networks can be commissioned, bound, and configured from AS-P using the built-in LonWorks Network Management Tool. No third-party tools are needed. A protocol analyzer with powerful debugging and network quality monitoring features can be achieved using third-party software, without additional hardware needed. To increase ease of use, LNS device plug-ins are supported. This allows for easier engineering and maintenance of LonWorks devices from Schneider Electric and other vendors. There are some limitations on how LNS device plug-ins can be used.

Native Modbus support

AS-P natively integrates Modbus RS-485 master and slave configurations, as well as TCP client and server. This allows full access to third-party products and the range of Schneider Electric products that communicate on the Modbus protocol, such as power meters, UPS, circuit breakers, and lighting controllers.

Additional building protocol support

AS-P also supports integration and communication with Schneider Electric supplied BMS systems and devices that use the following standards for buildings: I/NET, MicroNet, NETWORK 8000, and Andover Continuum Infinet.

Web Services support

AS-P supports the use of Web Services based on open standards, such as SOAP and REST, to consume data into the SmartStruxure solution. Use incoming third-party data (temperature forecast, energy cost) over the Web to determine site modes, scheduling, and programming.

EcoStruxure Web Services support

EcoStruxure Web Services, Schneider Electric's Web Services standard, is natively supported in AS-P. EcoStruxure Web Services offers extra features between compliant systems whether within Schneider Electric or other authorized systems. These features include system directory browsing, read/write of current values, alarm receipt and acknowledgement, and historical trend log data. EcoStruxure Web Services is secure. User name and password are required to log on to the system.

Scalable custom configurations

AS-P and its family of I/O modules were designed to meet the unique needs of each installation. Depending on the configuration, each AS-P can control up to 464 I/O points. Because power and communications are delivered along a common bus, multiple modules can be plugged together without tools in a simple one-step process using the built-in connectors.

Two programming options

Unique to the industry, AS-P has both Script and Function Block programming options. This flexibility assures that the best programming method can be selected for the application.

4 GB of eMMC memory for data and backup

AS-P has an available capacity of 4 GB of eMMC memory. This represents 2 GB for application and historical data and 2 GB dedicated for backup storage. This ensures that all data is safe from damage, loss, or unintended edits. Users can also manually back up or restore AS-P to a storage location on a PC or network. Through the Enterprise Server, users have the ability to perform scheduled backups of associated AS-P devices to network storage for even greater levels of protection.

IT friendly

AS-P communicates using the networking standards. This makes installations easy, management simple, and transactions secure.

TLS support

Communication between clients and the SmartStruxure servers can be encrypted using Transport Layer Security (TLS 1.2). The servers are delivered with a default self-signed certificate. Commercial Certification Authority (CA) server certificates are supported to lower the risk of malicious information technology attacks. Use of encrypted communication can be enforced for both WorkStation and WebStation access.

Supported protocols

- IP addressing (IPv6 ready)
- TCP communications
- DHCP/DNS for rapid deployment and lookup of addresses
- HTTP/HTTPS for Internet access through firewalls, which enables remote monitoring and control
- NTP (Network Time Protocol) for time synchronization throughout the system
- SMTP or SMTPS with support for SSL/TLS based authentication, enables sending email messages triggered by schedule or alarm

Specifications

Electrical

DC input supply power 10 W

DC input supply voltage 24 VDC

Environment

Ambient temperature, operating 0 to 50 °C (32 to 122 °F)

- SNMP enables network supervision and reception of application alarms in designated network management tools

Patented two-piece design

Each module can be separated from its terminal base to allow the site to be wired prior to the installation of the electronics. The patented locking mechanism serves as handles for removing the module from its base. All critical components have a protective cover that permits convection cooling to occur.

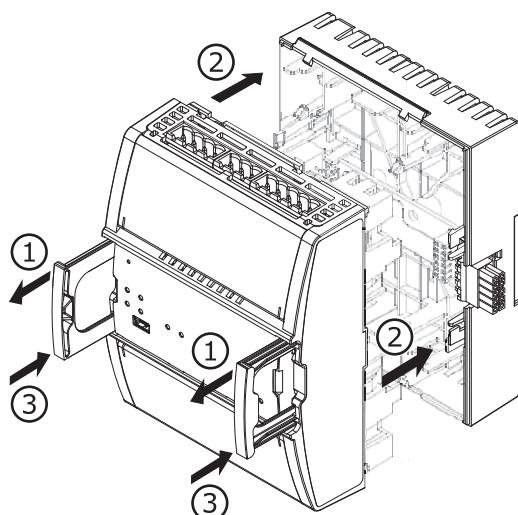


Figure: Two-piece design

Auto-addressing

The auto-addressing feature eliminates the need for setting DIP switches or pressing commission buttons. Each module automatically knows its order in the chain and assigns itself accordingly – significantly reducing engineering and maintenance time.

Simple DIN-rail installation

Fasteners easily snap into a locked position for panel installation. The fastener has a quick-release feature for easy DIN-rail removal.

Ambient temperature, storage -20 to +70 °C (-4 to +158 °F)

Maximum humidity 95 % RH non-condensing

Material

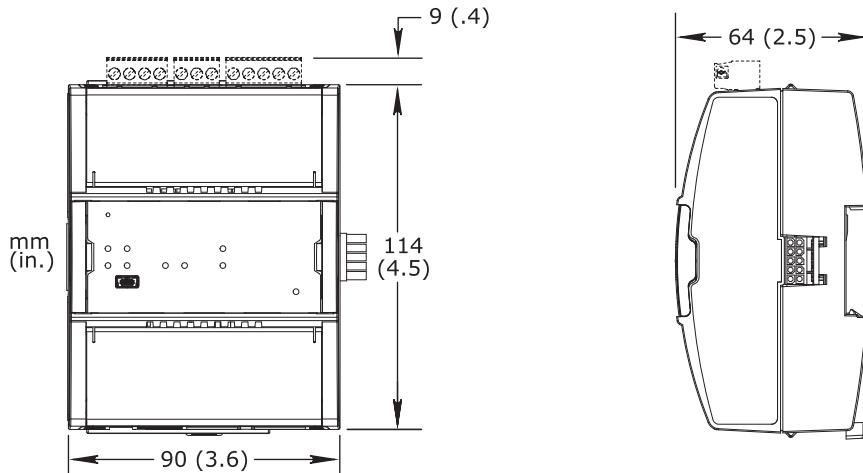
Plastic rating UL94-5VB

Enclosure PC/ABS

Enclosure rating IP 20

Mechanical

Dimensions including terminal base 90 W x 114 H x 64 D mm (3.6 W x 4.5 H x 2.5 D in.)



Weight including terminal base 0.321 kg (0.71 lb)

Weight excluding terminal base 0.245 kg (0.54 lb)

Agency compliances

Emission RCM; EN 61000-6-3; EN 50491-5-2; FCC Part 15, Sub-part B, Class B

Immunity EN 61000-6-2; EN 50491-5-3

Safety EN 60730-1; EN 60730-2-11; EN 50491-3; UL 916 C-UL US Listed

Product EN 50491-1

Smoke control product safety^{a, b} UL 864

a) Applies to AS-P for Smoke Control (AS-P-SMK) and AS-P Terminal Base (TB-ASP-W1).

b) AS-P for Smoke Control (AS-P-SMK) is shipped with a validated UL 864 software version, which can differ from the latest released software. For more information, see Smoke Control Design Guide for UL 864.

Real-time clock backup

Inaccuracy, at 25 °C (77 °F) +/- 52 seconds per month

Backup time 10 days

Communication ports

Ethernet Dual 10/100BASE-TX RJ45

USB USB 2.0, 1 device port (mini-B) and 1 host port (type-A)

RS-485 Dual 2-wire ports, bias 5.0 VDC

LonWorks TP/FT-10

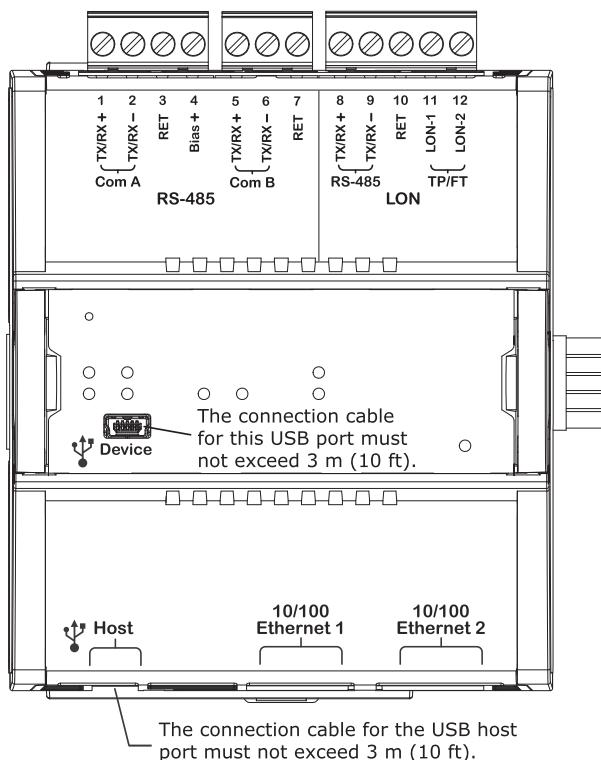
Communications

BACnet BACnet/IP and MS/TP, port configurable, default 47808

.....BTL B-BC (BACnet Building Controller)^a
 a) See the BTL Product Catalog for up-to-date details on BTL listed firmware revisions on BACnet International's home page.

Modbus	Modbus TCP, client and server
.....Serial, RS-485, master or slave	
TCP	Binary, port fixed, 4444
HTTP.....	Non-binary, port configurable, default 80
HTTPS.....	Encrypted supporting TLS 1.2, 1.1, and 1.0, port configurable default 443
SMTP.....	Email sending, port configurable, default 25
SMTSP	Email sending, port configurable, default 587
SNMP.....	version 3
.....Network supervision using poll and trap	
.....Application alarm distribution using trap	

Terminals



LNS

LNS version.....	OpenLNSInstalled on WorkStation PC
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LonMark

Resource files version	14.00
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CPU

Frequency	500 MHz
Type	SPEAr1380, ARM Cortex-A9 dual-core
DDR3 SDRAM.....	512 MB

eMMC memory 4 GB

Memory backup Yes, battery-free, no maintenance

Part numbers

SmartX Controller – AS-P SXWASPXXX10001

SmartX Controller – AS-P-SMK^a SXWASPXXX1S001

a) AS-P for Smoke Control (AS-P-SMK) is shipped with a validated UL 864 software version, which can differ from the latest released software. For more information, see Smoke Control Design Guide for UL 864.

TB-ASP-W1, Terminal Base for SmartX Controller – AS-P
(Required for each SmartX Controller – AS-P) SXWTBASW110002

Add-on options

SW-EWS-1, EcoStruxure Web Services (run-time) option

Consume only for one SmartStruxure server, no maintenance SXWSWEWSX00001

SW-EWS-2, EcoStruxure Web Services (run-time) option

Serve & Consume for one SmartStruxure server, no maintenance SXWSWEWSX00002

SW-EWS-3, EcoStruxure Web Services (run-time) option

Serve & Consume, plus Historical trend log data for one SmartStruxure server, no maintenance SXWSWEWSX00003

SW-GWS-1, Web Services (Generic Consume) option

For one SmartStruxure server, no maintenance SXWSWGWSX00001

SW-SNMP-1, Alarm notifications via SNMP option

For one SmartStruxure server, no maintenance SXWSWSNMP00001

SW-SMARTDRIVER-1, Communication to external devices via SmartDriver

For one SmartDriver license SXWSWSDRV00001

Regulatory Notices

Federal Communications Commission

FCC Rules and Regulations CFR 47, Part 15, Class B

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.

Industry Canada

This Class B digital apparatus complies with Canadian ICES-003.

Cet appareil numérique de la classe B est conforme à la norme NMB-003 du Canada.

Regulatory Compliance Mark (RCM) - Australian Communications and Media Authority (ACMA)

This equipment complies with the requirements of the relevant ACMA standards made under the Radiocommunications Act 1992 and the Telecommunications Act 1997. These standards are referenced in notices made under section 182 of the Radiocommunications Act and 407 of the Telecommunications Act.

CE - Compliance to European Union (EU)

2014/30/EU Electromagnetic Compatibility Directive

2011/65/EU Restriction of Hazardous Substances (RoHS) Directive

This equipment complies with the rules, of the Official Journal of the European Union, for governing the Self Declaration of the CE Marking for the European Union as specified in the above directive(s) per the provisions of the following standards: EN 50491-1 Product Standard; EN 60730-1, EN 60730-2-11, and EN 50491-3 Safety Standards.



WEEE - Directive of the European Union (EU)

This equipment and its packaging carry the waste of electrical and electronic equipment (WEEE) label, in compliance with European Union (EU) Directive 2012/19/EU, governing the disposal and recycling of electrical and electronic equipment in the European community.



LISTED UL 916 Listed products for the United States and Canada, Open Class Energy Management Equipment. UL file E80146.



LISTED UL 864 Listed products for the United States. 10th Edition Smoke Control System. UL file S5527.

Automation Server



Introduction

A StruxureWare Building Operation server is the core of the system and performs key functionality, such as control logic, trend logging, and alarm supervision. The Automation Server software is pre-loaded on Schneider Electric supplied hardware that supports communication and connectivity to the I/O and field busses. The distributed intelligence of the Automation Servers ensures fault tolerance in the system and provides a fully featured user interface through WorkStation and WebStation.

Features

The Automation Server is a powerful device that can act as a standalone StruxureWare Building Operation server and also control I/O modules and monitor and manage field bus devices. In a small installation, the embedded Automation Server acts as a stand-alone StruxureWare Building Operation server, mounted with its I/O modules in a small footprint. In medium and large installations, functionality is distributed over multiple Automation Servers that communicate over TCP/IP.

Communications hub

Capable of coordinating traffic from above and below its location, the Automation Server can deliver data directly to you or to other servers throughout the site. The Automation Server can run multiple control programs, manage local I/O, alarms, and users, handle scheduling and logging, and communicate using a variety of protocols. Because of this, most parts of the system function autonomously and continue to run as a whole even if communication fails or individual servers or devices go offline.

Variety of connectivity options

The Automation Server has numerous ports that enable it to communicate with a wide range of protocols, devices, and servers.

The Automation Server has the following ports:

- One 10/100 Ethernet port
- Two RS-485 ports
- One built-in I/O bus port
- Two USB host ports
- One USB device port

The USB device port allows you to upgrade and interact with the Automation Server using the Device Administrator.

WorkStation/WebStation interface

Through any client, the user experience is similar regardless of which StruxureWare Building Operation server the user is logged on to. The user can log directly on to an Automation Server to engineer, commission, supervise, and monitor the Automation Server as well as its attached I/O modules and field bus devices. See the WorkStation and WebStation datasheets for additional information.

Open building protocol support

One of the cornerstones of StruxureWare Building Operation is support for open standards. The Automation Server can natively communicate with three of the most popular standards for buildings: BACnet, LonWorks, and Modbus.

Native BTL-listed BACnet support

The Automation Server communicates directly to BACnet/IP and BACnet MS/TP networks. It is compliant with ASHRAE 135-2004, the Automation Server is BTL-listed as a BACnet Building Controller (B-BC), the most advanced BACnet Device Profile, and as a BACnet Operator Workstation (B-OWS). This capability provides access to the full range of BACnet devices from Schneider Electric and other vendors. See the BTL Product Catalog for up-to-date details on BTL listed firmware revisions on BACnet International's home page. The Automation Server can also serve as a BACnet Broadcast Management Device (BBMD) to facilitate BACnet systems that span multiple IP networks.

Native LonWorks support

The Automation Server has a built in FTT-10 port to communicate to the TP/FTT-10 LonWorks network. Integrated LonWorks functionality enables access to LonWorks devices from Schneider Electric and other vendors. Lonworks networks can be commissioned, bound, and configured from the Automation Server using the built-in LonWorks Network Management Tool. No third-party tools are needed. A protocol analyzer with powerful debugging and network quality monitoring features can be achieved using third-party software, without additional hardware needed.

Native Modbus support

The Automation Server natively integrates Modbus RS-485 master and slave configurations, as well as TCP client and server. This allows full access to third-party products and the range of Schneider Electric products that communicate on the Modbus protocol, such as power meters, UPS, circuit breakers, and lighting controllers.

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The Automation Server supports the use of Generic Web Services based on open standards, such as SOAP and REST, to consume data into StruxureWare Building Operation. Use incoming third-party data (temperature forecast, energy cost) over the Web to determine site modes, scheduling, and programming.

EcoStruxure Web Services support

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alarm receipt and acknowledgement, and historical trend log data. EcoStruxure Web Services is secure. User name and password are required to log on to the system.

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The Automation Server and its family of I/O modules were designed to meet the unique needs of each installation. Depending on the configuration, each Automation Server can control up to 464 I/O points. Because power and communications are delivered along a common bus, multiple modules can be plugged together without tools in a simple one-step process using the built-in connectors.

Two programming options

Unique to the industry, the Automation Server has both Script and Function Block programming options. This flexibility assures that the best programming method can be selected for the application.

4 GB of memory for data and backup

The Automation Server has an available capacity of 4 GB of memory. This represents 2 GB for application and historical data and 2 GB dedicated for backup storage. This ensures that all data is safe from damage, loss, or unintended edits. Users can also manually back up or restore the Automation Server to a storage location on a PC or network. Through the Enterprise Server, users have the ability to perform scheduled backups of associated Automation Servers to network storage for even greater levels of protection.

IT friendly

The Automation Server communicates using the networking standards. This makes installations easy, management simple, and transactions secure.

Supported protocols

- IP addressing (IPv6 ready)
- TCP communications
- DHCP/DNS for rapid deployment and lookup of addresses
- HTTP/HTTPS for Internet access through firewalls, which enables remote monitoring and control
- NTP (Network Time Protocol) for time synchronization throughout the system
- SMTP enables sending email messages

Patented two-piece design

Each module can be separated from its terminal base to allow the site to be wired prior to the installation of the electronics. The patented locking mechanism serves as handles for removing the module from its base. All critical components have a protective cover that permits natural convection cooling to occur.

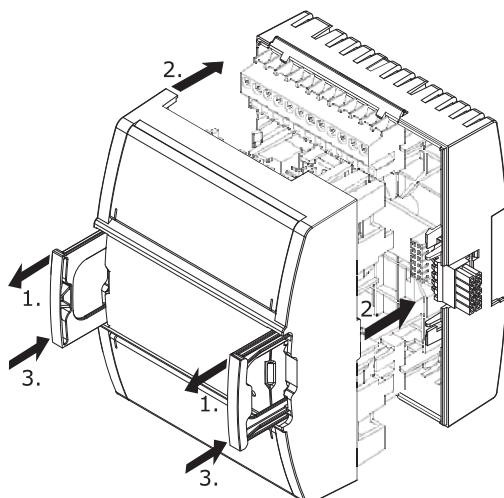


Figure: Two-piece design

Auto-addressing

The auto-addressing feature eliminates the need for setting DIP switches or pressing commission buttons. With the Automation Server family, each I/O module automatically knows its order in the chain and assigns itself accordingly – significantly reducing engineering and maintenance time.

Simple DIN-rail installation

Fasteners easily snap into a locked position for panel installation. The fastener has a quick-release feature for easy DIN rail removal.

Specifications

Electrical

DC input supply power	7 W
DC input supply voltage	24 VDC

Environment

Ambient temperature, operating	0 to 50 °C (32 to 122 °F)
Ambient temperature, storage	-20 to +70 °C (-4 to +158 °F)

Maximum humidity.....	95 % RH non-condensing
-----------------------	------------------------

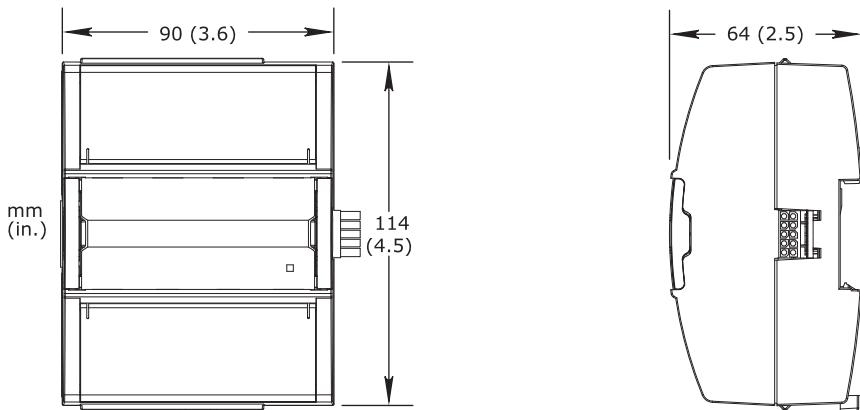
Material

Plastic rating.....	UL94-5VB
Enclosure	Eco Friendly ABS/PC

Enclosure rating.....	IP 20
-----------------------	-------

Mechanical

Dimensions including terminal base	90 W x 114 H x 64 D mm (3.6 W x 4.5 H x 2.5 D in.)
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Weight including terminal base.....	0.294 kg (0.65 lb)
Weight excluding terminal base.....	0.194 kg (0.43 lb)

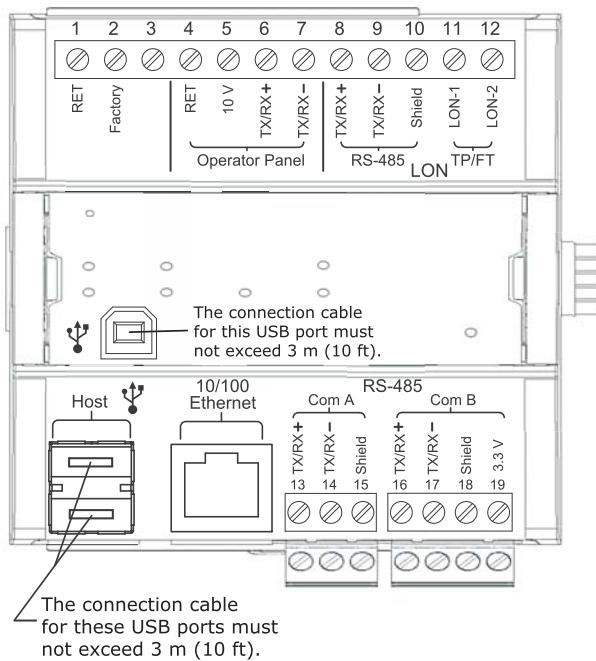
Agency compliances

Emission.....	C-Tick; EN 61000-6-3; FCC Part 15, Sub-part B, Class B
Immunity	EN 61000-6-2
Safety.....	UL 916 C-UL US Listed
Real-time clock backup30 days

Communications

Ethernet LAN interface.....	10/100 Mbit/s; twisted pair cable with RJ-45 connector
USB	1 device and 2 host ports
BACnet	BACnet/IP and MS/TPBTL B-BC (BACnet Building Controller) ^aBTL B-OWS (BACnet Operator Workstation) ^a
a) See the BTL Product Catalog for up-to-date details on BTL listed firmware revisions on BACnet International's home page.	
LonWorks	TP/FT-10
COM A	2-wire RS-485
COM B	2-wire RS-485 and 3.3 VDC
I/O Modules	RS-485
TCP	Binary, port configurable, default 4444
HTTP	Non-binary, port configurable, default 80
HTTPS	Encrypted supporting SSL 1.0, 2.0, 3.0 and TSL 1.0, port configurable default 443
SMTP	Email sending, port configurable, default 25

Terminals



CPU

Frequency	160 MHz
SDRAM	128 MB
Flash memory	4 GB

Part numbers

Automation Server	SXWAUTSVR10001
TB-AS-W1, Terminal Base for Automation Server (Required for each Automation Server)	SXWTBASW110001

Add-on options

SW-EWS-1, EcoStruxure Web Services (run-time) option Consume only for one Automation Server, no maintenance	SXWSWEWSX00001
SW-EWS-2, EcoStruxure Web Services (run-time) option Serve & Consume for one Automation Server, no maintenance	SXWSWEWSX00002
SW-EWS-3, EcoStruxure Web Services (run-time) option Serve & Consume, plus Historical trend log data for one Automation Server, no maintenance	SXWSWEWSX00003
SW-GWS-1, Web Services (Generic Consume) option For one Automation Server, no maintenance	SXWSWGWSX00001

Internal configuration

All connectors of the Automation Server except for the Ethernet connector refers to signal ground as shown in the figure below.

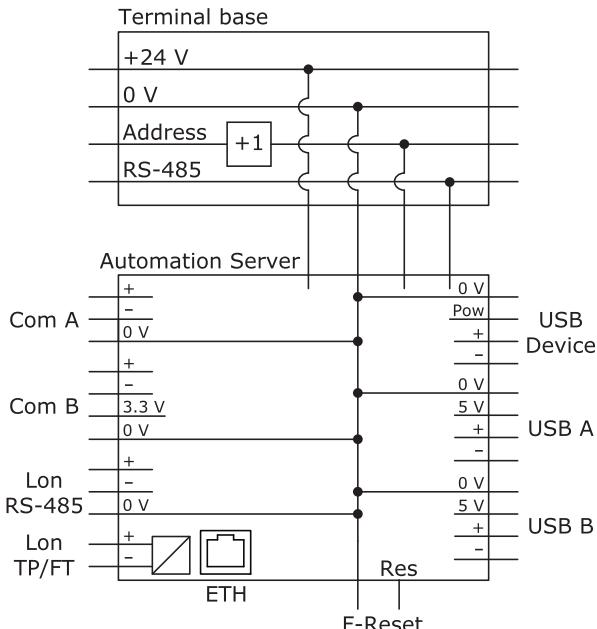


Figure: Automation Server internal configuration

The I/O bus in the terminal base provides the Automation Server with power and an address. The address value in the terminal base is increased by one for each terminal base. The I/O bus also enables RS-485 communication between the Automation Server and the I/O modules.

Regulatory Notices

FCC Federal Communications Commission

FCC Rules and Regulations CFR 47, Part 15, Class B

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.

Industry Canada

ICES-003

This is a Class B digital device that meets all requirements of the Canadian Interference Causing Equipment Regulations.



N1831 C-Tick (Australian Communications Authority (ACA))

AS/NZS 3548

This equipment carries the C-Tick label and complies with EMC and radio communications regulations of the Australian Communications Authority (ACA), governing the Australian and New Zealand (AS/NZS) communities.

Trademarks and registered trademarks are the property of their respective owners.

CE - Compliance to European Union (EU)

2004/108/EC Electromagnetic Compatibility Directive

This equipment complies with the rules, of the Official Journal of the European Union, for governing the Self Declaration of the CE Marking for the European Union as specified in the above directive(s) per the provisions of the following standards: IEC/EN 61326-1 Product Standard, IEC/EN 61010-1 Safety Standard.



WEEE - Directive of the European Union (EU)

This equipment and its packaging carry the waste of electrical and electronic equipment (WEEE) label, in compliance with European Union (EU) Directive 2002/96/EC, governing the disposal and recycling of electrical and electronic equipment in the European community.



UL 916 Listed products for the United States and Canada, Open Class Energy Management Equipment.

Automation Server PS-24V Power Supply

Enables StruxureWare Building
Operation v1.3

Automation Server power supply modules are designed to accommodate the specific power requirements of the Automation Server and its connected I/O modules.



Make the most of your energySM

Schneider
Electric

Automation Server PS-24V Power Supply Module Features



The PS-24V is a power supply module that accommodates 24 VAC or 24 VDC input power.

Reliable consistent output power

Each power supply module delivers reliable and consistent output power of 24 VDC to the backplane.

Modular and scalable system

This power supply supports the Automation Server and its family of I/O modules. This modular system delivers power and communications on a common bus. Connecting modules is a one-step process: just slide the modules together using the built-in connectors.

A 30 W power supply can deliver power to the Automation Server and a number of I/O modules calculated from the Power Budget Table (located on page 3). If more I/O modules are needed, another power supply can be added to the bus. The power supplies are isolated from each other while also providing communication pass-through.



PRODUCT AT A GLANCE

- Reliable consistent output power
- Modular and scalable system
- Polarity independent
- Overload protection
- Patented two-piece design
- Hot-connect / Hot-swap
- Auto-addressing
- Simple DIN-rail installation
- Accommodates multiple row panel installations
- 30 W rating
- Status indicators

Polarity independent

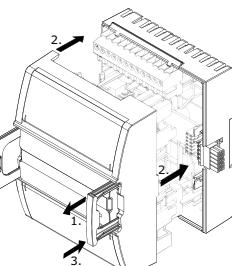
The power supply input (from main power) and output (to modules) are galvanically isolated. This removes the risk of damage due to earth currents and permits the input power to be wired without concern for polarity matching.

Overload protection

When a power supply module's load (total load of Automation Server, I/O modules, communication modules) exceeds its rating, the power supply will protect itself from being damaged.

Patented two-piece design

Each module can be separated from its terminal base to allow the site to be wired prior to the installation of the electronics. The patented locking mechanism serves as handles for removing the module from its base. All critical components have a protective cover that permits natural convection cooling to occur.



Automation Server PS-24 Power Supply Module

Features (continued)

Power Budget Table

	Power Requirements 24 VDC Power
Automation Server	7 W
Input Only I/O	
DI-16	1.6 W
UI-16	1.8 W
Output Only I/O	
DO-FA-12	1.8 W
DO-FA-12-H	1.8 W
DO-FC-8	2.2 W
DO-FC-8-H	2.2 W
AO-8	4.9 W
AO-8-H	4.9 W
AO-V-8	0.7 W
AO-V-8-H	0.7 W
Mixed I/O	
UI-8/DO-FC-4	1.9 W
UI-8/DO-FC-4-H	1.9 W
UI-8/AO-4	3.2 W
UI-8/AO-4-H	3.2 W
UI-8/AO-V-4	1.0 W
UI-8/AO-V-4-H	1.0 W

Hot-connect / Hot-swap

Because critical applications require 24-hour operation, Schneider Electric designed the entire family of modules for hot-connection of terminal bases and hot-swapping of modules to and from their bases. This design ensures continuous power and communication during service operations.

Auto-addressing

The auto-addressing feature eliminates the need for setting DIP switches or pressing commission buttons. With the Automation Server family, each module automatically knows its order in the chain and assigns itself accordingly.

Simple DIN-rail installation

Fasteners easily snap into a locked position for panel installation. The fastener has a quick-release feature for easy DIN rail removal.

Accommodates multiple row panel installations

The Automation Server module family uses built-in connectors for single row connectivity. If a panel size requires multiple rows, an interconnection cable is available.

30 W rating

This power supply module can supply power for loads up to 30 W. The consumption of downstream modules can vary. A PS-24V can typically power an Automation Server and a number of I/O modules calculated from the Power Budget Table.

Status indicators

The front panel of the PS-24V module includes status LEDs for input and output power. The LED for input power indicates the status of the main power. The output power indicator shows if the power supply output is within the proper range.

Automation Server PS-24 Power Supply Module Specifications

Specifications

Electrical

I/O bus power

24 VDC, max. 30 W per I/O bus power supply, Class 2

Maximum addresses per I/O bus

32

AC input

Nominal voltage

24 VAC, 50/60 Hz

Operating range

24 VAC, $\pm 20\%$, 50/60 Hz

Input current

Max. 2.5 A rms

Recommended transformer rating

≥ 60 VA

DC input

Nominal voltage

24 to 30 VDC

Operating range

21 to 33 VDC

Power consumption

Max. 40 W

DC output

Output voltage

24 V ± 1 V

Output power

Max. 30 W

Mechanical

Enclosure

Eco Friendly ABS/PC

Enclosure rating

IP 20

Plastic rating

UL94-5VB rated plastic

Dimensions (including terminal base)

90 W x 114 H x 64 D mm

(3.6 W x 4.5 H x 2.5 D in.)

Weight (including terminal base)

0.285 kg (0.63 lb)

Weight (excluding terminal base)

0.186 kg (0.41 lb)

Installation

DIN-rail or panel installation

Operation environment

Ambient temperature, operating

0 °C to 50 °C (32 °F to 122 °F)

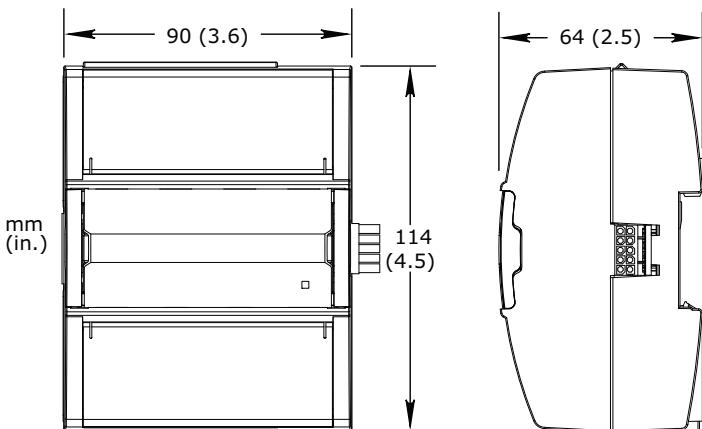
Ambient temperature, storage

-20 °C to +70 °C (-4 °F to +158 °F)

Humidity

Max. 95 % RH (non-condensing)

Dimensional drawing



Agency compliances

Emission

C-Tick; EN 61000-6-3; FCC Part 15,
Sub-part B, Class B

Immunity

EN 61000-6-2

Safety

UL 916 C-UL US Listed

Part numbers

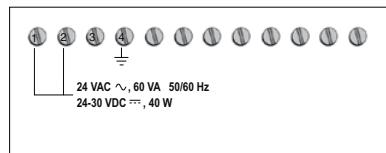
PS-24V, Power Supply 24 VAC/VDC

P/N: SXWPS24VX10001

TB-PS-W1, Terminal Base for Power Supply (Required for each power supply)

P/N: SXWTBPSW110001

Connectors



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Schneider Electric One High Street, North Andover, MA 01845 USA Telephone: +1 978 975 9600 Fax: +1 978 975 9698 www.schneider-electric.com/buildings
SDS-AS-POWERSUPPLY-A4.BU.N.EN.11.2012.0.00.CC November 2012 BAS

5 & 8 Port, Ultra Compact Industrial Ethernet Switches

ESW105 & ESW108 Series



PRODUCT FEATURES

- Ultra compact design - less than 1 inch wide
- UL/cUL Class I/Division 2 Groups A,B,C, and D
- Designed to meet Level 3 (Heavy) industrial environments - EN61000-6-2 Certifications
- Shock, vibration, free fall tested
- LC single and multi mode fiber ports
- 10/100M, full/half duplex, MDI/MDI-X (Auto-negotiate)
- Supports IEEE 802.3, 802.3u, and 802.3x standards
- IP30 rated DIN rail case with 6 different panel mount options
- Dual power inputs, 12 to 36 VDC and 10 to 24 VAC
- 2K MAC addresses

Designed to fit many applications, the ESW105 and ESW108 series are more than just an Ethernet switch with low pricing. They are plug-and-play industrial Ethernet Switches with an ultra compact IP30 DIN rail case, 6 way mountable panel brackets, LEDs for Power, (Link / Speed / Activity for each port), 12 to 36 VDC and 10 to 24 VAC power inputs with removable terminal blocks. These switches are perfect for any applications that require special protection from harsh environments.

Choose a switch with five or eight copper ports, or a combination of copper and fiber ports. Multi-mode fiber models extend range up to 2 km. Single-mode fiber models extend range up to 20 km. All models require an external power supply (sold separately).

The switch ships with 4 panel mount clips giving the user 6 different ways to panel mount the unit.

ORDERING INFORMATION

MODEL NUMBER	10/100 COPPER	MULTI-MODE FIBER	SINGLE-MODE FIBER
ESW105	5		
ESW105-ML	4	1 (LC)	
ESW105-SL	4		1 (LC)
ESW108	8		
ESW108-ML	7	1 (LC)	
ESW108-SL	7		1 (LC)

ACCESSORIES

- DFMM-LCLC-3M - Multi-Mode Duplex Fiber Cable, LC to LC, 3 Meter
 MDR-20-24 - DIN rail mount power supply 24VDC, 1.0 A output power
 MDR-40-24 - DIN rail mount power supply 24VDC, 1.7 A output power
 EIRSP1 - Industrial DIN rail mount Ethernet Surge Suppressor

5 & 8 Port, Ultra Compact Industrial Ethernet Switches

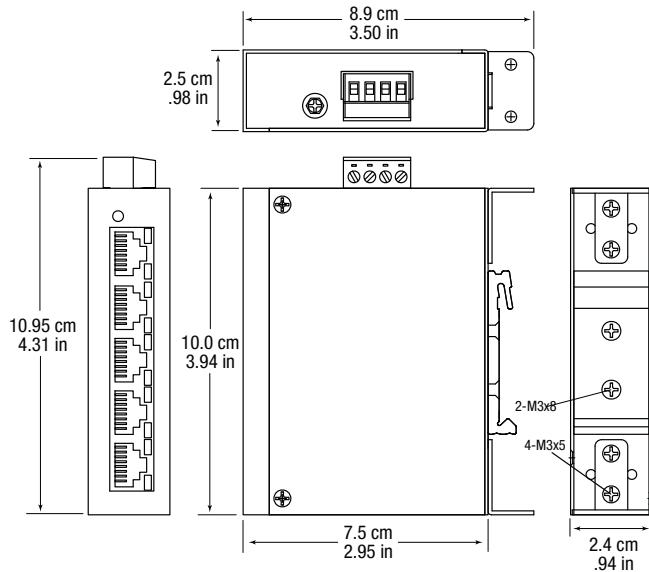
ESW105 & ESW108 Series



SPECIFICATIONS

TECHNOLOGY	
Standards:	IEEE802.3, 802.3u, 802.3x
Processing Type:	Store and forward with IEEE802.3x full duplex, non-blocking flow control
Flow Control:	IEEE802.3x flow control, back pressure flow control
Packet Buffer Memory:	64K bytes
Address Table Size	2K MAC Addresses
INTERFACE	
RJ45 Ports:	10/100BaseT(X) auto negation, Full/Half duplex, auto MDI/MD-X
Fiber Ports:	100BaseFX, (multi-mode or single-mode with LC connectors)
LED Indicators:	Power, (Link / Speed / Activity for each port)
POWER	
Input Voltage	12 to 36 VDC and 10 to 24 VAC
Power Consumption	4.00 W Max
Input Connection	Removable Terminal Block
Protection	Reverse Polarity Protection
ENVIRONMENTAL	
Operating Temperature	-10 to 60°C (14 to 140°F)
Storage Temperature	-40 to 80°C (-40 to 176°F)
Humidity	10 to 95% Non-condensing
MTBF	200,000 hours
MTBF Calculation	Parts count reliability prediction
MECHANICAL	
Enclosure	IP30 DIN mount metal case
Dimensions (5 ports)	H 10.0 x W 2.5 x D 7.5 mm (3.94 x 0.98 x 2.95in)
Dimensions (8 ports)	H 145 x W 24 x D 75mm (5.71 X 0.94 x 2.95in)
Installation	35 mm DIN or 6 way panel mount

MECHANICAL DIAGRAM 5 PORT MODEL



FIBER OPTICS

Fiber Type	Distance	Wavelength	Transmit Power	Receive Sensitivity
Multi-mode	2 km	1310 nm	-.23.5 to -.14 dBm	≤ -.35 dBm
Single-mode	20 km	1310 nm	-.15 to -.8 dBm	≤ -.35 dBm

REGULATORY APPROVALS

CE, FCC, RoHS

HAZARDOUS LOCATIONS

UL/cUL Class I Div 2 Groups A,B,C, and D

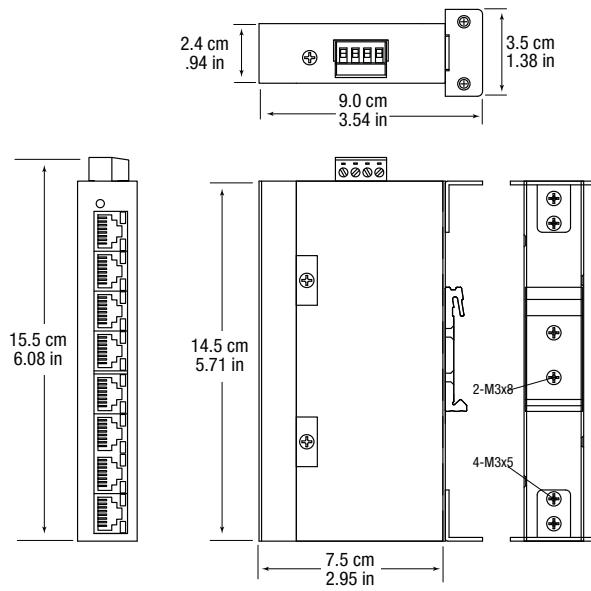
SPECIFICATIONS-LEVEL 3, EN 61000-6-2: 2006 GENERIC STANDARDS FOR (HEAVY) INDUSTRIAL ENVIRONMENTS

Test	Description	Test Level	Level
EN 55022: 2006 + A1:2007	Class B Emissions		
EN 61000-4-2: 2009	Electro-Static Discharge (ESD)	Enclosure Contact 6kV Enclosure Air 8kV	3 3
EN61000-4-3:2006+A1:2008	Radiated Field Immunity (RFI)	Enclosure Ports 10V/m	3
EN61000-4-4:2004	Burst (Fast Transient)	Signal Ports 1kV@2.5Khz DC Ports 2kV	3 3
EN61000-4-5:2006	Surge	Signal Ports 1kV DC Power 2kV	3
EN61000-4-6: 2009	Induced (Conductive) RFI	Signal Ports 10 V RMS DC Power Ports 10 V RMS	3 3

ENVIRONMENTAL SPECIFICATIONS

TEST	DESCRIPTION	TEST LEVEL	LEVEL
IEC60068-2-6	Vibration	Test Fc	2G
IEC60068-2-27	Shock	Test Ea	30G
IEC 60068-2-32	Free Fall		-----

MECHANICAL DIAGRAM 8 PORT MODEL



AS-B



Introduction

At the core of a SmartStruxure solution is a SmartStruxure server device, such as AS-B. AS-B performs key functionality, such as control logic, trend logging, and alarm supervision, provides built-in I/O, and supports communication and connectivity to the field buses. The distributed intelligence of the SmartStruxure solution ensures fault tolerance in the system and provides a fully featured user interface through WorkStation and WebStation.

Feature

AS-B is a powerful device with built-in power supply and I/O. AS-B can act as a standalone server using its built-in I/O and also monitor and manage field bus devices. In a small installation, the embedded AS-B device acts as a standalone server, mounted in a small footprint. In medium and large installations, functionality is distributed over multiple SmartStruxure server devices that communicate over TCP/IP.

Communications hub

Capable of coordinating traffic from above and below its location, AS-B can deliver data directly to you or to other servers throughout the site. AS-B can run multiple control programs, manage built-in

I/O, alarms, and users, handle scheduling and logging, and communicate using a variety of protocols. Because of this, most parts of the system function autonomously and continue to run as a whole even if communication fails or individual SmartStruxure servers or devices go offline.

Models

AS-B comes in eight models with different I/O point count and I/O mix.

Model	I/O Points
AS-B-24	24
AS-B-24H	24
AS-B-24L	24
AS-B-24HL	24
AS-B-36	36
AS-B-36H	36
AS-B-36L	36
AS-B-36HL	36

AS-Bs with "H" in the product name are equipped with a display for output override.

AS-Bs with "L" in the product name do not support Modbus, BACnet MS/TP, or hosting of BACnet/IP devices. The RS-485 port is not used.

AS-Bs with 36 I/O points have the same small footprint as AS-Bs with 24 I/O points, but with 50 percent higher I/O point count.

Versatile and flexible mix of I/O points

AS-B offers a mix of I/O point types that match most types of HVAC applications. Most I/O points are highly flexible and can be configured as either inputs or outputs.

AS-Bs with 24 I/O points have the following types:

- 12 Universal inputs/outputs, Ua type
- 4 Universal inputs/outputs, Ub type
- 4 Digital inputs
- 4 Relay outputs

AS-Bs with 36 I/O points have the following types:

- 20 Universal inputs/outputs, Ua type
- 8 Universal inputs/outputs, Ub type
- 4 Triac outputs
- 4 Relay outputs

Universal inputs/outputs

The universal inputs/outputs are ideal for any mix of temperature, pressure, flow, status points, and similar point types in a building control system.

The universal inputs/outputs can be configured to read several different types of inputs:

- Digital
- Counter
- Supervised
- Voltage
- Current (Ub only)
- Temperature
- Resistive
- 2-Wire RTD temperature
- 2-Wire RTD resistive

As counter inputs, the universal inputs/outputs are commonly used in energy metering applications. As RTD inputs, they are ideal for temperature points in a building control system. As supervised inputs,

they are used for security applications where it is critical to know whether or not a wire has been cut or shorted. These events provide a separate indication of alarms and trouble conditions to the system.

The universal inputs/outputs are capable of supporting analog outputs of type voltage outputs. Therefore, the universal inputs/outputs support a wide range of devices, such as actuators.

Digital inputs

The digital inputs can be used for cost effective sensing of multiple dry contact digital inputs in applications, such as equipment status monitoring or alarm point monitoring. As counter inputs, digital inputs are commonly used in energy metering applications.

Relay outputs

The relay outputs support digital Form A point types. The Form A relays are designed for direct load applications.

Triac outputs

The triac outputs can be used in many applications to switch 24 VAC on or off for external loads such as actuators, relays, or indicators. Triacs are silent and last longer than relays.

Manual override function

AS-Bs with "H" in the product name are equipped with an LCD display and keys to support manual override control of analog and digital outputs. This function allows you to manually override the outputs for testing, commissioning, and maintenance of equipment.

The override configuration is readable through user interfaces, such as Building Operation WorkStation, enabling more precise monitoring and control.

Built-in power supply

The device has a built-in power supply designed to accommodate 24 VAC or 24 VDC input power. The main AC/DC input (L/+ and N/-) is galvanically isolated from the electronics. This removes the risk of damage due to earth currents and permits the input power to be wired without concern for polarity matching.

Variety of connectivity options

AS-B has numerous ports that enable it to communicate with a wide range of protocols, devices, and servers.

AS-B has the following ports:

- Two 10/100 Ethernet ports
- One RS-485 port
- One USB host port
- One USB device port

The two Ethernet ports are connected to a built-in Ethernet switch. One port should be connected to the site network. The other port can be used to connect a single WorkStation or WebStation, a Modbus TCP unit, or a BACnet/IP device, but not another SmartStruxure server.

The USB device port allows you to upgrade and interact with AS-B using Device Administrator. The USB host port can be used to provide power and communications for AD.

Authentication and permissions

A SmartStruxure solution provides a powerful permission system that is easy to manage, flexible, and adapts to all kinds of system sizes. The permission system provides a security level to the highest standards. Authentication is done against the built-in user account management system or against Windows Active Directory Domains. The built-in account management system allows an administrator to set password policies that meet stringent CyberSecurity guidelines. When Windows Active Directory is used, the administration costs are lower because users do not have to be managed in multiple directories.

WorkStation/WebStation interface

Through any client, the user experience is similar regardless of which SmartStruxure server the user is logged on to. The user can log directly on to AS-B to engineer, commission, supervise, and monitor AS-B and its built-in I/O as well as its attached field bus devices. See the WorkStation and WebStation specification sheets for additional information.

Open building protocol support

One of the cornerstones of SmartStruxure solution is support for open standards. AS-B can natively communicate with two of the most popular standards for buildings: BACnet and Modbus.

Native BACnet support

AS-B communicates directly to BACnet/IP and BACnet MS/TP networks. AS-B provides access to an extensive range of BACnet devices from Schneider Electric and other vendors.

Native Modbus support

AS-B natively integrates Modbus RS-485 master and slave configurations, as well as Modbus TCP client and server. This allows full access to third-party products and the range of Schneider Electric products that communicate on the Modbus protocol, such as power meters, UPS, circuit breakers, and lighting controllers.

Web Services support

AS-B supports the use of Web Services based on open standards, such as SOAP and REST, to consume data into the SmartStruxure solution. Use incoming third-party data (temperature forecast, energy cost) over the Web to determine site modes, scheduling, and programming.

EcoStruxure Web Services support

EcoStruxure Web Services, Schneider Electric's Web Services standard, is natively supported in AS-B. EcoStruxure Web Services offers extra features between compliant systems whether within Schneider Electric or other authorized systems. These features include system directory browsing, read/write of current values, alarm receipt and acknowledgement, and historical trend log data. EcoStruxure Web Services is secure. User name and password are required to log on to the system.

Two programming options

Unique to the industry, AS-B has both Script and Function Block programming options. This flexibility assures that the best programming method can be selected for the application.

4 GB of eMMC memory for data and backup

AS-B has an available capacity of 4 GB of eMMC memory. This represents 2 GB for application and historical data and 2 GB dedicated for backup storage. This ensures that all data is safe from damage, loss, or unintended edits. Users can also manually back up or restore AS-B to a storage location on a PC or network. Through the Enterprise Server, users have the ability to perform scheduled backups of associated AS-B devices to network storage for even greater levels of protection.

IT friendly

AS-B communicates using the networking standards. This makes installations easy, management simple, and transactions secure.

TLS support

Communication between clients and the SmartStruxure servers can be encrypted using Transport Layer Security (TLS 1.0). The servers are delivered with a default self-signed certificate. Commercial Certification Authority (CA) server certificates are supported to lower the risk of malicious information technology attacks. Use of encrypted communication can be enforced for both WorkStation and WebStation access.

Supported protocols

- IP addressing (IPv6 ready)
- TCP communications
- DHCP/DNS for rapid deployment and lookup of addresses
- HTTP/HTTPS for Internet access through firewalls, which enables remote monitoring and control
- NTP (Network Time Protocol) for time synchronization throughout the system
- SMTP or SMTPS with support for SSL/TLS based authentication, enables sending email messages triggered by schedule or alarm
- SNMP enables network supervision and reception of application alarms in designated network management tools

Specifications

AC input

Nominal voltage24 VAC
Operating voltage range.....	+/-20 %
Frequency50/60 Hz
Maximum current.....	0.5 A rms
Recommended transformer rating	≥15 VA

DC input

Nominal voltage24 to 30 VDC
Operating voltage range.....	.21 to 33 VDC
Maximum power consumption.....	10 W

Environment

Ambient temperature, operating0 to 50 °C (32 to 122 °F)
Ambient temperature, storage	-.20 to +70 °C (-4 to +158 °F)
Maximum humidity.....	.95 % RH non-condensing

Material

Plastic rating	UL94-5VB
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Simple DIN-rail installation

Fasteners easily snap into a locked position for panel installation. The fastener has a quick-release feature for easy DIN-rail removal.

Removable terminal blocks

AS-B uses pluggable terminal blocks, which are easy to install and remove from the device. The terminal blocks are ordered separately from Schneider Electric.

Efficient terminal management

The input and output terminals are clearly labeled. The Building Operation WorkStation software can generate custom as-built labels for AS-B.

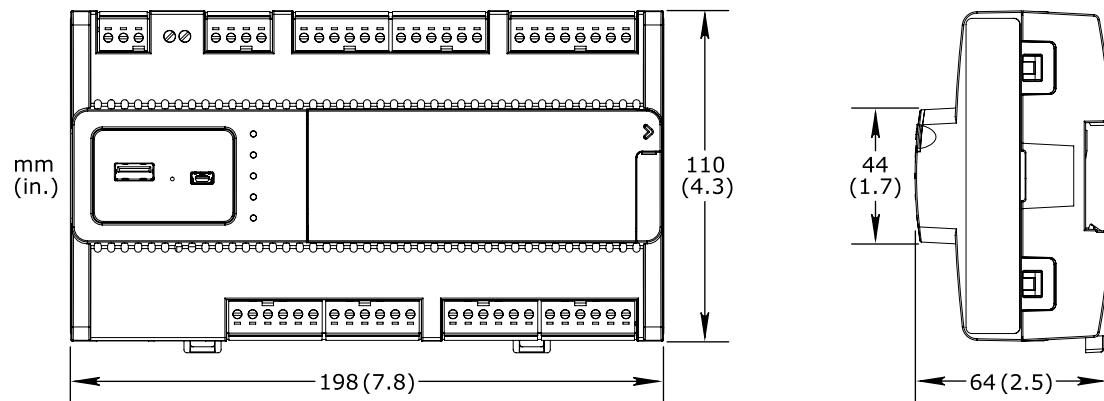
Protection

Protection components on the universal inputs/outputs, digital inputs, and triac outputs protect against high-voltage short-duration transient events. Universal inputs/outputs configured as current inputs (Ub only) are protected against over current. Universal inputs/outputs configured as voltage outputs have current limits to protect against permanent short-circuit to ground.

Enclosure PC/ABS
 Enclosure rating IP 20

Mechanical

Dimensions 198 W x 110 H x 64 D mm (7.8 W x 4.3 H x 2.5 D in.)



Weight, including terminal blocks 0.504 kg (1.111 lb)^a
 a) The weight includes the display and keys, which are 0.022 kg (0.049 lb).

Weight, excluding terminal blocks 0.420 kg (0.926 lb)^a
 a) The weight includes the display and keys, which are 0.022 kg (0.049 lb).

Agency compliances

Emission RCM; EN 61000-6-3; EN 50491-5-2; FCC Part 15, Sub-part B, Class B
 Immunity EN 61000-6-2; EN 50491-5-3
 Safety EN 60730-1; EN 60730-2-11; EN 50491-3; UL 916 C-UL US Listed
 Product EN 50491-1

Real-time clock backup

Inaccuracy, at 25 °C (77 °F) +/-52 seconds per month
 Backup time 10 days

Communication ports

Ethernet Dual 10/100BASE-TX RJ45
 USB USB 2.0, 1 device port (mini-B) and 1 host port (type-A)
 RS-485 2-wire port, bias 5.0 VDC

Communications

BACnet BACnet/IP and MS/TP, port configurable, default 47808
 Modbus Modbus TCP, client and server
 Serial, RS-485, master or slave
 TCP Binary, port fixed, 4444
 HTTP Non-binary, port configurable, default 80
 HTTPS Encrypted supporting TLS 1.0, port configurable default 443
 SMTP Email sending, port configurable, default 25
 SMTPS Email sending, port configurable, default 587
 SNMP version 3
 Network supervision using poll and trap

CPUApplication alarm distribution using trap
Frequency	333 MHz
Type	SPEAr320S, ARM926 core
DDR2 SDRAM.....	256 MB
eMMC memory	4 GB
Memory backup	Yes, battery-free, no maintenance
Display	
Display resolution	128 x 64 pixels
Display size	36 W x 17 H mm (1.4 W x 0.7 H in.)
Display type	FSTN monochrome LCD, white color transflective backlight
Part numbers	
SmartX Controller – AS-B-24	SXWASB24X10001
SmartX Controller – AS-B-24H	
Includes display	SXWASB24H10001
SmartX Controller – AS-B-24L	
No support for Modbus, BACnet MS/TP, or hosting of BACnet/IP devices	SXWASB24X10002
SmartX Controller – AS-B-24HL	
Includes display	
No support for Modbus, BACnet MS/TP, or hosting of BACnet/IP devices	SXWASB24H10002
SmartX Controller – AS-B-36	SXWASB36X10001
SmartX Controller – AS-B-36H	
Includes display	SXWASB36H10001
SmartX Controller – AS-B-36L	
No support for Modbus, BACnet MS/TP, or hosting of BACnet/IP devices	SXWASB36X10002
SmartX Controller – AS-B-36HL	
Includes display	
No support for Modbus, BACnet MS/TP, or hosting of BACnet/IP devices	SXWASB36H10002
AS-B connector kit (includes terminal blocks).....	SXWASBCON10001
AS-B installer kit	SXWASBINS10001
Add-on options	
SW-EWS-1, EcoStruxure Web Services (run-time) option Consume only for one SmartStruxure server, no maintenance.....	SXWSWEWSX00001
SW-EWS-2, EcoStruxure Web Services (run-time) option Serve & Consume for one SmartStruxure server, no maintenance	SXWSWEWSX00002
SW-EWS-3, EcoStruxure Web Services (run-time) option Serve & Consume, plus Historical trend log data for one SmartStruxure server, no maintenance.....	SXWSWEWSX00003
SW-GWS-1, Web Services (Generic Consume) option For one SmartStruxure server, no maintenance	SXWSWGWSX00001
SW-SNMP-1, Alarm notifications via SNMP option For one SmartStruxure server, no maintenance.....	SXWSWSNMP00001
Universal inputs/outputs, Ua and Ub	
Channels, AS-B with 24 I/O points	12 Ua, Ua1–Ua12 4 Ub, Ub1–Ub4

Channels, AS-B with 36 I/O points 20 Ua, Ua1–Ua20,
..... 8 Ub, Ub1–Ub8

Absolute maximum ratings -0.5 to +24 VDC

A/D converter resolution 16 bits

Digital inputs

Range.....Dry contact switch closure or open collector/open drain, 24 VDC, typical wetting current 2.4 mA
Minimum pulse width 120 ms

Counter inputs

Range.....Dry contact switch closure or open collector/open drain, 24 VDC, typical wetting current 2.4 mA
Minimum pulse width 20 ms

Maximum frequency 25 Hz

Supervised inputs

5 V circuit, 1 or 2 resistors

Monitored switch combinations.....Series only, parallel only, and series and parallel

Resistor range 1 to 10 kohm

For a 2-resistor configuration, each resistor is assumed to have the same value +/- 5 %

Voltage inputs

Range.....0 to 10 VDC

Accuracy +/- (7 mV + 0.2 % of reading)

Resolution <0.5 mV

Impedance 100 kohm

Current inputs

Range.....0 to 20 mA

Accuracy +/- (0.01 mA + 0.4 % of reading)

Resolution <1 µA

Impedance 47 ohm

Resistive inputs

10 ohm to 10 kohm accuracy +/- (7 + 4 x 10⁻³ x R) ohm

R = Resistance in ohm

10 kohm to 60 kohm accuracy +/- (4 x 10⁻³ x R + 7 x 10⁻⁸ x R²) ohm

R = Resistance in ohm

Temperature inputs (thermistors)

Range -50 to +150 °C (-58 to +302 °F)

Supported thermistors

Honeywell 20 kohm

Type I (Continuum) 10 kohm

Type II (I/NET) 10 kohm

Type III (Satchwell) 10 kohm

Type IV (FD) 10 kohm

Type V (FD w/ 11k shunt) Linearized 10 kohm

Satchwell D?T Linearized 10 kohm

Johnson Controls.....	2.2 kohm
Xenta	1.8 kohm
Balco	1 kohm
Thermistor accuracy	
20 kohm.....	-50 to -30 °C: +/-1.5 °C (-58 to -22 °F: +/-2.7 °F)-30 to 0 °C: +/-0.5 °C (-22 to +32 °F: +/-0.9 °F) 0 to 100 °C: +/-0.2 °C (32 to 212 °F: +/-0.4 °F) 100 to 150 °C: +/-0.5 °C (212 to 302 °F: +/-0.9 °F)
10 kohm, 2.2 kohm, and 1.8 kohm	-50 to -30 °C: +/-0.75 °C (-58 to -22 °F: +/-1.35 °F)-30 to +100 °C: +/-0.2 °C (-22 to +212 °F: +/-0.4 °F) 100 to 150 °C: +/-0.5 °C (212 to 302 °F: +/-0.9 °F)
Linearized 10 kohm	-50 to -30 °C: +/-2.0 °C (-58 to -22 °F: +/-3.6 °F)-30 to 0 °C: +/-0.75 °C (-22 to +32 °F: +/-1.35 °F) 0 to 100 °C: +/-0.2 °C (32 to 212 °F: +/-0.4 °F) 100 to 150 °C: +/-0.5 °C (212 to 302 °F: +/-0.9 °F)
1 kohm	-50 to +150 °C: +/-1.0 °C (-58 to +302° F: +/-1.8 °F)
RTD temperature	
Supported RTDs	Pt1000, Ni1000, and LG-Ni1000
Pt1000	
Range	-50 to +150 °C (-58 to +302 °F)
Accuracy	-50 to +70 °C: +/-0.5 °C (-58 to +158 °F: +/-0.9 °F) 70 to 150 °C: +/-0.7 °C (158 to 302 °F: +/-1.3 °F)
Ni1000	
Range	-50 to +150 °C (-58 to +302 °F)
Accuracy	+/-0.5 °C (+/-0.9 °F)
LG-Ni1000	
Range	-50 to +150 °C (-58 to +302 °F)
Accuracy	+/-0.5 °C (+/-0.9 °F)
RTD temperature wiring	
Maximum wire resistance	20 ohm/wire (40 ohm total)
Maximum wire capacitance.....	60 nF
The wire resistance and capacitance typically corresponds to a 200 m wire.	
RTD resistive	
1,000 ohm	
Range	500 to 2,200 ohmIncluding wiring resistance
Accuracy	+/-0.2 + 1.5 x 10 ⁻³ x R) ohm
R = resistance in ohm	
Resolution.....	0.1 ohm
RTD resistive wiring	
Maximum wire capacitance.....	60 nF
Voltage outputs	
Range.....	0 to 10 VDC

Accuracy	+/-60 mV
Resolution	10 mV
Minimum load resistance.....	5 kohm
Load range.....	-1 to +2 mA

Digital inputs, DI

Channels, AS-B with 24 I/O points.....	4, DI1–DI4
Channels, AS-B with 36 I/O points	0
Absolute maximum ratings	-0.5 to +24 VDC

Digital inputs

Range.....Dry contact switch closure or open collector/open drain, 24 VDC, typical wetting current 2.4 mA	
Minimum pulse width	120 ms

Counter inputs

Range.....Dry contact switch closure or open collector/open drain, 24 VDC, typical wetting current 2.4 mA	
Minimum pulse width	20 ms
Maximum frequency	25 Hz

Relay outputs, DO

Channels, AS-B with 24 I/O points.....	4, DO1–DO4
Channels, AS-B with 36 I/O points	4, DO1–DO4
Contact rating.....	250 VAC/30 VDC, 2 A, Pilot Duty (C300)
Switch type.....	Form A Relay
.....	Single Pole Single Throw
.....	Normally Open
Isolation contact to system ground.....	3000 VAC
Cycle life (Resistive load)	At least 100,000 cycles
Minimum pulse width	100 ms

Triac outputs, DO

Channels, AS-B with 24 I/O points	0
Channels, AS-B with 36 I/O points	4, DO5–DO8
Output rating.....	Max. 0.8 A
Voltage	24 to 30 VAC
Commons	COM1 for DO5 and DO6
.....	COM2 for DO7 and DO8
The common terminals COM1 and COM2 can be connected to 24 VAC or to ground.	
Common voltage, high side output.....	0 V
Common voltage, low side output	24 to 30 VAC
Minimum pulse width	100 ms

Terminals

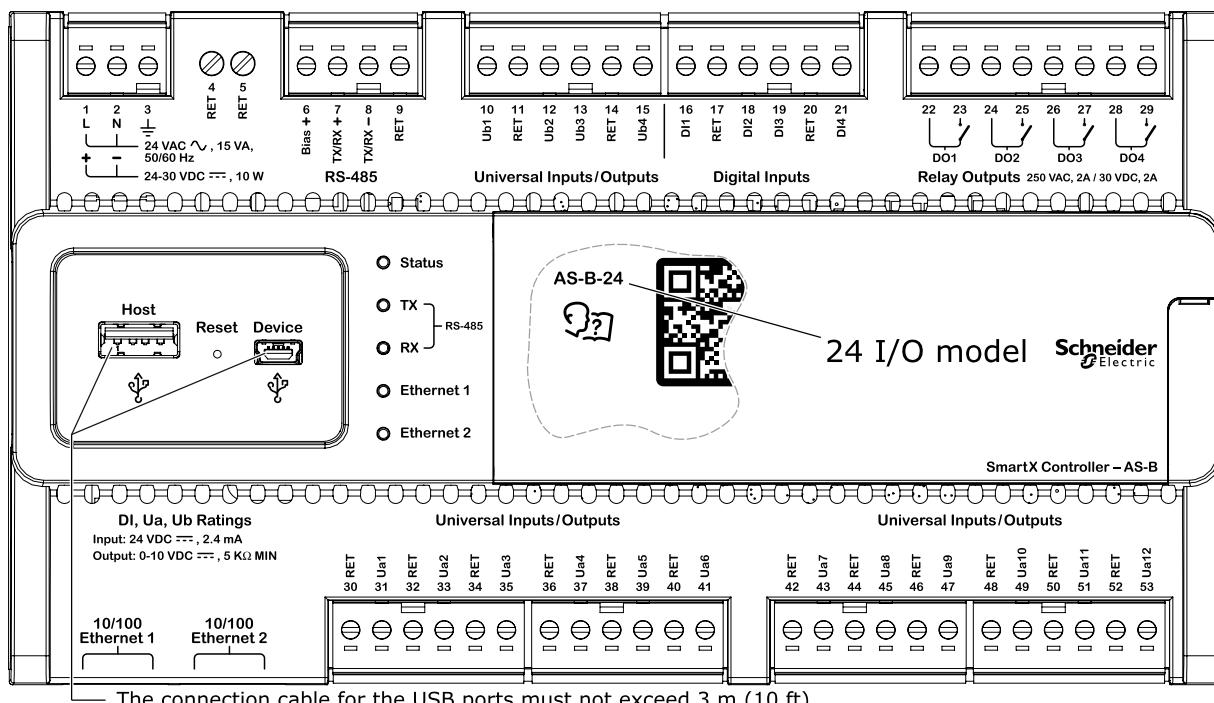


Figure: AS-B model with 24 I/O points

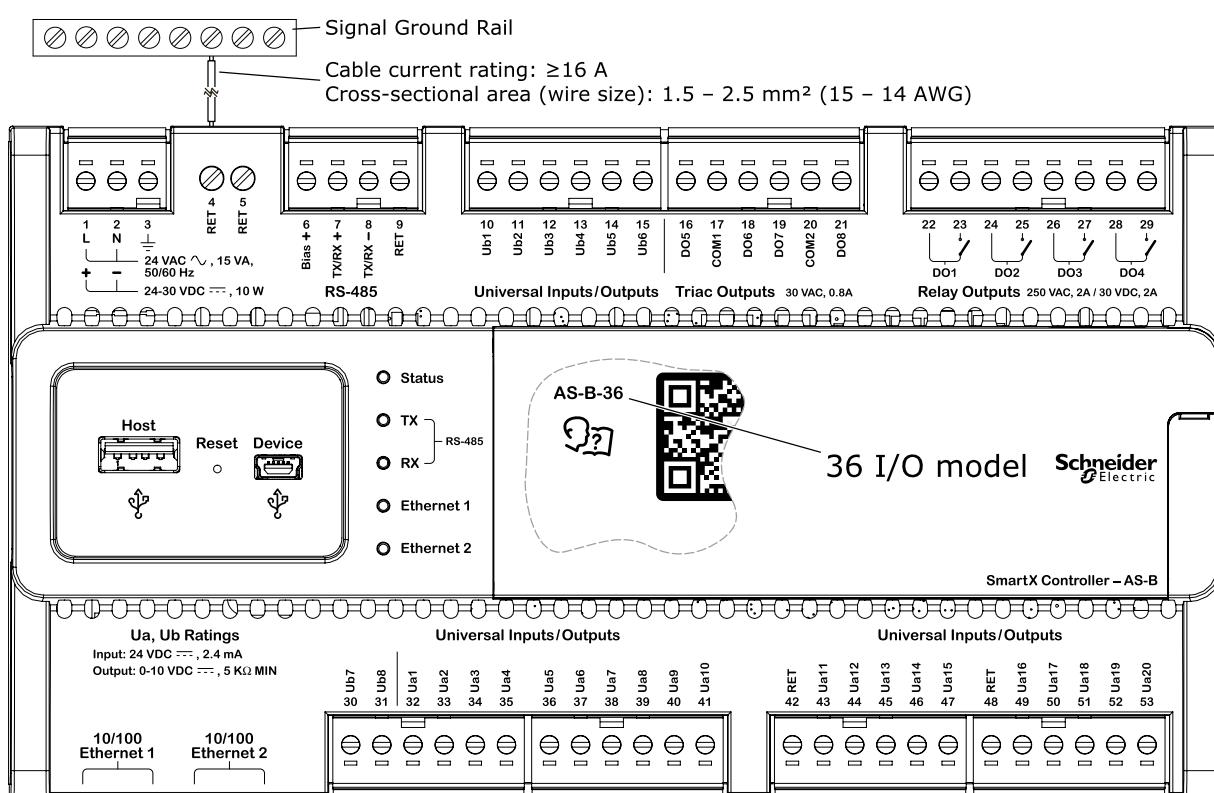


Figure: AS-B model with 36 I/O points

For protection from excess current that could be produced by field wiring, follow these instructions:

- Connect RET terminal number 4 or 5 to a common chassis/signal ground rail in the control panel using a size 14 AWG (1.5 to 2.5 mm²) or larger wire. The wire must have a current rating greater than or equal to 16 A.

- AS-Bs with 24 I/O points have more RET terminals for connection of I/O returns, so the common chassis/signal ground rail is optional and may not be needed.
- Individual 24 VDC power sources to the field must be current limited to maximum 4 A for UL compliant installations, and maximum 6 A in other areas.

For more information on wiring, see Hardware Reference Guide.

Regulatory Notices



Federal Communications Commission

FCC Rules and Regulations CFR 47, Part 15, Class B

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.

Industry Canada

This Class B digital apparatus complies with Canadian ICES-003.

Cet appareil numérique de la classe B est conforme à la norme NMB-003 du Canada.



Regulatory Compliance Mark (RCM) - Australian Communications and Media Authority (ACMA)

This equipment complies with the requirements of the relevant ACMA standards made under the Radiocommunications Act 1992 and the Telecommunications Act 1997. These standards are referenced in notices made under section 182 of the Radiocommunications Act and 407 of the Telecommunications Act.



CE - Compliance to European Union (EU)

2014/30/EU Electromagnetic Compatibility Directive

2014/35/EU Low Voltage Directive

2011/65/EU Restriction of Hazardous Substances (RoHS) Directive

This equipment complies with the rules, of the Official Journal of the European Union, for governing the Self Declaration of the CE Marking for the European Union as specified in the above directive(s) per the provisions of the following standards: EN 50491-1 Product Standard; EN 60730-1, EN 60730-2-11, and EN 50491-3 Safety Standards.



WEEE - Directive of the European Union (EU)

This equipment and its packaging carry the waste of electrical and electronic equipment (WEEE) label, in compliance with European Union (EU) Directive 2012/19/EU, governing the disposal and recycling of electrical and electronic equipment in the European community.



LISTED

UL 916 Listed products for the United States and Canada, Open Class Energy Management Equipment. UL file E80146.

MP-C

SmartX IP Controller



Introduction

SmartX IP Controller – MP-C is a multi-purpose, fully programmable, IP based field controller. The MP-C models offer a flexible mix of I/O point types that suit a wide range of HVAC applications. MP-C can either be used as a standalone BACnet/IP field controller or as part of an EcoStruxure BMS with a SmartX AS-P or AS-B server or an Enterprise Server as the parent server. The MP-C models support an optional display that provides insight and control of the inputs and outputs.

The MP-C has the following features:

- IP enabled with dual port Ethernet switch
- Versatile onboard I/O point mix
- High reliability
- Sensor bus for living space sensors
- Mobile commissioning application
- Full EcoStruxure Building Operation software support, providing efficient engineering tools

IP connectivity and flexible network topologies

The MP Series controllers are based on open protocols that simplify interoperability, IP configuration, and device management:

- IP addressing

- BACnet/IP communications
- DHCP for easy network configuration

The MP Series controllers have a dual-port Ethernet switch, which enables flexible network topologies:

- Star
- Daisy chain
- Rapid Spanning Tree Protocol (RSTP) ring

In a star topology, the controller and the parent EcoStruxure BMS server are individually connected to an Ethernet switch. You can reduce the installation time and cost by daisy-chaining multiple controllers together. You can use an RSTP ring topology when you want failures of a single controller to be detected and recovered quickly and efficiently.

Models with a versatile mix of I/O points

MP-C comes in five models with different I/O point count and a versatile mix of I/O point types that match a wide variety of applications. Most of the I/O points are universal inputs/outputs, which are highly flexible and can be configured as either inputs or outputs.

MP-C

SmartX IP Controller

I/O Point Types by MP-C Models

I/O Point Types	MP-C-15A	MP-C-18A	MP-C-18B	MP-C-24A	MP-C-36A
Universal I/O	8	10	10	16	20
Type Ub					
Universal I/O	-	-	-	4	8
Type Uc					
Triac outputs	6	4	8	-	-
Relay outputs	-	3	-	4	8
Form A					
High power relay outputs	1	1	-	-	-
Form A					

Configurations by I/O Point Types

Configurations	Universal I/O Type Ub	Universal I/O Type Uc	Triac Outputs	Relay Outputs Form A	High Power Relay Outputs Form A
Digital inputs	yes	yes	-	-	-
Counter inputs	yes	yes	-	-	-
Supervised inputs	yes	yes	-	-	-
Voltage inputs (0 to 10 VDC)	yes	yes	-	-	-
Current inputs (0 to 20 mA)	yes	yes	-	-	-
Temperature inputs	yes	yes	-	-	-
Resistive inputs	yes	yes	-	-	-
2-wire RTD temperature inputs	yes	yes	-	-	-
Voltage outputs (0 to 10 VDC)	yes	yes	-	-	-
Current outputs (0 to 20 mA)	-	yes	-	-	-
Digital outputs	-	-	yes	yes	yes
Digital pulsed outputs	-	-	yes	yes	yes
PWM outputs	-	-	yes	yes ^a	yes ^a
Tristate outputs	-	-	yes	yes	-
Tristate pulsed outputs	-	-	yes	yes	-

a) Not suitable as Pulse Width Modulated (PWM) outputs.

MP-C

SmartX IP Controller

Universal inputs/outputs

The universal inputs/outputs are ideal for any mix of temperature, pressure, flow, status points, and similar point types in a building control system.

As counter inputs, the universal inputs/outputs are commonly used in energy metering applications. As RTD inputs, they are ideal for temperature points in a building control system. As supervised inputs, they are used for security applications where it is critical to know whether or not a wire has been cut or shorted. These events provide a separate indication of alarms and trouble conditions to the system.

For all analog inputs, maximum and minimum levels can be defined to automatically detect over-range and under-range values.

The universal inputs/outputs can also be used as voltage outputs or current outputs (Uc only), without the need for external bias resistors. Therefore, the universal inputs/outputs support a wide range of devices, such as actuators.

Triac outputs

The triac outputs can be used in many applications to switch 24 VAC on or off for external loads such as actuators, relays, or indicators. The triac outputs are isolated from the controller. Triacs are silent and do not suffer from relay contact wear.

Relay outputs

The relay outputs support digital Form A point types. The Form A relays are designed for direct load applications.

High power relay output

MP-C-15A and MP-C-18A have a high power relay output, which is ideal for switching loads of up to 12 A, such as electrical heating elements.

High reliability

The MP Series controllers support local trends, schedules, and alarms, enabling local operation when the controller is offline or used in standalone applications.

The battery-free power backup of the memory and real-time clock prevents data loss and ensures seamless and quick recovery after a power failure.

All MP-C models can be equipped with the MP-C Display add-on module, which features an LCD display and five keys. With this module, you can manually override analog and digital outputs for testing, commissioning, and maintenance of equipment connected to the outputs. The module's dedicated processing power ensures reliable override for maintenance applications. The override status is readable through EcoStruxure Building Operation WorkStation and WebStation, enabling precise monitoring and reliable control.



MP-C Display

WorkStation allows you to update the firmware of multiple MP Series controllers at the same time and with minimum down time. The EcoStruxure BMS server keeps track of the installed firmware to support backup, restore, and replacement of the controllers and sensors. The server can host controllers of different firmware versions.

Sensor bus for living space sensors

The MP Series controllers provide an interface designed for the SmartX Sensor family of living space sensors. The SmartX Sensors offer an efficient way to sense the temperature, humidity, CO₂, and occupancy in a room. The SmartX Sensors are available with different combinations of sensor types and various covers and user interface options, such as touchscreen, setpoint and override buttons, and blank covers.

MP-C

SmartX IP Controller



SmartX Sensors

The sensor bus provides both power and communications for up to four sensors that are daisy-chained using standard Cat 5 (or higher) cables. The maximum number of sensors that can be connected to a controller varies depending on the sensor model and the combination of cover and sensor base type:

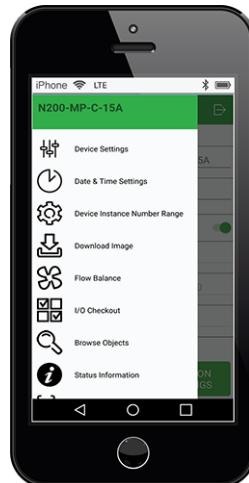
- Blank covers: Up to four sensors of any combination of sensor base types
- 3-button and touchscreen covers:
 - Up to two sensor bases with CO₂ option
 - Up to four sensor bases without CO₂ option
- SmartX LCD temperature sensors: Up to four sensors are supported

The maximum total length of the sensor bus is 61 m (200 ft). For more information, see the SmartX Living Space Sensors Specification Sheet.

Mobile commissioning application

The eCommission SmartX Controllers mobile application is designed for local configuration, field deployment, and commissioning of MP Series controllers. The mobile application reduces the commissioning time, allows flexibility in project execution, and eliminates dependencies on network infrastructure.

The mobile application is designed for use with Android, Apple (iOS), and Microsoft Windows 10 devices. For more information, see the eCommission SmartX Controllers Specification Sheet.



eCommission SmartX Controllers mobile app

Using the eCommission SmartX Controllers mobile application, you can connect to one or many MP Series controllers. You can connect to a single MP Series controller using the eCommission Bluetooth Adapter connected to a SmartX Sensor. You can connect to a network of MP Series controllers on the local IP network, using a wireless access point or a network switch.

Device configuration

With the eCommission SmartX Controllers mobile application, you can easily discover MP Series controllers on the IP network and change each controller's configuration, including the BACnet and IP network settings, location, and parent server. To save engineering time, you can save common device settings and then reuse them for controllers of the same model.

Field deployment and I/O checkout

The eCommission SmartX Controllers mobile application does not require an EcoStruxure BMS server or a network infrastructure to be in place. You can use the mobile application to load the controller application directly into the local MP Series controller and deploy the controller. The controller application can be created offline using Project Configuration Tool or WorkStation. You can also perform an I/O checkout to ensure that the controller's I/O points are configured, wired, and operating correctly.

MP-C

SmartX IP Controller

Full EcoStruxure Building Operation software support

The power of the MP Series controller is fully realized when it is part of an EcoStruxure BMS, which provides the following benefits:

- WorkStation/WebStation interface
- Script and Function Block programming options
- Device discovery
- Engineering efficiency

WorkStation/WebStation interface

WorkStation and WebStation provide a consistent user experience regardless of which EcoStruxure BMS server the user is logged on to. The user can log on to the parent EcoStruxure BMS server to engineer, commission, supervise, and monitor the MP Series controller and its I/O as well as its attached SmartX Sensors. For more information, see the WorkStation and WebStation specification sheets.

Script and Function Block programming options

Unique to the industry, the MP Series controllers have both Script and Function Block programming options. This flexibility assures that the best programming method can be selected for the application. Existing programs can easily be reused between the EcoStruxure BMS server and the controller.

Device discovery

The enhanced Device Discovery in WorkStation enables you to easily identify MP Series controllers on a BACnet network and to associate the controllers with their parent server.

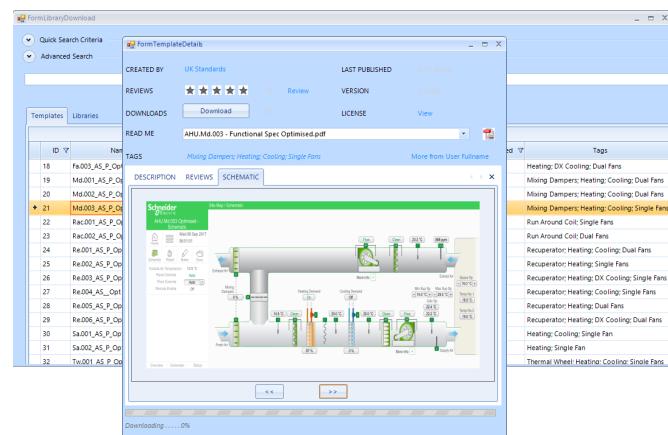
Engineering efficiency

The engineering and maintenance of MP Series controllers can be done very efficiently using the EcoStruxure Building Operation reusability features. With these features, you can create library items (Custom Types) for a complete controller application that contains programs and all necessary objects such as trends, alarms, and schedules. The controller application in the Custom Types library is reusable across all controllers of the same model. You can use the controller application as a base for creating new controllers intended for similar applications. You can then edit the controller application, and the changes are automatically replicated to all controllers, while each controller keeps its local values.

WorkStation supports both online and offline engineering of MP Series controllers. You can make the configuration changes online or use database mode to make the changes offline. In database mode, the changes are saved to the EcoStruxure Building Operation database so that you can apply the changes to the controllers later.

Project Configuration Tool enables you to perform all the engineering off site, without the need for physical hardware, which minimizes the time you need to spend on site. You can run the EcoStruxure BMS servers virtually and engineer the MP Series controllers, before you deploy your server and controller applications to the servers and controllers on site. For more information, see the Project Configuration Tool specification sheet.

In addition, you can use Automated Engineering Tool to facilitate your engineering process when using MP Series controllers. This tool provides access to a library of standard controller applications. These standard applications can be quickly configured and customized using the wizards and mass edit functions provided in the tool and then loaded into your target server. The tool also enables the quick creation of your own templates based on MP Series controller applications that you have developed. This facilitates a standard approach and drives the ability to easily reuse and duplicate common controller applications. For more information, see the Automated Engineering Tool specification sheet.



Library of standard HVAC applications

MP-C

SmartX IP Controller

Part Numbers

Product	Part number
MP-C-15A	SXWMPC15A10001
MP-C-18A	SXWMPC18A10001
MP-C-18B	SXWMPC18B10001
MP-C-24A	SXWMPC24A10001
MP-C-36A	SXWMPC36A10001
MP-C DISPLAY (MP-C override display module)	SXWMPCDSP10001
Spare terminal blocks for all MP-C models (4 x 3-pin, 1 x 4-pin, 7 x 6-pin, 2 x 8-pin terminal blocks)	SXWMPCCON10001
DIN-RAIL-CLIP, DIN-rail end clip package of 25 pieces	SXWDINEND10001
eCommission Bluetooth Adapter	SXWBTAECXX10001

Specifications

AC input

Nominal voltage.....	24 VAC
Operating voltage range	+/-20 %
Frequency	50/60 Hz
Maximum power consumption (MP-C-15A, -18A, -18B)	22 VA
Maximum power consumption (MP-C-24A)	28 VA
Maximum power consumption (MP-C-36A)	33 VA
Power input protection.....	MOV suppression and internal fuse

DC input

Nominal voltage.....	24 to 30 VDC
Operating voltage range	21 to 33 VDC
Maximum power consumption (MP-C-15A, -18A, -18B).....	12 W
Maximum power consumption (MP-C-24A).....	15 W
Maximum power consumption (MP-C-36A).....	18 W
Power input protection.....	MOV suppression and internal fuse

Environment

Ambient temperature, operating	0 to 50 °C (32 to 122 °F) at normal operation ^a
.....	-40 to +60 °C (-40 to +140 °F) for rooftop applications, horizontal installation only ^a
a) MP-C Display has an operating temperature range of -30 to +60 °C (-22 to +140 °F).	
Ambient temperature, storage	-40 to +70 °C (-40 to +158 °F)
Maximum humidity.....	95 % RH non-condensing

MP-C

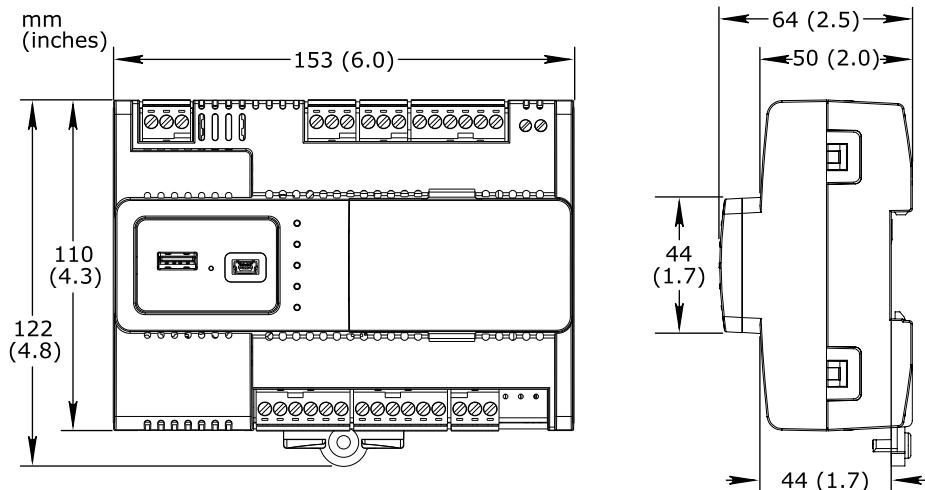
SmartX IP Controller

Material

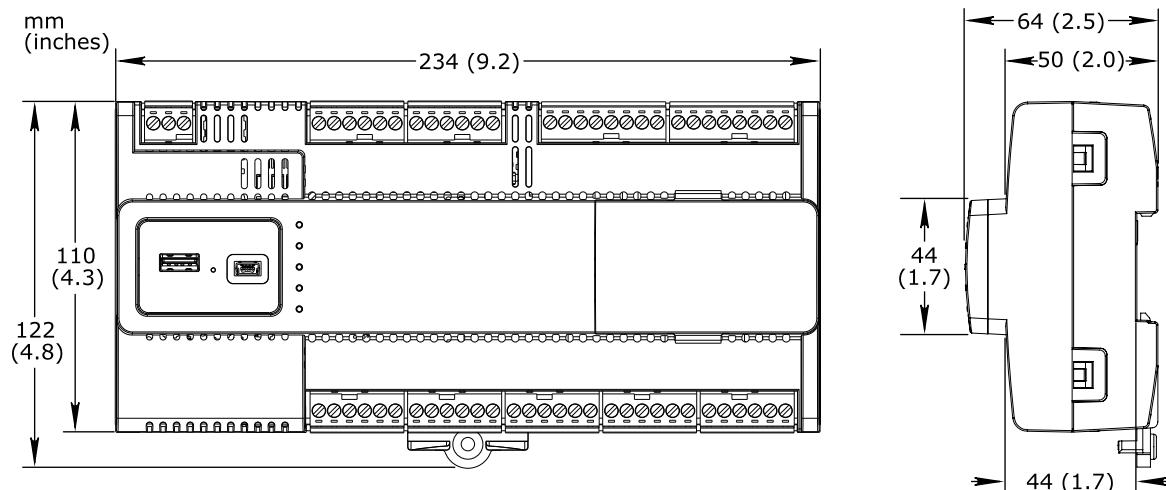
Plastic flame rating	UL94-5V
Ingress protection rating	IP 20

Mechanical

Dimensions (MP-C-15A, -18A, -18B) 153 W x 110 H x 64 D mm (6.0 W x 4.3 H x 2.5 D in.)



Dimensions (MP-C-24A, -36A) 234 W x 110 H x 64 D mm (9.2 W x 4.3 H x 2.5 D in.)



Weight, MP-C-15A Including terminal blocks	0.358 kg (0.789 lb)
Weight, MP-C-18A Including terminal blocks	0.371 kg (0.818 lb)
Weight, MP-C-18B Including terminal blocks	0.361 kg (0.796 lb)
Weight, MP-C-24A Including terminal blocks	0.495 kg (1.091 lb)
Weight, MP-C-36A Including terminal blocks	0.547 kg (1.206 lb)

MP-C

SmartX IP Controller

Installation.....DIN rail or other flat surface inside a cabinet

Terminal blocksRemovable

Software compliance

EcoStruxure Building Operation softwareversion 2.0 or later

Agency compliances

Emission.....RCM; EN 61000-6-3; EN 50491-5-2; FCC Part 15, Sub-part B, Class B

Immunity.....EN 61000-6-2; EN 50491-5-3

Safety.....EN 60730-1; EN 60730-2-11; EN 50491-3; UL 916 C-UL US Listed

Real-time clock

Accuracy, at 25 °C (77 °F)+/-1 minute per month

Backup time, at 25 °C (77 °F)7 days minimum

Communication ports

Ethernet.....Dual 10/100BASE-TX (RJ45)

USBUSB 2.0, 5 VDC, 2.5 W, 1 device port (mini-B) and 1 host port (type-A)

Sensor Bus24 VDC, 2 W, RS-485 (RJ45)

Sensor Bus protectionTransient voltage suppressors on communication and power signals

Communications

BACnet.....BACnet/IP, port configurable, default 47808

.....BTL B-AAC (BACnet Advanced Application Controller)^a
a) See the BTL Product Catalog for up-to-date details on BTL listed firmware revisions on BACnet International's home page.

CPU

Frequency500 MHz

Type.....ARM Cortex-A7 dual-core

DDR3 SDRAM128 MB

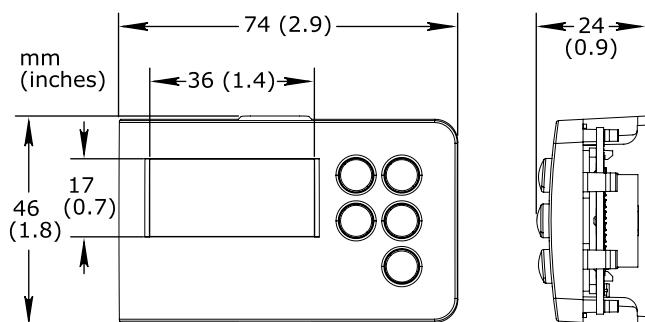
NOR flash memory32 MB

Memory backup.....128 kB, FRAM, non-volatile

MP-C Display (Optional)

RemovableNo

Dimensions74 W x 46 H x 24 D mm (2.9 W x 1.8 H x 0.9 D in.)



MP-C

SmartX IP Controller

Display size 36 W x 17 H mm (1.4 W x 0.7 H in.)

Display resolution 128 x 64 pixels

Display type FSTN monochrome LCD, white color transflective backlight

Power consumption max. 0.15 W (45 mA at 3.3 V)

Ambient temperature, operating -30 to +60 °C (-22 to +140 °F)

Ambient temperature, storage -40 to +70 °C (-40 to +158 °F)

Maximum humidity 95 % RH non-condensing

Weight 0.035 kg (0.077 lb)

Compliance with standards EN ISO 16484-2

Universal inputs/outputs, Ub and Uc

Channels, MP-C-15A 8 Ub, Ub1–Ub8

Channels, MP-C-18A 10 Ub, Ub1–Ub10

Channels, MP-C-18B 10 Ub, Ub1–Ub10

Channels, MP-C-24A 16 Ub, Ub1–Ub16

..... 4 Uc, Uc1–Uc4

Channels, MP-C-36A 20 Ub, Ub1–Ub20

..... 8 Uc, Uc1–Uc8

Absolute maximum ratings -0.5 to +24 VDC

A/D converter resolution 16 bits

Universal input/output protection Transient voltage suppressor on each universal input/output

Digital inputs

Range Dry contact switch closure or open collector/open drain, 24 VDC, typical wetting current 2.4 mA

Minimum pulse width 150 ms

Counter inputs

Range Dry contact switch closure or open collector/open drain, 24 VDC, typical wetting current 2.4 mA

Minimum pulse width 20 ms

Maximum frequency 25 Hz

Supervised inputs

5 V circuit, 1 or 2 resistors

Monitored switch combinations Series only, parallel only, and series and parallel

Resistor range 1 to 10 kohm

For a 2-resistor configuration, each resistor must have the same value +/- 5 %

Voltage inputs

Range 0 to 10 VDC

Accuracy +/- (7 mV + 0.2 % of reading)

Resolution 1.0 mV

Impedance 100 kohm

Current inputs

Range 0 to 20 mA

MP-C

SmartX IP Controller

Accuracy..... $+/- (0.01 \text{ mA} + 0.4 \% \text{ of reading})$

Resolution..... $1 \mu\text{A}$

Impedance 47 ohm

Resistive inputs

10 ohm to 10 kohm accuracy $+/- (7 + 4 \times 10^{-3} \times R) \text{ ohm}$

R = Resistance in ohm

10 kohm to 60 kohm accuracy $+/- (4 \times 10^{-3} \times R + 7 \times 10^{-8} \times R^2) \text{ ohm}$

R = Resistance in ohm

Temperature inputs (thermistors)

Range..... -50 to +150 °C (-58 to +302 °F)

Supported thermistors

Honeywell 20 kohm

Type I (Continuum) 10 kohm

Type II (I/NET) 10 kohm

Type III (Satchwell) 10 kohm

Type IV (FD) 10 kohm

Type V (FD w/ 11k shunt) Linearized 10 kohm

Satchwell D?T Linearized 10 kohm

Johnson Controls 2.2 kohm

Xenta 1.8 kohm

Balco 1 kohm

Measurement accuracy

20 kohm..... -50 to -30 °C: +/-1.5 °C (-58 to -22 °F: +/-2.7 °F)

..... -30 to 0 °C: +/-0.5 °C (-22 to +32 °F: +/-0.9 °F)

..... 0 to 100 °C: +/-0.2 °C (32 to 212 °F: +/-0.4 °F)

..... 100 to 150 °C: +/-0.5 °C (212 to 302 °F: +/-0.9 °F)

10 kohm, 2.2 kohm, and 1.8 kohm..... -50 to -30 °C: +/-0.75 °C (-58 to -22 °F: +/-1.35 °F)

..... -30 to +100 °C: +/-0.2 °C (-22 to +212 °F: +/-0.4 °F)

..... 100 to 150 °C: +/-0.5 °C (212 to 302 °F: +/-0.9 °F)

Linearized 10 kohm..... -50 to -30 °C: +/-2.0 °C (-58 to -22 °F: +/-3.6 °F)

..... -30 to 0 °C: +/-0.75 °C (-22 to +32 °F: +/-1.35 °F)

..... 0 to 100 °C: +/-0.2 °C (32 to 212 °F: +/-0.4 °F)

..... 100 to 150 °C: +/-0.5 °C (212 to 302 °F: +/-0.9 °F)

1 kohm -50 to +150 °C: +/-1.0 °C (-58 to +302° F: +/-1.8 °F)

RTD temperature inputs

Supported RTDs..... Pt1000

Pt1000

Sensor range..... -50 to +150 °C (-58 to +302 °F)

Controller environment	Sensor range	Measurement accuracy
0 to 50 °C (32 to 122 °F)	-50 to +70 °C (-58 to +158 °F)	+/-0.5 °C (+/-0.9 °F)

MP-C

SmartX IP Controller

Continued

Controller environment	Sensor range	Measurement accuracy
0 to 50 °C (32 to 122 °F)	70 to 150 °C (158 to 302 °F)	+/-0.7 °C (+/-1.3 °F)
-40 to +60 °C (-40 to +140 °F)	-50 to +150 °C (-58 to +302 °F)	+/-1.0 °C (+/-1.8 °F)

RTD temperature wiring

Maximum wire resistance 20 ohm/wire (40 ohm total)
 Maximum wire capacitance 60 nF
 The wire resistance and capacitance typically corresponds to a 200 m wire.

Voltage outputs

Range 0 to 10 VDC
 Accuracy +/-60 mV
 Resolution 10 mV
 Minimum load resistance 5 kohm
 Load range -1 to +2 mA

Current outputs (Uc only)

Range 0 to 20 mA
 Accuracy +/-0.2 mA
 Resolution 21 µA
 Load range 0 to 650 ohm

Relay outputs, DO

Channels, MP-C-15A 0
 Channels, MP-C-18A 3, DO5–DO7
 Channels, MP-C-18B 0
 Channels, MP-C-24A 4, DO1–DO4
 Channels, MP-C-36A 8, DO1–DO8
 Contact rating 250 VAC/30 VDC, 2 A, Pilot Duty (C300)
 Switch type Form A Relay
 Single Pole Single Throw
 Normally Open
 Isolation contact to system ground 3000 VAC
 Cycle life (Resistive load) At least 100,000 cycles
 Minimum pulse width 100 ms

High power relay outputs, DO

Channels, MP-C-15A 1, DO7
 Channels, MP-C-18A 1, DO8
 Channels, MP-C-18B 0
 Channels, MP-C-24A 0
 Channels, MP-C-36A 0

MP-C

SmartX IP Controller

Contact rating 250 VAC/24 VDC, 12 A, Pilot Duty (B300)

Switch type Form A Relay
..... Single Pole Single Throw
..... Normally Open

Isolation contact to system ground 5000 VAC

Cycle life (Resistive load) At least 100,000 cycles

Minimum pulse width 100 ms

Triac outputs, DO

Channels, MP-C-15A 6, DO1–DO6

Channels, MP-C-18A 4, DO1–DO4

Channels, MP-C-18B 8, DO1–DO8

Channels, MP-C-24A 0

Channels, MP-C-36A 0

Output rating (for each triac output) Max. 0.5 A

Voltage 24 VAC +/-20 %

Commons COM1 for DO1 and DO2 (on MP-C-15A, -18A, -18B)
..... COM2 for DO3 and DO4 (on MP-C-15A, -18A, -18B)
..... COM3 for DO5 and DO6 (on MP-C-15A, -18B)
..... COM4 for DO7 and DO8 (on MP-C-18B only)

The common terminals can be connected to 24 VAC or to ground.

Common voltage, high side output 24 VAC

Common voltage, low side output 0 VAC (ground)

Minimum pulse width 100 ms

Triac output protection MOV and snubber across each triac output
..... MOV from triac COM to ground

Terminals

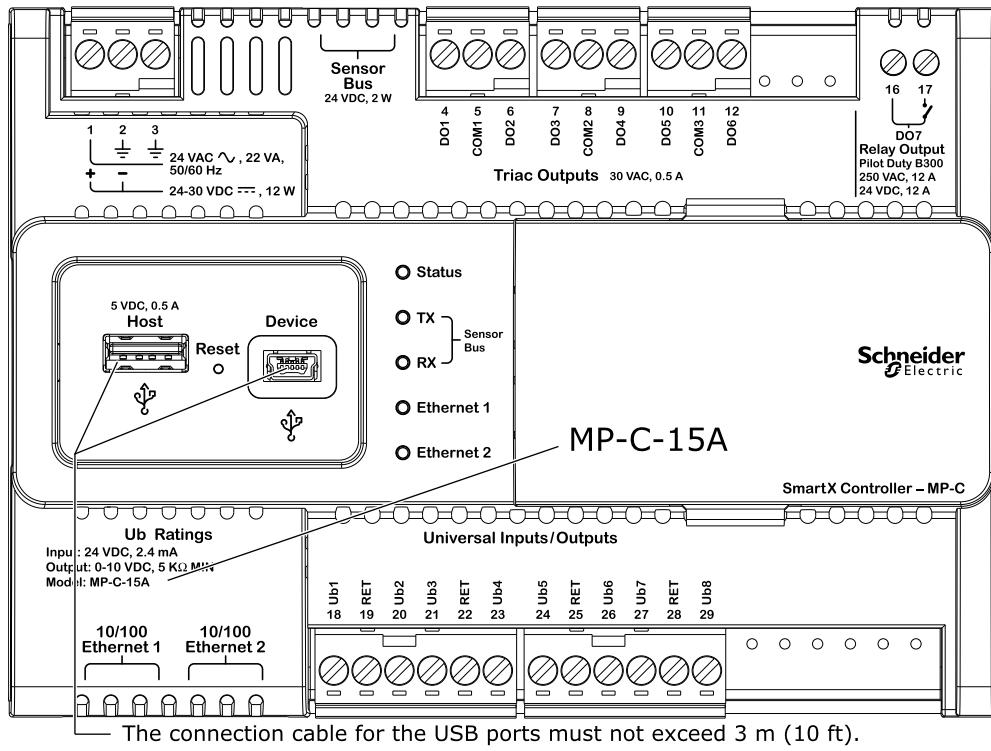
Be sure to follow proper installation wiring diagrams and instructions, including these instructions:

- All MP-C models have several RET terminals for connection of I/O returns, so a common chassis/signal ground rail is optional and may not be needed.

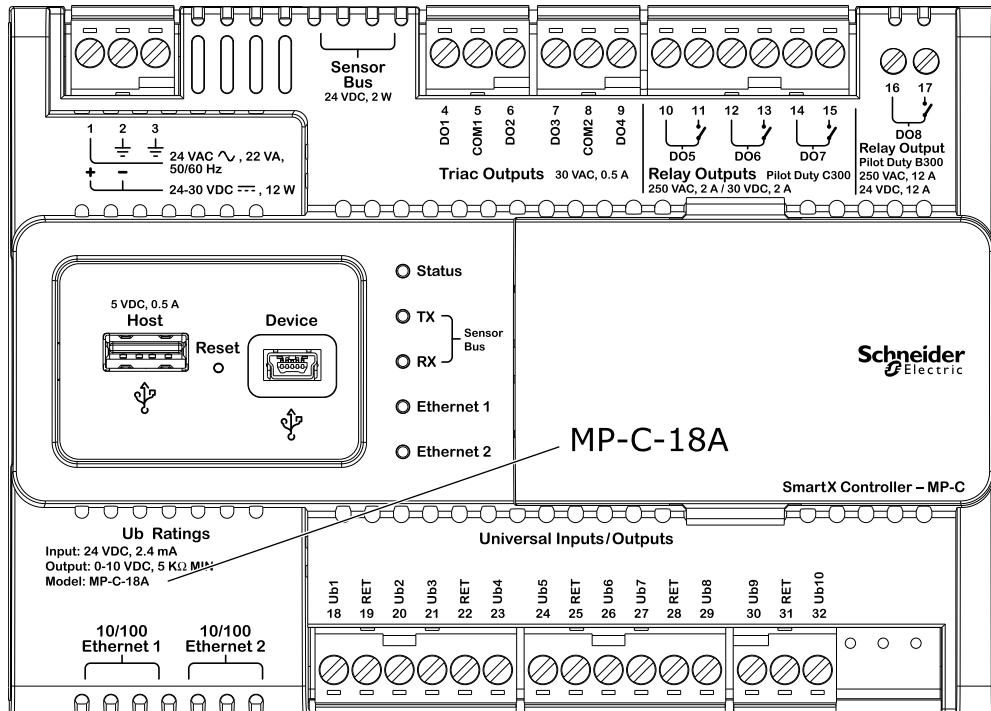
- Individual 24 VDC power sources to the field must be current limited to maximum 4 A for UL compliant installations, and maximum 6 A in other areas.
- For more information on wiring, see Hardware Reference Guide.

MP-C

SmartX IP Controller



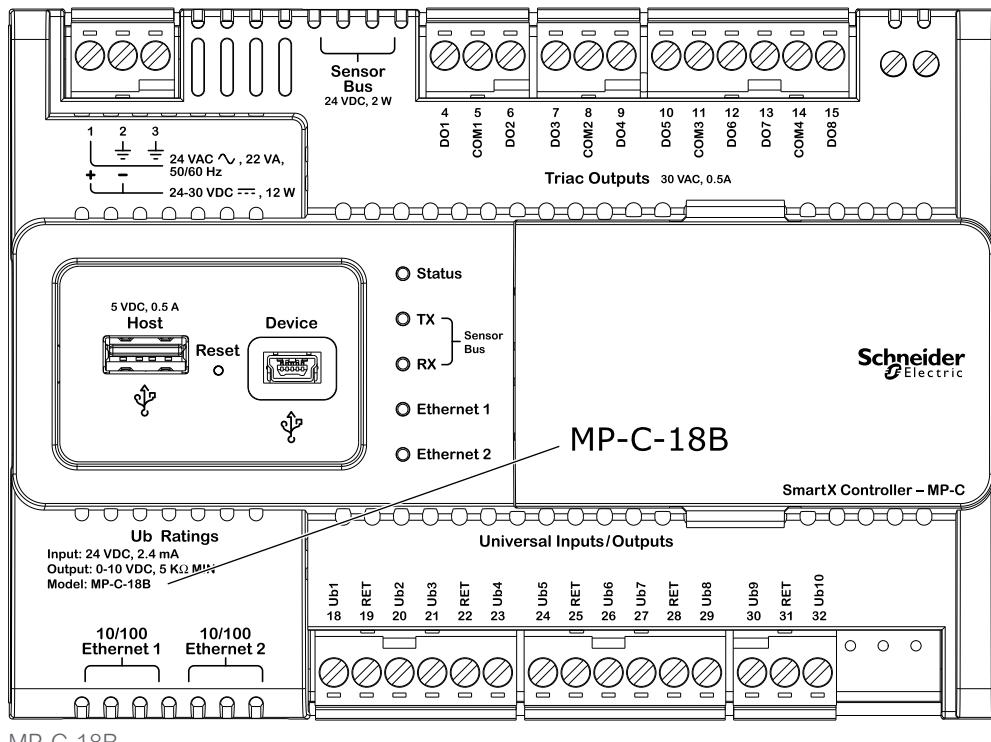
MP-C-15A



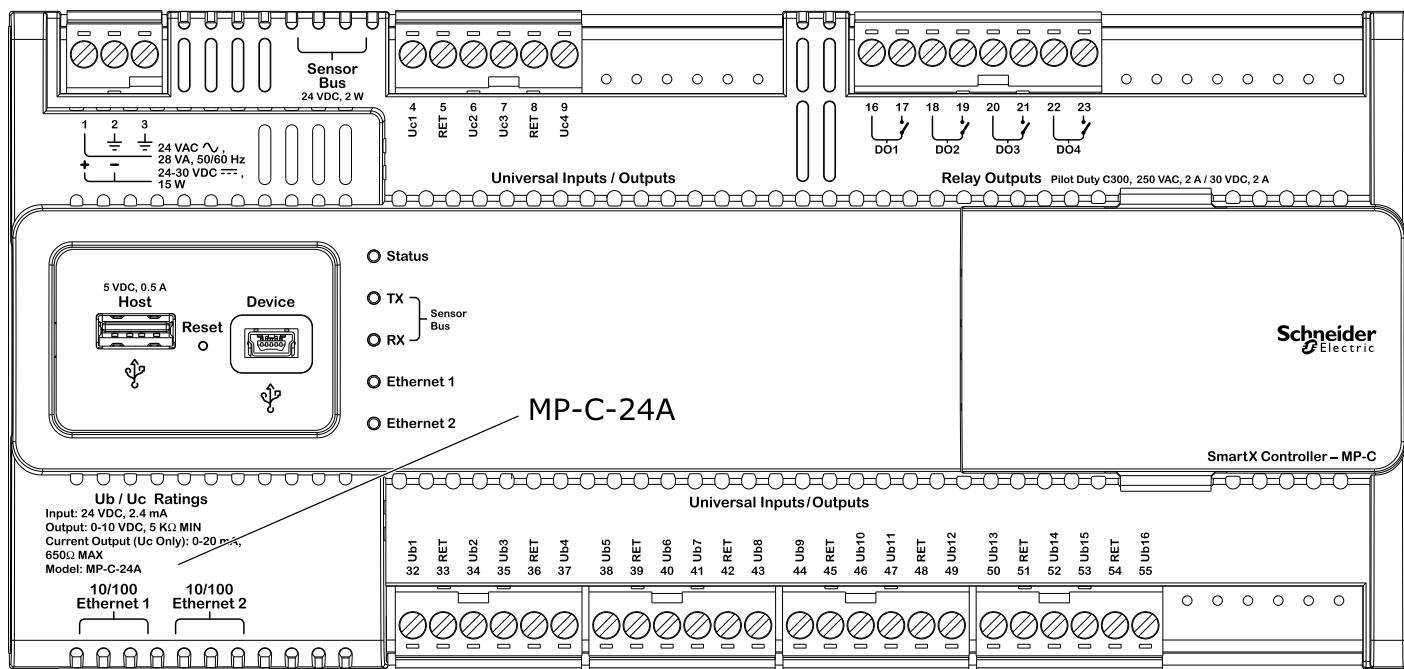
MP-C-18A

MP-C

SmartX IP Controller



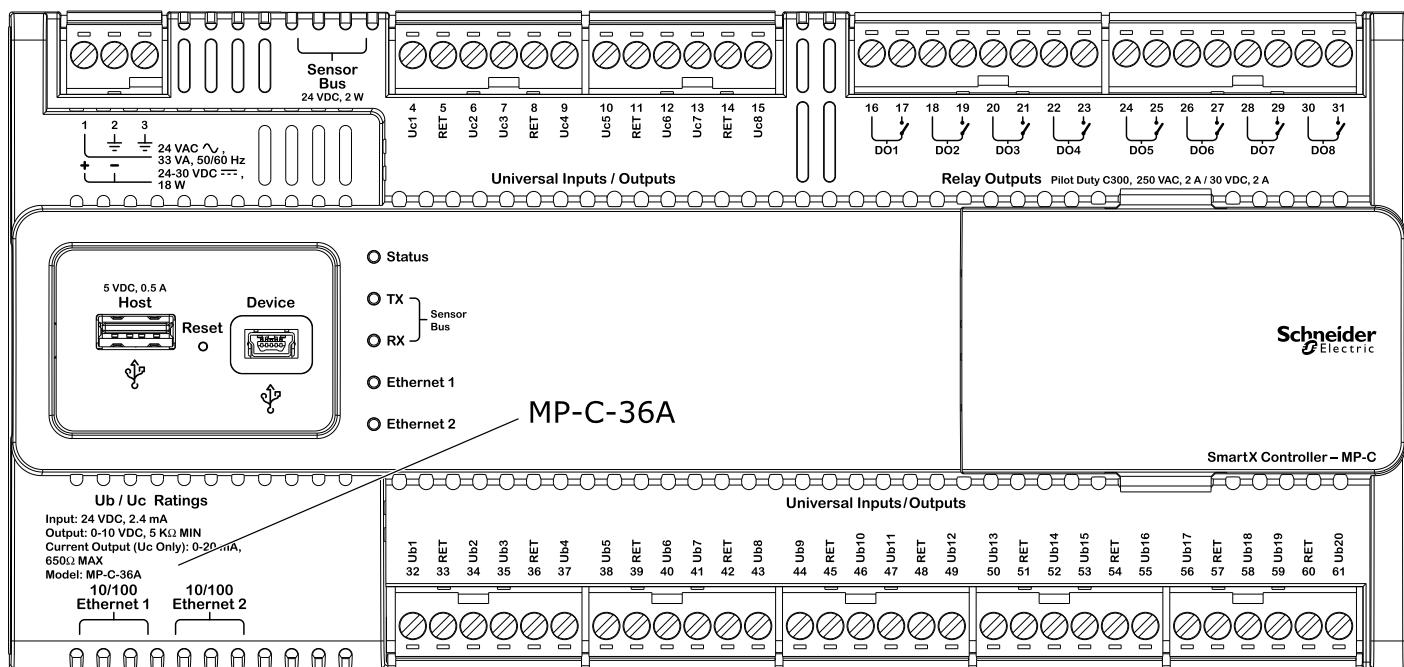
MP-C-18B



MP-C-24A

MP-C

SmartX IP Controller



MP-C-36A

Part Numbers in AMER Region for Network Connectivity Accessories

Product description ^a	Part number (AMER region)
Cat 6 field-term plug, UTP	ACTPG6TLU001
Cat 6 pull-through plug, UTP, 100-pack	ACTPG6PTU100
Actassi crimping tool	ACTTLCPT
Cat 6 cable, UTP, 1000 ft (305 m), CMP, green	ACT4P6UCP1ARXGR
Cat 6 patch cord, UTP, 30 ft (9 m), CMP, green	ACTPC6UBCP30AGR
Cat 6 patch cord, UTP, 50 ft (15 m), CMP, green	ACTPC6UBCP50AGR
Cat 6 patch cord, UTP, 70 ft (21 m), CMP, green	ACTPC6UBCP70AGR
Cat 6 patch cord, UTP, 90 ft (27 m), CMP, green	ACTPC6UBCP90AGR
Cat 5e pull-through plug, UTP, 100-pack	ACTPG5PTU100
Cat 5e cable, UTP, 1000 ft (305 m), CMP, green	ACT4P5UCP1ARXGR
Cat 5e patch cord, UTP, 30 ft (9 m), CMP, green	ACTPC5EUBCP30AGR
Cat 5e patch cord, UTP, 50 ft (15 m), CMP, green	ACTPC5EUBCP50AGR
Cat 5e patch cord, UTP, 70 ft (21 m), CMP, green	ACTPC5EUBCP70AGR
Cat 5e patch cord, UTP, 90 ft (27 m), CMP, green	ACTPC5EUBCP90AGR

a) Abbreviations: UTP (Unshielded Twisted Pair), CMP (Plenum-rated cable)

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SmartX IP Controller

Part Numbers in EMEA Region for Network Connectivity Accessories

Product description^a	Part number (EMEA region)
Cat 6 field-term plug, UTP	ACTPG6TLU001
Cat 6 pull-through plug, UTP, 100-pack	ACTPG6PTU100
Actassi crimping tool	ACTTLCPT
Cat 6 LAN cable, UTP, 4-Pair, 250 MHz, LSZH, 305 m (1000 ft)	VDICD116118
Cat 6 patch cord, UTP, 10 m (32 ft), LSZH, green	ACTPC6UBLS100GR
Cat 6 patch cord, UTP, 15 m (49 ft), LSZH, green	ACTPC6UBLS150GR
Cat 6 patch cord, UTP, 20 m (65 ft), LSZH, green	ACTPC6UBLS200GR
Cat 6 patch cord, UTP, 25 m (82 ft), LSZH, green	ACTPC6UBLS250GR
Cat 5e pull-through plug, UTP, 100-pack	ACTPG5PTU100
Cat 5e cable, UTP, 1000 ft (305 m), CMP, green	VDICD115118
Cat 5e patch cord, UTP, 10 m (32 ft), LSZH, green	ACTPC5EUBLS100GR
Cat 5e patch cord, UTP, 15 m (49 ft), LSZH, green	ACTPC5EUBLS150GR
Cat 5e patch cord, UTP, 20 m (65 ft), LSZH, green	ACTPC5EUBLS200GR
Cat 5e patch cord, UTP, 25 m (82 ft), LSZH, green	ACTPC5EUBLS250GR

a) Abbreviations: UTP (Unshielded Twisted Pair), CMP (Plenum-rated cable), LSZH (Low Smoke Zero Halogen)

Part Numbers in APAC Region for Network Connectivity Accessories

Product description^a	Part number (APAC region)
Cat 6 field-term plug, UTP	ACTPG6TLU001
Cat 6 pull-through plug, UTP, 100-pack	ACTPG6PTU100
Actassi crimping tool	ACTTLCPT
Cat 6 LAN cable, 305 m	2D4P6IPV3B-GR
Cat 6 patch lead, UTP, 10 m (32 ft), green	RJ6_100PL-GR
Cat 6 patch lead, UTP, 15 m (49 ft), green	RJ6_150PL-GR
Cat 6 patch lead, UTP, 20 m (65 ft), green	RJ6_200PL-GR
Cat 6 patch lead, UTP, 25 m (82 ft), green	RJ6_250PL-GR
Cat 5e field-term plug, UTP	ACTPG5ETLU001
Cat 5e pull-through plug, UTP, 100-pack	ACTPG5EPTU100
Cat 5e LAN cable, 305 m (1000 ft)	2D4P5IPV3B-GR
Cat 5e patch lead, UTP, 10 m (32 ft), green	RJ5_100PL-GR
Cat 5e patch lead, UTP, 15 m (49 ft), green	RJ5_150PL-GR
Cat 5e patch lead, UTP, 20 m (65 ft), green	RJ5_200PL-GR
Cat 5e patch lead, UTP, 25 m (82 ft), green	RJ5_250PL-GR

a) Abbreviations: UTP (Unshielded Twisted Pair)

MP-C

SmartX IP Controller

Regulatory Notices

Federal Communications Commission

FCC Rules and Regulations CFR 47, Part 15, Class B

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.

Industry Canada

This Class B digital apparatus complies with Canadian ICES-003.

Cet appareil numérique de la classe B est conforme à la norme NMB-003 du Canada.

Regulatory Compliance Mark (RCM) - Australian Communications and Media Authority (ACMA)

This equipment complies with the requirements of the relevant ACMA standards made under the Radiocommunications Act 1992 and the Telecommunications Act 1997. These standards are referenced in notices made under section 182 of the Radiocommunications Act and 407 of the Telecommunications Act.

CE - Compliance to European Union (EU)

2014/30/EU Electromagnetic Compatibility Directive

2014/35/EU Low Voltage Directive

2011/65/EU Restriction of Hazardous Substances (RoHS) Directive

This equipment complies with the rules, of the Official Journal of the European Union, for governing the Self Declaration of the CE Marking for the European Union as specified in the above directive(s) per the provisions of the following standards: EN 60730-1, EN 60730-2-11, and EN 50491-3 Safety Standards.



WEEE - Directive of the European Union (EU)

This equipment and its packaging carry the waste of electrical and electronic equipment (WEEE) label, in compliance with European Union (EU) Directive 2012/19/EU, governing the disposal and recycling of electrical and electronic equipment in the European community.



 LISTED UL 916 Listed products for the United States and Canada, Open Class Energy Management Equipment. UL file E80146.

MP-V

SmartX IP Controller



Introduction

SmartX IP Controller – MP-V is a multi-purpose, fully programmable, IP based field controller dedicated for VAV cooling and heating applications. MP-V integrates a controller, a damper actuator, and an air flow sensor in a single compact package for ease of installation. MP-V can either be used as a standalone BACnet/IP field controller or as part of an EcoStruxure BMS with a SmartX AS-P or AS-B server or an Enterprise Server as the parent server. MP-V comes in two models with different I/O count.

The MP-V has the following features:

- IP enabled with dual port Ethernet switch
- Integrated damper actuator with feedback signal
- Factory-calibrated air flow sensor
- High reliability
- Sensor bus for living space sensors
- Mobile commissioning application
- Full EcoStruxure Building Operation software support, providing efficient engineering tools

IP connectivity and flexible network topologies

The MP Series controllers are based on open protocols that simplify interoperability, IP configuration, and device management:

- IP addressing
- BACnet/IP communications
- DHCP for easy network configuration

The MP Series controllers have a dual-port Ethernet switch, which enables flexible network topologies:

- Star
- Daisy chain
- Rapid Spanning Tree Protocol (RSTP) ring

In a star topology, the controller and the parent EcoStruxure BMS server are individually connected to an Ethernet switch. You can reduce the installation time and cost by daisy-chaining multiple controllers together. You can use an RSTP ring topology when you want failures of a single controller to be detected and recovered quickly and efficiently.

Models with a versatile mix of I/O points

MP-V comes in two models with different I/O point count and a versatile mix of I/O point types that match a wide variety of VAV applications.

MP-V

SmartX IP Controller

I/O Point Types by MP-V Models

I/O Point Types	MP-V-7A	MP-V-9A
Universal inputs	3	4
Triac outputs	3	3
Analog outputs	1	2

Configurations by I/O Point Types

Configurations	Universal Inputs	Triac Outputs	Analog Outputs
Digital inputs	yes	-	-
Counter inputs	yes	-	-
Supervised inputs	yes	-	-
Voltage inputs (0 to 10 VDC)	yes	-	-
Current inputs (0 to 20 mA)	yes	-	-
Temperature inputs	yes	-	-
Resistive inputs	yes	-	-
2-wire RTD temperature inputs	yes	-	-
Digital outputs	-	yes	-
Digital pulsed outputs	-	yes	-
PWM outputs	-	yes	-
Tristate outputs	-	yes	-
Tristate pulsed outputs	-	yes	-
Voltage outputs (0 to 10 VDC)	-	-	yes
Current outputs (0 to 20 mA)	-	-	yes

Universal inputs

The universal inputs are ideal for any mix of temperature, pressure, flow, status points, and similar point types in a building control system.

As counter inputs, they are commonly used in energy metering applications. As RTD inputs, they are ideal for temperature points in a building control system. As supervised inputs, they are used for security applications where it is critical to know whether or not a wire has been cut or shorted. These events provide a separate indication of alarms and trouble conditions to the system.

For all analog inputs, maximum and minimum levels can be defined to automatically detect over-range and under-range values.

Triac outputs

The triac outputs can be used in many applications to switch 24 VAC on or off for external loads such as actuators, relays, or indicators. The triac outputs are isolated from the controller. Triacs are silent and do not suffer from relay contact wear.

MP-V

SmartX IP Controller

Analog outputs

The analog outputs are capable of supporting analog voltage or current point types, without the need for external bias resistors. Therefore, analog outputs support a wide range of devices, such as actuators.

Integrated damper actuator with feedback signal

The integrated damper actuator allows for simplified installation of MP-V directly over the damper shaft. This eliminates the need for separate installation, wiring, and positioning of the damper motor. MP-V uses the same actuator mechanics as many Schneider Electric VAV controller models from the Andover Continuum, TAC Vista, TAC I/A Series, and TAC I/NET product lines. The feedback signal from the actuator makes it possible to determine the exact position of the damper. The actuator also features a push button for manual positioning of the damper during commissioning.

Factory-calibrated air flow sensor

The factory-calibrated air flow sensor uses a state-of-the-art technology that requires no air flow from the velocity probe. Unlike flow-through sensors, the sensor does not impose rigid requirements on tubing, dust, or filters, and the sensor is not affected by errors induced on the local probe pressure readings. The sensor requires no maintenance and a minimum of field adjustments.

High reliability

The MP Series controllers support local trends, schedules, and alarms, enabling local operation when the controller is offline or used in standalone applications.

The battery-free power backup of the memory and real-time clock prevents data loss and ensures seamless and quick recovery after a power failure.

WorkStation allows you to update the firmware of multiple MP Series controllers at the same time and with minimum down time. The EcoStruxure BMS server keeps track of the installed firmware to support backup, restore, and replacement of the controllers and sensors. The server can host controllers of different firmware versions.

Sensor bus for living space sensors

The MP Series controllers provide an interface designed for the SmartX Sensor family of living space sensors. The SmartX Sensors offer an efficient way to sense the temperature, humidity, CO₂, and occupancy

in a room. The SmartX Sensors are available with different combinations of sensor types and various covers and user interface options, such as touchscreen, setpoint and override buttons, and blank covers.



SmartX Sensors

The sensor bus provides both power and communications for up to four sensors that are daisy-chained using standard Cat 5 (or higher) cables. The maximum number of sensors that can be connected to a controller varies depending on the sensor model and the combination of cover and sensor base type:

- Blank covers: Up to four sensors of any combination of sensor base types
- 3-button and touchscreen covers:
 - Up to two sensor bases with CO₂ option
 - Up to four sensor bases without CO₂ option
- SmartX LCD temperature sensors: Up to four sensors are supported

The maximum total length of the sensor bus is 61 m (200 ft). For more information, see the SmartX Living Space Sensors Specification Sheet.

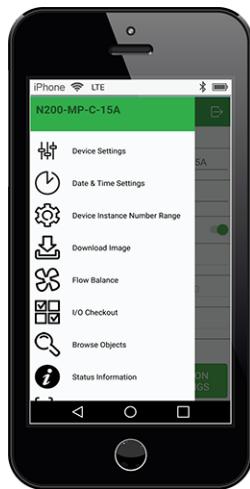
Mobile commissioning application

The eCommission SmartX Controllers mobile application is designed for local configuration, field deployment, and commissioning of MP Series controllers, and air flow balancing of VAV units. The mobile application reduces the commissioning time, allows flexibility in project execution, and eliminates dependencies on network infrastructure.

The mobile application is designed for use with Android, Apple (iOS), and Microsoft Windows 10 devices. For more information, see the eCommission SmartX Controllers Specification Sheet.

MP-V

SmartX IP Controller



eCommission SmartX Controllers mobile app

Using the eCommission SmartX Controllers mobile application, you can connect to one or many MP Series controllers. You can connect to a single MP Series controller using the eCommission Bluetooth Adapter connected to a SmartX Sensor. You can connect to a network of MP Series controllers on the local IP network, using a wireless access point or a network switch.

Device configuration

With the eCommission SmartX Controllers mobile application, you can easily discover MP Series controllers on the IP network and change each controller's configuration, including the BACnet and IP network settings, location, and parent server. To save engineering time, you can save common device settings and then reuse them for controllers of the same model.

Field deployment and I/O checkout

The eCommission SmartX Controllers mobile application does not require an EcoStruxure BMS server or a network infrastructure to be in place. You can use the mobile application to load the controller application directly into the local MP Series controller and deploy the controller. The controller application can be created offline using Project Configuration Tool or WorkStation. You can also perform an I/O checkout to ensure that the controller's I/O points are configured, wired, and operating correctly.

Air flow balancing

Using the eCommission SmartX Controllers mobile application, you can perform air flow balancing of VAV units controlled by MP-Vs. An intuitive workflow automatically guides you through the process. After the

flow balancing, you can generate a report in HTML format for one or more VAV units. The balancing parameters associated with each MP-V are stored in the parent server, which makes it easier to replace the controller if necessary.

Full EcoStruxure Building Operation software support

The power of the MP Series controller is fully realized when it is part of an EcoStruxure BMS, which provides the following benefits:

- WorkStation/WebStation interface
- Script and Function Block programming options
- Device discovery
- Engineering efficiency

WorkStation/WebStation interface

WorkStation and WebStation provide a consistent user experience regardless of which EcoStruxure BMS server the user is logged on to. The user can log on to the parent EcoStruxure BMS server to engineer, commission, supervise, and monitor the MP Series controller and its I/O as well as its attached SmartX Sensors. For more information, see the WorkStation and WebStation specification sheets.

Script and Function Block programming options

Unique to the industry, the MP Series controllers have both Script and Function Block programming options. This flexibility assures that the best programming method can be selected for the application. Existing programs can easily be reused between the EcoStruxure BMS server and the controller.

Device discovery

The enhanced Device Discovery in WorkStation enables you to easily identify MP Series controllers on a BACnet network and to associate the controllers with their parent server.

Engineering efficiency

The engineering and maintenance of MP Series controllers can be done very efficiently using the EcoStruxure Building Operation reusability features. With these features, you can create library items (Custom Types) for a complete controller application that contains programs and all necessary objects such as trends, alarms, and schedules. The controller application in the Custom Types library is reusable across all controllers of the same model. You can use the controller application as a base for creating new

MP-V

SmartX IP Controller

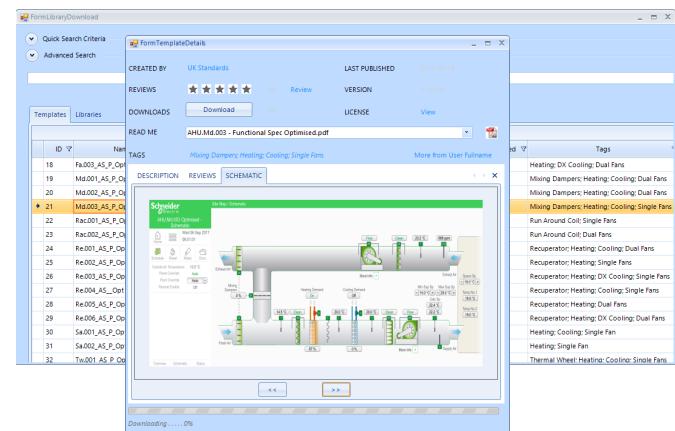
controllers intended for similar applications. You can then edit the controller application, and the changes are automatically replicated to all controllers, while each controller keeps its local values.

WorkStation supports both online and offline engineering of MP Series controllers. You can make the configuration changes online or use database mode to make the changes offline. In database mode, the changes are saved to the EcoStruxure Building Operation database so that you can apply the changes to the controllers later.

Project Configuration Tool enables you to perform all the engineering off site, without the need for physical hardware, which minimizes the time you need to spend on site. You can run the EcoStruxure BMS servers virtually and engineer the MP Series controllers, before you deploy your server and controller applications to the servers and controllers on site. For more information, see the Project Configuration Tool specification sheet.

In addition, you can use Automated Engineering Tool to facilitate your engineering process when using MP Series controllers. This tool provides access to a library of standard controller applications. These standard

applications can be quickly configured and customized using the wizards and mass edit functions provided in the tool and then loaded into your target server. The tool also enables the quick creation of your own templates based on MP Series controller applications that you have developed. This facilitates a standard approach and drives the ability to easily reuse and duplicate common controller applications. For more information, see the Automated Engineering Tool specification sheet.



Library of standard HVAC applications

Part Numbers

Product	Part number
MP-V-7A	SXWMPV7AX10001
MP-V-9A	SXWMPV9AX10001
Spare terminal blocks for all MP-V models (1 x 2-pin, 2 x 3-pin, 2 x 4-pin, 1 x 5-pin, 1 x 6-pin terminal blocks)	SXWMPVCON10001
Adapter for damper shaft diameter 9.5 mm (0.375 inch)	AM-135
eCommission Bluetooth Adapter	SXWBTAECXX10001

Specifications

AC input

Nominal voltage	24 VAC
Operating voltage range	+/-20 %
Frequency	50/60 Hz
Maximum power consumption (MP-V-7A)	21 VA
Maximum power consumption (MP-V-9A)	22 VA
Power input protection	MOV suppression and internal fuse

MP-V

SmartX IP Controller

Environment

Ambient temperature, operating 0 to 50 °C (32 to 122 °F)

Ambient temperature, storage -40 to +70 °C (-40 to +158 °F)

Maximum humidity 95 % RH non-condensing

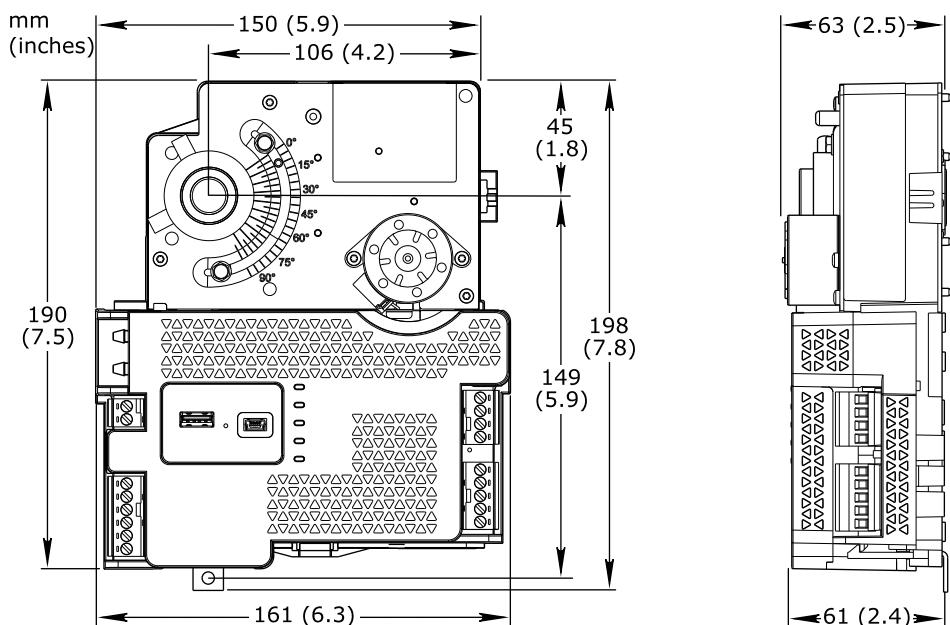
Material

Plastic flame rating UL94 V-0

Ingress protection rating IP 20

Mechanical

Dimensions 161 W x 198 H x 63 D mm (6.3 W x 7.8 H x 2.5 D in.)



Weight 1.13 kg (2.5 lb)

Installation Over the damper shaft

Terminal blocks Removable

Software compliance

EcoStruxure Building Operation software version 2.0 or later

Agency compliances

Emission RCM; EN 61000-6-3; EN 50491-5-2; FCC Part 15, Sub-part B, Class B

Immunity EN 61000-6-2; EN 50491-5-3

Safety EN 60730-1; EN 60730-2-11; EN 50491-3; UL 916 C-UL US Listed

Fire performance in air-handling spaces^a UL 2043
a) MP-V-7A and MP-V-9A are approved for plenum applications.

Real-time clock

Accuracy, at 25 °C (77 °F) +/-1 minute per month

Backup time, at 25 °C (77 °F) 7 days minimum

MP-V

SmartX IP Controller

Communication ports

Ethernet	Dual 10/100BASE-TX (RJ45)
USB	USB 2.0, 5 VDC, 2.5 W, 1 device port (mini-B) and 1 host port (type-A)
Sensor Bus	24 VDC, 2 W, RS-485 (RJ45)
Sensor Bus protection	Transient voltage suppressors on communication and power signals

Communications

BACnet	BACnet/IP, port configurable, default 47808
.....	BTL B-AAC (BACnet Advanced Application Controller) ^a

a) See the BTL Product Catalog for up-to-date details on BTL listed firmware revisions on BACnet International's home page.

CPU

Frequency	500 MHz
Type	ARM Cortex-A7 dual-core
DDR3 SDRAM	128 MB
NOR flash memory	32 MB
Memory backup	128 kB, FRAM, non-volatile

Damper actuator

Torque rating	6 Nm (53 lbf.in)
Stroke	0° to 90°, fully adjustable
Timing	Approximately 2 seconds/degree at 60 Hz and 2.4 seconds/degree at 50 Hz for 90° rotation at 24 VAC
Position indication	Visual indication
Damper position feedback	Yes
Manual override	Push-button clutch release
Damper shaft diameter	12.7 mm (0.5 inch) or 9.5 mm (0.375 inch)Adapter kit AM-135 is required for 9.5 mm (0.375 inch) diameter shafts.
Damper shaft minimum length (from VAV box)	22.2 mm (0.875 inch)

Air flow sensor

Range	0 to 249 Pa (0 to 1 inH ₂ O)
Resolution	0.33 Pa (0.001 inH ₂ O) at 25°C (77°F)
Accuracy	±5% of 249 Pa (1.00 inH ₂ O) span at 25°C (77°F)

Universal inputs, UI

Channels, MP-V-7A	3, UI1–UI3
Channels, MP-V-9A	4, UI1–UI4
Absolute maximum ratings	-0.5 to +24 VDC
A/D converter resolution	16 bits
Universal input protection	Transient voltage suppressor on each input

Digital inputs

Range	Dry contact switch closure or open collector/open drain, 24 VDC, typical wetting current 2.4 mA
Minimum pulse width	150 ms

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SmartX IP Controller

Counter inputs

Range	Dry contact switch closure or open collector/open drain, 24 VDC, typical wetting current 2.4 mA
Minimum pulse width	20 ms
Maximum frequency	25 Hz

Supervised inputs

5 V circuit, 1 or 2 resistors	
Monitored switch combinations	Series only, parallel only, and series and parallel
Resistor range	1 to 10 kohm
For a 2-resistor configuration, each resistor must have the same value +/- 5 %	

Voltage inputs

Range	0 to 10 VDC
Accuracy	+/- (7 mV + 0.2 % of reading)
Resolution	1.0 mV
Impedance	100 kohm

Current inputs

Range	0 to 20 mA
Accuracy	+/- (0.01 mA + 0.4 % of reading)
Resolution	1 μA
Impedance	47 ohm

Resistive inputs

10 ohm to 10 kohm accuracy	+/- (7 + 4 x 10 ⁻³ x R) ohm
R = Resistance in ohm	
10 kohm to 60 kohm accuracy	+/- (4 x 10 ⁻³ x R + 7 x 10 ⁻⁸ x R ²) ohm
R = Resistance in ohm	

Temperature inputs (thermistors)

Range	-50 to +150 °C (-58 to +302 °F)
-------------	---------------------------------

Supported thermistors

Honeywell	20 kohm
Type I (Continuum)	10 kohm
Type II (I/NET)	10 kohm
Type III (Satchwell)	10 kohm
Type IV (FD)	10 kohm
Type V (FD w/ 11k shunt)	Linearized 10 kohm
Satchwell D?T	Linearized 10 kohm
Johnson Controls	2.2 kohm
Xenta	1.8 kohm
Balco	1 kohm

Measurement accuracy

20 kohm	-50 to -30 °C: +/- 1.5 °C (-58 to -22 °F: +/- 2.7 °F)
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MP-V

SmartX IP Controller

.....	-30 to 0 °C: +/-0.5 °C (-22 to +32 °F: +/-0.9 °F)
.....	0 to 100 °C: +/-0.2 °C (32 to 212 °F: +/-0.4 °F)
.....	100 to 150 °C: +/-0.5 °C (212 to 302 °F: +/-0.9 °F)
10 kohm, 2.2 kohm, and 1.8 kohm.....	-50 to -30 °C: +/-0.75 °C (-58 to -22 °F: +/-1.35 °F) -30 to +100 °C: +/-0.2 °C (-22 to +212 °F: +/-0.4 °F) 100 to 150 °C: +/-0.5 °C (212 to 302 °F: +/-0.9 °F)
Linearized 10 kohm	-50 to -30 °C: +/-2.0 °C (-58 to -22 °F: +/-3.6 °F) -30 to 0 °C: +/-0.75 °C (-22 to +32 °F: +/-1.35 °F) 0 to 100 °C: +/-0.2 °C (32 to 212 °F: +/-0.4 °F) 100 to 150 °C: +/-0.5 °C (212 to 302 °F: +/-0.9 °F)
1 kohm	-50 to +150 °C: +/-1.0 °C (-58 to +302 °F: +/-1.8 °F)
RTD temperature inputs	
Supported RTDs	Pt1000
Pt1000	
Range.....	-50 to +150 °C (-58 to +302 °F)
Measurement accuracy	-50 to +70 °C: +/-0.5 °C (-58 to +158 °F: +/-0.9 °F) 70 to 150 °C: +/-0.7 °C (158 to 302 °F: +/-1.3 °F)
RTD temperature wiring	
Maximum wire resistance	20 ohm/wire (40 ohm total)
Maximum wire capacitance	60 nF
The wire resistance and capacitance typically corresponds to a 200 m wire.	
Triac outputs, DO	
Channels, MP-V-7A	3, DO1–DO3
Channels, MP-V-9A	3, DO1–DO3
Output rating (for each triac output)	Max. 0.5 A
Voltage	24 VAC +/-20 %
Commons.....	COM (terminal number 18)
The common terminal COM can be connected to 24 VAC or to ground.	
Common voltage, high side output.....	24 VAC
Common voltage, low side output	0 VAC (ground)
Minimum pulse width	100 ms
Triac output protection	MOV and snubber across each triac output MOV from triac COM to ground
Analog outputs, AO	
Channels, MP-V-7A	1, VO1/CO1
Channels, MP-V-9A	2, VO1/CO1 and VO2/CO2
Analog output protection	Transient voltage suppressor on each output
Voltage outputs	
Range	0 to 10 VDC
Accuracy.....	+/-60 mV
Resolution	10 mV

MP-V

SmartX IP Controller

Minimum load resistance.....5 kohm to ground

Load range.....0 to +2 mA

TerminalsVoltage Output (VO), Return (RET)

Current outputs

Range0 to 20 mA

Accuracy+/-0.2 mA

Resolution.....21 µA

Load range.....0 to 650 ohm

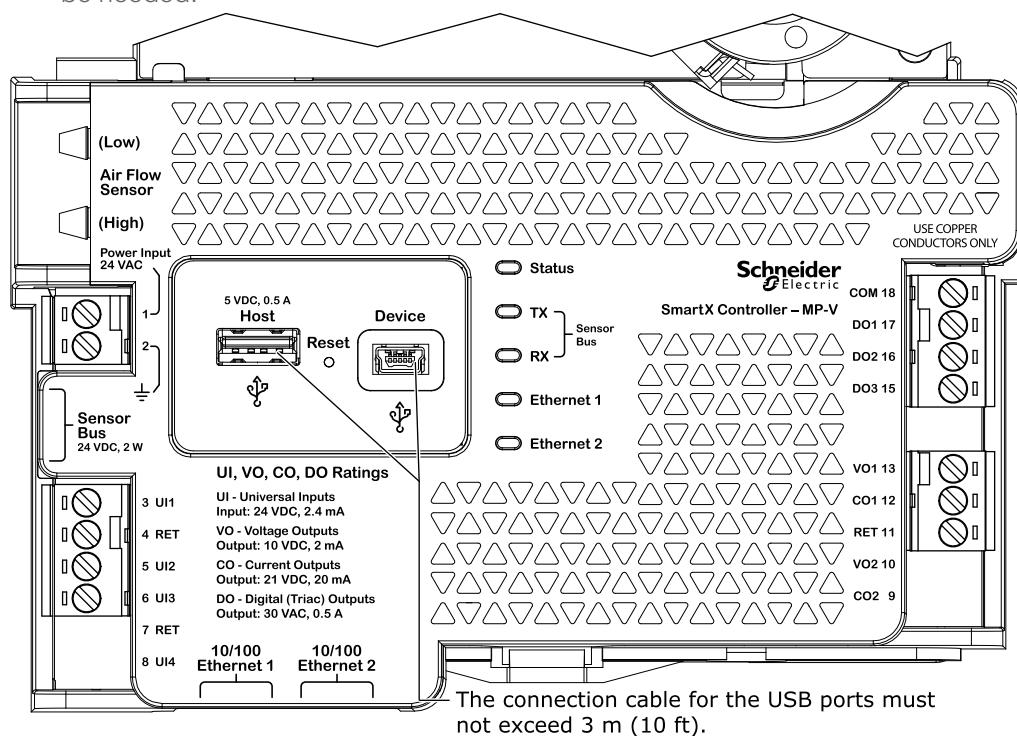
TerminalsCurrent Output (CO), Return (RET)

Terminals

Be sure to follow proper installation wiring diagrams and instructions, including these instructions:

- MP-V-7A and MP-V-9A have several RET terminals for connection of I/O returns, so a common chassis/signal ground rail is optional and may not be needed.

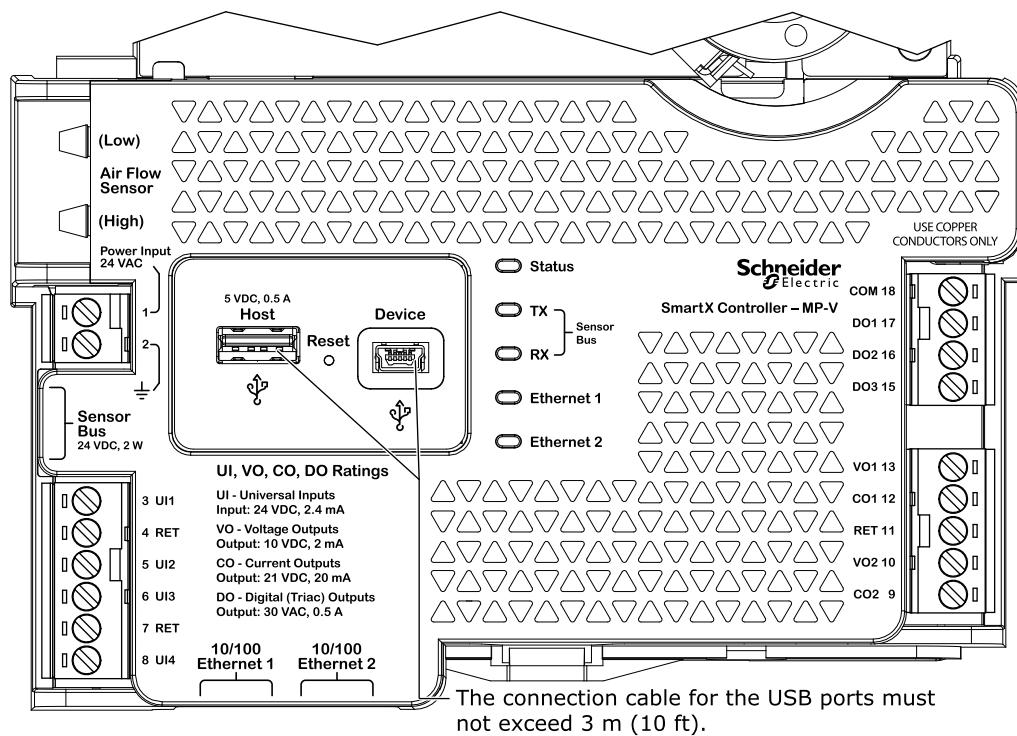
- Individual 24 VDC power sources to the field must be current limited to maximum 4 A for UL compliant installations, and maximum 6 A in other areas.
- For more information on wiring, see Hardware Reference Guide.



MP-V-7A

MP-V

SmartX IP Controller



MP-V-9A

Part Numbers in AMER Region for Network Connectivity Accessories

Product description ^a	Part number (AMER region)
Cat 6 field-term plug, UTP	ACTPG6TLU001
Cat 6 pull-through plug, UTP, 100-pack	ACTPG6PTU100
Actassi crimping tool	ACTTLCPT
Cat 6 cable, UTP, 1000 ft (305 m), CMP, green	ACT4P6UCP1ARXGR
Cat 6 patch cord, UTP, 30 ft (9 m), CMP, green	ACTPC6UBCP30AGR
Cat 6 patch cord, UTP, 50 ft (15 m), CMP, green	ACTPC6UBCP50AGR
Cat 6 patch cord, UTP, 70 ft (21 m), CMP, green	ACTPC6UBCP70AGR
Cat 6 patch cord, UTP, 90 ft (27 m), CMP, green	ACTPC6UBCP90AGR
Cat 5e pull-through plug, UTP, 100-pack	ACTPG5PTU100
Cat 5e cable, UTP, 1000 ft (305 m), CMP, green	ACT4P5UCP1ARXGR
Cat 5e patch cord, UTP, 30 ft (9 m), CMP, green	ACTPC5EUBCP30AGR
Cat 5e patch cord, UTP, 50 ft (15 m), CMP, green	ACTPC5EUBCP50AGR
Cat 5e patch cord, UTP, 70 ft (21 m), CMP, green	ACTPC5EUBCP70AGR
Cat 5e patch cord, UTP, 90 ft (27 m), CMP, green	ACTPC5EUBCP90AGR

a) Abbreviations: UTP (Unshielded Twisted Pair), CMP (Plenum-rated cable)

MP-V

SmartX IP Controller

Part Numbers in EMEA Region for Network Connectivity Accessories

Product description^a	Part number (EMEA region)
Cat 6 field-term plug, UTP	ACTPG6TLU001
Cat 6 pull-through plug, UTP, 100-pack	ACTPG6PTU100
Actassi crimping tool	ACTTLCPT
Cat 6 LAN cable, UTP, 4-Pair, 250 MHz, LSZH, 305 m (1000 ft)	VDICD116118
Cat 6 patch cord, UTP, 10 m (32 ft), LSZH, green	ACTPC6UBLS100GR
Cat 6 patch cord, UTP, 15 m (49 ft), LSZH, green	ACTPC6UBLS150GR
Cat 6 patch cord, UTP, 20 m (65 ft), LSZH, green	ACTPC6UBLS200GR
Cat 6 patch cord, UTP, 25 m (82 ft), LSZH, green	ACTPC6UBLS250GR
Cat 5e pull-through plug, UTP, 100-pack	ACTPG5PTU100
Cat 5e cable, UTP, 1000 ft (305 m), CMP, green	VDICD115118
Cat 5e patch cord, UTP, 10 m (32 ft), LSZH, green	ACTPC5EUBLS100GR
Cat 5e patch cord, UTP, 15 m (49 ft), LSZH, green	ACTPC5EUBLS150GR
Cat 5e patch cord, UTP, 20 m (65 ft), LSZH, green	ACTPC5EUBLS200GR
Cat 5e patch cord, UTP, 25 m (82 ft), LSZH, green	ACTPC5EUBLS250GR

a) Abbreviations: UTP (Unshielded Twisted Pair), CMP (Plenum-rated cable), LSZH (Low Smoke Zero Halogen)

Part Numbers in APAC Region for Network Connectivity Accessories

Product description^a	Part number (APAC region)
Cat 6 field-term plug, UTP	ACTPG6TLU001
Cat 6 pull-through plug, UTP, 100-pack	ACTPG6PTU100
Actassi crimping tool	ACTTLCPT
Cat 6 LAN cable, 305 m	2D4P6IPV3B-GR
Cat 6 patch lead, UTP, 10 m (32 ft), green	RJ6_100PL-GR
Cat 6 patch lead, UTP, 15 m (49 ft), green	RJ6_150PL-GR
Cat 6 patch lead, UTP, 20 m (65 ft), green	RJ6_200PL-GR
Cat 6 patch lead, UTP, 25 m (82 ft), green	RJ6_250PL-GR
Cat 5e field-term plug, UTP	ACTPG5ETLU001
Cat 5e pull-through plug, UTP, 100-pack	ACTPG5EPTU100
Cat 5e LAN cable, 305 m (1000 ft)	2D4P5IPV3B-GR
Cat 5e patch lead, UTP, 10 m (32 ft), green	RJ5_100PL-GR
Cat 5e patch lead, UTP, 15 m (49 ft), green	RJ5_150PL-GR
Cat 5e patch lead, UTP, 20 m (65 ft), green	RJ5_200PL-GR
Cat 5e patch lead, UTP, 25 m (82 ft), green	RJ5_250PL-GR

a) Abbreviations: UTP (Unshielded Twisted Pair)

MP-V

SmartX IP Controller

Regulatory Notices

Federal Communications Commission

FCC Rules and Regulations CFR 47, Part 15, Class B

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.

Industry Canada

This Class B digital apparatus complies with Canadian ICES-003.

Cet appareil numérique de la classe B est conforme à la norme NMB-003 du Canada.

Regulatory Compliance Mark (RCM) - Australian Communications and Media Authority (ACMA)

This equipment complies with the requirements of the relevant ACMA standards made under the Radiocommunications Act 1992 and the Telecommunications Act 1997. These standards are referenced in notices made under section 182 of the Radiocommunications Act and 407 of the Telecommunications Act.

CE - Compliance to European Union (EU)

2014/30/EU Electromagnetic Compatibility Directive

2011/65/EU Restriction of Hazardous Substances (RoHS) Directive

This equipment complies with the rules, of the Official Journal of the European Union, for governing the Self Declaration of the CE Marking for the European Union as specified in the above directive(s) per the provisions of the following standards: EN 60730-1, EN 60730-2-11, and EN 50491-3 Safety Standards.



WEEE - Directive of the European Union (EU)

This equipment and its packaging carry the waste of electrical and electronic equipment (WEEE) label, in compliance with European Union (EU) Directive 2012/19/EU, governing the disposal and recycling of electrical and electronic equipment in the European community.



LISTED

UL 916 Listed products for the United States and Canada, Enclosed Energy Management Equipment. UL file E80146.

[Temperature Sensors]

ET Series



SPECIFICATIONS

	For TAC Vista, I/NET, Continuum, and I/A	1000 Ohm Platinum	1000 Ohm BALCO
Output	1.8K Ohms @ 77° F (25° C) Vista 10K Ohms @ 77° F (25° C) I/Net 10K Ohms @ 77° F (25° C) Continuum 10K Ohms @ 77° F (25° C) with 11K Ohms shunt resistor I/A	1K Ohms @ 32°F (0°C)	1000 Ohms @ 70°F (21°C)
Temperature Range	-40° to 302° F (-40° to 150° C)	-58° to 392°F (-50 to 200°C) -50° to 275°F (-45.5° to 134.8°C)	-40° to 240°F (-40° to 116°C)
Interchangeability	+/- 0.2 C (0° to 70° C)		
Temperature Coefficient		0.00385 Ohm/Ohm/°C	2.2 Ohms/°F
Dissipation Constant Stability	3 mW / C		
Accuracy	+/- 0.2° C (0° to 70° C) +/- 0.4° F (32° to 158° C)	+/- 0.06% @ 32°F (0°C) Single Point +/- 1.0 Ohm @ 70°F (Averaging)	+/- 0.1%
Operating Humidity	0 to 90% RH non-condensing		

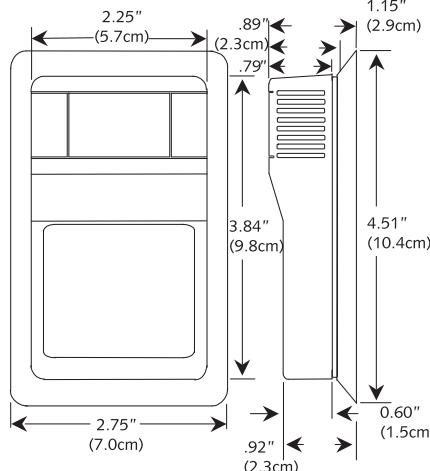
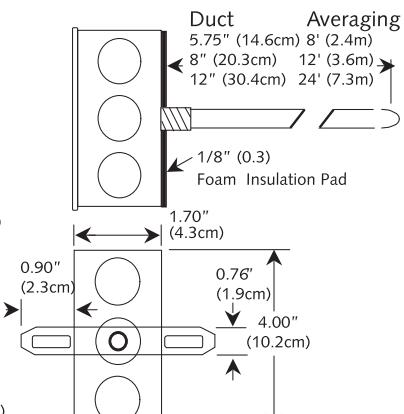
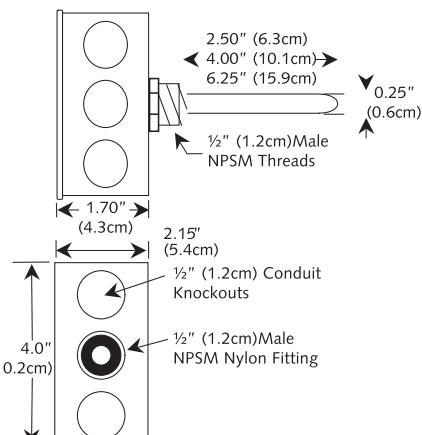
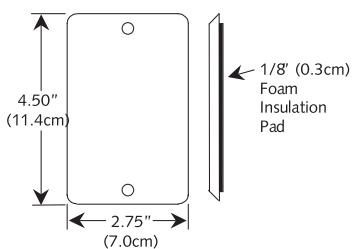
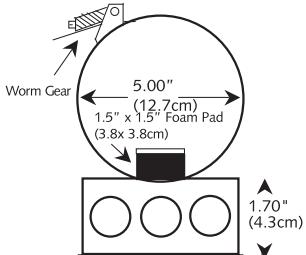
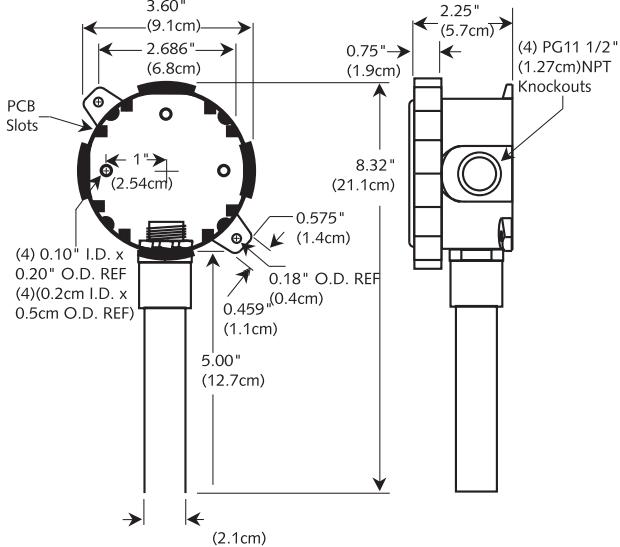
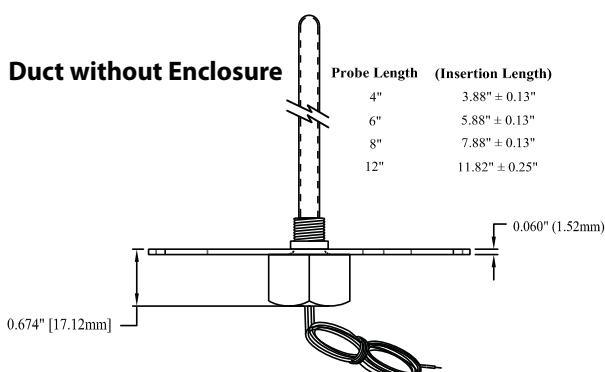
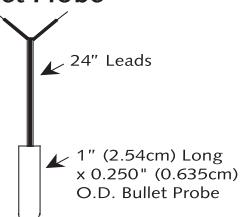
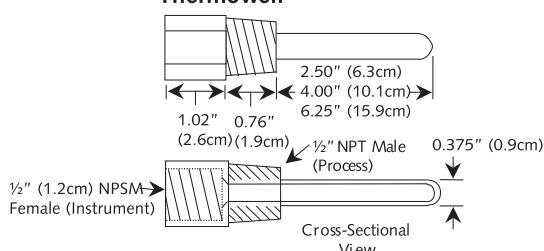
Application

Thermistors offer high accuracy and interchangeability over a wide temperature range. The ET series can be used in the following applications:

- Space
- Duct
- Immersion
- Averaging
- Strap-On
- Bead/Bullet
- Outdoor Air

Features

- Offer high accuracy and interchangeability over a wide temperature range.
- Non-polarity sensitive

DIMENSIONS**Room****Duct / Averaging****Immersion****Stainless Plate****Strap-On****Outside Air****Duct without Enclosure****Bullet Probe****Thermowell**

INSTALLATION

Room Temperature Sensors

This unit is suitable for either drywall mounting or junction box mounting. The room sensor is provided with screw terminal blocks for all connections. Remove the cover from the unit and mount the housing base to the wall using the (2) 6/32" x 1" machine screws. Replace the cover and tighten down, using the (2) 1/16" Allen Screws located on the bottom of the enclosure.

Duct and Duct Averaging Sensors

Duct temperature sensors - drill a 3/8" hole in the duct and insert the probe through the hole until the foam pad is tight to the duct. Now insert (2) screws through the mounting holes in flange and tighten them until the unit is held firmly to the duct. Duct Averaging sensors - Drill a 3/8" hole in the duct and insert the averaging element through the hole until the foam pad is tight to the duct. Now insert the (2) screws through the holes in the mounting flange and tighten until the unit is held firmly to the duct. The sensor should then be strung in a criss-cross pattern throughout the duct using the mounting clips provided, in a pattern that covers the greatest surface area of the duct, to insure that there is no stratification. When bending the copper tubing, be careful that you use a gradual bend and that you DO NOT kink the copper tubing.

Immersion Temperature Sensors

The Fluid Immersion-type sensors are provided with a 2 1/2", 4", or 6 1/4" insertion length, 304 series stainless steel thermowell. The thermowell has a 1/2" NPT external or process thread and a 1/2" NPS Female process thread. Heat transfer compound may be used but it is not necessary.

Strap-On Temperature Sensors

The TAC Strap-On sensors, are provided in a NEMA 1 rated junction box with an adjustable 2" to 5" pipe clamp. The unit should be mounted on the bottom side of the pipe to ensure proper heat transfer and a true temperature reading. Heat transfer compound and insulating the sensor will help the overall accuracy of the sensor. By ordering extra straps, and fastening them together, it is possible to make them fit larger pipes.

Outside Air Temperature Sensors

The TAC Outdoor Air temperature sensors are provided in a weatherproof enclosure. An optional weatherproof Aluminum Bell Box or NEMA 4X Polycarbonate enclosure is also available upon request for an additional charge. All of the mounting hardware is provided with the sensor. Be sure to mount the sensor out of direct sunlight, with the sensor probe pointing downward.

Stainless Plate Temperature Sensors

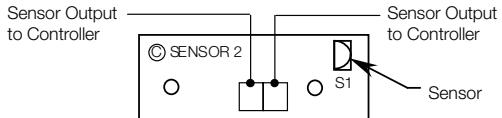
The TAC Stainless Plate temperature sensors are mounted on the back of a 1 Gang stainless steel plate. The foam pad will insulate the sensor from any drafts in the wall. (2) 6/32" x 1" machine screws are provided for junction box mounting. Be sure that the sensor is not mounted on an outside wall, due to the extreme temperature changes from either drafts or heat transfer.

WIRING

For wiring Information on room temperature sensors, please refer to the following documents:

System	F-Number
Vista	F-27616
I/NET	F-27617
Continuum	F-27618
I/A	F-27619

Diagram for ET Sensors Except ETR



ORDERING INFORMATION

Temperature Sensor Description	TAC Vista	I/NET	Continuum	I/A	1000 Ohm Platinum	1000 Ohm BALCO
Room	ETR100	ETR200	ETR500	ETR800	-	-
Room with Setpoint	ETR101	ETR201	ETR501	ETR801	-	-
Room with Override Pushbutton	ETR102	ETR202	ETR502	ETR802	-	-
Room with Setpoint and Override Pushbutton	ETR103	ETR203	ETR503	ETR803	-	-
Wallplate (Stainless Steel)	ETP100	ETP200	ETP500	ETP800		
4" Duct (Galvanized Steel Enclosure)	ETD100-4	ETD200-4	ETD500-4	ETD800-4	ETDPK0-4	ETDBK0-4
6" Duct Galvanized Steel Enclosure)	ETD100-6	ETD200-6	ETD500-6	ETD800-6	ETDPK0-6	ETDBK0-6
8" Duct (Galvanized Steel Enclosure)	ETD100-8	ETD200-8	ETD500-8	ETD800-8	ETDPK0-8	ETDBK0-8
12" Duct (Galvanized Steel Enclosure)	ETD100-12	ETD200-12	ETD500-12	ETD800-12	ETDPK0-12	ETDBK0-12
4" Duct without Enclosure	ETD100-NE-4	ETD200-NE-4	ETD500-NE-4	ETD800-NE-4	ETDPK0-NE-4	ETDBK0-NE-4
6" Duct without Enclosure	ETD100-NE-6	ETD200-NE-6	ETD500-NE-6	ETD800-NE-6	ETDPK0-NE-6	ETDBK0-NE-6
8" Duct without Enclosure	ETD100-NE-8	ETD200-NE-8	ETD500-NE-8	ETD800-NE-8	ETDPK0-NE-8	ETDBK0-NE-8
12" Duct without Enclosure	ETD100-NE-12	ETD200-NE-12	ETD500-NE-12	ETD800-NE-12	ETDPK0-NE-12	ETDBK0-NE-12
2.5" Immersion (Galvanized Steel Enclosure)*	ETI100-2	ETI200-2	ETI500-2	ETI800-2	ETIPK0-2	ETIBK0-2
4" Immersion (Galvanized Steel Enclosure)*	ETI100-4	ETI200-4	ETI500-4	ETI800-4	ETIPK0-4	ETIBK0-4
6.25" Immersion (Galvanized Steel Enclosure)*	ETI100-6	ETI200-6	ETI500-6	ETI800-6	ETIPK0-6	ETIBK0-6
8' Averaging (Flexible Copper)	ETA100-8	ETA200-8	ETA500-8	ETA800-8	-	-
12' Averaging (Flexible Copper)	ETA100-12	ETA200-12	ETA500-12	ETA800-12	ETAPK0-12	ETABK0-12
24' Averaging (Flexible Copper)	ETA100-24	ETA200-24	ETA500-24	ETA800-24	ETAPK0-24	ETABK0-24
Outside Air	ETO100	ETO200	ETO500	ETO800	-	-
Strap On	ETS100	ETS200	ETS500	ETS800	-	-
Bead / Bullet	ETB100	ETB200	ETB500	ETB800	-	-

* Length indicates immersion depth.

Miscellaneous Options	Code
LCD Display in Fahrenheit (for room units only)	-LCD
LED Indicator* (for room units with override only)	-LED
Thermometer Indicator (for room units only)	-TI
RS232 Communication Jack (for use with I/NET systems only)	-RS232
Four-Pin RJ11 Communication Jack (for use with TAC Vista and Continuum systems only)	-RJ4

Well Type	Part Number
2.5" Stainless Steel Well*	ETI-WELL-2S
4" Stainless Steel Well*	ETI-WELL-4S
6.25" Stainless Steel Well*	ETI-WELL-6S

* Length indicates immersion depth.

* Not available on I/A, 1000 Ohm Platinum, or 1000 Ohm BALCO.

Data Sheet

DESCRIPTION

The EH Series Room, Duct and Outside humidity sensors are a universal Relative Humidity transmitter that can be powered with either a +15 to 36 Vdc or 24 Vac supply voltage. The EH series sensors are designed with a field selectable 4-20 mA, 0-5 VDC, or 0-10 Vdc output signal that is equivalent to 0 to 100% RH. The EH Series is used in building automation systems, humidity chambers, and OEM applications and is compatible with Vista, Continuum, I/Net and I/A Systems.



EH Series

FEATURES

- Single point Field Calibration
- Field selectable output signals
- $\pm 2\%$ Accuracies
- Low Drift
- Highly Repeatable
- Integral Temperature Sensor

SPECIFICATIONS

Supply Voltage	250 Ohm Load: +15 to 36 Vdc / 21.6-26.4 Vac 0-5VDC: +15-36 Vdc / 21.6-26.4 Vac 500 Ohm Load: +18 to 36 Vdc / 21.6-26.4 Vac 0-10VDC: +18-36 Vdc / 21.6-26.4 Vac
Power Consumption	1VA maximum
RH Measurement Range	0 to 100%
RH Output	2-wire, 4 to 20mA (Factory Standard) 3-wire, 0-5, 0-10 Vdc or 4 to 20mA
Accuracy at 77° F (25° C)	+/- 2 % from 20 to 95%
Long-term Stability	Less than 2% drift / 5 years
Hysteresis	Less than 0.4% RH
Repeatability	0.5% RH
Sensitivity	0.1 % RH
Response Time	110 seconds for 63% Step
Storage Temperature Range	41 to 95°F (5°C to 35°C) < 75% RH
Operating Temperature Range	-10 to 122°F (-23.3 to 50°C)
Operating Humidity Range	0 to 95 % RH non-condensing
Saturation Response Time	10 minutes for 63% Step
Temperature Sensor output at 77° F (25° C)	1.8K ohm (Vista), 10K ohm Type II (I/Net), 10K ohm Type III (Continuum), 10K ohm with 11K ohm shunt (I/A)

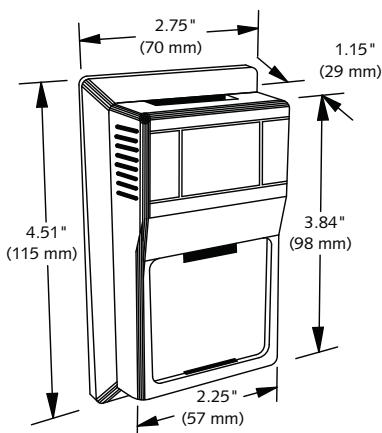
ORDERING INFORMATION

Description	Vista	I/Net	Continuum	I/A
Room-Humidity Only		EHR110		
Room-Humidity and Temperature	EHR110-100	EHR110-200	EHR110-500	EHR110-800
Duct-Humidity Only	EHD110			
Duct-Humidity and Temperature	EHD110-100	EHD110-200	EHD110-500	EHD110-800
Outdoor-Humidity Only	EOH110			
Outdoor-Humidity and Temperature	EHO110-100	EHO110-200	EHO110-500	EHO110-800

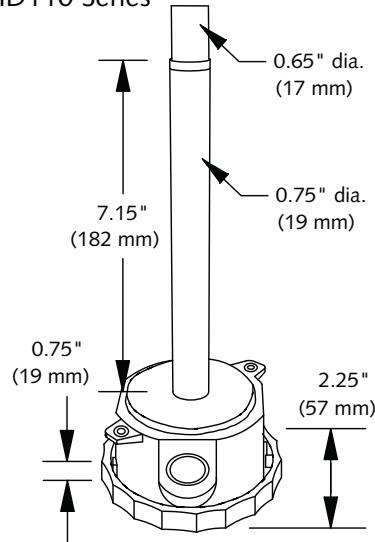
Miscellaneous Option	Code
LCD Display (Room Units Only. LCD displays humidity value.)	-LCD

DIMENSIONS

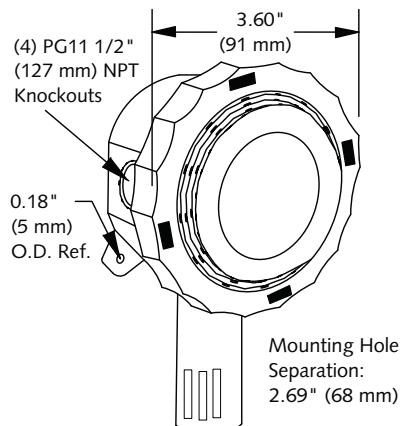
EHR110 Series



EHD110 Series



EHO110 Series



On October 1st, 2009, TAC became the Buildings business of its parent company Schneider Electric. This document reflects the visual identity of Schneider Electric, however there remains references to TAC as a corporate brand in the body copy. As each document is updated, the body copy will be changed to reflect appropriate corporate brand changes.

CDE & CWE SERIES

Field-selectable 4 to 20 mA / 0 to 10 Vdc Output



The CDE and CWE are non-dispersive infrared (NDIR) sensors designed for measuring environmental CO₂ concentration in ventilation systems and indoor living spaces. Their measurement range of 0 to 2000 ppm makes them compliant with ASHRAE and other standards for ventilation control.

The CWE/CDE Series provides a user-selectable 4 to 20 mA or 0 to 10 Vdc output for versatility. Microprocessor-based digital electronics and a unique self-calibration algorithm improves long-term stability and accuracy.

SPECIFICATIONS

Input Power	Class 2; 20 to 30 Vdc/24 AC 50/60 Hz; 100 mA max.
Analog Output	4 to 20 mA (clipped & capped)/0 to 10 Vdc (selectable)
Operating Temp. Range	0 to 50 °C (32 to 122 °F)
Operating Humidity Range	0 to 95% RH non-condensing
Housing Material	High impact ABS plastic
Terminal Block Torque: CDE CWE	0.5 to 0.6 N·m (4.4 to 5.3 in-lbf) max. 0.2 N·m (2.0 in-lbf) max.
Terminal Block Wire Size: CDE CWE	24 to 12 AWG (0.25 to 2.5mm ²) 28 to 20 AWG (0.08 to 0.5mm ²)
Sensor Type	Non-dispersive infrared, diffusion sampling
Output Range	0 to 2000 ppm
Accuracy	±30 ppm ±2% of measured value*

Microprocessor based

Microprocessor-based design increases accuracy and reduces installation time

4 to 20 mA/ 0 to 10 Vdc

4 to 20 mA/0 to 10 Vdc output for flexible control system interface

Self-calibrating

Innovative self-calibration algorithm...easy to maintain.
5-year calibration interval (recommended)

Sensitivity

Low ambient sensitivity

APPLICATIONS

- Controlling ventilation in response to occupancy
- Facilitating compliance with ASHRAE 62.1 standard for air quality

- Office buildings, conference rooms, schools, retail stores, etc.

Repeatability	±20 ppm ±1% of measured value
Response Time	<60 seconds for 90% step change

WARRANTY

Limited Warranty 3 years

AGENCY APPROVALS



RTD/Termistors in wall housings are not compensated for internal heating of product. EMC Conformance: Low voltage directive 2014/35/EU and 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).

* Measured at NTP

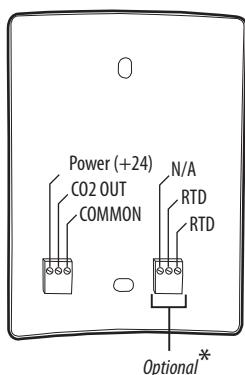
**The CE mark indicates RoHS2 compliance. Please refer to the CE Declaration of Conformity for additional details.

Note: Rough handling and transportation may cause a temporary reduction of CO₂ sensor accuracy. With time, the ABC function will tune the readings back to the correct accuracy range. The default tuning speed is limited to 30 ppm per week.



CWE WALL MOUNT

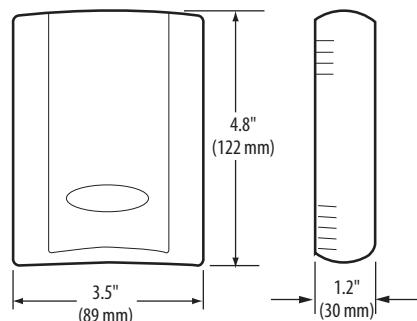
Wiring Diagram



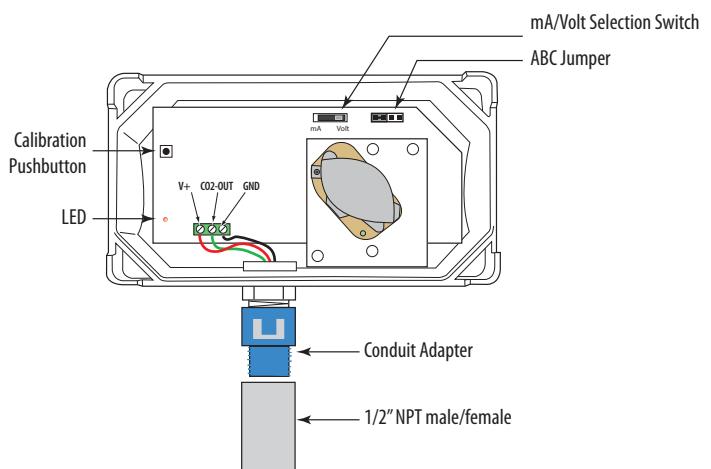
* Note: Connector blocks and headers for optional features are not included with non-option models.

CWE WALL MOUNT

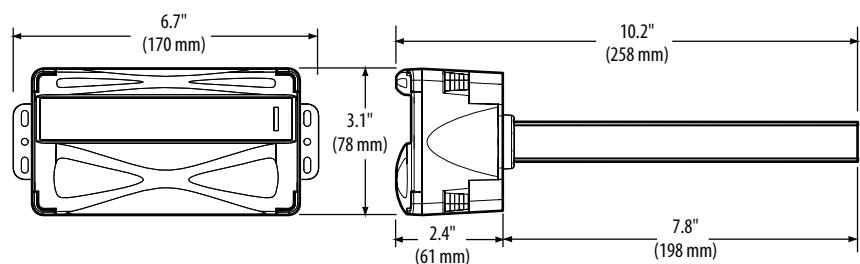
Dimensional Drawing

**CDE DUCT MOUNT**

Wiring Diagram

**CDE DUCT MOUNT**

Dimensional Drawing

**ORDERING INFORMATION**

Duct Mount	Wall Mount, Temp. Option	Wall Mount, No Temp. Option
CDE (No Options)	<p>Sensor Type</p> <p>CWE <input type="checkbox"/></p> <p>Housing</p> <p>Blank = Cloud white B = Black</p> <p>Example: CWE <input type="checkbox"/> SH <input type="checkbox"/> B</p> <p>SB= 100R Platinum, RTD SC= 1k Platinum, RTD SD= 10k T2, RTD, Thermistor SE= 2.2k, Thermistor SF= 3k, Thermistor SG= 10k CPC, Thermistor SH= 10k T3, Thermistor SJ= 10k Dale, Thermistor SK= 10k with 11k shunt, Thermistor SM= 20k NTC, Thermistor SN= 1800 ohm, Thermistor SR= 10k US, Thermistor SS= 10k 3A221, Thermistor ST= 100k, Thermistor SU= 20k "D" Thermistor SW= 10k T2 high accuracy, Thermistor SY= 10k T3 high accuracy, Thermistor</p>	<p>Housing</p> <p>Blank = Cloud white B = Black</p> <p>Example: CWE <input type="checkbox"/> B</p>



AIR PRESSURE SENSING SWITCH WITH ADJUSTABLE SET POINT RANGE

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

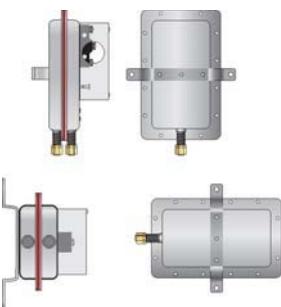
The plated housing contains a diaphragm, a calibration spring and a snap-acting SPDT switch. The sample connections located on each side of the diaphragm accept $\frac{1}{4}$ " OD metallic tubing via the integral compression ferrule and nut.

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 $\frac{1}{2}$ " 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 $\frac{3}{16}$ " diameter holes in the integral mounting bracket. The mounting holes are $3\frac{7}{8}$ " apart.

(Fig. 1)



AIR SAMPLING CONNECTION (SEE FIGURE 2)

The AFS-222 is designed to accept firm-wall sample lines of $\frac{1}{4}$ " OD tubing by means of ferrule and nut compression connections. For sample lines of up to 10 feet, $\frac{1}{4}$ " OD tubing is acceptable. For lines up to 20 feet, use $\frac{1}{4}$ " ID tubing. For lines up to 60 feet, use $\frac{1}{2}$ " ID tubing. A $\frac{1}{4}$ " 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.

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.



Cleveland Controls
DIVISION OF UNICONTROL INC.
1111 Brookpark Rd
Cleveland OH 44109

Tel: 216-398-0330

Fax: 216-398-8558

Email:saleshvac@unicontrolinc.com

Web page: <http://www.clevelandcontrols.com>



ELECTRICAL CONNECTIONS (SEE FIGURE 3)

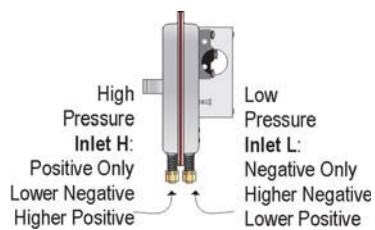
Before pressure is applied to the diaphragm, the switch contacts will be in the normally closed (NC) position. The snap switch has screw top terminals with cup washers. Wire alarm and control applications as shown in Figure 4.

FIELD ADJUSTMENT

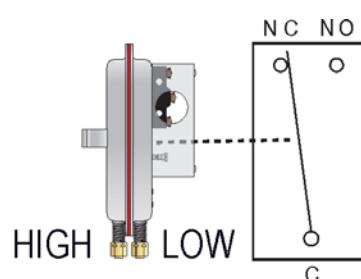
The adjustment range of an AFS-222 Air Switch is 0.05 ± 0.02 " w.c. to 12.0" w.c. To adjust the set point, turn the adjusting screw counterclockwise until motion has stopped. Next, turn the adjusting screw 4 complete turns in a clockwise direction to engage the spring. From this point, the next ten turns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

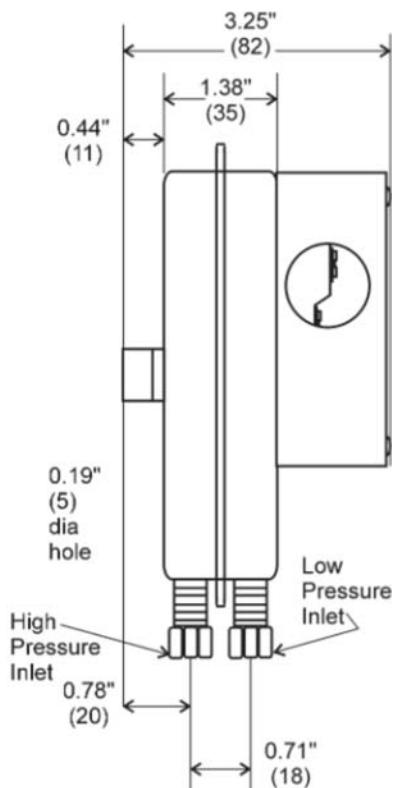
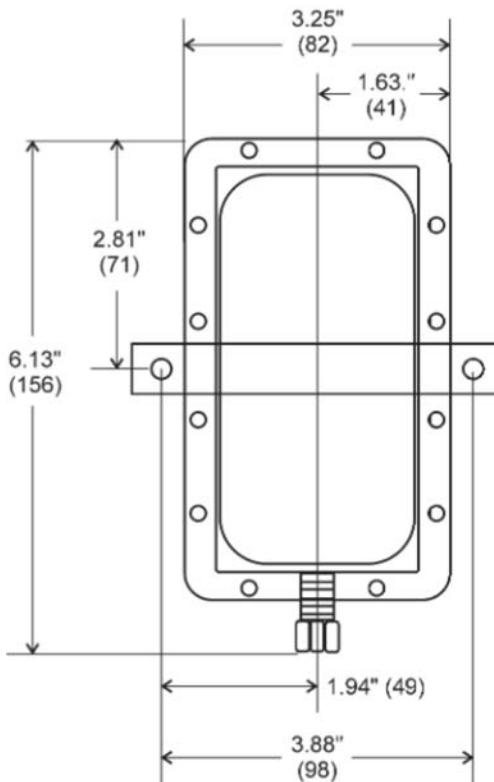
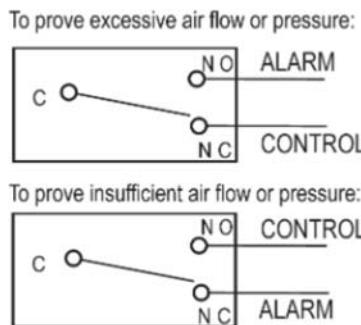
(Figure 2)



(Figure 3)



(Figure 4)



Nominal Dimensions in Inches (Millimeters)

SPECIFICATIONS

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

Mounting Position:

Mount with the diaphragm in any vertical 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:

$\frac{1}{2}$ psi (0.03 bar).

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

Life:

100,000 cycles minimum at $\frac{1}{2}$ 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:

$\frac{7}{8}$ " diameter opening accepts $\frac{1}{2}$ " conduit.

Sample Line Connectors:

Male, externally threaded $\frac{7}{16}$ " -24 UNS 2A thread, complete with nuts and self-aligning ferrules.

Sample Line Connections:

Connectors will accept $\frac{1}{4}$ " OD rigid or semi-rigid tubing.

Approvals: UL, FM, CSA.

Shipping Weight: 1.2 lbs.

Accessories:

- P/N 18311 Slip-on $\frac{1}{4}$ " OD Tubing Adapter, suitable for slipping on flexible plastic tubing.
- Sample line probes.
- Orifice plugs (pulsation dampers).

Airflow Measurement with Temperature and Alarm Capability

Gold Series
GTx116-P+

OVERVIEW



- Thermal Dispersion Technology
- High Sensor Density
- NIST-traceable Calibration
- %-of-reading Accuracy
- Airflow and Status Alarm
- Temperature Output Capability
- Combination Analog/Network Models
- Three Mounting Styles
- Remote Transmitter with LCD Display
- 3-year Warranty

The GTx116-P+ is EBTRON's top-of-the-line measurement solution for accurate and repeatable measurement in ducts and plenums. Ideal for outdoor air delivery monitoring and airflow tracking applications. Temperature and alarm capability plus unsurpassed product features and connectivity options make this the best choice for today's high performance buildings.

Typical Applications	Benefits	Product Highlights
<ul style="list-style-type: none"> Outdoor Air Delivery Monitoring Differential Airflow Tracking Hospital Pressurization Laboratory Pressurization Air Change Verification & Monitoring System Performance Monitoring 	<ul style="list-style-type: none"> Comply with ASHRAE Standards Demonstrate Code Compliance Satisfy LEED Prerequisites and Credits Provide Acceptable IAQ Save Energy Reduce Liability Improve Performance 	<ul style="list-style-type: none"> Best Installed Accuracy Low Airflow Capability Volumetric or Mass Airflow Measurement Long-term Stability "Plug and Play" Operation Intuitive User Interface Waterproof Sensor Assembly FEP Plenum Rated Cables



SPECIFICATIONS: GTx116-P+

General

Probe and Sensor Node Configurations (max.)

- 2 probes x 8 sensor nodes/probe
- 4 probes x 4 sensor nodes/probe

Installed Airflow Accuracy¹

- Ducts/Plenum: ±3% of reading
- Non-ducted OA Intakes: better than or equal to ±5% of reading

P+ Sensor Density Rules

Area (sq.ft.) [sq.m]	Sensor Nodes	Area (sq.ft.) [sq.m]	Sensor Nodes
≤ 0.5 [0.046]	1	> 4 & ≤ 8 [0.743]	8
> 0.5 & ≤ 1 [0.092]	2	> 8 & ≤ 12 [1.11]	12
> 1 & ≤ 2 [0.185]	4	> 12 & ≤ 14 [1.30]	14
> 2 & ≤ 4 [0.371]	6	> 14 [1.30]	16

Sensor Node Averaging Method

Airflow: Independent, arithmetic average

Temperature: Independent, velocity weighted or arithmetic average

Listings

UL: UL 873 Listed

CE: European shipments only

BACnet International: BTL Listed (GTC116 and GTM116 transmitters)

Environmental Limits

Temperature:

Probes: -20 to 160 °F [-28.9 to 71.1 °C]

Transmitter: -20 to 120 °F [-28.9 to 48.9 °C]

Humidity: (non-condensing)

Probes: 0 to 100%

Transmitter: 5 to 95%

Individual Sensing Nodes

Sensing Node Sensors

Self-heated sensor: Precision, hermetically sealed, bead-in-glass thermistor probe

Temperature sensor: Precision, hermetically sealed, bead-in-glass thermistor probe

Sensing Node Housing

Material: Glass-filled Polypropylene (Kynar® with /SS option)

Sensor Potting Materials: Waterproof marine epoxy

Sensing Node Internal Wiring

Type: Kynar® coated copper

Airflow Measurement

Accuracy: ±2% of reading to NIST-traceable airflow standards (includes transmitter uncertainty)

Calibrated Range: 0 to 5,000 fpm [25.4 m/s]

Calibration Points: 16

Temperature Measurement

Accuracy: ±0.15°F [0.08 °C] to NIST-traceable temperature standards (includes transmitter uncertainty)

Calibrated Range: -20 to 160 °F [-28.9 to 71.1 °C]

Calibration Points: 3

Sensor Probe Assembly

Tube

Material: Gold anodized 6063 aluminum (316 stainless steel with /SS option)

Mounting Brackets

Material: 304 stainless steel

Mounting Options & Standard Size Limits²

Insertion and Stand-off: 6 to 120 in. [152.4 to 3048 mm]

Internal: 8 to 120 in. [203.2 to 3048 mm]

Probe to Transmitter Cables

Type: FEP jacket, plenum rated CMP/CL2P, UL/cUL listed, -67 to 392 °F [-55 to 200 °C], UV tolerant

Standard Lengths: 10, 15, 20, 25, 30, 40 and 50 ft. [3.1, 4.6, 6.1, 7.6, 9.1, 12.2, and 15.2 m]

Connecting Plug: 13/16" [20.63 mm] nominal diameter with gold-plated connector pins

Transmitter

Power Requirement: 24 VAC (22.8 to 26.4 under load) @20V-A

Connector Receptacle Pins and PCB Connections: Gold-plated receptacle pins, PCB interconnects, PCB edge fingers, and test points

User Interface: 16-character LCD display and 4 button interface

B.A.S. Connectivity Options

GTC116 Transmitter: Two field selectable (0-5/0-10 VDC or 4-20mA), scalable and isolated analog output signals (AO1=airflow, AO2=temperature or alarm) plus one field selectable (BACnet MS/TP or Modbus RTU) and isolated RS-485 network connection - Individual sensor node airflow rates and temperatures are available via the network

GTM116 Transmitter: Two field selectable (0-5/0-10 VDC or 4-20mA), scalable and isolated analog output signals (AO1=airflow, AO2=temperature or alarm) plus one isolated Ethernet (simultaneously supported BACnet Ethernet or BACnet IP, Modbus TCP and TCP/IP) network connection - Individual sensor node airflow rates and temperatures are available via the network

GTL116 Transmitter: One isolated Lonworks Free Topology network connection

GTD116 Transmitter: One USB connection for thumb drive data-logging of sensor node airflow rates and temperatures over specified time intervals

Airflow Alarm

Type: Low and/or high user defined setpoint alarm

Tolerance: User defined % of setpoint

Delay: User defined

Zero Disable: Alarm can be disabled when the airflow rate falls below the low limit cutoff value (unoccupied periods)

Reset Method: Manual or automatic

Visual Indication: Yes, LCD display

Network Indication: Yes (GTC116 and GTM116 only)

Analog Signal Indication: Yes, on AO2 assignment

System Status Alarm

Type: Sensor diagnostic system trouble indication

Visual Indication: Yes, LCD display

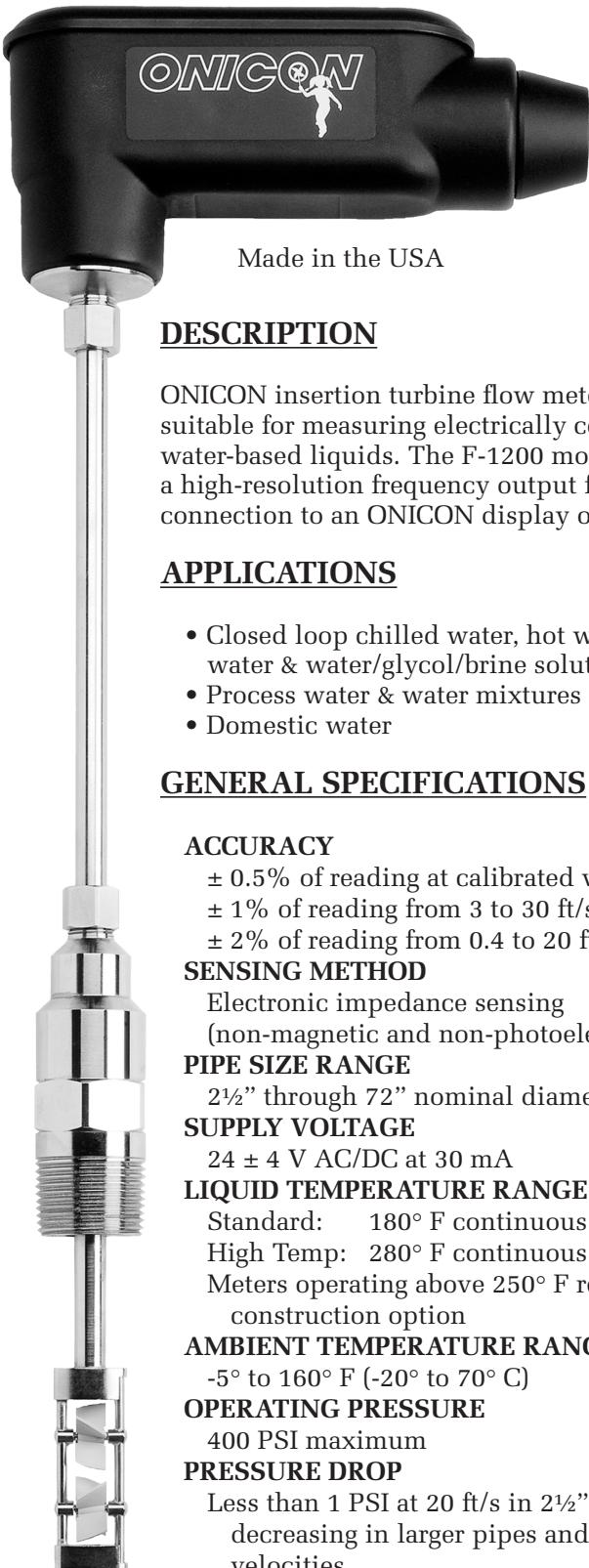
Network Indication: Yes (GTC116 and GTM116 only)

Analog Signal Indication: Yes, on AO2 assignment

EB-Link Infra-red Interface (with /EL option): Provides individual airflow and temperature data to an EB-Link Reader

¹ Installed airflow accuracy is the actual system accuracy expected and includes sampling uncertainty of the sensor probes when installation meets or exceeds placement guidelines.

² Custom probes are available up to 192 inches. Sensing nodes/probe limitations apply on sizes greater than 120 inches to ensure structural stability of the probe tube and may not meet P+ sensor density rules. Contact factory for more information.



Made in the USA

DESCRIPTION

ONICON insertion turbine flow meters are suitable for measuring electrically conductive water-based liquids. The F-1200 model provides a high-resolution frequency output for connection to an ONICON display or Btu meter.

APPLICATIONS

- Closed loop chilled water, hot water, condenser water & water/glycol/brine solutions for HVAC
- Process water & water mixtures
- Domestic water

GENERAL SPECIFICATIONS

ACCURACY

- ± 0.5% of reading at calibrated velocity
- ± 1% of reading from 3 to 30 ft/s (10:1 range)
- ± 2% of reading from 0.4 to 20 ft/s (50:1 range)

SENSING METHOD

Electronic impedance sensing
(non-magnetic and non-photoelectric)

PIPE SIZE RANGE

2½" through 72" nominal diameter

SUPPLY VOLTAGE

24 ± 4 V AC/DC at 30 mA

LIQUID TEMPERATURE RANGE

Standard: 180° F continuous, 200° F peak

High Temp: 280° F continuous, 300° F peak

Meters operating above 250° F require 316 SS construction option

AMBIENT TEMPERATURE RANGE

-5° to 160° F (-20° to 70° C)

OPERATING PRESSURE

400 PSI maximum

PRESSURE DROP

Less than 1 PSI at 20 ft/s in 2½" pipe,
decreasing in larger pipes and lower
velocities

OUTPUT SIGNALS PROVIDED

Frequency Output

0 – 15 V peak pulse, typically less than 300 Hz

(continued on back)

• F-1200 DUAL TURBINE • INSERTION FLOW METER FREQUENCY OUTPUT



CALIBRATION

Every ONICON flow meter is wet calibrated in our flow laboratory against primary volumetric standards that are directly traceable to N.I.S.T. A certificate of calibration accompanies every meter.

FEATURES

Unmatched Price vs. Performance - Custom calibrated, highly accurate instrumentation at very competitive prices.

Excellent Long-term Reliability - Patented electronic sensing is resistant to scale and particulate matter. Low mass turbines with engineered jewel bearing systems provide a mechanical system that virtually does not wear.

Industry Leading Two-year “No-fault” Warranty - Reduces start-up costs with extended coverage to include accidental installation damage (miswiring, etc.) Certain exclusions apply. See our complete warranty statement for details.

Simplified Hot Tap Insertion Design -

Standard on every insertion flow meter.
Allows for insertion and removal by hand
without system shutdown.

OPERATING RANGE FOR COMMON PIPE SIZES

0.17 TO 20 ft/s

±2% accuracy begins at 0.4 ft/s

Pipe Size (Inches)	Flow Rate (GPM)
2 ½	2.5 - 230
3	4 - 460
4	8 - 800
6	15 - 1,800
8	26 - 3,100
10	42 - 4,900
12	60 - 7,050
14	72 - 8,600
16	98 - 11,400
18	120 - 14,600
20	150 - 18,100
24	230 - 26,500
30	360 - 41,900
36	510 - 60,900

F-1200 SPECIFICATIONS cont.

MATERIAL

Wetted metal components:

Standard: Electroless nickel plated brass

Optional: 316 stainless steel

ELECTRONICS ENCLOSURE

Standard: Weathertight aluminum enclosure

Optional: Submersible enclosure

ELECTRICAL CONNECTIONS

3-wire for frequency output

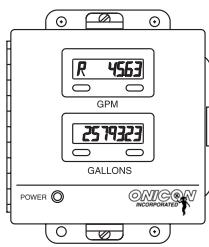
Standard: 10' of cable with 1/2" NPT conduit connection

Optional: Indoor DIN connector with 10' of plenum rated cable

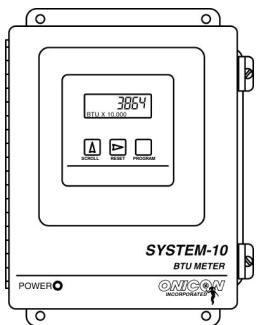
F-1200 Wiring Information

WIRE COLOR	DESCRIPTION	NOTES
RED	(+) 24 V AC/DC supply voltage, 30 mA	Connect to power supply positive
BLACK	(-) Common ground (Common with pipe ground)	Connect to power supply negative
GREEN	(+) Frequency output signal: 0-15 V peak pulse	Signal for ONICON display or Btu meter
DIAGNOSTIC SIGNALS		
ORANGE	Bottom turbine frequency	These signals are for diagnostic purposes - connect to local display or Btu meter
WHITE	Top turbine frequency	

ALSO AVAILABLE

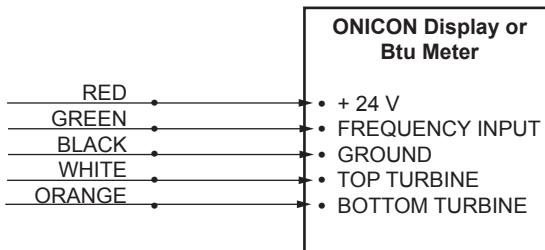


Display Modules



Btu Measurement Systems

F-1200 Wiring Diagram



NOTE: Black wire is common with the pipe ground (typically earth ground).

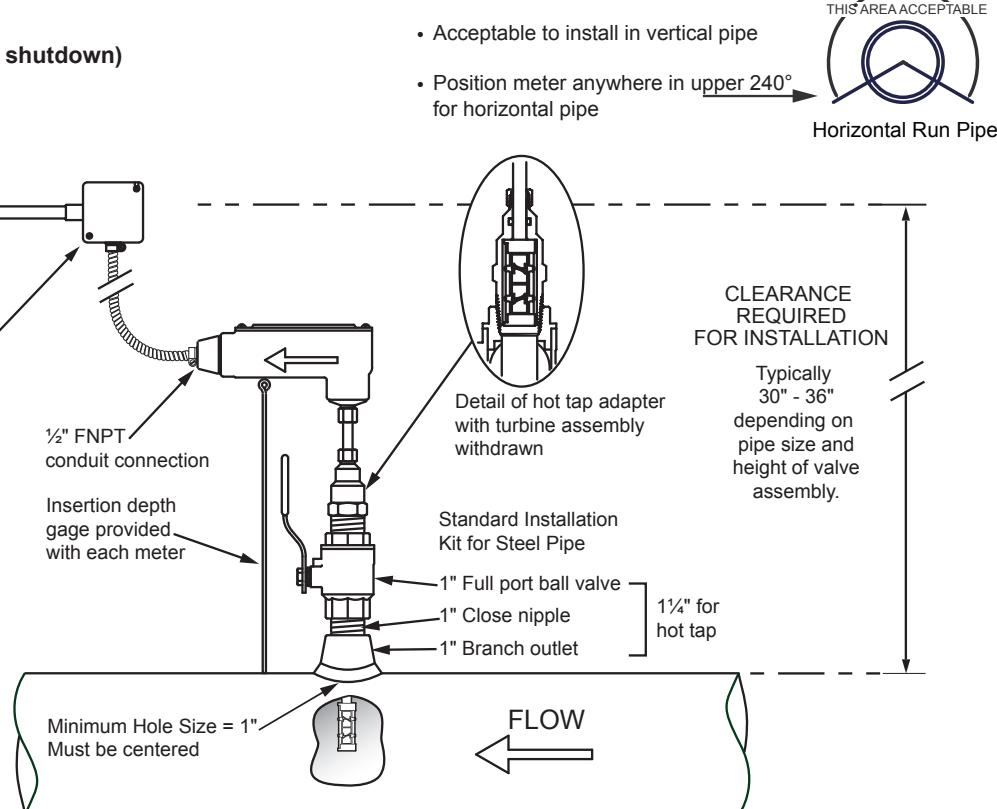
Typical Meter Installation (New construction or scheduled shutdown)

- Acceptable to install in vertical pipe
- Position meter anywhere in upper 240° for horizontal pipe



Horizontal Run Pipe

NOTE: Installation kits vary based on pipe material and application.
For installations in pressurized (live) systems, use "hot tap" 1 1/4" installation kit and drill hole using a 1" wet tap drill.



Model 230

True Wet-to-Wet Differential Pressure Transducer

The Model 230 is Setra's highest accuracy solution for monitoring differential pressure in wet-to-wet applications. Its single diaphragm design enables a true wet-to-wet differential pressure measurement with superior $\pm 0.25\%$ FS accuracy compared to competitive units which calculate differential pressure using two single point pressure sensors. The stainless steel capacitive sensor provides a highly accurate, linear analog output proportional to the pressure over a wide temperature range. The 230 is offered with an optional 3 or 5 valve machined brass manifold for ease of installation and maintenance.

Avoid Line Pressure w/ Single Diaphragm Sensor

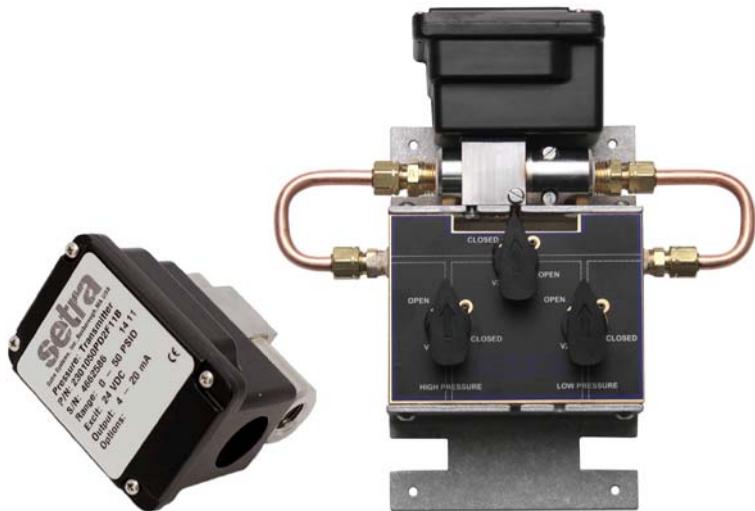
Unlike the competition, the 230 is a true wet-to-wet sensor with a single diaphragm construction. The differential pressure range of a single diaphragm is not impacted by line pressure whereas dual differential pressure sensors require the individual sensors to measure gauge pressure, comparing the outputs to determine the differential pressure.

Increase the Sensors Response Time

The 230 utilizes an all stainless steel capacitive sensor which responds 20x faster than oil filled sensors and provides conditioned electronic circuitry with a highly accurate, linear analog output proportional to the pressure over a wide temperature range.

Save Time on Money & Installation

When time and project costs are a priority, the 230 is offered with an optional 3 or 5 valve machined brass manifold for ease of installation and maintenance. The brass body has no internal process connections, therefore eliminating the risk of internal leaks.



- Single Diaphragm Design
- All Stainless Steel Capacitive Sensor
- 3 or 5 Valve Manifold Assembly Options

Model 230 Features:

- Only true wet-to-wet differential pressure transducer on the market
- $\pm 0.25\%$ FS Accuracy
- Available to 1 PSID with 350 PSI Line Pressure
- No Liquid Fill Diaphragm
- NEMA 4 Rated Housing
- Low Line Pressure Effect
- Fast Response Time
- Gas & Liquid Compatible
- CE & RoHS Compliant

Applications:

- Energy Management Systems
- Process Control Systems
- Flow Measurement of Various Gases or Liquids
- Liquid Level Measurement or Pressurized Vessels
- Pressure Drop Across Filters

Model 230

True Wet-to-Wet Differential Pressure Transducer



PROOF PRESSURE

Unidirectional		
Pressure Range PSID	Proof Pressure High Side PSI	Proof Pressure Low Side PSI
0 to 1.0	50	2.5
0 to 2.0	50	5
0 to 5.0	100	12.5
0 to 10.0	100	25
0 to 25.0	350	62.5
0 to 30.0	350	75
0 to 50.0	350	125
0 to 100.0	350	250

Bidirectional		
Pressure Range PSID	Proof Pressure High Side PSI	Proof Pressure Low Side PSI
0 to \pm 0.5	50	1.25
0 to \pm 1.0	50	2.5
0 to \pm 2.5	100	6.35
0 to \pm 5.0	100	12.5
0 to \pm 10.0	200	25
0 to \pm 25.0	350	62.5
0 to \pm 50.0	350	125

GENERAL SPECIFICATIONS

Performance Data		Physical Description (Model 230)	
Accuracy RSS ¹ (at constant temp)	$\pm 0.25\%$ FS	Case	Stainless Steel/Aluminum
Non-Linearity, BFSL	$\pm 0.20\%$ FS	Electrical Connection	Barrier strip terminal block with conduit enclosure & 0.875 DIA conduit opening.
Hysteresis	0.10% FS	Pressure Fittings	1/4"-18 NPT internal
Non-Repeatability	0.05% FS	Weight (approx.)	14.4 oz
Thermal Effects²		Sensor Cavity Volume	
Compensated Range °F (°C)	+30 to +150 (-1 to +65)	(With 1/4"NPT external fittings installed-does not include cavity volume of 1/4"NPT external fittings.)	
Zero Shift %FS/100°F (%FS/50°C)	2.0 (1.8)	Physical Description (3-Valve Manifold Assembly)⁴	
Span Shift %FS/100°F (%FS/50°C)	2.0 (1.8)	Manifold Block	Brass
Line Pressure Effect	Zero shift $\pm 0.004\%$ FS/PSIG line pressure	Valves (3) ⁵	V1 for Connection to + port V2 for Connection to - port V3 for Equalizing Pressure
Resolution	Infinite, limited only by output noise level (0.02%FS)	Valve Type	90° On/Off
Static Acceleration Effect	2%FS/g (most sensitive axis)	Process Connections	1/4"-18 NPT Internal Thread
Natural Frequency	500 Hz (gaseous media)	Dimensions	7.05"W x 6.25"H x 2.16"D
Warm-up Shift	$\pm 0.1\%$ FS total	Weight	<2.5 lbs.
Response Time	30 to 50 milliseconds	Physical Description (5-Valve Manifold Assembly)⁶	
Long Term Stability	0.5%FS/1 YR	Manifold Block	Brass
Maximum Line Pressure	350 PSIG	Valve (5) ⁵	V1 for Connection to \pm Port V2 for Connection to – Port V3 for Equalizing Pressure V4 & V5 for Connection to External Gauge or Alternate Plumbing Configuration
Environmental Data			
Operating ³ Temperature °F (°C)	0 to +175 (-18 to +80)	Process Connection	1/4"-18 NPT Internal Thread
Storage Temperature °F (°C)	-65 to +250 (-54 to +121)	Dimensions	7.05"W x 6.25"H x 2.16"D
Vibration	5 g from 5 Hz to 500 Hz	Weight	<3.8 lbs.
Acceleration	10g	Electrical Data (Voltage)	
Shock	50g	Circuit	3-Wire (Exc, Out, Com)
Pressure Media		Excitation	9 to 30 VDC for 0-5 VDC Output, 13 to 30 VDC for 0-10 VDC Output
Model 230		Output ⁷	0 to 5 VDC ⁸ , 0 to 10 VDC ⁹
Gases or liquids compatible with 17-4 PH Stainless Steel, 300 Series Viton O-Rings. Note: Hydrogen not recommended for use with 17-4 PH stainless steel. Optional Buna-N O' rings are recommended for hydrocarbon applications.		Output Impedance	100 ohms
		Electrical Data (Current)	
3 & 5 Valve Manifold		Circuit	2-Wire
Gases or liquids compatible with 360 brass, Copper 122, Acetal plug valves and Nitrile O-rings.		Output ⁹	4 to 20mA ¹⁰
		External Load	0 to 1000 ohms
		Minimum supply voltage (VDC)	9+ 0.02 x (Resistance of receiver plus line).
		Maximum supply voltage (VDC)	30+ 0.004 x (Resistance of receiver plus line).

¹ RSS of Non-Linearity, Hysteresis, and Non-Repeatability.

² Units calibrated at nominal 70° F. Maximum thermal error computed from this datum.

³ Operating temperature limits of the electronics only. Pressure media temperatures may be considerably higher.

⁴ Order assembled with the Model 230 (Code 3V) or separately as Option 891.

⁵ Refer to drawings

⁶ Order assembled with the Model 230 (Code 5V)

⁷ Calibrated into a 50K ohm load, operable into a 5000 ohm load or greater.

⁸ Zero output factory set to within $\pm 25\text{mV}$ (for 5 VDC output) or $\pm 50\text{mV}$ (for 10 VDC output)

⁹ Span (Full Scale) output factory set to $\pm 25\text{ mV}$ (for 5 VDC output) or $\pm 50\text{ mV}$ (for 10 VDC output)

¹⁰ Calibrated at factory with a 24 VDC loop supply voltage and a 250 ohm load.

¹¹ Zero output factory set to within $\pm 0.16\text{mA}$. Span factory set to within $\pm 0.16\text{ mA}$

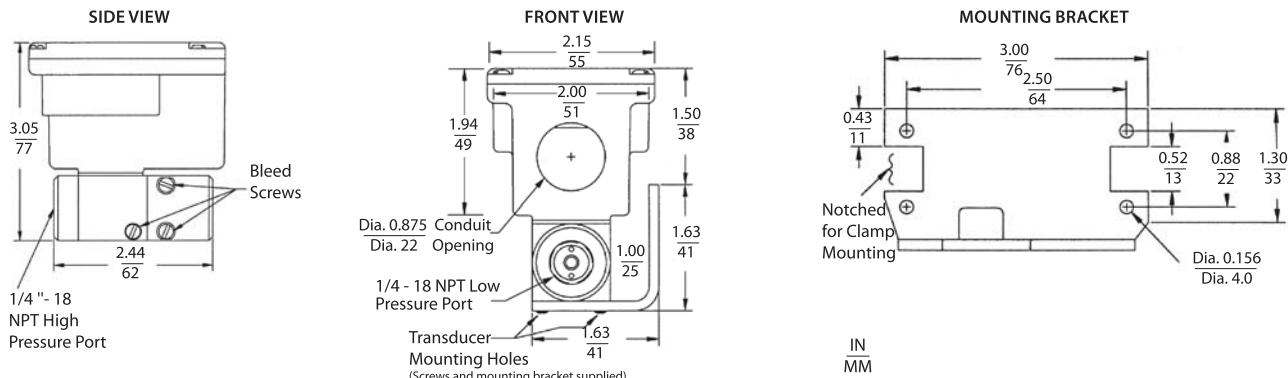
Specifications subject to change without notice.

Model 230

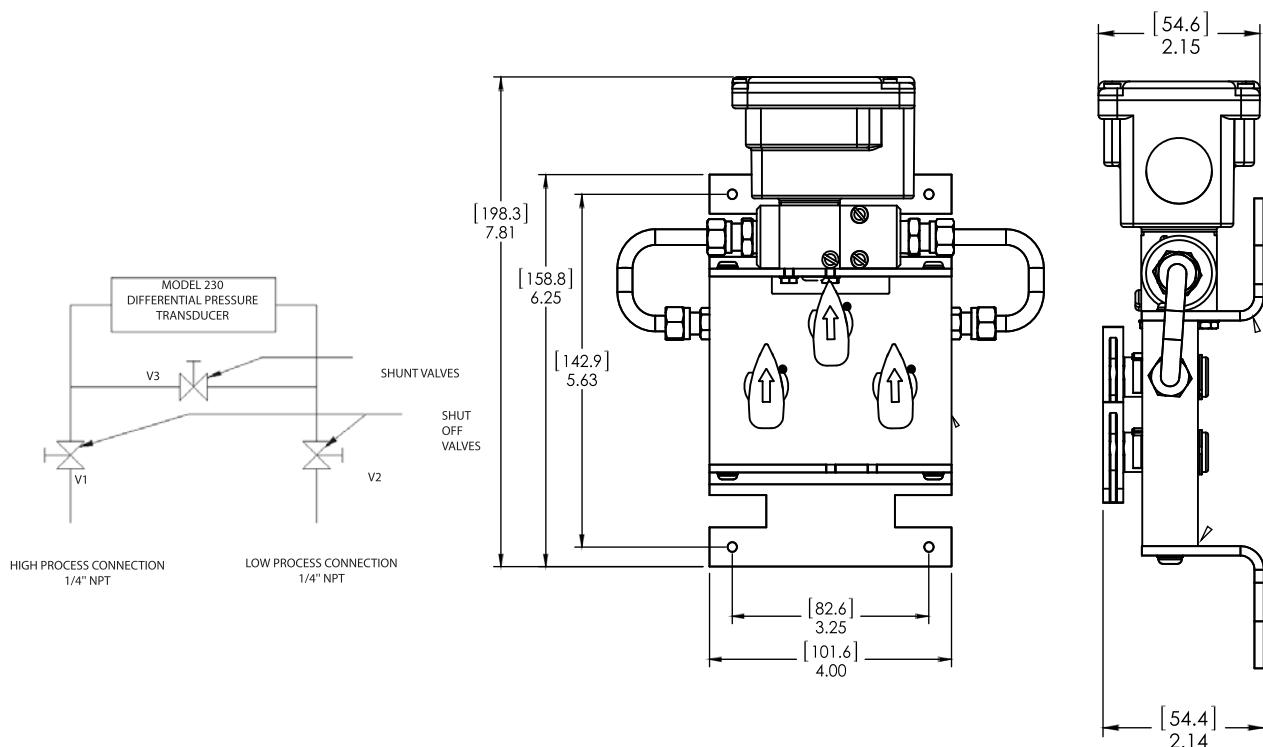
True Wet-to-Wet Differential Pressure Transducer



MODEL 230 DIMENSIONS



DIMENSIONS W/ 3-VALVE MANIFOLD ASSEMBLY



For differential pressure measurements at high line pressure (350 PSIG max), it is recommended that the pressure sensor be installed with a valve in each line, plus a shunt valve across the high and low (reference) pressure ports as shown.

Model 230

True Wet-to-Wet Differential Pressure Transducer



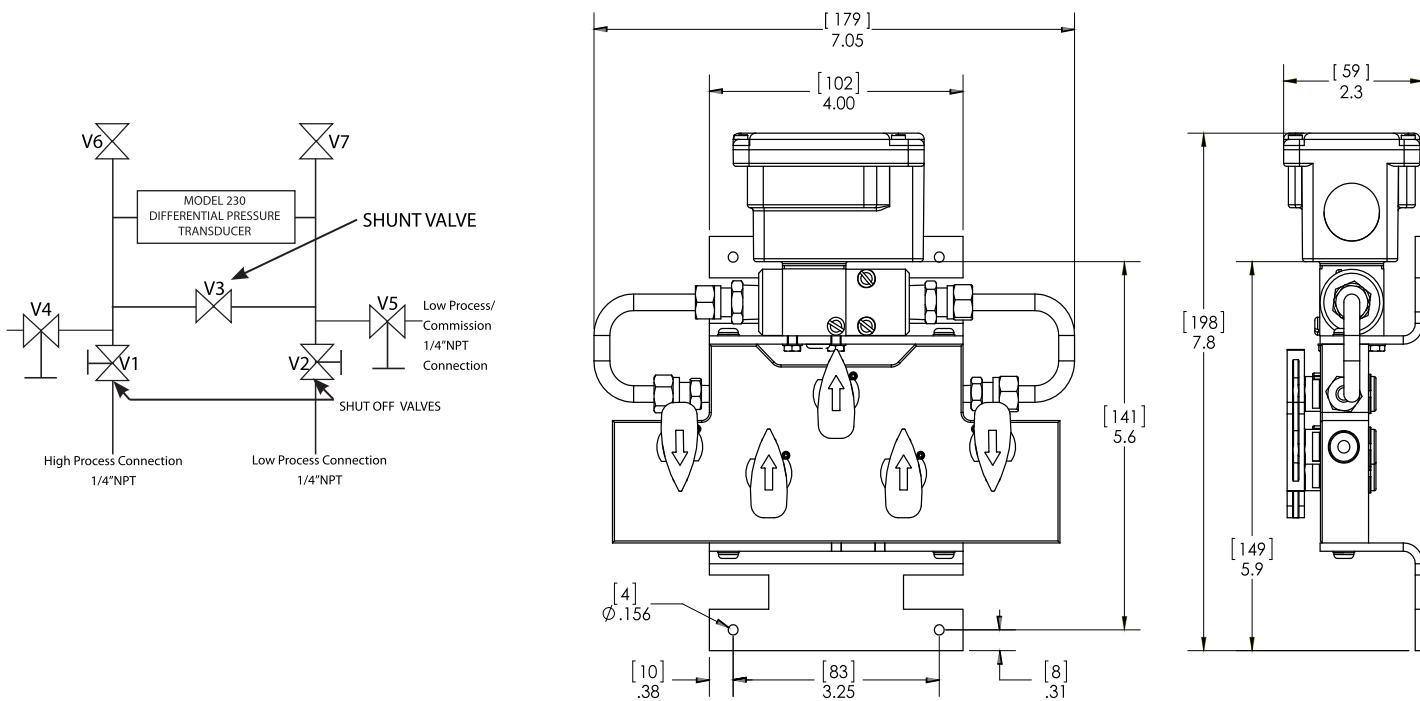
ORDERING INFORMATION

2	3	0	1	-			-			-		-		
Model	Range				Pressure Fitting		Output		Bleed Screw Seals			Optional		
2301 = 230	Unidirectional		Bidirectional		2F	1/4" NPT (F)	11	4-20 mA	Std.	B	Viton	C	Calibration Certificate	
	001PD	0 to 1 PSID	0R5PB	± 0.5 PSID	3V	3-Valve Manifold	2D	0.05-5.05 VDC	Opt.	A	Buna-N			
	002PD	0 to 2 PSID	001PB	± 1 PSID	5V	5-Valve Manifold	2E	0.05-10.05 VDC						
	005PD	0 to 5 PSID	2R5PB	± 2.5 PSID										
	010PD	0 to 10 PSID	005PB	± 5 PSID										
	025PD	0 to 25 PSID	010PB	± 10 PSID										
	030PD	0 to 30 PSID	025PB	± 25 PSID										
	050PD	0 to 50 PSID	050PB	± 50 PSID										
	100PD	0 to 100 PSID												

Please contact factory for versions not shown.

Ordering Example: 2301005PD2F11B = Model 230 0 to 5 PSID unidirectional, 1/4-18 NPT Ext. fitting, 4 to 20 mA Output, and Viton/Silicone Seals.
 2301005PD3V11B = Model 230, 0 to 5 PSID unidirectional, 3-Valve Manifold, 4 to 20 mA, Output, and Viton/Silicone Seals (Assembled w/3- Valve Manifold).

DIMENSIONS W/ 5-VALVE MANIFOLD ASSEMBLY



For differential pressure measurements at high line pressure (350 PSIG max), it is recommended that the pressure sensor be installed with a valve in each line, plus a shunt valve across the high and low (reference) pressure ports as shown.

Note: V6 and V7 bleed valves are not required when used with a Setra Model 230. Use the bleed screws on Model 230 to bleed the lines of air.

LEVEL & LEAK DETECTION

ULTRASONIC LEVEL TRANSMITTER LU2 SERIES ECHOSONIC



DESCRIPTION

The Flowline EchoSonic LU2 Series ultrasonic level transmitter provides non-contact liquid level measurement with a reversible 4-20 mA output. Models are available in three measurement ranges from 9.8 ft to 32.8 ft (3m to 10m), and an accuracy of $\pm 0.2\%$. The LU2 Series is ideal for ultrapure, corrosive, waste, and slurry applications. Transmitters can be quickly configured using WebCal software. The software offers pre-programmed menus, tank set point graphics, and custom wiring diagrams. User can define loop failsafe, start-up condition, output at empty, and specific tank levels.

FLOWLINE
We Do Your Level Best!



LU2 Series

FEATURES

- 9.8', 26.2', 32.8' (3.0, 8.0, or 10m) ranges available
- Simple configuration
- Polycarbonate enclosure designed to be corrosion resistant and submersible
- Minimal deadband optimizes the filling capacity of tanks and sumps
- Adjustable loop failsafe
- 2" (5.1 cm) beam diameter for applications with restricted space

APPLICATIONS

- Cooling tower sumps
- Tanks
- Wells
- Ice storage
- Waste sumps
- Process vessels

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LEVEL & LEAK DETECTION

SPECIFICATIONS

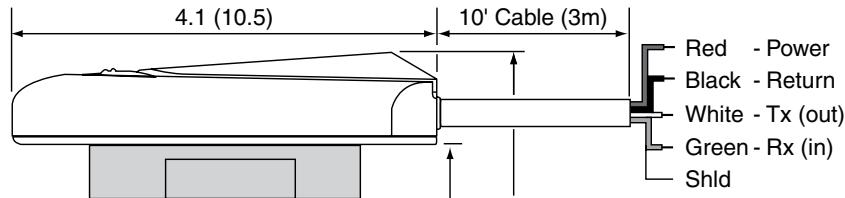
Supply Voltage	24 VDC	LU27	2" (5.1 cm)
Signal Output	4-20 mA two-wire	LU28/29	3" (7.6 cm)
Maximum Output		Fail Safe	Selectable: 4 mA, 20 mA, 21 mA, 22 mA, or hold last signal
Impedance	500 Ω @ 24VDC	Resolution	
Memory	Non-volatile	LU27	0.019" (0.5 mm)
Deadband		LU28/29	0.079" (2.0 mm)
LU23	8" (20 cm) from sensor	Operating Temperature	-31° to 140°F (-35° to 60°C)
LU27	4" (10 cm) from sensor	Enclosure	Polycarbonate
LU28/29	8" (20 cm) from sensor	Enclosure Rating	NEMA 6P (UL 50 Type 6P)
Accuracy	$\pm 0.2\%$ of span in air	Process Connection	2" NPT
Operating Pressure	30 psig (206.9 kPa)	LU23	1" NPT
Process Temperature	-4° to 140°F (-20° to 60°C)	LU27	2" NPT
Measurement Range		LU28/29	10' (3m) length
LU23	8" to 18.0' (20 cm to 5.5 m)	Dimensions	2.9"H x 4.1"W x 4.1"D (7.4 x 10.5 x 10.5 cm)
LU27	4" to 9.8' (10 cm to 3.0 m)	Approvals	CE, FM, RoHS
LU28	8" to 26.2' (20 cm to 8.0 m)	Warranty	1 year
LU29	8" to 32.8' (20cm to 10 m)		
Beam Width			
LU23	3" (7.6 cm)		



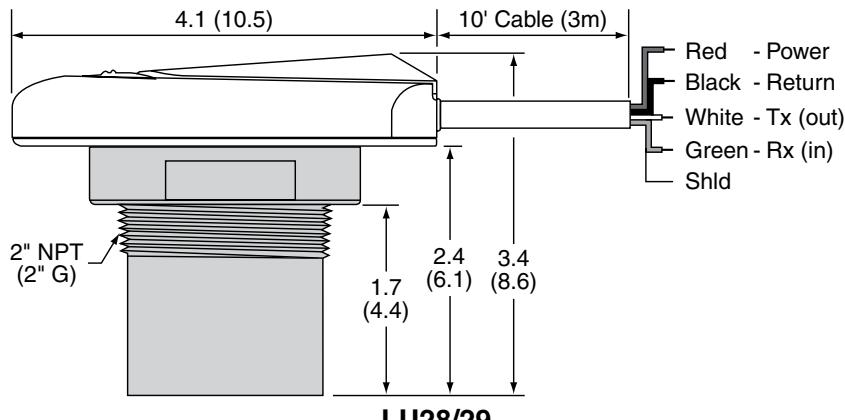
LEVEL & LEAK DETECTION

ULTRASONIC LEVEL TRANSMITTER LU2 SERIES ECHOSONIC

DIMENSIONS



LU27



LU28/29

10

ORDERING INFORMATION

MODEL	DESCRIPTION
LU27-01	Ultrasonic level transmitter with fob, 9.0 ft (3.0m)
LU27-01-B	Ultrasonic level transmitter with fob, 9.0 ft (3.0m) with bracket
LU27-01-B-C	Ultrasonic level transmitter with fob, 9.0 ft (3.0m) with bracket, custom calibration
LU27-01-C	Ultrasonic level transmitter with fob, 9.0 ft (3.0m) custom calibration
LU28-01	Ultrasonic level transmitter with fob, 26.2 ft (8.0m)
LU28-01-B	Ultrasonic level transmitter with fob, 26.2 ft (8.0m) with bracket
LU28-01-B-C	Ultrasonic level transmitter with fob, 26.2 ft (8.0m) with bracket, custom calibration
LU28-01-C	Ultrasonic level transmitter with fob, 26.2 ft (8.0m) custom calibration
LU29-01	Ultrasonic level transmitter with fob, 32.8 ft (10m)
LU29-01-B	Ultrasonic level transmitter with fob, 32.8 ft (10m) with bracket
LU29-01-B-C	Ultrasonic level transmitter with fob, 32.8 ft (10m) with bracket, custom calibration
LU29-01-C	Ultrasonic level transmitter with fob, 32.8 ft (10m) custom calibration

RELATED PRODUCTS

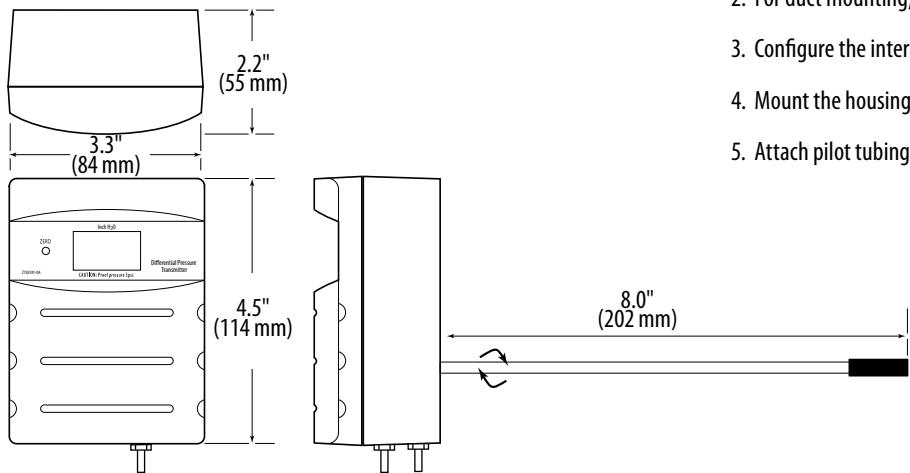
LI99-1001	Fob calibration key
LM50-1001	2" Mounting bracket (included with "B" option)
LM50-1001-1	1" Mounting bracket (included with "B" option)
LM52-1400	2"NPT x 1" NPT (Sch. 40) fitting
LM52-2400	3" NPT x 2" NPT (Sch. 40) fitting
LM52-2800	3" NPT x 2" NPT (Sch. 80) fitting
LM52-3800	4" NPT x 2" NPT (Sch. 80) fitting

PX SERIES**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.

PRODUCT IDENTIFICATION

<i>Enclosure</i>	<i>Local Display</i>	<i>NIST</i>	<i>Range</i>	<i>Response</i>
PX	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
D = Duct	L = LCD Display	N = NIST	01 = 0-1" W.C./0-250Pa	S = Selectable
P = Panel	X = No Display	X = None	02 = 0-10" W.C./0-2,500kPa	F = Selectable
 <i>Local Display</i>	 <i>NIST</i>	 <i>Range</i>	 <i>Response</i>	
PXU	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> 05	<input type="checkbox"/> S
L = LCD Display	N = NIST	= 0-10"/0-2,500kPa	= Selectable	
X = No Display	X = None			

DIMENSIONS**PX SERIES**
Digital Pressure Transducer
*Dry Media**Installer's Specifications*

Media Compatibility	Dry air or inert gas
Input Power	12-30VDC, or 24VAC nominal; 2-wire: 20mA max.; 3-wire: 30mA max.
Output	Field-selectable: 2-wire, loop-powered 4-20mA (DC only, clipped and capped), or 3-wire 0-5V/0-10V*
<i>Pressure Ranges:</i>	
PX: 01	Unidirectional: 0.1/0.25/0.5/1.0" W.C. F.S., switch selectable Bidirectional: ±0.1/±0.25/±0.5/±1.0" W.C. F.S., switch selectable
	Unidirectional: 25 Pa/50 Pa/100 Pa/250 Pa, F.S., switch selectable Bidirectional: ±25 Pa/±50 Pa/±100 Pa/±250 Pa, F.S., switch selectable
PX: 02	Unidirectional: 1.0/2.5/5.0/10" W.C. F.S., switch selectable Bidirectional: ±1.0/±2.5/±5.0/±10" W.C. F.S., switch selectable
	Unidirectional: 0.250 kPa/0.500 kPa/1.000 kPa/2.500 kPa, F.S., switch selectable Bidirectional: ±0.250 kPa/±0.500 kPa/±1.000 kPa/±2.500 kPa, F.S., switch selectable
PXU: 05	Unidirectional: 0.1/0.25/0.5/1.0/2.5/5/10" W.C. F.S., switch selectable Bidirectional: ±0.1/0.25/0.5/1.0/2.5/5/10" W.C. F.S., switch selectable
	Unidirectional: 25Pa/50Pa/100Pa/250Pa/0.5kPa/1kPa/2.5kPa F.S., switch selectable Bidirectional: ±25Pa/50Pa/100Pa/250Pa/0.5kPa/1kPa/2.5kPa F.S., switch selectable
Response Time	Standard: T95 in 20 sec, Fast: T95 in 2 sec, jumper selectable
Mode	Unidirectional or bidirectional, jumper selectable
Display (option)	Signed 3-1/2 digit LCD, indicates pressure, overrange indicator
Proof Pressure	3 psid (20.6kPa)
Burst Pressure	5 psid (34.5kPa)
Accuracy	±1% F.S. of selected range (combined linearity and hysteresis)
Temperature Effect	1" (250Pa) models: 0.05%/°C; 10" (2.5kPa) models: 0.01%/°C (Relative to 25°C) 0° to 50°C (32° to 122°F)
Zero Drift (1-year)	1" (250Pa) models: 2.0% max.; 10" (2.5kPa) models: 0.5% max.
Zero Adjust	Pushbutton auto-zero and digital input (2-pos terminal block)
Operating Environment	0°-60°C (32° to 140°F); 0 to 90% RH non-condensing
Fittings	Brass barb; 0.24" (6.1mm) o.d.
Physical	UL 94 V-0 Fire Retardant ABS

EMC Conformance: EN 61000-6-3:2007 and A1:2011 Class B, EN 61000-6-1:2007

EMC Special Note: Connect this product to a DC distribution network or an AC/DC power adaptor with proper surge protection (EN 61000-6-1:2007 specification requirements).

* Minimum input voltage for 4-20 mA operation: 250 Ω loop = 13 VDC, 500 Ω loop = 19 VDC

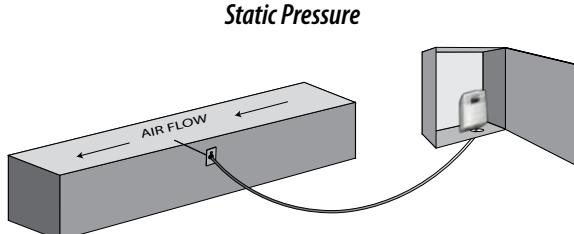
QUICK INSTALL

- Plan the installation. Panel or duct mount?
- For duct mounting, thread the probe into the rear of the device housing.
- Configure the internal tubing for the selected installation method.
- Mount the housing vertically.
- Attach pilot tubing.

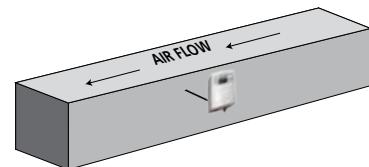
INSTALLATION

1. Plan the installation. Panel or duct mount?

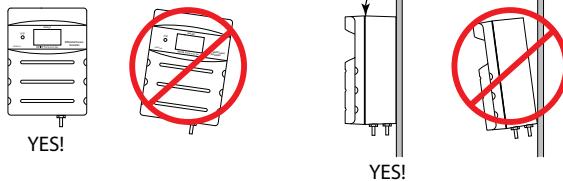
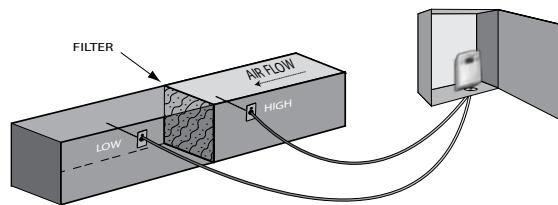
**Panel
Installations**



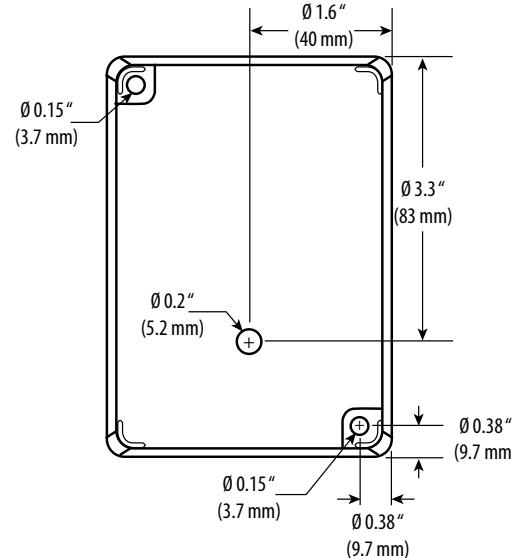
**Duct
Installations**



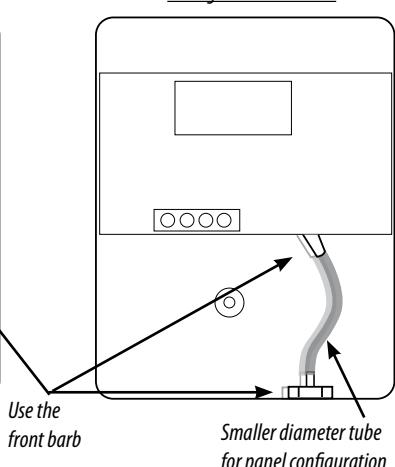
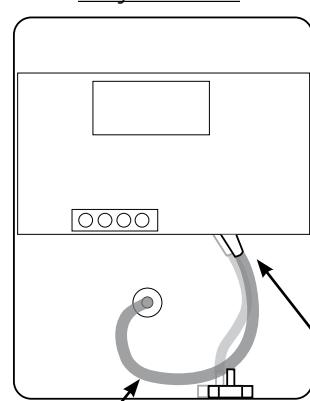
Differential Pressure



4. Mount the transducer (see the screw hole diagram). Position the transducer vertically.

Screw Hole Mounting

5. Determine the length of pilot tubing needed.



Larger diameter tube
for duct configuration

WIRING & CONFIGURATION

Connect the transmitter to the control system and power supply as indicated below.

Optional: Connect the ZERO terminals to the digital output (contact closure) of the control system.

Use the switch to select voltage (V) or current (mA) mode.

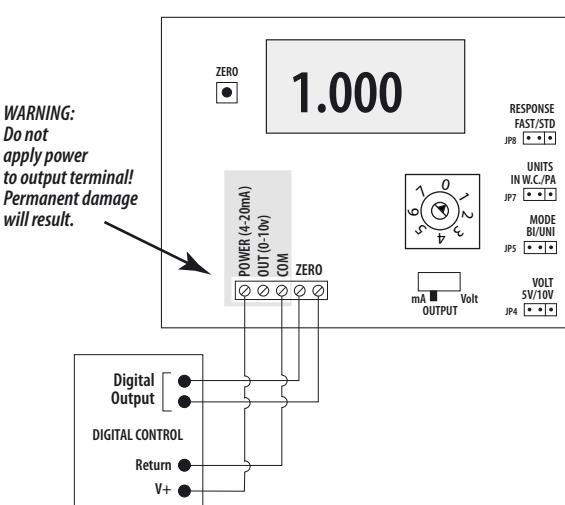
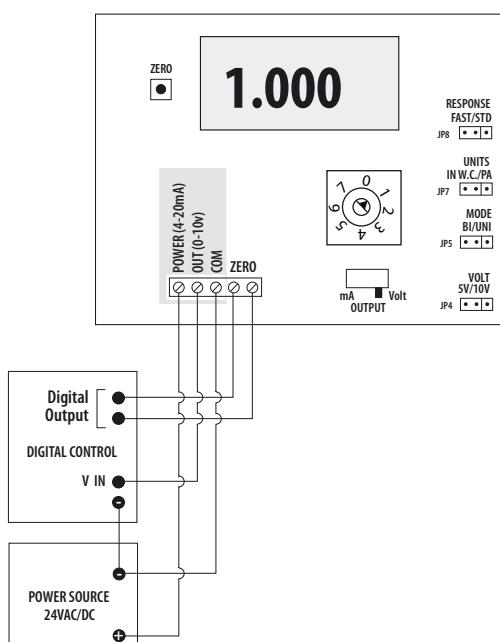
Jumper JP4: select 0-10 V or 0-5 V output span (voltage mode only).

Jumper JP5: select bidirectional or unidirectional mode.

Jumper JP7: select inches W.C. or Pascal scale

Jumper JP8: select fast or standard response time.

Align the arrow (not the slot) on the rotary switch to the desired full-scale range. LCD models momentarily indicate the selected range.

2-wire, 4-20 mA3-wire, 0-5 V/0-10 V**OPERATION**

PX Series devices employ ceramic capacitive sensors and sophisticated temperature compensation circuitry. The sensor achieves its best accuracy after an initial warm-up period. During the first few minutes of operation, readings at zero pressure and the lowest pressure ranges appear erroneous. Following this initial warm-up period, PX Series maintains its specified accuracy and stability.

LCD DISPLAY: The display momentarily indicates range "SET" when selection is made. Pressure is normally indicated on the display. Units are in inches water column (in. W.C.), Pascals (Pa) or kilopascals (kPa) as indicated on the display. The display shows OVER when the pressure is over range.

ZERO: Press and hold the ZERO pushbutton for 2 seconds or provide contact closure on 'AUX ZERO' terminal to automatically reset the output and display to zero pressure. To protect the unit from accidental zero, this feature is enabled only when the detected pressure is within about 0.1 in. W.C. (25 Pa) of factory calibration.

Range Selection Guide

Rotary Switch Position	PX01		PX02		PX05	
	Inches W.C.	Pascal	Inches W.C.	Pascal	Inches W.C.	Pascal
0	0.1	25	1	250	0.1	25
1	0.25	50	1	250	0.25	50
2	0.5	100	1	250	0.5	100
3	1	250	1	250	1	250
4	1	250	2.5	0.5 kPa	2.5	0.5 kPa
5	1	250	5	1 kPa	5	1 kPa
6	1	250	10	2.5 kPa	10	2.5 kPa
7	1	250	10	2.5 kPa	10	2.5 kPa

LF24-SR-S US - Damper Actuator

Modulating, Spring Return, 24 VAC/DC, for 2 to 10 VDC or 4 to 20 mA Control Signal



Technical Data

Power Supply	24 VAC, ±20%, 50/60 Hz, 24 VDC, ±10%
Power Consumption Running	2.5 W
Power Consumption Holding	1 W
Transformer Sizing	5 VA (class 2 power source)
Shaft Diameter	3/8" to 1/2" round, centers on 1/2"
Electrical Connection	(2) 3ft [1m], 18 GA appliance cables with 1/2" conduit connectors
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	2 to 10 VDC (max 0.7 mA) for 95°
Angle of Rotation	Max. 95°,
Torque motor	Min. 35 in-lbs [4 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)
Running Time (Motor)	150 sec
Running Time (Fail-Safe)	<25 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°F to 122°F [-30°C to 50°C]
Storage Temperature Range	-40°F to 176°F [-40°C to 80°C]
Housing	NEMA 2, IP54
Housing Material	zinc coated steel
Agency Listings†	cULus acc. To UL 873 and CAN/CSA C22.2 No. 24-93
Noise Level (Motor)	<30 dB (A)
Noise Level (Fail-Safe)	<62 dB (A)
Servicing	maintenance free
Quality Standard	ISO 9001
Weight	3.1 lb [1.4 kg]
Auxiliary switch	1 x SPDT, 3A resistive (0.5A inductive) @ 250 VAC, adjustable 0° to 95°

†Rated Impulse Voltage 800V, Type of Action 1.AA.B, Control Pollution Degree 3

Torque min. 35 in-lb, for control of air dampers.

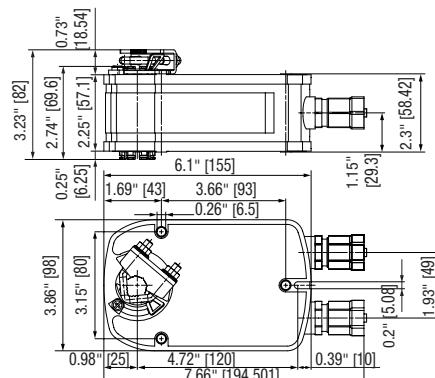
Application

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 from 3/8" up to 1/2" in diameter by means of its universal clamp, 1/2" shaft centered at delivery. For shafts up to 3/4" use K6-1 accessory. 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.

Operation

The LF 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 consistent torque to the damper with, and without, power applied to the actuator. The LF series provides 95° of rotation and is provided with a graduated position indicator showing 0 to 95°. The LF24-SR-S US 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. Power consumption is reduced in holding mode. The LF24-SR-S US version is provided with one built-in auxiliary switch. This SPDT switch is provided for safety interfacing or signaling, for example, for fan start-up. The switching function is adjustable between 0° and 95°. The auxiliary switch in the LF24-SR-S US is double insulated so an electrical ground is not necessary.

Dimensions (Inches[mm])

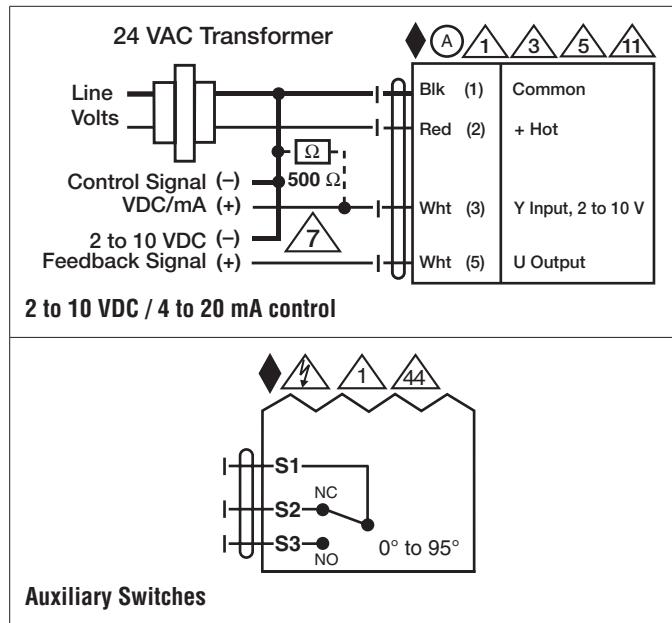


LF24-SR-S US - Damper Actuator

Modulating, Spring Return, 24 VAC/DC, for 2 to 10 VDC or 4 to 20 mA Control Signal

Accessories

AV6-20	6.7" shaft extension for 1/4" to 3/4" diameter shafts.
IND-LF	LF position indicator.
K6 US	Standard LF clamp (3/8" to 1/2").
K6-1	LF clamp (1/2" to 3/4").
KG10A	Ball joint for 3/8" diameter rod, zinc plated.
KG6	Ball joint for 5/16" diameter rod, zinc plated.
KG8	Ball joint for 5/16" diameter rod, 90°, galvanized steel.
KH12	Univ. crankarm, slot 21/64" w, for 3/4" to 1" dia. shafts.
KH6	Univ. crankarm, slot 1/4" w, for 3/8" to 11/16" dia. shafts.
KH8	Univ. crankarm, slot 21/64" w, for 3/8" to 11/16" dia. shafts.
KH-LF	LF crankarm (with 1/2" diameter shaft pass through).
KH-LFV	V-bolt Kit for KH-LF.
LF-P	Anti-rotation bracket LF.
SH10	Push rod for KG10A ball joint (36" L, 3/8" diameter).
SH8	Push rod for KG6 & KG8 ball joints (36" L, 5/16" diameter).
TOOL-06	8 mm and 10 mm wrench.
ZDB-LF	Angle of rotation Limiter for LF.
ZF8-LF	8x8 mm form fit adaptor for LF.
ZG-109	Right angle bracket for ZS-260.
ZG-110	Stand-off bracket for ZS-260.
ZG-112	LF right angle bracket (4-1/2" H x 5-1/2" W x 2-1/2" D).
ZG-DC1	Damper clip for damper blade, 3.5" width.
ZG-DC2	Damper clip for damper blade, 6" width.
ZG-LF112	LF crankarm adaptor kit (includes ZG-112).
ZG-LF2	LF crankarm adaptor kit (T bracket included).
ZG-LMSA-1	Shaft extension for 3/8" diameter shafts (4" L).
ZG-LMSA-1/2-5	Shaft extension for 1/2" diameter shafts (5" L).
ZS-100	Weather shield - galvaneal (13" L x 8" W x 6" D).
ZS-101	Base plate for ZS-100.
ZS-150	Weather shield - PC w/ foam seal (16" L x 8-3/8" W x 4" D).
ZS-260	Explosion proof housing.
ZS-300	NEMA 4X, 304 stainless steel enclosure.
ZS-300-5	NEMA 4X, 316L stainless steel enclosure.
ZS-300-C1	1/2" shaft adaptor, standard wtih ZS-300(-5).
ZS-300-C2	3/4" shaft adaptor for ZS-300(-5).
ZS-300-C3	1" shaft adaptor for ZS-300(-5).
ADS-100	Analog to digital switch for modulating actuators.
IRM-100	Input rescaling module for modulating actuators.
PS-100	Actuator power supply and control simulator.
PTA-250	Pulse width modulation interface for modulating actuators.
SGA24	Positioner control for modualting actuators (surface mount).
SGF24	Positioner control for modulating actuators (flush mount).
ZG-CBLS	Electrical junction box for LF.
ZG-R01	4 to 20 mA adaptor, 500Ω, 1/4 W resistor w 6" pigtail wires.
ZG-R02	50% voltage divider kit (resistors with wires).
ZG-SGF	Mounting plate for SGF.
ZG-X40	120 to 24 VAC, 40 VA transformer.



LF24-SR-S US - Damper Actuator

Modulating, Spring Return, 24 VAC/DC, for 2 to 10 VDC or 4 to 20 mA Control Signal

Typical Specification

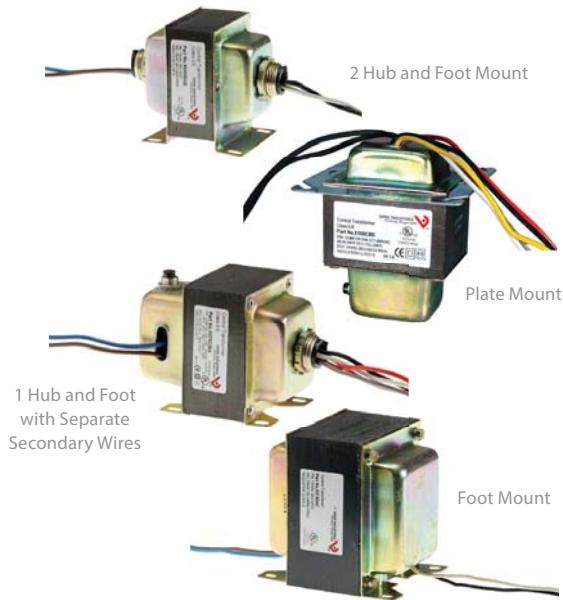
Spring return control damper actuators shall be direct coupled type which require no crank arm and linkage and be capable of direct mounting to a shaft up to a 3/4" diameter and center on a 1/2" shaft (default). Actuator shall deliver a minimum output torque of 35 in-lbs. The actuator must provide modulating 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. 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 feedback signal shall be provided for position feedback. The actuator must be designed so that they may be used for either clockwise or counter clockwise failsafe operation. Actuators shall be cULus listed, 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.
-  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.
-  One built-in auxiliary switch (1x SPDT), for end position indication, interlock control, fan startup, etc.

X SERIES



Veris X Series Control Transformers are a convenient source of control power for HVAC control and building automation applications. A wide variety of UL-listed transformers are available with single and dual threaded hub mounting options. Multiple current limiting options are available, including a circuit breaker in some models. Save ordering time and purchase order costs when buying other Veris sensors by including transformers in your order.

SPECIFICATIONS

Frequency	50/60 Hz
Operating Temperature	-40 to 65 °C (-40 to 149 °F)
No Load Voltage	27 to 28 Vac
Hub Style	Fits 1/2" electrical k.o.
Wire	UL 1015, 18 AWG*
Wire Length	8 inches
WARRANTY	
Limited Warranty	5 years
AGENCY APPROVALS	



*X085AAA, X375DAC have 14 AWG secondary wires.

**The CE mark indicates RoHS2 compliance.

UL Listings

UL Listings for all models simplify panel building requirements

One-stop shopping

Save time by ordering along with other Veris products

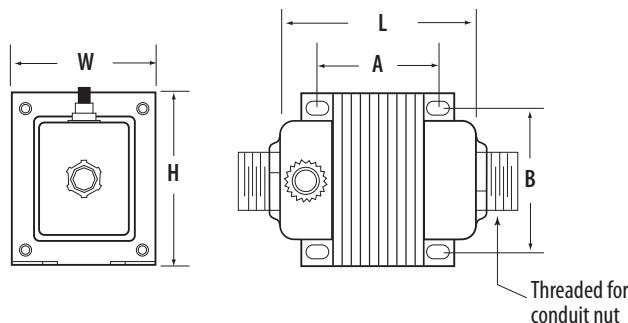
Threaded hub options

Threaded hub options maximize installation flexibility

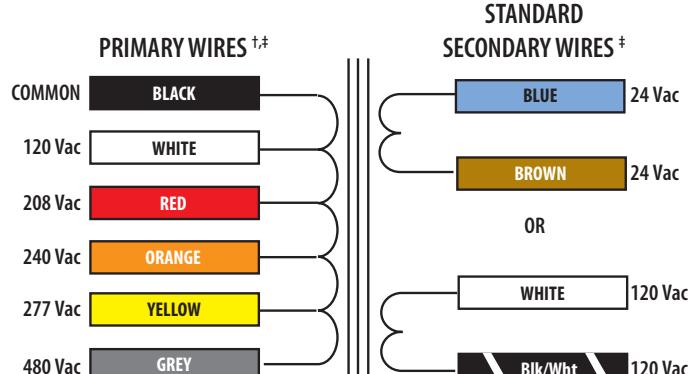
APPLICATIONS

- Controller power
- Driving relays and other digital I/O circuits
- Powering sensors

DIMENSIONAL DRAWING



WIRE COLORS



[†]Primary of 24 V isolation transformers = Red/Red

[‡]Colors refer to the transformer wiring, not the external circuit.

CENTER TAP SECONDARY WIRES [‡]



ORDERING INFORMATION

MODEL	VA	PRIMARY VOLTAGE (VAC)	SECONDARY VOLTAGE (VAC)	CURRENT LIMITING METHOD	CLASS	MOUNTING	SEPARATED PRIMARY & SECONDARY WIRES	UL	CE	L	W	H	A	B
STANDARD														
X020AAA	20	120	24	Inherent	2	1HUB+FT		•	•	2.3	1.9	2.6	1.59	1.69
X020ACA		277		Inherent	2	1HUB+FT		•	•	2.3	1.9	2.6	1.59	1.69
X020ADA		24		Inherent	General	1HUB+FT		•	•	2.3	1.9	2.6	1.59	1.69
X040AAA	40	120	24	Inherent	2	1HUB+FT		•	•	2.7	2.2	2.9	1.98	1.81
X040AAB		120		Inherent	2	2HUB+FT	•	•	•	2.7	2.2	2.9	1.98	1.81
X040ACA		277		Inherent	2	1HUB+FT		•	•	2.7	2.2	2.9	1.98	1.81
X040ADA		24		Inherent	2	1HUB+FT		•	•	2.7	2.2	2.9	1.98	1.81
X040AMB		120/208/240/277		Fuse	2	2HUB+FT	•	•	•	2.7	2.2	2.9	1.98	1.81
X040BNA		120/208/240		Fuse	2	1HUB+FT		•	•	2.7	2.2	2.9	1.98	1.81
X040BPC		24		Fuse	2	Foot	•	•	•	2.7	2.2	2.9	1.98	1.81
X050BAA		120	24	Fuse	2	1HUB+FT		•	•	2.8	2.2	2.9	2.06	1.81
X050BAB		120		Fuse	2	2HUB+FT	•	•	•	2.8	2.2	2.9	2.06	1.81
X050BCA		277		Fuse	2	1HUB+FT		•	•	2.8	2.2	2.9	2.06	1.81
X050BGB		208/240		Fuse	2	2HUB+FT	•	•	•	2.8	2.2	2.9	2.06	1.81
X050CAA		120		Circuit Breaker	2	1HUB+FT		•	•	3.5	2.5	3.1	1.91	2.03
X050CBA		120/240/277/480		Circuit Breaker	2	1HUB+FT		•	•	3.5	2.5	3.1	1.91	2.03
X050CBB		120/240/277/480		Circuit Breaker	2	2HUB+FT	•	•	•	3.5	2.5	3.1	1.91	2.03
X050CCA		277		Circuit Breaker	2	1HUB+FT		•	•	3.5	2.5	3.1	1.91	2.03
X050CEB	50	208/240/277/480	120	Circuit Breaker	General	2HUB+FT	•	•	•	3.5	2.5	3.1	1.91	2.03
X050CEG		208/240/277/480		Circuit Breaker	General	Plate, 90° Sec Elbow	•	•	•	3.5	4.0	4.0	3.38	3.38
X050CHA		120/208/240/480		Circuit Breaker	2	1HUB+FT		•	•	3.5	2.5	3.1	1.91	2.03
X050CHB		120/208/240/480		Circuit Breaker	2	2HUB+FT	•	•	•	3.5	2.5	3.1	1.91	2.03
X050CNA		120/208/240		Circuit Breaker	2	1HUB+FT		•	•	3.5	2.5	3.1	1.91	2.03
X050CNB		120/208/240		Circuit Breaker	2	2HUB+FT	•	•	•	3.5	2.5	3.1	1.91	2.03
X050COA		120/208/240/277/480		Circuit Breaker	2	1HUB+FT		•	•	3.5	2.5	3.1	1.91	2.03
X050COB		120/208/240/277/480		Circuit Breaker	2	2HUB+FT	•	•	•	4.3	2.5	3.1	2.70	2.00
X050DLB		220	24	None	2	2HUB+FT	•	•	•	2.8	2.2	2.9	2.06	1.81
X075CAA	75	120		Circuit Breaker	2	1HUB+FT		•	•	3.9	2.5	3.1	2.31	2.03
X075CAB		120		Circuit Breaker	2	2HUB+FT	•	•	•	3.9	2.5	3.1	2.31	2.03
X075CBA		120/240/277/480		Circuit Breaker	2	1HUB+FT		•	•	3.9	2.5	3.1	2.31	2.03
X075CHA		120/208/240/480		Circuit Breaker	2	1HUB+FT		•	•	3.9	2.5	3.1	2.31	2.03
X085AAA	99	120	120	Inherent	General	1HUB+FT		•	•	3.2	3.8	3.2	2.2	3.14
X100CAA		120		Circuit Breaker	2	1HUB+FT		•	•	4.1	2.5	3.1	2.51	2.03
X100CAB		120		Circuit Breaker	2	2HUB+FT	•	•	•	4.1	2.5	3.1	2.51	2.03
X100CBA		120/240/277/480		Circuit Breaker	2	1HUB+FT		•	•	4.3	2.5	3.1	2.70	2.03
X100CBB		120/240/277/480		Circuit Breaker	2	2HUB+FT	•	•	•	4.3	2.5	3.1	2.70	2.03
X100CBE		120/208/277/480		Circuit Breaker	2	Plate		•	•	4.3	4.0	4.0	3.38	3.38
X100CHB		120/208/240/480		Circuit Breaker	2	2HUB+FT	•	•	•	4.3	2.5	3.1	2.70	2.03
X100CKB		480		Circuit Breaker	General	2HUB+FT	•	•	•	4.1	2.5	3.1	2.51	2.03
X100CLB		220		Circuit Breaker	2	2HUB+FT	•	•	•	4.1	2.5	3.1	2.51	2.03
X150CAA	150	120		Circuit Breaker	General	1HUB+FT	•	•	•	3.5	3.8	3.2	2.08	3.26
X175BAB	175	120	24	Fuse	General	2HUB+FT	•	•	•	4.1	3.8	3.2	3.19	3.14
X175CAB		120		Circuit Breaker	General	2HUB+FT	•	•	•	4.1	3.8	3.2	3.19	3.14
X240DAA	240	120	120	None	General	1HUB+FT	•	•	•	3.7	3.8	4.5	3.24	3.18
X375DAC	375	120		None	General	Foot	•	•	•	4.3	3.8	4.5	3.83	3.18
CENTER TAP														
X020APC	20	24	12/24	Inherent	2	Foot	•	•	•	2.3	1.9	2.6	1.59	1.69
X040BQC	40	120/208/240		Fuse	2	Foot	•	•	•	2.7	2.2	2.9	1.98	1.81
X100CRC	100	120/240		Circuit Breaker	2	1HUB+FT	•	•	•	4.3	2.5	3.1	2.70	2.03

HX08 SERIES & H701

Detect Belt Loss, Coupling Shear, and Mechanical Failure



H908



H708



H608



H808

Maximize Reliability
Minimize Installed Cost

H308

Hx08 Series and H701 adjustable current switches offer high performance, with a wide array of amperage range options. These products can accurately detect belt loss, coupling shear, or other mechanical failure on unit vents, exhaust fans, recirculation pumps, and other fixed loads down to as little as 1/5 HP.

SPECIFICATIONS

Hx08 Series & H701

Sensor Power	Induced from monitored conductor
Insulation Class	600 Vac RMS (UL), 300VAC RMS (CE*)
Frequency Range ²	50/60 Hz, On/Off status for Variable Frequency Drive (VFD) outputs at 12 to 115 Hz
Temperature Range	-15 to 60 °C (5 to 140 °F)
Humidity Range	10 to 90% RH non-condensing
Hysteresis	10% (typical)
Terminal Block Wire Size	H308: 22-16 AWG (0.3 to 1.3 mm ²) Others: 24-14 AWG (0.2 to 2.1 mm ²)
Terminal Block Torque	H308: 3.5 to 7 in-lbs (0.8 N-m) Others: 3.5 to 4.4 in-lbs (0.4 to 0.5 N-m)

WARRANTY

Limited Warranty 5 years

AGENCY APPROVALS

Agency Approvals	UL 508 open device listing; CE: EN61010-1, CAT III, Pollution Degree 2, basic insulation
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800.354.8556

+1 503.598.4564

sales@veris.com

intl@veris.com

www.veris.com

Retrofit or new construction

High performance devices in split- and solid-core housings

Small size

Fits easily inside small enclosures

Adjustable trip point

Precise current trip point setting

Low setpoint

Minimum trip point as low as 0.5 A (H608)...no need for multiple wraps of the conductor through the sensor, even on loads as small as 1/5 HP

Self-gripping iris

Self-gripping iris on split-core housings for easy installation

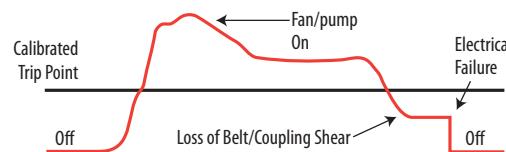
Status LEDs

Status LEDs available for easy setup and local indication

APPLICATIONS

- Detecting belt loss, coupling shear, and mechanical failure
- Verifying lighting circuit and other electrical service run times
- VFD output on/off status

DETECTS BELT LOSS/COUPLING SHEAR!



Now you can easily detect when drive belts slip, break, or pump couplings shear. In fact, a typical HVAC motor that loses its load has a reduction of current draw of up to 50%. That's why our sensors are the industry standard for status.

*The CE mark indicates RoHS2 compliance. Please refer to the CE Declaration of Conformity for additional details.

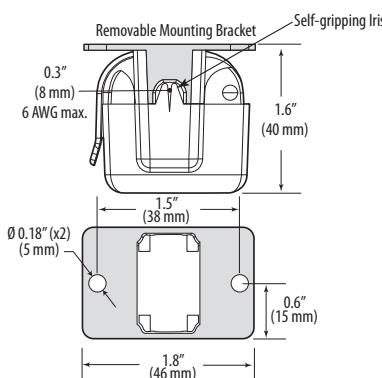
Notes: Do not use the LED status indicators as evidence of applied voltage.

If using this switch in an application that includes an electronically commutated motor (ECM), see Veris Application Note VN61, at www.veris.com.

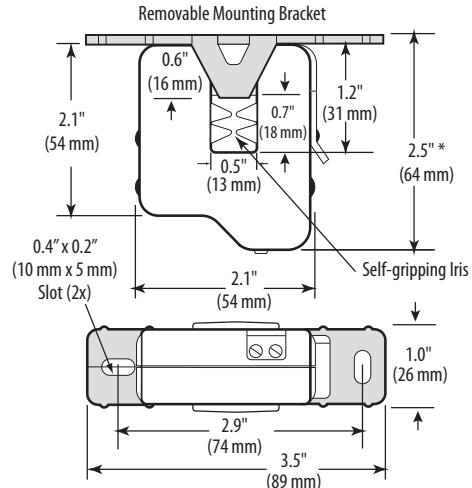
VFD systems generate fields that can disrupt electrical devices. Ensure that these fields are minimized and are not affecting the sensor.

H308

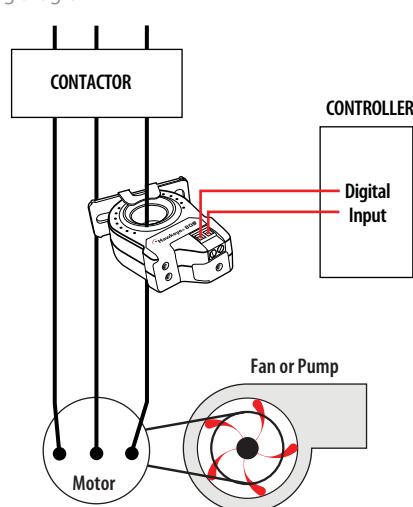
Dimensional Drawing

**H608**

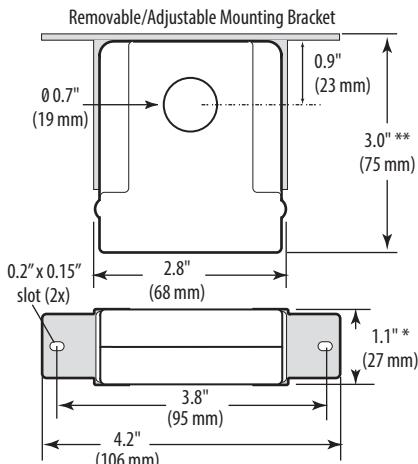
Dimensional Drawing

**MONITORING FAN /PUMP MOTORS FOR POSITIVE PROOF OF FLOW**

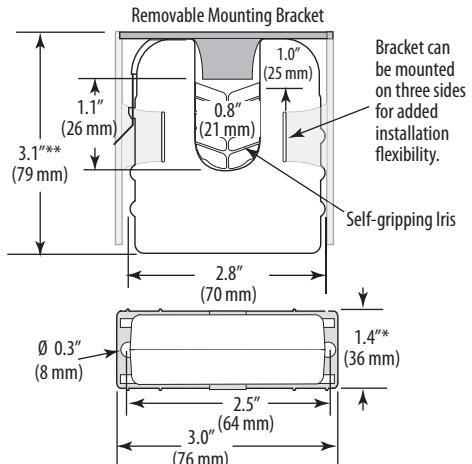
Wiring Diagram

**H708/701**

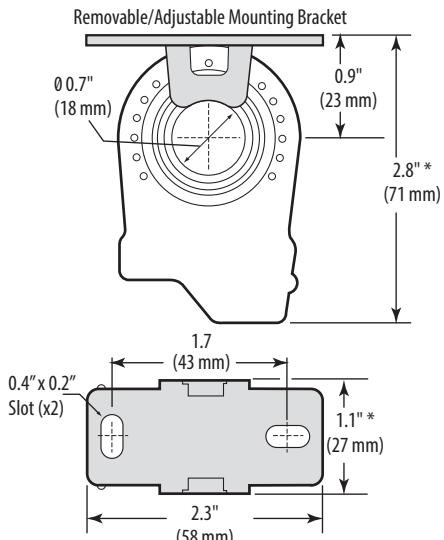
Dimensional Drawing

**H908**

Dimensional Drawing

**H808**

Dimensional Drawing



* Terminal block may extend up to 1/8" over the height dimensions shown.
** Slide switch may extend up to 1/4" over the height dimensions shown.

ORDERING INFORMATION

MODEL	AMPERAGE RANGE @ 50/60 Hz ONLY	STATUS OUTPUT (MAX.)	MIN. TRIP POINT	HOUSING	STATUS LED	UL	CE
H308	0.75 to 50 A	N.O. 1.0 A @ 30 Vac/dc	0.75 A or less	Split-Core	•	• ²	•
H608	0.5 to 175 A		0.5 A or less	Split-Core	•	• ¹	•
H701	1 to 135 A		1.0 A or less	Solid-Core		•	
H708	1 to 135 A		1.0 A or less	Solid-Core	•	•	
H808	0.75 to 50 A		0.75 A or less	Solid-Core	•	•	•
H908	2.5 to 135 A		2.5 A or less	Split-Core	•	•	•

1. Listed for use on 75 °C insulated conductors.

2. Product provides functional insulation only.

Socket SPDT Relays

Socket Relays In A Wide Range Of Coil Voltages

DESCRIPTION

The Veris VMD1B-C Series are SPDT blade-style relays for socket/DIN mounting. The DIN-rail compatible VBD1B-C sockets feature finger-safe terminals in a slim, attractive design.

The Veris VMD1B-F Series are full-featured SPDT blade style relays for socket/DIN mounting. The VMD1B-F Series are equipped with an LED for coil proof, a flag for contact proof, an override lever, and a push-to-test button for momentary contact control. The VMD1B-F allows for instant and conclusive troubleshooting. Never wonder if the relay, control system, or wiring is the cause of a problem. The DIN-rail-compatible VBD1B-F sockets feature a slim design with finger-safe terminals and a removable hold-down clip. Never struggle with wire clips again.



FEATURES

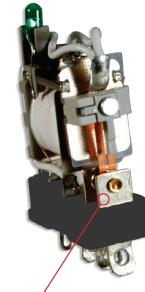
Full featured model:

- 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 relay 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

Low current 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

VMD1B-S with bifurcated contacts - perfect for low current applications!



3mA - 3 Amps

Dual (bifurcated) contacts for optimum wiping & contact performance.

SPECIFICATIONS



Operating Temperature Range

-40° to 55°C (-40° to 131°F)

Operating Range

85% to 110% of rated voltage

Drop-out Voltage Threshold

15% of rated voltage

Expected Relay Life

Electrical (@ rated current) 100,000 cycles; Mechanical (unpowered) 10,000,000 cycles

Operating Time

20 msec typical

Dielectric Strength

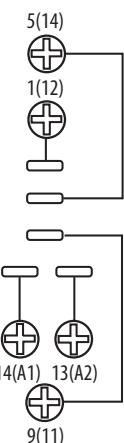
1500VAC RMS

APPLICATION/WIRING EXAMPLE

VBD1B Sockets

Function	NEMA (IEC)* Terminal
Coil (+)**	14 (A1)
Coil (-)**	13 (A2)
COMM	9 (11)
N.O.	5 (14)
N.C.	1 (12)

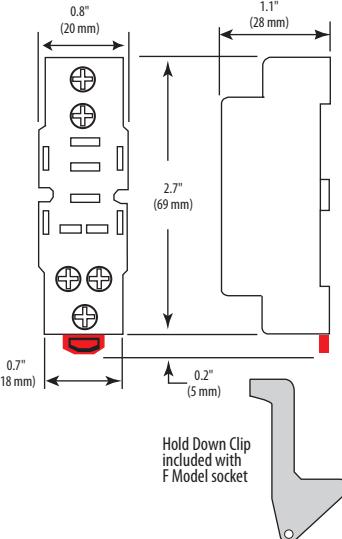
TOP VIEW



** NOTE: Observe polarity for relays with DC coil voltages only

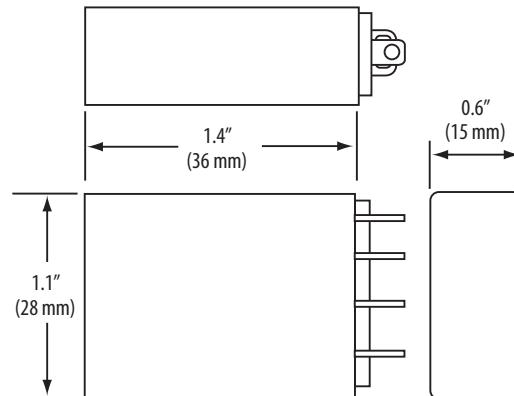
DIMENSIONAL DRAWINGS

VMD1B Sockets



Hold Down Clip included with F Model socket

VMD1B Relays



ORDERING INFORMATION



MODEL	RELAY TYPE	AMPERAGE RATING	COIL VOLTAGE	MIN. SWITCHING CURRENT	FULL FEATURED	UL	CE
VMD1B-C12D	SPDT	15A	12VDC	100mA@5VDC		●	●
VMD1B-C24D		15A	24VDC	100mA@5VDC		●	●
VMD1B-C24A		15A	24VAC	100mA@5VDC		●	●
VMD1B-C120A		15A	120VAC	100mA@5VDC		●	●
VMD1B-F12D		15A	12VDC	100mA@5VDC	●	●	●
VMD1B-F24D		15A	24VDC	100mA@5VDC	●	●	●
VMD1B-F24A		15A	24VAC	100mA@5VDC	●	●	●
VMD1B-F120A		15A	120VAC	100mA@5VDC	●	●	●
VMD1B-F240A		15A	240VAC	100mA@5VDC	●	●	●
VMD1B-24SVAC		3A	24VAC	3mA@17VDC	●	●	●
VMD1B-120SVAC		3A	120VAC	3mA@17VDC	●	●	●

These relays are UL Listed when used with the Veris sockets.

SOCKET ORDERING INFORMATION

MODEL	AMPERAGE RATING	VOLTAGE RATING	FINGER SAFE	HOLD DOWN CLIP	UL	CE
VBD1B-C	15A	300V	●		●	●
VBD1B-F			●	●	●	●

When relays and sockets are used together, amperage rating is the lesser of the two ratings.

ACCESSORIES

DIN Rail, DIN Stop Clip (AV01, AV02)



ENCLOSURES

NEMA 1 HINGE COVER BOXES HC SERIES



DESCRIPTION

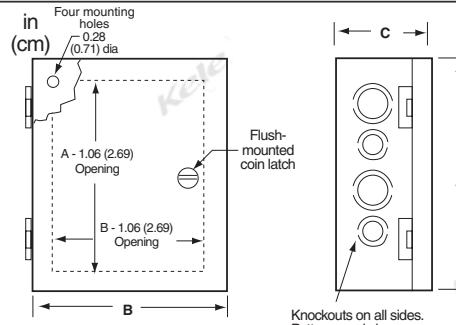
The **HC Series** NEMA 1 hinge cover boxes serve as surface-mounted junction boxes or switch boxes. With the addition of a field-installed perforated subpanel, they can also house controls and instruments in areas that do not require oil-tight and dust-tight ratings.

FEATURES

- 16-gauge steel construction meets **NEMA 1**
- Removable doors with butt hinges
- Door hinge on left or right side
- Mounting holes on back of enclosure
- Easy operation of flush latch with a screwdriver or coin
- Various sizes of easily removable knockouts on all sides
- ANSI 61 gray polyester-powder finish inside and out over phosphatized surfaces
- Available with optional perf panel
- UL listed, File #E27525
- CSA certified, File #LL42184
- One-year warranty



DIMENSIONS



5

ENCLOSURES

ORDERING INFORMATION

ENCLOSURE MODEL†	DIMENSIONS A x B x C in (cm)	WEIGHT lb (kg)	OPTIONAL PERF PANEL DIMENSION SIZE H x W in (cm)
HC664	6 x 6 x 4 (15 x 15 x 10)	3.2 (1.5)	4.25 x 4.25 (11 x 11)
HC666	6 x 6 x 6 (15 x 15 x 15)	4.0 (1.8)	4.25 x 4.25 (11 x 11)
HC886	8 x 8 x 6 (20 x 20 x 15)	6.0 (2.7)	6.25 x 6.25 (16 x 16)
HC1084	10 x 8 x 4 (25 x 20 x 10)	7.0 (3.2)	8.25 x 6.25 (21 x 16)
HC1284	12 x 8 x 4 (30 x 20 x 10)	8.0 (3.6)	10.25 x 6.25 (26 x 16)
HC12104	12 x 10 x 4 (30 x 25 x 10)	8.0 (3.6)	10.25 x 8.25 (26 x 21)
HC12124	12 x 12 x 4 (30 x 30 x 10)	8.8 (4.0)	10.25 x 10.25 (26 x 26)
HC12126	12 x 12 x 6 (30 x 30 x 15)	10.3 (4.7)	10.25 x 10.25 (26 x 26)
HC16124	16 x 12 x 4 (41 x 30 x 10)	12.0 (5.5)	14.25 x 10.625 (36 x 26)
HC16126	16 x 12 x 6 (41 x 30 x 15)	13.0 (5.9)	14.25 x 10.25 (36 x 26)
HC18124	18 x 12 x 4 (46 x 30 x 10)	12.0 (5.4)	16.25 x 10.25 (41 x 26)
HC18126	18 x 12 x 6 (46 x 30 x 15)	14.0 (6.4)	16.25 x 10.25 (41 x 26)

† Add P to the end of part number to order optional perf panel. (Standoffs are field installed, drilling required.)

See Hoffman Enclosure Accessory page in the Enclosure section for locks, latches, heaters, fans, and ventilation kits. Additional box sizes available.

HINGE-COVER, MEDIUM, TYPE 3R



APPLICATION

These enclosures have a size range of 16 x 12 x 6-in. to 48 x 36 x 16-in. and meet basic functionality requirements for applications that require protection from rain, sleet, snow or dripping water.

FEATURES

- Drip shield top and seam-free sides, front, and back protect from rain, snow, or sleet
- 16 gauge plated steel continuous hinge has stainless steel pin
- Cover fastened securely with captive plated steel screws
- Collar studs provided for mounting optional panels
- Hasp and staple provided for padlocking
- No gasketing or knockouts

SPECIFICATIONS

- 16 or 14 gauge galvanized steel

FINISH

ANSI 61 gray polyester powder paint finish inside and out over galvanized steel. Optional solid panels are white.

ACCESSORIES

See also Accessories.
 Industrial Corrosion Inhibitors
 Electric Heater
 Grounding Device
 Panels for Type 3R, 4, 4X, 12 and 13 Enclosures
 Rack Mounting Angles - U Style (Type RA)
 Touch-Up Paint
 Steel and Stainless Steel Window Kits

BULLETIN: A3M

INDUSTRY STANDARDS

UL 50, 50E Listed; Type 3R; File No. E27567
 cUL Listed per CSA C22.2 No 94; Type 3R File No. E27567

NEMA/EEMAC Type 3R
 IEC 60529, IP32

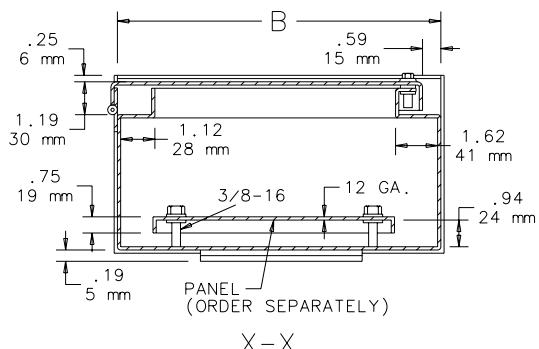
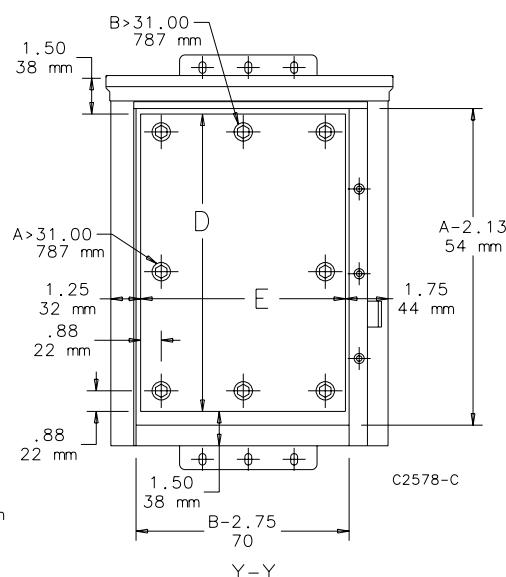
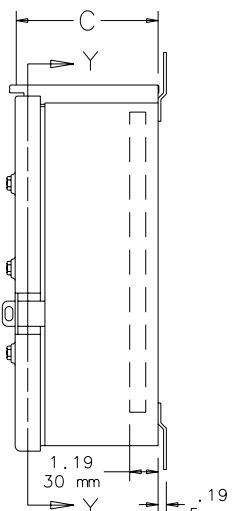
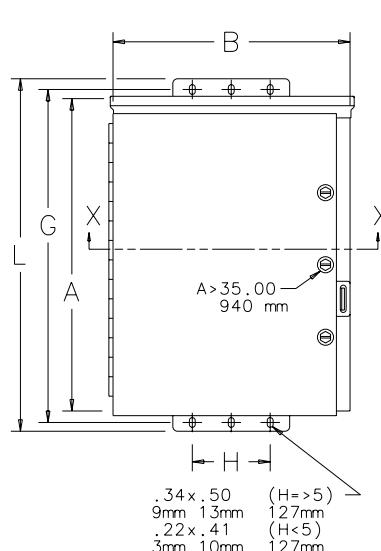
Standard Product

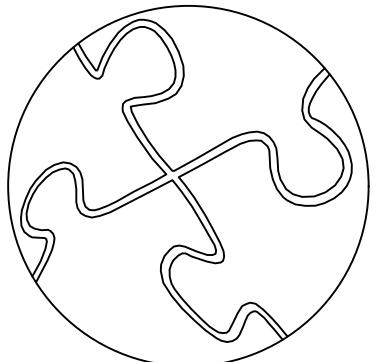
Catalog Number	AxBxC in.	AxBxC mm	Panel	Perforated Panel	Panel Size D x E (in.)	Panel Size D x E (mm)	Mounting G x H (in.)	Mounting G x H (mm)	Overall L (in.)	Overall L (mm)
A16R126HCR	16.00 x 12.00 x 6.00	406 x 305 x 152	A16P12	A16P12PP	13.00 x 9.00	330 x 229	17.00 x 3.00	432 x 76	18.00	457
A16R166HCR	16.00 x 16.00 x 6.00	406 x 406 x 152	A16P16	A16P16PP	13.00 x 13.00	330 x 330	17.00 x 13.00	432 x 330	18.00	457
A18R186HCR	18.00 x 18.00 x 6.00	457 x 457 x 152	A18P18	A18P18PP	15.00 x 15.00	381 x 381	19.00 x 13.00	483 x 330	20.00	508
A20R166HCR	20.00 x 16.00 x 6.00	508 x 406 x 152	A20P16	A20P16PP	17.00 x 13.00	432 x 330	21.00 x 13.00	533 x 330	22.00	559
A20R208HCR	20.00 x 20.00 x 8.00	508 x 508 x 203	A20P20	A20P20PP	17.00 x 17.00	432 x 432	21.00 x 13.00	533 x 330	22.00	559
A24R208HCR	24.00 x 20.00 x 8.00	610 x 508 x 203	A24P20	A24P20PP	21.00 x 17.00	533 x 432	25.00 x 13.00	635 x 330	26.00	660
A24R248HCR	24.00 x 24.00 x 8.00	610 x 610 x 203	A24P24	A24P24PP	21.00 x 21.00	533 x 533	25.00 x 13.00	635 x 330	26.00	660
A30R248HCR	30.00 x 24.00 x 8.00	762 x 610 x 203	A30P24	A30P24PP	27.00 x 21.00	686 x 533	31.00 x 13.00	787 x 330	32.00	813
A18R1810HCR	18.00 x 18.00 x 10.00	457 x 457 x 254	A18P18	A18P18PP	15.00 x 15.00	381 x 381	19.00 x 13.00	483 x 330	20.00	508
A30R308HCR	30.00 x 30.00 x 8.00	762 x 762 x 203	A30P30	A30P30PP	27.00 x 27.00	686 x 686	31.00 x 27.00	787 x 686	32.00	813
A24R2410HCR	24.00 x 24.00 x 10.00	610 x 610 x 254	A24P24	A24P24PP	21.00 x 21.00	533 x 533	25.00 x 13.00	635 x 330	26.00	660
A30R2410HCR	30.00 x 24.00 x 10.00	762 x 610 x 254	A30P24	A30P24PP	27.00 x 21.00	686 x 533	31.00 x 13.00	787 x 330	32.00	813
A36R3610HCR	36.00 x 36.00 x 10.00	914 x 914 x 254	A36P36	A36P36PP	33.00 x 33.00	838 x 838	37.00 x 30.00	940 x 762	38.00	965
A30R3012HCR	30.00 x 30.00 x 12.00	762 x 762 x 305	A30P30	A30P30PP	27.00 x 27.00	686 x 686	31.00 x 27.00	787 x 686	32.00	813
A36R2412HCR	36.00 x 24.00 x 12.00	914 x 610 x 305	A36P24	A36P24PP	33.00 x 21.00	838 x 533	37.00 x 13.00	940 x 330	38.00	965
A36R3012HCR	36.00 x 30.00 x 12.00	914 x 762 x 305	A36P30	A36P30PP	33.00 x 27.00	838 x 686	37.00 x 27.00	940 x 686	38.00	965
A42R3012HCR	42.00 x 30.00 x 12.00	1067 x 762 x 305	A42P30	—	39.00 x 27.00	991 x 686	43.00 x 27.00	1092 x 686	44.00	1118
A36R3612HCR	36.00 x 36.00 x 12.00	914 x 914 x 305	A36P36	A36P36PP	33.00 x 33.00	838 x 838	37.00 x 27.00	940 x 686	38.00	965
A42R3612HCR	42.00 x 36.00 x 12.00	1067 x 914 x 305	A42P36	—	39.00 x 33.00	991 x 838	43.00 x 27.00	1092 x 686	44.00	1118
A48R3612HCR	48.00 x 36.00 x 12.00	1219 x 914 x 305	A48P36	—	45.00 x 33.00	1143 x 838	49.00 x 27.00	1245 x 686	50.00	1270
A60R3612HCR	60.00 x 36.00 x 12.00	1524 x 914 x 305	A60P36	—	57.00 x 33.00	1448 x 838	61.00 x 27.00	1549 x 686	62.00	1575
A30R3016HCR	30.00 x 30.00 x 16.00	762 x 762 x 406	A30P30	A30P30PP	27.00 x 27.00	686 x 686	31.00 x 27.00	787 x 686	32.00	813
A48R3616HCR	48.00 x 36.00 x 16.00	1219 x 914 x 406	A48P36	—	45.00 x 33.00	1143 X 838	49.00 X 27.00	1245 X 686	50.00	1270

Purchase panels separately. Optional aluminum panels are available for most sizes.

Purchase perforated panels separately.

Flanged on all four sides.





ROTH

S Q U T H E A S T

Automation • Energy Management • Lighting

OPERATIONAL STANDARDS:

1. CONDUIT FILL - CONDUIT FILL IS DONE ON A POINT SYSTEM. $\frac{1}{2}$ " CONDUIT IS RATED AT 12 POINTS AND $\frac{3}{4}$ " IS RATED AT 22. EACH CONDUCTOR 18 GAUGE OR SMALLER IS TO BE COUNTED AS A POINT. CAT5 CABLE IS COUNTED AS 4 POINTS. THE TOTAL NUMBER OF POINTS / CONDUCTORS SHALL NOT EXCEED THE MAXIMUM RATING OF THE CONDUIT.
 2. LOW VOLTAGE STRAPPING - WHEN A LOW VOLTAGE CABLE IS INSTALLED NOT IN A CONDUIT OR FREE WIRED, THEY SHOULD BE SUPPORTED EVERY 6'.
 3. ALL JUNCTION BOXES NEED TO BE ACCESSIBLE. ACCESSIBLE - CAPABLE OF BEING REMOVED OR EXPOSED WITHOUT DAMAGING THE BUILDING STRUCTURE OR FINISH OR NOT PERMANENTLY CLOSE IN THE STRUCTURE OR FINISH OF THE BUILDING. MUST ALSO HAVE 2' OF CLEARANCE IN FRONT OF THE BOX.
 4. GUTTERS - GUTTERS SHOULD BE INSTALLED WHERE MORE THAN 4 CONDUITS ENTER THE SAME SIDE ON THE ENCLOSURE. GUTTERS WILL BE INSTALLED WITH 2" CONDUIT NIPPLES BETWEEN GUTTER AND ENCLOSURE.
 5. ENCLOSURES - CONDUIT SHOULD ENTER IN THE TOP AND BOTTOM OF THE ENCLOSURE. ALL 120V POWER SHOULD ENTER IN THE BOTTOM RIGHT CORNER.
 6. LABELING - ALL WIRES ARE TO BE LABELED WITHIN 12" OF TERMINATION POINT WITH THE CORRECT ACRONYM.

WIRING COLOR STANDARDS:

ANALOG OUTPUTS WIRE COLOR - TAN	 TAN	3 WIRE ANALOG INPUT	N2 WIRE COLOR - BLUE
DIGITAL OUTPUTS WIRE COLOR - PURPLE	 PURPLE	2 WIRE DIGITAL OUTPUT	BACNET - GREEN
ANALOG INPUTS WIRE COLOR - YELLOW	 YEL	3 WIRE ANALOG OUTPUT	LON - PINK
DIGITAL INPUTS WIRE COLOR - ORANGE	 ORG	2 WIRE DIGITAL INPUT	MODBUS - GREY

WHITE CABLE CAN BE USED IF CORRECT COLOR IS NOT AVAILABLE. THE WHITE CABLE NEEDS TO BE MARKED WITH CORRECT COLOR TAPE WITHIN 12" OF TERMINATION. ALL MULTI-CONDUCTORS MUST ALSO BE MARKED WITH COLORED TAPE FOR EACH INPUT OR OUTPUT THEY HAVE.

CONTACTS:

NEIL CAPORALE
ROTH SOUTHEAST
OPERATIONS MANAGER

PHONE:
954-423-6640 EXT 228

DALE CHUNG
ROTH SOUTHEAST
PROJECT ENGINEER

PHONE:
954-423-6640 EXT 434

PROJECT SCOPE:

1. BUILDING 6
 - 1.1. 2 AHU - AHU-6-5 (NEW- DX UNIT), AHU-6-6 (NEW- CHW)
 - 1.2. 6 VAV (NEW) - VAV-6-1A, 6-1B, 6-1C, 6-2, 6-3, 6-4
 2. BUILDING 9
 - 2.1. 1 AHU - AHU-9-6 (NEW - CHW)
 - 2.2. 2 VAV - VAV-9-1-1, 9-1-2
 3. BUILDING 10
 - 3.1. 1 CHILLER (EXISTING, NEW CONTROLS)
 - 3.2. 2 CHW PUMPS (NEW)
 4. BUILDING 11
 - 4.1. 2 AHU - AHU-11-3, 11-4 (NEW-CHW)
 5. BUILDING 17
 - 5.1. 2 CHILLERS (EXISTING, NEW CONTROLS)
 - 5.2. 5 PUMPS (NEW)

PROJECT TITLE:

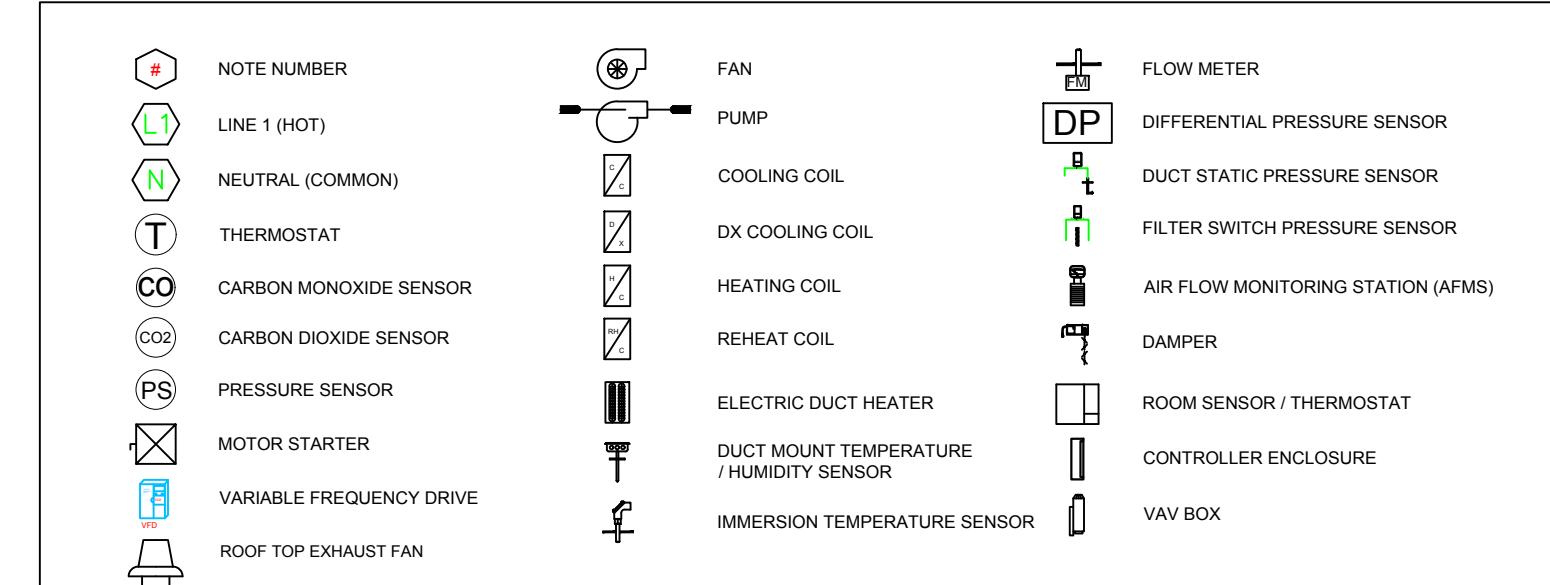
**NORCREST
ELEMENTARY SCHOOL
3951 NE 16TH AVE
POMPANO BEACH, FL 33064**

DRAWING INDEX			
NUMBER	TITLE	NUMBER	TITLE
0	TITLE PAGE	14	TPY DX AHU SOP & PARTS
1	DRAWING LEGENDS & SCHEDULES	15	TYP F&B AHU AHU DIAGRAM
2	RISER DIAGRAM	16	TYP F&B AHU WIRING DIAGRAM
3	BUILDING 6 FLOORPLAN	17	TYP F&B AHU SOP & PARTS
4	BUILDING 9 FLOORPLAN	18	TYP SCR 1 STAGE HEAT VAV DIAGRAM
5	BUILDING 10 FLOORPLAN	19	TYP SCR 2 STAGE HEAT VAV DIAGRAM
6	BUILDING 11 FLOORPLAN	20	BLDG 10 CHILLER DIAGRAM
7	BUILDING 16 FLOORPLAN	21	BLDG 10 CHILLER WIRING DIAGRAM
8	BUILDING 17 FLOORPLAN	22	BLDG 10 CHILLER SOP & PARTS
9	TYP VAV AHU AHU DIAGRAM	23	BLDG 17 CHILLER WIRING DIAGRAM
10	TYP VAV AHU WIRING DIAGRAM	24	BLDG 17 CHILLER SOP & PARTS
11	TYP VAV AHU SOP & PARTS	25	BLDG 17 CHILLER SOP & PARTS
12	TPY DX AHU AHU DIAGRAM	26	DEVICE TERMINATION
13	TPY DX AHU WIRING DIAGRAM		

ACRONYM LEGEND:

ACRONYM	MEANING	ACRONYM	MEANING
AC	AIR CONDITIONER	EPF	ELEVATOR PRESSURIZATION FAN
AFMS	AIR FLOW MEASURING STATION	ERU	ENERGY RECOVERY UNIT
AHU	AIR HANDLING UNIT	FA	FIRE ALARM
AI	ANALOG INPUT	FPB	FAN POWERED BOX
AO	ANALOG OUTPUT	FCU	FAN COIL UNIT
BMS	BUILDING MANAGEMENT SYSTEM	FD	FIRE DAMPER
BTU	BRITISH THERMAL UNIT	FM	FLOW METER
CFM	CUBIC FEET PER MINUTE	FSD	FIRE / SMOKE DAMPER
CH	CHILLER	GEF	GARAGE EXHAUST FAN
CHWP	CHILL WATER PUMP	GPM	LOADING DOCK EXHAUST FAN
CHWV	CHILL WATER VALVE	GSF	GARAGE SUPPLY FAN
CPF	CHILLER PLANT EXHAUST FAN	HP	HEAT PUMP
CV	CONSTANT VOLUME	HX	HEAT EXCHANGE
CS	CURRENT SWITCH	LEF	LOADING DOCK EXHAUST FAN
CT	COOLING TOWER	NTS	NOT TO SCALE
CWP	CONDENSER WATER PUMP	OA	OUTSIDE AIR
DDC	DIRECT DIGITAL CONTROLS	PSI	POUNDS PER SQUARE INCH
DI	DIGITAL INPUT	RA	RETURN AIR
DO	DIGITAL OUTPUT	RF	RETURN FAN
DP	DIFFERENTIAL PRESSURE	RTU	ROOF TOP UNIT
DPS	DIFFERENTIAL PRESSURE SWITCH	SA	SUPPLY AIR
DPT	DIFFERENTIAL PRESSURE TRANSDUCER	SCWP	SECONDARY CONDENSER WATER PUMP
EA	EXHAUST AIR	SF	SUPPLY FAN
EEP	EAST EJECTOR PUMP	SP	STATIC PRESSURE
EESC	EAST ESCALATOR PUMP	SPF	STAIRWELL PRESSURIZATION FAN
EESP	EAST ELEVATOR SUMP PUMP	TF	TRANSFER FAN
EFSP	EAST FIRE SUMP PUMP	TXF	TOILET EXHAUST FAN
EF	EXHAUST FAN	VAV	VARIABLE AIR VOLUME
EMS	ENERGY MANAGEMENT SYSTEM	VFD	VARIABLE FREQUENCY DRIVE

SYMBOL LEGEND:

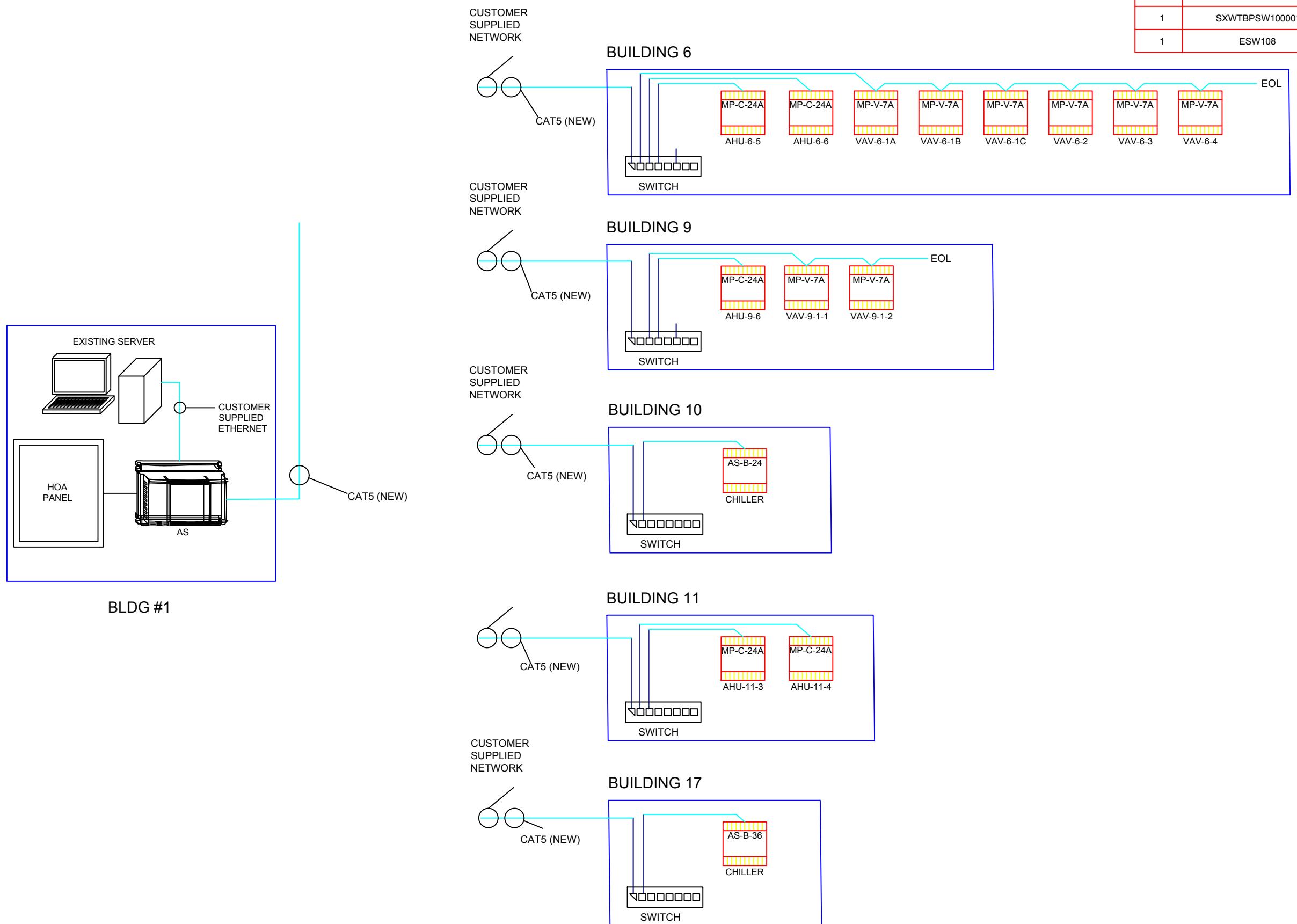


AFMS SCHEDULE					
UNIT	CFM	DUCT SIZE		VELOCITY	MODEL
		H"	W"		
AHU-6-5	350				
AHU-6-6	1050	20	12	630	GTC-116-P
AHU-9-6	840	16	10	756	GTC-116-P
AHU-11-3	700	22	14	327	GTC-116-P
AHU-11-4	775	16	12	581	EF-2000-T

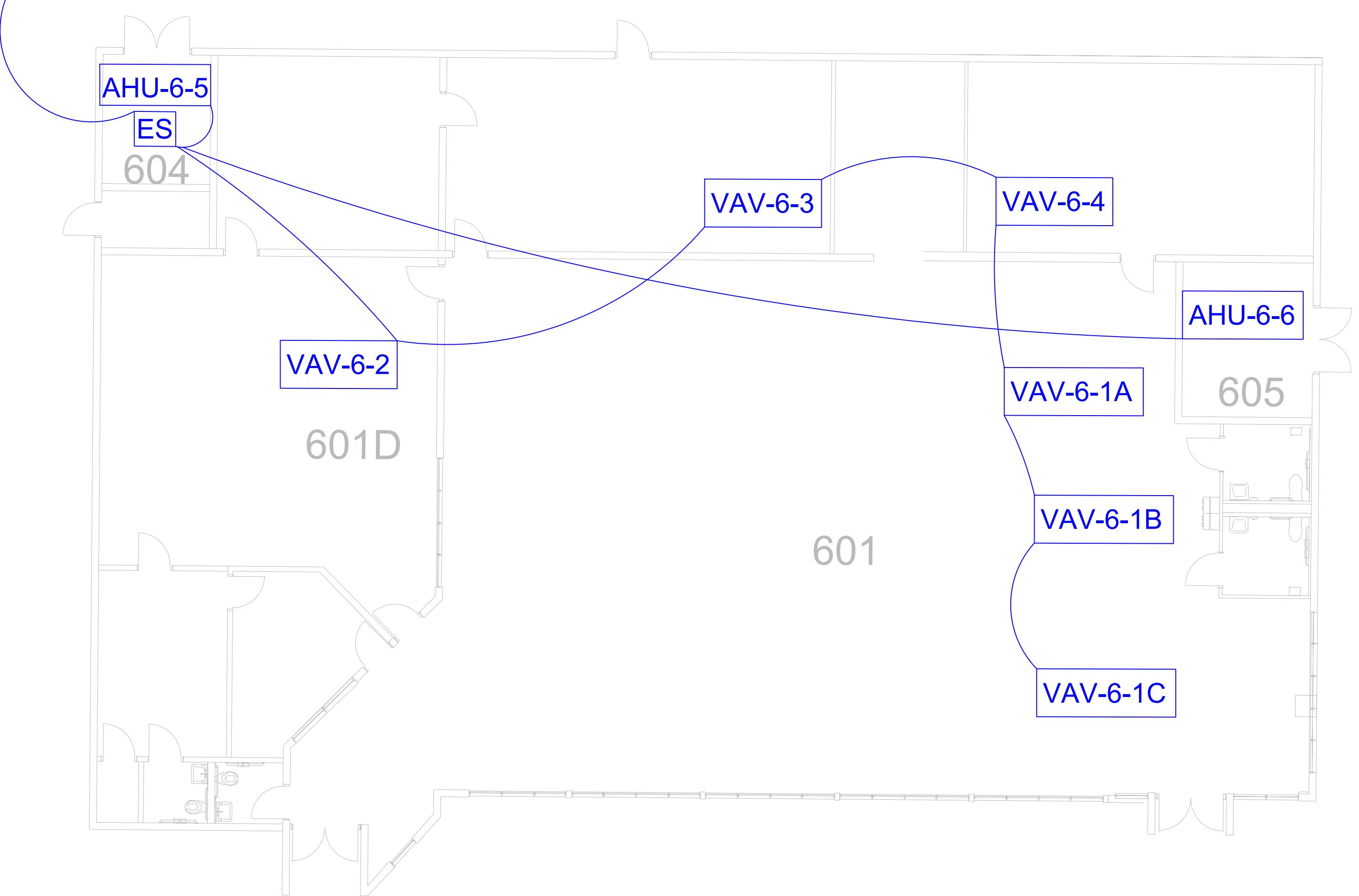
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	DATE	APPROVED	ENGINEER	MANAGER	DESIGNER	INIT	DATE		
DESCRIPTION									
REV									

QTY	PART NUMBER	DESCRIPTION	MANUFACTURER
1	SXWASPXXX10001	AS CONTROLLER	SCHNEIDER
1	SXWTBASW110002	AS TERMINAL BASE	SCHNEIDER
1	SXWPS24VX100001	POWER SUPPLY	SCHNEIDER
1	SXWTBPSW100001	POWER SUPPLY BASE	SCHNEIDER
1	ESW108	ETHERNET SWITCH	B&B ELEC

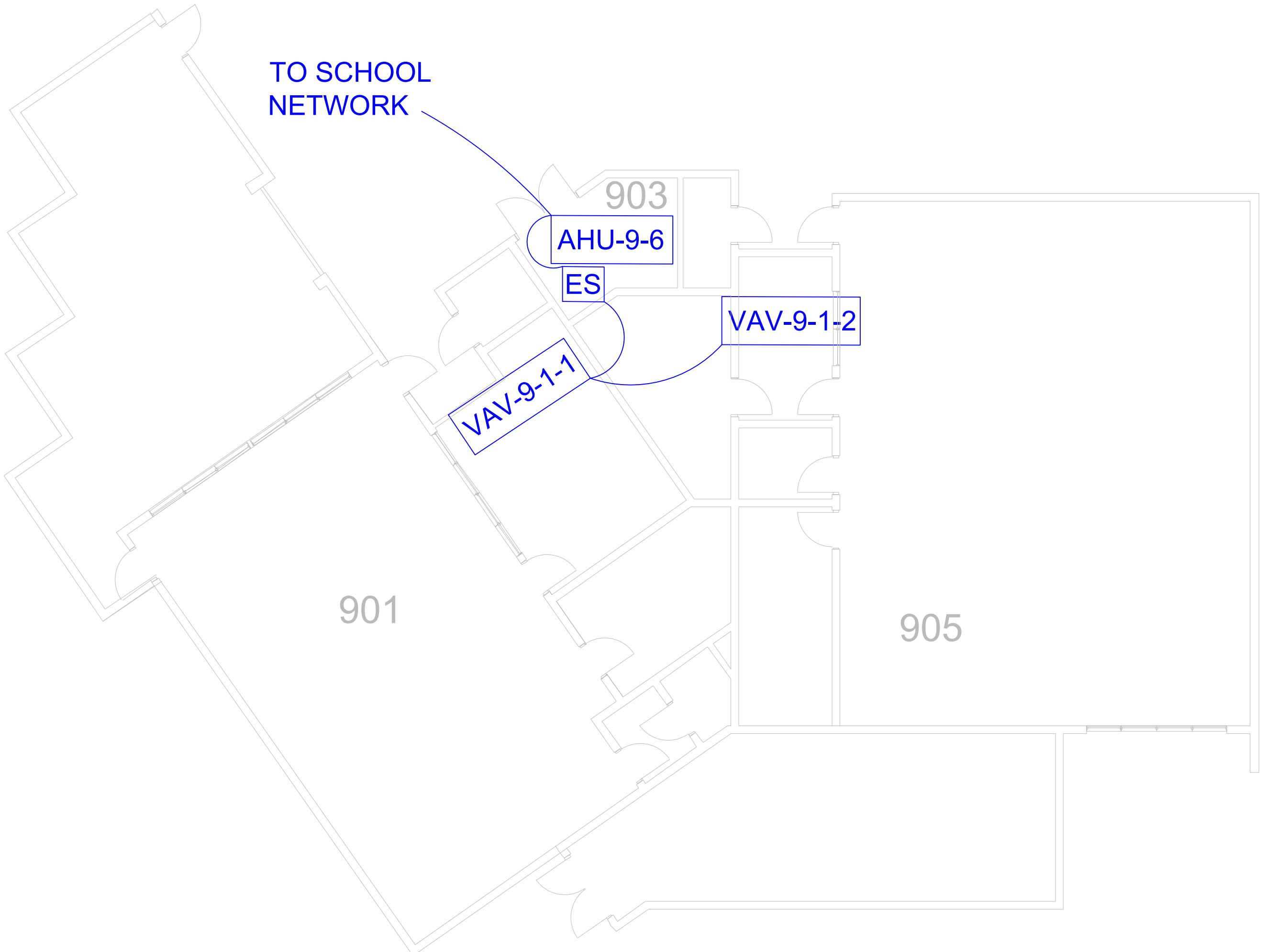
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					2		
REVISION	DATE	APPROVED	DATE	INITIALS	DATE	INITIALS	INIT. DATE
RISER DIAGRAM							
Norcrest Elementary School 3951 NE 16th Ave Pompano Beach, FL 33064							
 ROTH Automated User Management • Building							



TO SCHOOL NETWORK



REV	DESCRIPTION	DATE	APPROVED	JOB/CONT #	FILE:	SALES	PROJECT	APPL.	DRAWN	DRAWG #	DRAWING
						ENGINEER	MANAGER	ENGINEER	BY:	REV.	
											INIT DATE
	ROTH				Bldg 6 Floorplan						
	S U T H E A S T				Norcrest Elementary School						
					3951 NE 16th Ave						
					Pompano Beach, FL 33064						
											
					Automated User Management • Drafting						



TO SCHOOL NETWORK

909

907

908

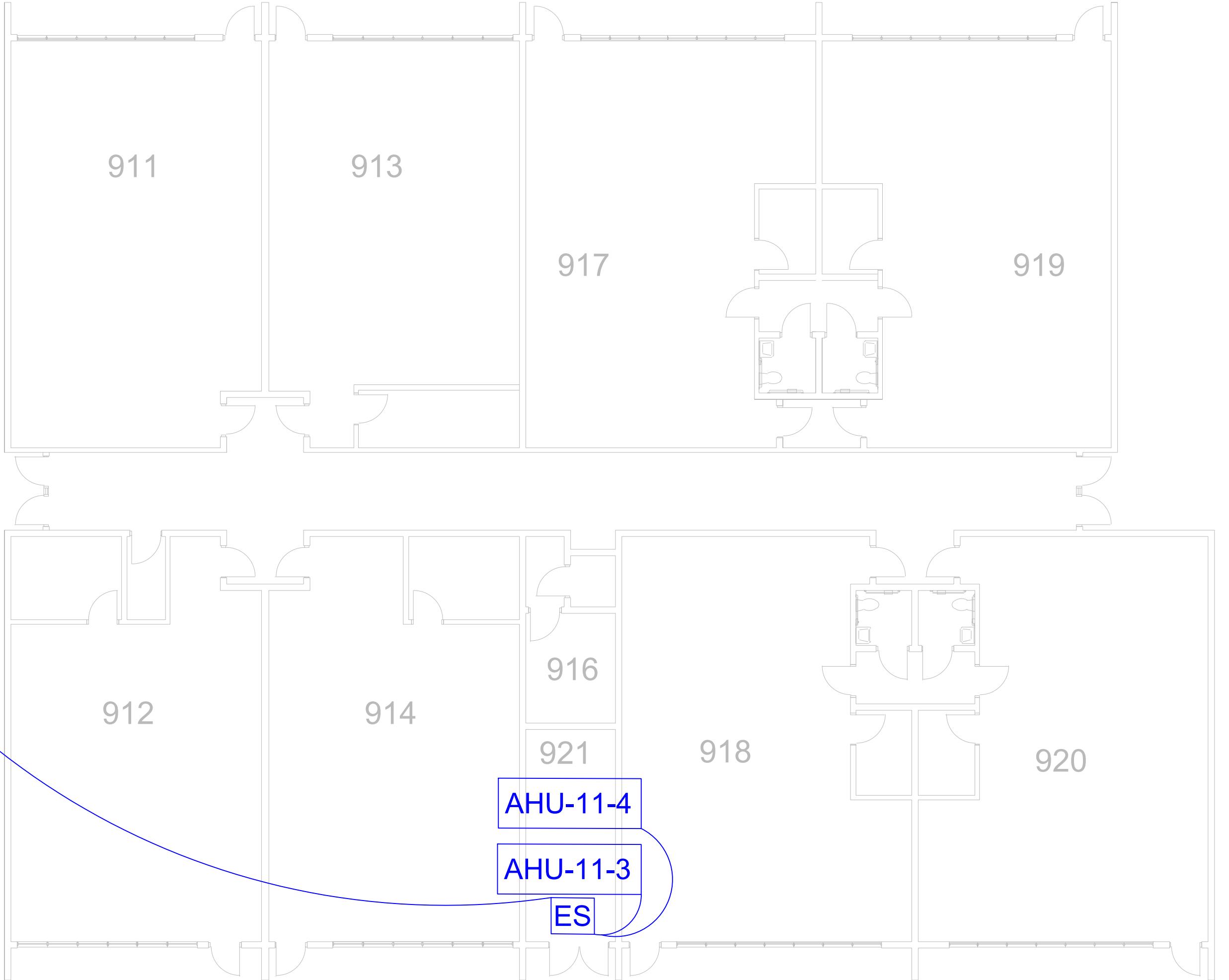
AS

PCHWP-2

PCHWP-1

CHILLER-1 (EXISTING)

TO
SCHOOL
NETWORK

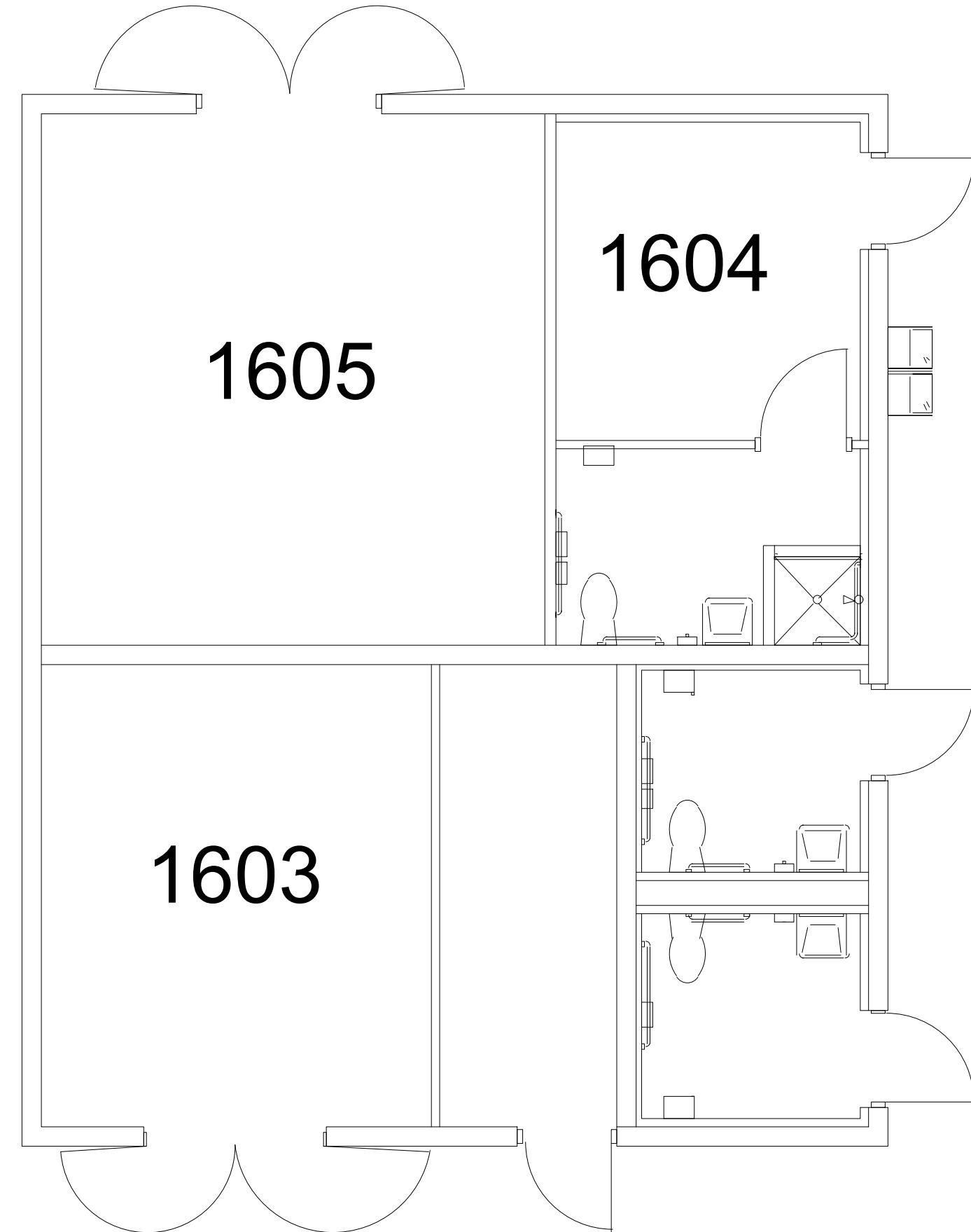


REV	DESCRIPTION	DATE	APPROVED	Bldg 11 Floorplan				DRAWING
				JOB/CONT #	SALES PROJECT	APPL.	DRAWN BY:	
	 ROTH							6
	Norcrest Elementary School							
	3951 NE 16th Ave							
	Pompano Beach, FL 33064							
	Autodesk • User Management • Drafting							

PCHWP-2

PCHWP-3

PCHWP-1



REV	DESCRIPTION	DATE	APPROVED	JOB/CONT #	FILE:	SALES PROJECT	APPL.	DRAWN BY:	DRWG #	DRAWING
	ROTH					Norcrest Elementary School				
						3951 NE 16th Ave				
						Pompano Beach, FL 33064				
						SUSTAINABLE				
						Green Building Management • Consulting				
						Green Building Management • Consulting				

TO SCHOOL NETWORK

170

CHILLER-1 (EXISTING)

**CHILLER-2
(EXISTING)**

AS

PCHWP-2

PCHWP-3

PCHWP-1

SCHWP-1

SCHWP-2

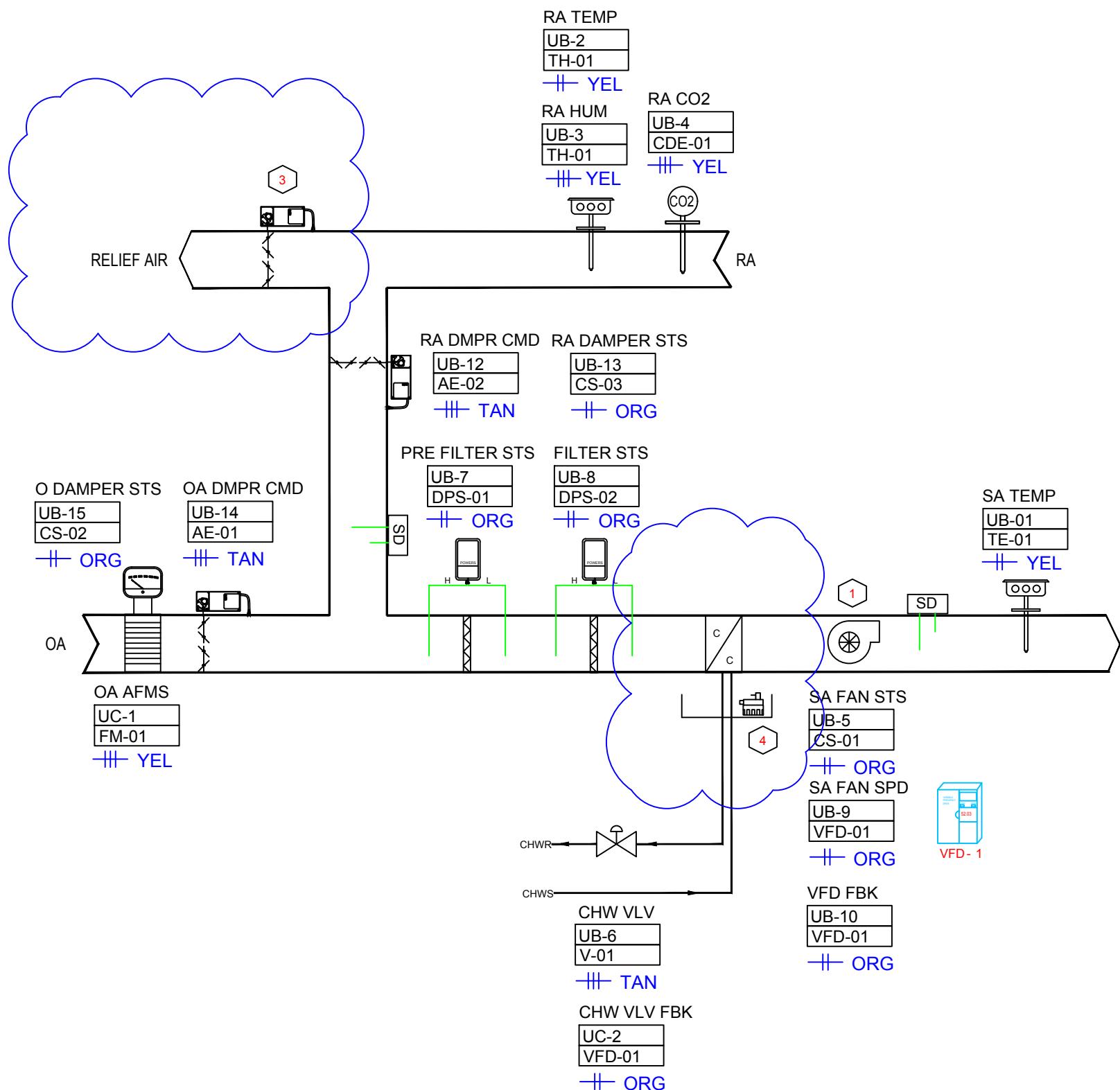
1702

REV:		DESCRIPTION	DATE	APPROVED	FILE:	
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					ENGINEER	APPL.
					MANAGER	DRAWN
					ENGINEER	BY:
						REV.
						INIT DATE
ROTH			Bldg 17 Floorplan		Norcrest Elementary School 3951 NE 16th Ave Pompano Beach, FL 33064	
ROTH					Automation • Project Management • Consulting	

TYPICAL OF AHU-6-6 & AHU-9-6

NOTES:

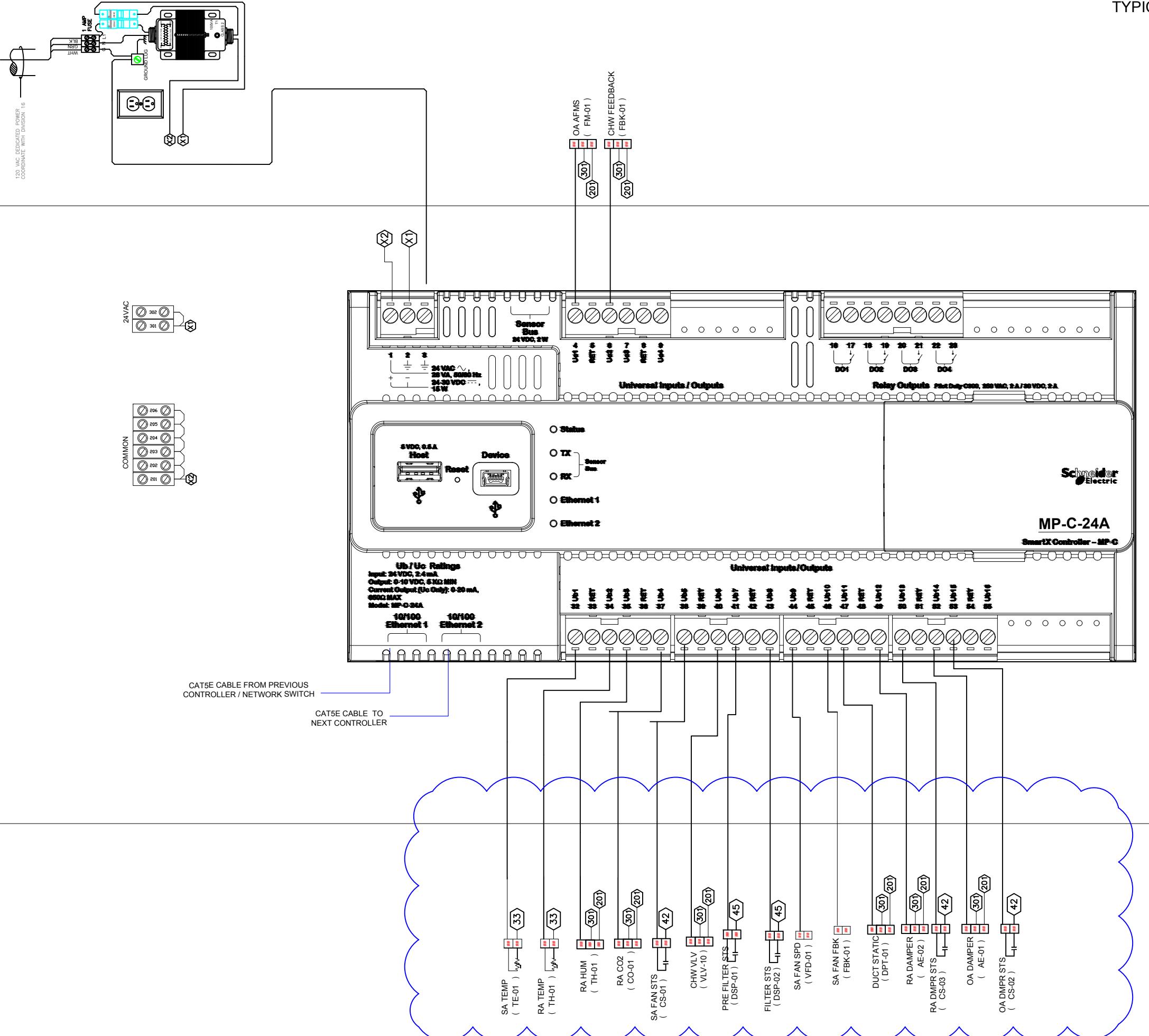
- ① SUPPLY FANS COMMANDED FROM OVERRIDE PANEL.
- ② DUCT STATIC SENSOR LOCATED $\frac{2}{3}$ DOWN DUCT.
- ③ BAROMETRIC DAMPER, FOR REFERENCE ONLY
- ④ PROVIDED, INSTALLED AND WIRED BY OTHER



POINT LIST							
POINT NUMBER	POINT NAME	AI	DI	AO	DO	ALARM	TREND
UB-1	SA TEMP	X				X	X
UB-2	RA TEMP	X				X	X
UB-3	RA HUM	X				X	X
UB-4	RA CO ₂	X				X	X
UB-5	SA FAN STS	X				X	X
UB-6	CHW VLV	X				X	X
UB-7	PRE FILTER STS	X				X	X
UB-8	FILTER STS	X				X	X
UB-9	SA FAN SPD			X		X	X
UB-10	VFD FBK	X				X	X
UB-11	DUCT STATIC		X			X	X
UB-12	RA DMPR CMD			X		X	X
UB-13	OA DMPR CMD			X		X	X
UB-14	RA DMPR STS	X				X	X
UB-15	OA DMPR STS	X				X	X
UC-1	OA AFMS	X				X	X
UC-2	CHW VLV FBK	X				X	X

FILE: ROTH	JOB / CONT #	SALES PROJECT	APPL. DRAWN
3551 NE 16th Ave	REV. 1	ENGINEER MANAGER	DRAWN BY:
Pompano Beach, FL 33064	DATE APPROVED	INITIALS	REV.
B U T H E A G T Automation • Energy Management • Lighting			

TYPICAL OF AHU-6-6 & 9-6



		FILE:		DRAWING	
		JOB/CONT #		DRAWN BY:	REV.
		SALES ENGINEER	PROJECT MANAGER	APPL. ENGINEER	INIT. DATE
BOTH		Norcrest Elementary School 3951 NE 16th Ave Pompano Beach, FL 33064		10	
					
OUTHEAT					
Automation • Energy Management • Lighting					
REV	DESCRIPTION	REV 1	DATE	APPROVED	

SYMBOL	QTY	PART #	DESCRIPTION	MANU.	SIGNAL	RANGE
	2	MP-C-24A	IP CONTROLLER	SCHNEIDER		
RE-01-02	6	CKIT-VMD1B-F24	RELAY KIT	VERIS	24 VAC COIL	N.O.
CS-01-2	4	H608	CURRENT SENSORS	VERIS	DRY CONTACT	N.O.
TE-01	2	ETD500-8	DUCT MOUNT TEMP SENSOR	SCHNEIDER	10K OHMS	-40°F TO 302°F
TH-01	2	EHD110-500	DUCT TEMP/HUM SENSOR	SCHNEIDER	10K OHMS	-40°F TO 302°F
CO-01	2	CDE	CO SENSOR	VERIS	0-10V	0-2000 PPM
DPS-01-02	4	AFS-222	FILTER SWITCH	KELE	DRY CONTACT	NORMALLY OPEN
	8	21122	IMPACT TUBING			
DPT-01	2	PXUXX05S	DUCT STATIC SENSOR	SIEMENS	0-10V	0-5" W.C.F.
AE-01-02	4	LFB24-SR-S	ACTUATOR	BELIMO	2-10V	MODULATING
FM-01	2	SEE SCHEDULE	AIRFLOW MEASURING STATION			
V-01	2	SEE SCHEDULE	PICC VALVE	BELIMO	2-10V	MODULATING
	12	ZS6-RD	RED TERMINAL STRIP	ABB/KELE		
	12	ZS6-BK	BLACK TERMINAL STRIP	ABB/KELE		
	6	ZS6-PE	GROUND TERMINAL STRIP	ABB/KELE		
	12	ZS6	TERMINAL STRIP	ABB/KELE		
	12	JB6-2	JUMPER BAR	ABB/KELE		
	2	HC16124	ENCLOSURE	KELE		
	12	CS	CIRCUIT SEPERATOR	ABB/KELE		
	6	ES4	TERMINAL STRIP END STOP	ABB/KELE		

SEQUENCE OF OPERATION

RUN CONDITIONS SCHEDULED: THE UNIT SHALL RUN BASED UPON AN OPERATOR ADJUSTABLE SCHEDULE IN ONE OF THE FOLLOWING MODES:

OCCUPIED MODE: UNIT SHALL BE ENABLED AND OUTSIDE AIR DAMPER SHALL OPEN.

UNOCCUPIED MODE: UNIT SHALL BE DISABLED AND OUTSIDE AIR DAMPER SHALL CLOSE.

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.

EMERGENCY/SMOKE DETECTION SHUTDOWN: THE UNIT SHALL SHUT DOWN AND GENERATE AN ALARM UPON RECEIVING AN EMERGENCY/SMOKE DETECTION SIGNAL. SMOKE DETECTOR PROVIDED AND INSTALLED BY FIRE BY ALARM CONTRACTOR.

SUPPLY FAN: THE SUPPLY FAN SHALL RUN ANYTIME THE UNIT IS COMMENDED TO RUN, UNLESS SHUTDOWN ON SAFETIES. TO PREVENT SHORT CYCLING, THE SUPPLY FAN SHALL HAVE A USER DEFINABLE (ADJ.) MINIMUM RUNTIME. ALARMS SHALL BE PROVIDED AS FOLLOWS:

- SUPPLY FAN FAILURE: COMMENDED ON, BUT THE STATUS IS OFF.
- SUPPLY FAN IN HAND: COMMENDED OFF, BUT THE STATUS IS ON.
- SUPPLY FAN RUNTIME EXCEEDED: STATUS RUNTIME EXCEEDS A USER DEFINABLE LIMIT (ADJ.).

SUPPLY AIR DUCT STATIC PRESSURE CONTROL: THE CONTROLLER SHALL MEASURE DUCT STATIC PRESSURE AND MODULATE THE SUPPLY FAN VFD SPEED TO MAINTAIN A DUCT STATIC PRESSURE SETPOINT. THE SPEED SHALL NOT DROP BELOW 30% (ADJ.). ALARMS SHALL BE PROVIDED AS FOLLOWS:

- HIGH/LOW SUPPLY AIR STATIC PRESSURE
- VFD FAULT

SUPPLY AIR TEMPERATURE SETPOINT - FIXED: THE CONTROLLER SHALL MONITOR THE SUPPLY AIR TEMPERATURE AND SHALL MAINTAIN A FIXED SUPPLY AIR TEMPERATURE SETPOINT OF 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.

SUPPLY / RETURN / MIXED AIR TEMPERATURE: THE SYSTEM SHALL MONITOR THE SUPPLY/ RETURN / MIXED AIR TEMPERATURES. ALARMS SHALL BE PROVIDED AS FOLLOWS:

- HIGH / LOW SUPPLY AIR TEMP.

RETURN AIR HUMIDITY: THE CONTROLLER SHALL MONITOR THE RETURN AIR HUMIDITY AND USE IT AS REQUIRED FOR HUMIDITY CONTROL.

DEHUMIDIFICATION: THE UNIT CONTROLLER SHALL MEASURE THE RETURN AIR HUMIDITY AND OVERRIDE THE COOLING SEQUENCE TO MAINTAIN RETURN AIR HUMIDITY AT OR BELOW 55% RH (ADJ.). DEHUMIDIFICATION SHALL BE ENABLED WHENEVER THE SUPPLY FAN STATUS IS ON.

OA / RA DAMPERS: DURING OCCUPIED MODE THE OA DAMPER SHALL OPEN TO MAINTAIN THE MINIMUM OA REQUIREMENTS. DURING UNOCCUPIED MODE AND OPTIMAL START UP TIME THE OA DAMPER SHALL CLOSE AND THE RA DAMPER SHALL OPEN ALLOWING AIR RECIRCULATION.

RELIEF AIR DAMPER: A BAROMETRIC PRESSURE DAMPER SHALL BE BALANCED TO MAINTAIN A POSITIVE BUILDING PRESSURE OF 0.1 IN WG.

MINIMUM OUTSIDE AIR VENTILATION - CARBON DIOXIDE (CO2) CONTROL: WHEN IN THE OCCUPIED MODE, THE CONTROLLER SHALL MONITOR RA CO2 CONCENTRATION LEVELS. THE CONTROLLER SHALL MODULATE THE OUTSIDE AIR DAMPER OPEN AND THE RETURN AIR DAMPER CLOSE ON RISING CO2 CONCENTRATIONS OVERRIDING NORMAL DAMPER OPERATION TO MAINTAIN A CO2 CONCENTRATION SETPOINT OF 750 PPM (ADJ.). AN ALARM SHALL BE SENT TO THE WORKSTATION IF THE CO2 LEVELS ARE GREATER THAN 10 % OF IAQ SETPOINT (ADJ.).

AIR FLOW STATION: THE CONTROLLER SHALL MEASURE THE OUTSIDE AIR FLOW AND MODULATE THE OA DAMPER TO MAINTAIN THE MINIMUM OA VENTILATION REQUIREMENTS. THE CONTROLLER SHALL GENERATE AN ALARM WHEN THE SYSTEM IS 10 % BELOW OF THE DESIGN MINIMUM VENTILATION.

FILTER STATUS: A DIFFERENTIAL PRESSURE SWITCH SHALL MONITOR THE DIFFERENTIAL PRESSURE ACROSS THE FILTERS WHEN THE FAN IS RUNNING. ALARMS SHALL BE PROVIDED AS FOLLOWS:

- DIRTY FILTER

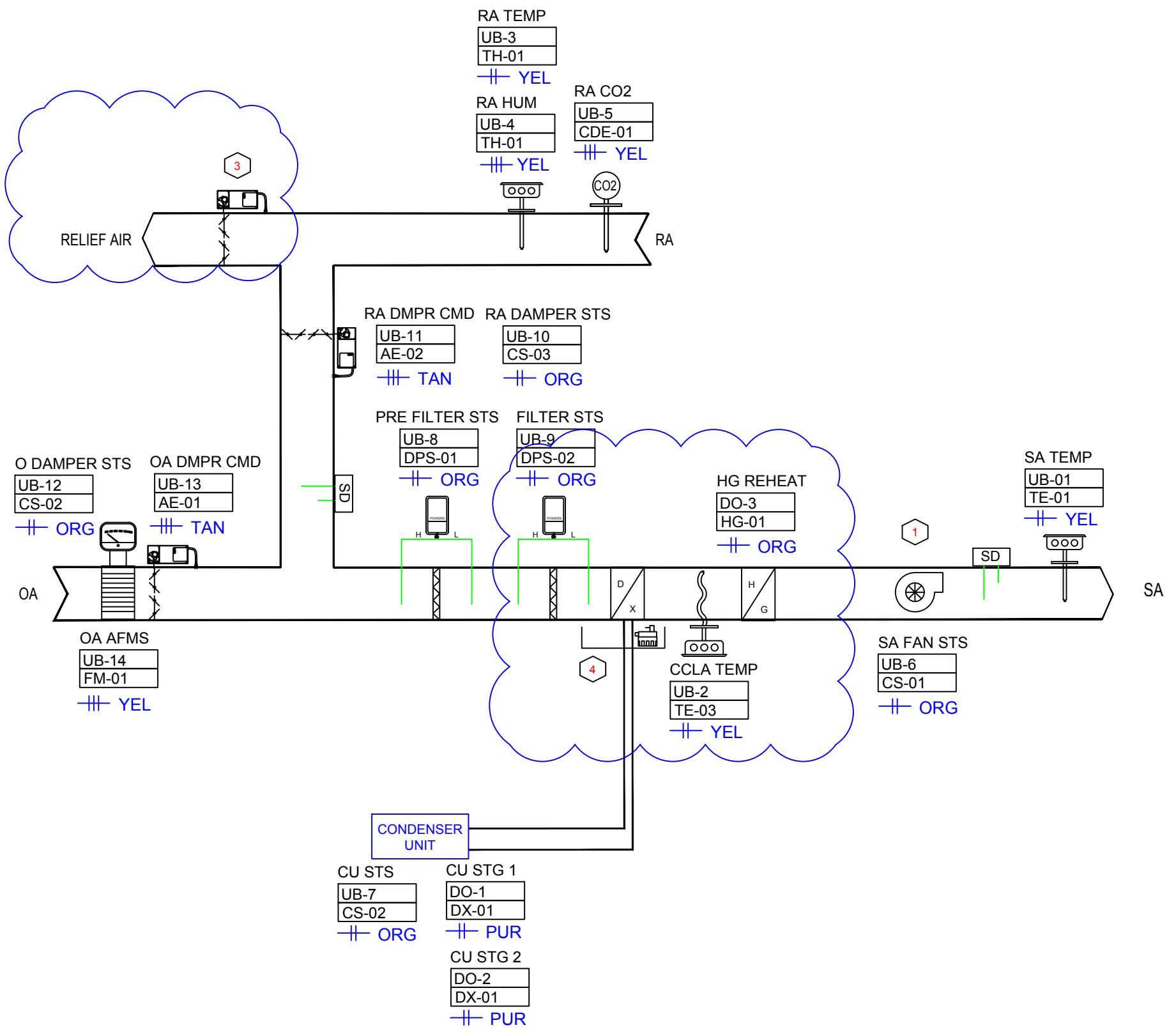
TITLE: ROTH		JOB/CONT #		DRAWING #	
SALES PROJECT		APPL.		DRAWN BY:	
ENGINEER MANAGER		ENGINEER		REV.	
INIT DATE					
DATE APPROVED					
DESCRIPTION REV 1					
REV					

Norcrest Elementary School
3951 NE 16th Ave
Pompano Beach, FL 33064

TYPICAL OF AHU-6-5

NOTES:

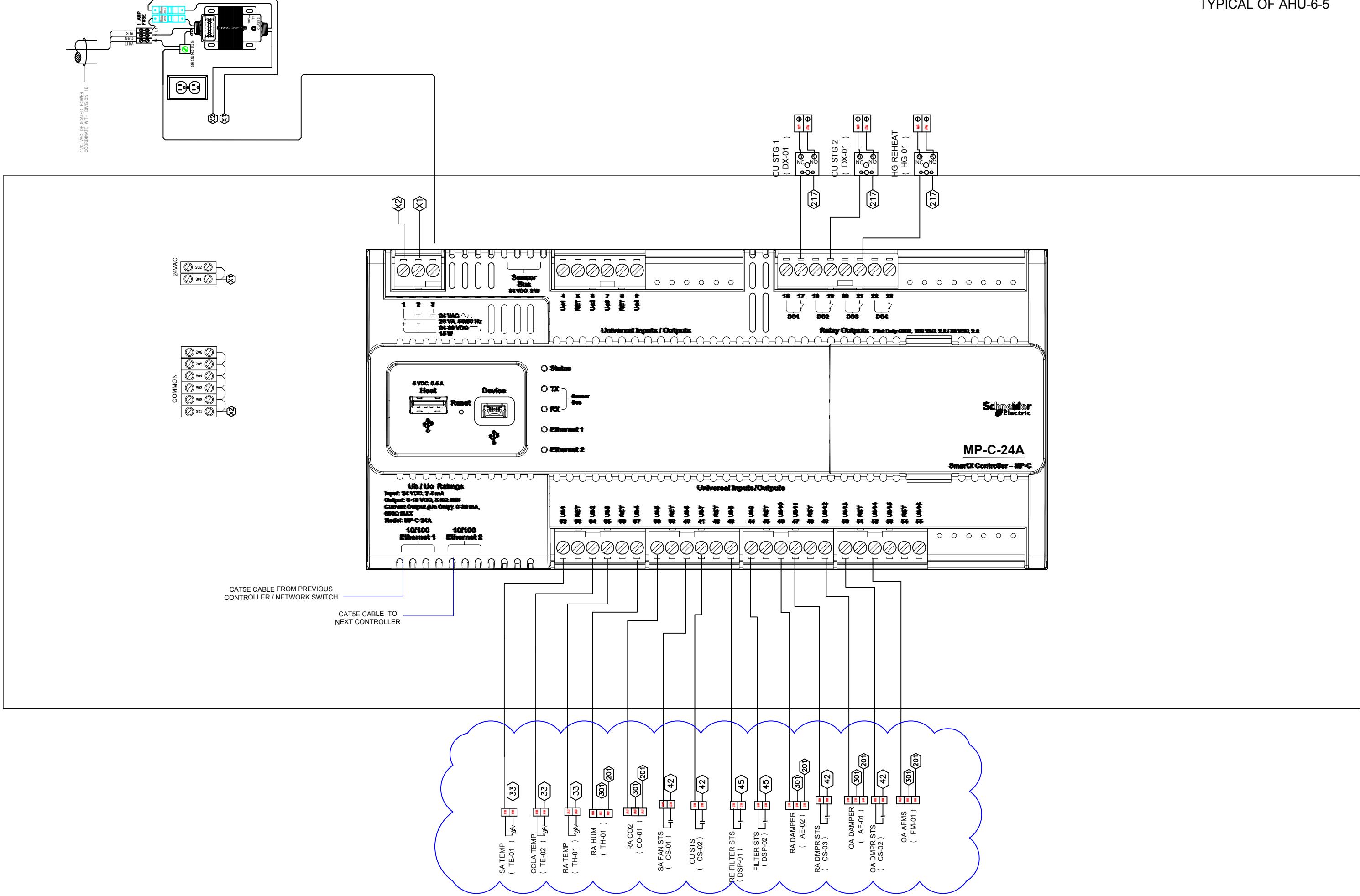
- 1 SUPPLY FANS COMMANDED FROM OVERRIDE PANEL.
 - 2 DUCT STATIC SENSOR LOCATED $\frac{2}{3}$ DOWN DUCT.
 - 3 BAROMETRIC DAMPER, FOR REFERENCE ONLY
 - 4 PROVIDED, INSTALLED AND WIRED BY OTHER



POINT LIST							
POINT NUMBER	POINT NAME	AI	DI	AO	DO	ALARM	TREND
UB-1	SA TEMP	X				X	X
UB-2	CCLA TEMP	X				X	X
UB-3	RA TEMP	X				X	X
UB-4	RA HUM	X				X	X
UB-5	RA CO2	X				X	X
UB-6	SA FAN STS	X				X	X
UB-7	CU STS			X		X	X
UB-8	PRE FILTER STS	X				X	X
UB-9	FILTER STS	X				X	X
UB-10	RA DMPR CMD			X		X	X
UB-11	RA DMPR STS	X				X	X
UB-12	OA DMPR CMD			X		X	X
UB-13	OA DMPR STS	X				X	X
UB-14	OA AFMS	X				X	X
DO-1	CU STG 1			X		X	X
DO-2	CU STG 2			X		X	X
DO-3	HOT GAS REHEAT			X		X	X

ROTH		TYP DX AHU DIAGRAM		FILE:	DRAWING	
ROTH BOUTHEA B.T. <small>Automation • Energy Management • Lighting</small>		REV 1	APPROVED	JOB/CONT #	DRWG #	12
DESCRIPTION	DATE	SALES	PROJECT	APPL.	DRAWN BY:	REV.
REV	REV	ENGINEER	MANAGER	ENGINEER		INIT DATE
Norcrest Elementary School 3951 NE 16th Ave Pompano Beach, FL 33064						

TYPICAL OF AHU-6-5



DRAWING					
FILE:	JOB/CONT #	SALES ENGINEER	PROJECT MANAGER	APPL. ENGINEER	DRAWN BY:
					DRWG #
					REV.
					INIT. DATE

SYMBOL	QTY	PART #	DESCRIPTION	MANU.	SIGNAL	RANGE
	1	MP-C-24A	IPCONTROLLER	SCHNEIDER		
RE-01-02	2	CKIT-VMD1B-F24	RELAY KIT	VERIS	24 VAC COIL	N.O.
CS-01-2	2	H608	CURRENT SENSORS	VERIS	DRY CONTACT	N.O.
TE-01	1	ETD500-8	DUCT MOUNT TEMP SENSOR	SCHNEIDER	10K OHMS	-40°F TO 302°F
TE-02	1	ETA500-8	DUCT AVG TEMP SENSOR	SCHNEIDER	10K OHMS	-40°F TO 302°F
TH-01	1	EHD110-500	DUCT TEMP/HUM SENSOR	SCHNEIDER	10K OHMS	-40°F TO 302°F
CO-01	1	CDE	CO SENSOR	VERIS	0-10V	0-2000 PPM
DPS-01-02	2	AFS-222	FILTER SWITCH	KELE	DRY CONTACT	NORMALLY OPEN
	4	21122	IMPACT TUBING			
AE-01-02	2	LFB24-SR-S	ACTUATOR	BELIMO	2-10V	MODULATING
FM-01	1	SEE SCHEDULE	AIRFLOW MEASURING STATION			
	5	ZS6-RD	RED TERMINAL STRIP	ABB/KELE		
	5	ZS6-BK	BLACK TERMINAL STRIP	ABB/KELE		
	3	ZS6-PE	GROUND TERMINAL STRIP	ABB/KELE		
	5	ZS6	TERMINAL STRIP	ABB/KELE		
	5	JB6-2	JUMPER BAR	ABB/KELE		
	1	HC16124	ENCLOSURE	KELE		
	5	CS	CIRCUIT SEPERATOR	ABB/KELE		
	3	ES4	TERMINAL STRIP END STOP	ABB/KELE		

SEQUENCE OF OPERATION

RUN CONDITIONS - SCHEDULED: THE UNIT SHALL RUN BASED UPON AN OPERATOR ADJUSTABLE SCHEDULE IN ONE OF THE FOLLOWING MODES:

- OCCUPIED MODE: UNIT SHALL BE ENABLED AND OUTSIDE AIR DAMPER SHALL OPEN TO MINIMUM OPEN POSITION.
- UNOCCUPIED MODE: UNIT SHALL BE DISABLED AND OUTSIDE AIR DAMPER SHALL CLOSE.

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.

EMERGENCY/SMOKE DETECTION SHUTDOWN: THE UNIT SHALL SHUT DOWN AND GENERATE AN ALARM UPON RECEIVING AN EMERGENCY/SMOKE DETECTION SIGNAL. SMOKE DETECTOR PROVIDED AND INSTALLED BY FIRE ALARM CONTRACTOR.

SUPPLY FAN: THE SUPPLY FAN SHALL RUN ON CONTINUOUS DUTY ANYTIME THE UNIT IS COMMENDED TO RUN BY THE ATC, UNLESS SHUTDOWN SAFETIES. TO PREVENT SHORT CYCLING, THE SUPPLY FAN SHALL HAVE A USER DEFINABLE (ADJ.) MINIMUM RUNTIME. ALARMS SHALL BE PROVIDED AS FOLLOWS:

- SUPPLY FAN FAILURE: COMMENDED ON, BUT THE STATUS IS OFF.
- SUPPLY FAN IN HAND: COMMENDED OFF, BUT THE STATUS IS ON.
- SUPPLY FAN RUNTIME EXCEEDED: STATUS RUNTIME EXCEEDS A USER DEFINABLE LIMIT (ADJ.).

COOLING COIL DX CONTROL VALVE: THE ATC CONTROLLER SHALL MONITOR THE SPACE TEMPERATURE SENSOR AND SHALL MODULATE THE COOLING COIL CONTROL VALVE TO SATISFY THE SPACE TEMPERATURE SENSOR SETPOINT OF 75 DEGREES F. (ADJ) WHEN THE SPACE SENSOR TEMPERATURE RISES ABOVE 75 DEGREES (ADJ).

HOT GAS BYPASS: DURING OPERATION, THE HOT GAS BYPASS VALVE WILL MODULATE OPEN, BYPASSING THE CONDENSER C01L PER INTERNAL CONDENSER CONTROLS.

SUPPLY/ RETURN/ MIXED/ COIL LEAVING AIR TEMPERATURE: THE SYSTEM SHALL MONITOR THE SUPPLY/ RETURN/ MIXED COIL LEAVING AIR TEMPERATURES.

RETURN AIR HUMIDITY: THE CONTROLLER SHALL MONITOR THE RETURN AIR HUMIDITY. IF THE RA HUMIDITY SENSOR IS GREATER THAN 60% (ADJ), THE HOT GAS REHEAT SHALL BE ENERGIZED AND THE COOLING COIL DX CONTROL VALVE SHALL BE FULLY OPEN UNTIL THE RA HUMIDITY SENSOR REACHES THE SETPOINT 50% (ADJ). THE HOT GAS BYPASS REHEAT VALVE SHOULD BE OPEN IF RA HUMIDITY SET POINT IS NOT SATISFIED WITHIN 15 MINUTES (ADJ.) AFTER VALVE OPENING, THEN THE HOT GAS REHEAT SHALL BE DE-ENERGIZED AND COOLING COIL DX CONTROL VALVE SHALL MODULATE TO SATISFY SPACE TEMPERATURE SET POINT.

OUTSIDE-AIR (OA) I RETURN-AIR (RA) MOTORIZED DAMPERS: DURING OCCUPIED MODE THE OA DAMPER SHALL OPEN TO MAINTAIN THE MINIMUM OA REQUIREMENTS. DURING UNOCCUPIED MODE AND OPTIMAL START UP TIME THE OA DAMPER SHALL CLOSE AND THE RA DAMPER SHALL OPEN ALLOWING MAXIMUM AIR RECIRCULATION.

RELIEF AIR DAMPER: A BAROMETRIC (GRAVITY TYPE) PRESSURE DAMPER SHALL BE BALANCED TO MAINTAIN A POSITIVE BUILDING PRESSURE OF 0.1 IN WG.

MINIMUM OUTSIDE AIR VENTILATION - CARBON DIOXIDE (CO2) DEMAND CONTROLLED: WHEN IN THE OCCUPIED MODE, THE CONTROLLER SHALL MONITOR THE RA CO2 CONCENTRATION LEVELS. THE CONTROLLER SHALL MODULATE THE OUTSIDE AIR DAMPER OPEN AND THE RETURN AIR DAMPER CLOSE ON RISING CO2 CONCENTRATIONS, OVERRIDING NORMAL DAMPER OPERATION, TO MAINTAIN A RA CO2 CONCENTRATION SETPOINT OF 900 PPM (ADJ.). AN ALARM SHALL BE SENT TO THE WORKSTATION.

- IF THE CO2 LEVELS ARE GREATER THAN 10 % OF IAQ SETPOINT (ADJ).
- AIR FLOW MEASURING STATION (AFMS): THE CONTROLLER SHALL MEASURE THE OA FLOW AND MODULATE THE OA DAMPER TO MAINTAIN THE MINIMUM OA VENTILATION REQUIREMENTS. THE CONTROLLER SHALL GENERATE AN ALARM WHEN THE SYSTEM IS 10 % BELOW OF THE DESIGN MINIMUM VENTILATION.

FILTER STATUS: A DIFFERENTIAL PRESSURE SWITCH SHALL MONITOR THE DIFFERENTIAL PRESSURE ACROSS THE FILTERS WHEN THE FAN IS RUNNING. ALARMS SHALL BE PROVIDED AS FOLLOWS:

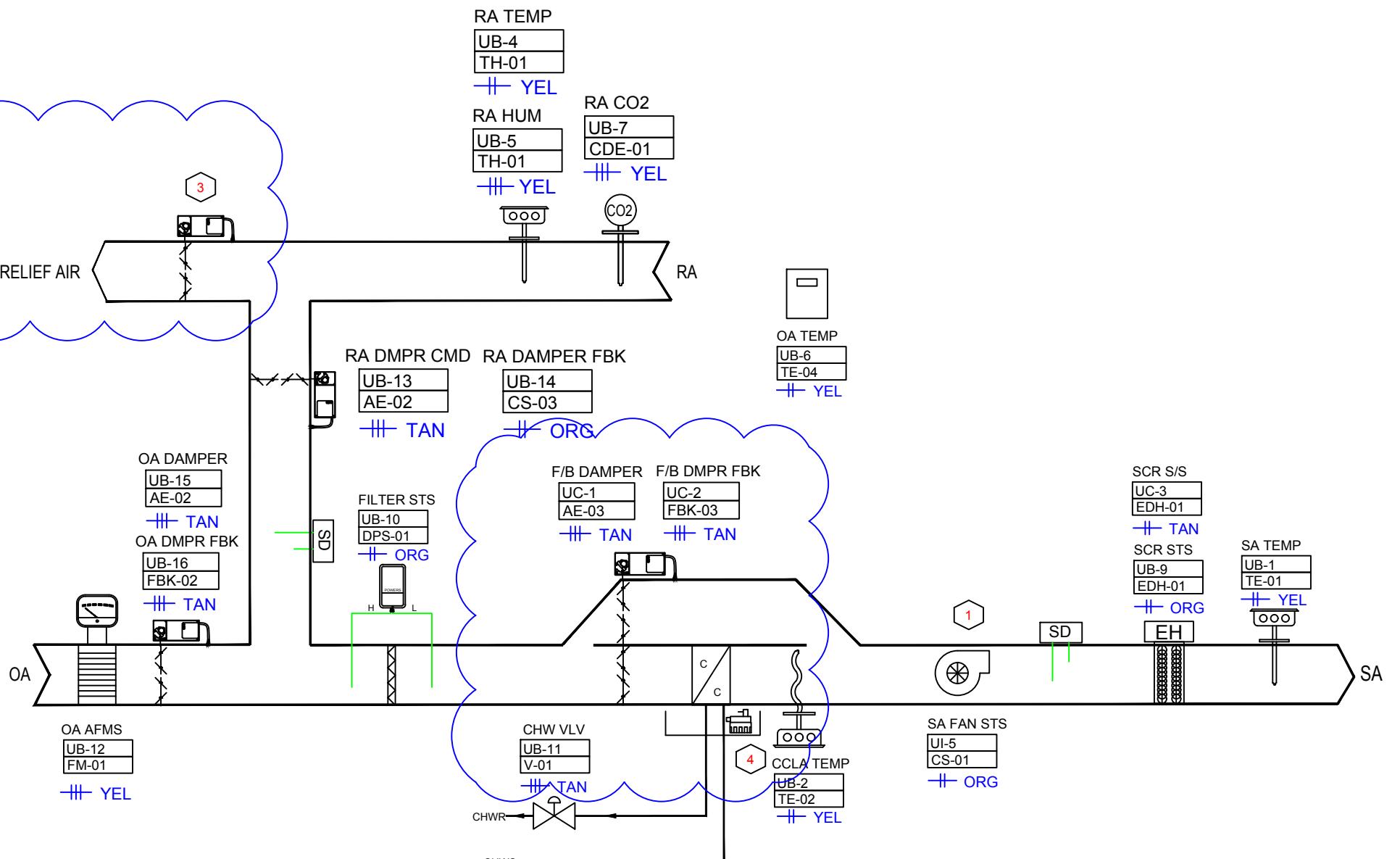
- LOADED (DIRTY) FILTER - PRESSURE DIFFERENTIAL GREATER THAN ONE (1") INCH (ADJ).

TITLE: TYP DX AHU SOP & PRT		DRAWING # 14	
DATE	APPROVED	SALES PROJECT	ENGINEER MANAGER
REV	REV 1	APPL.	DRAWN BY:
DESCRIPTION	DATE	INIT	DATE
REVISION	REVISION	INITIAL	DATE
Norcrest Elementary School 3951 NE 16th Ave Pompano Beach, FL 33064			

TYPICAL OF AHU-11-3 & 11-4

NOTES:

- ① SUPPLY AIR FAN COMMANDED FROM OVERRIDE PANEL
- ② BAROMETRIC DAMPER, FOR REFERENCE ONLY
- ③ PROVIDED, INSTALLED AND WIRED BY OTHER



POINT LIST

POINT NUMBER	POINT NAME	AI	DI	AO	DO	ALARM	TREND
UB-1	SA TEMP	X				X	X
UB-2	CCLA TEMP	X				X	X
UB-3	RA TEMP	X				X	X
UB-4	RA HUM	X				X	X
UB-5	OA TEMP	X				X	X
UB-6	RA CO2	X				X	X
UB-7	SA FAN STS		X			X	
UB-8	SA FAN STS		X			X	X
UB-9	FILTER STS		X			X	X
UB-10	CHW VLV		X			X	X
UB-11	OA AFMS			X		X	X
UB-12	RA DAMPER			X		X	X
UB-13	RA DAMPER FEEDBACK				X	X	X
UB-14	OA DAMPER			X		X	X
UB-15	OA DAMPER FEEDBACK			X		X	X
UC-1	F & B DAMPER				X	X	X
UC-2	F & B DAMPER FEEDBACK				X	X	X
UC-3	SCR HEAT				X	X	X

TYP. F&B AHU DIAGRAM

ROTH



DRAWING

15

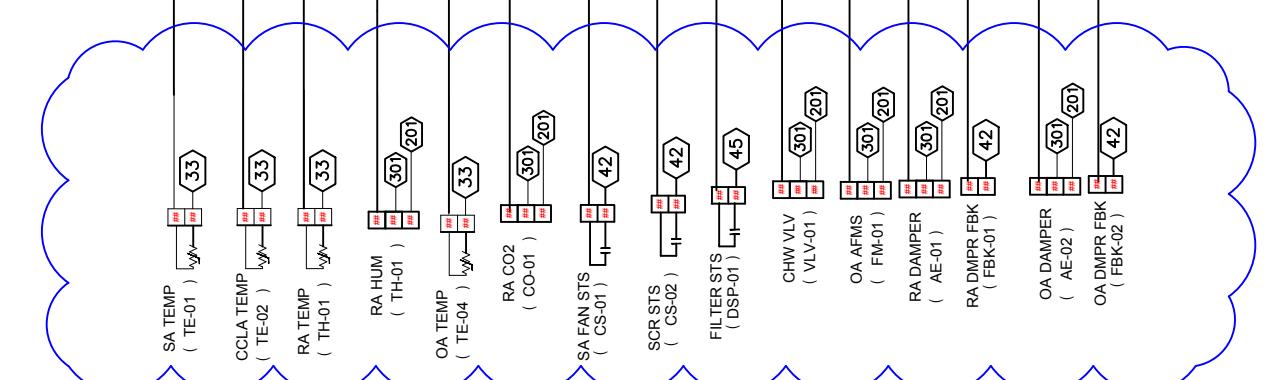
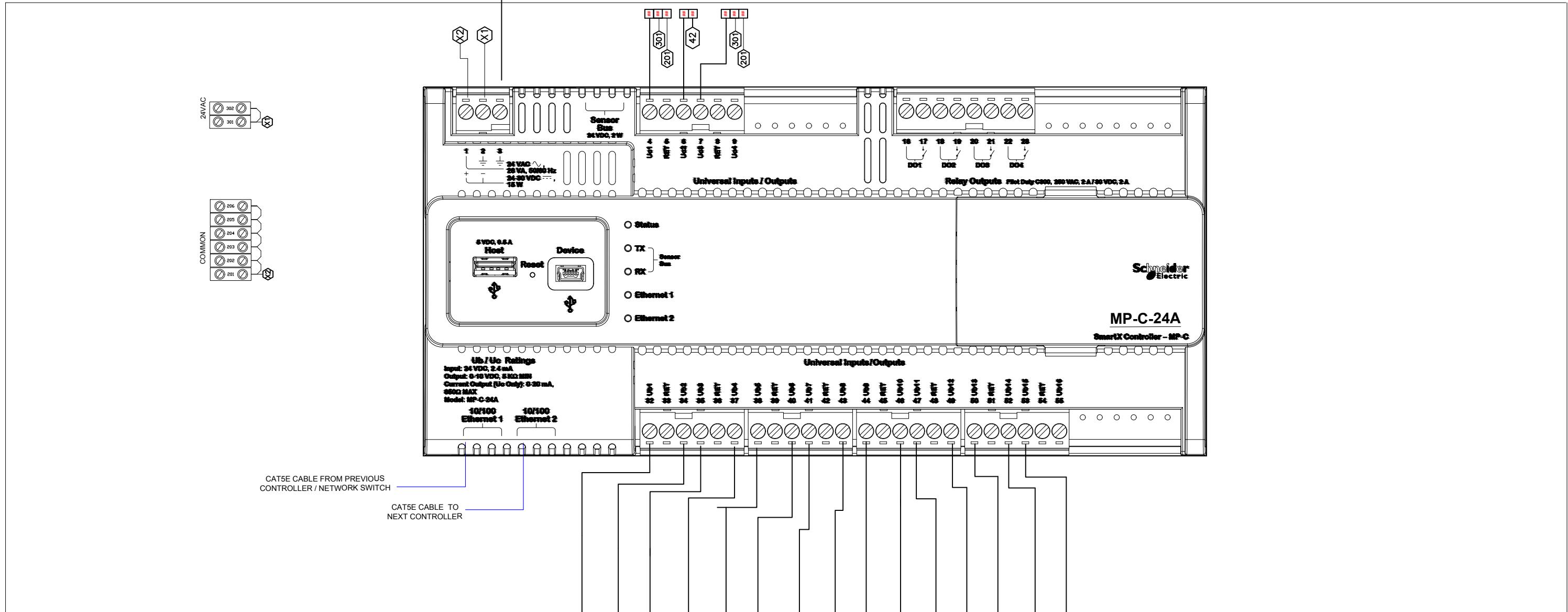
FILE:	JOB/CONT #	SALES PROJECT	APPL.	DRAWN BY:	REV.	INIT DATE
Norrest Elementary School 3551 NE 16th Ave Pompano Beach, FL 33064						

APPROVED

DATE

REV 1

REV



REV	DESCRIPTION	DATE	APPROVED	F & B AHU WIR DIA	FILE:
	REV 1				JOB/CONT #
					SALES PROJECT
					ENGINEER MANAGER
					DRAWN BY:
					DRAWN DATE
					INIT REV.
					INIT DATE
					DRAWING # 16
					DRWG #
					REV.

Norrest Elementary School
3551 NE 16th Ave
Pompano Beach, FL 33064



SYMBOL	QTY	PART #	DESCRIPTION	MANU.	SIGNAL	RANGE
	2	MP-C-24A	AS CONTROLLER	SCHNEIDER		
RE-01-02	4	CKIT-VMD1B-F24	RELAY KIT	VERIS	24 VAC COIL	N.O.
CS-01-2	4	H608	CURRENT SENSORS	VERIS	DRY CONTACT	N.O.
TE-01	2	ETD500-8	DUCT MOUNT TEMP SENSOR	SCHNEIDER	10K OHMS	-40°F TO 302°F
TE-02-03	2	ETA500-8	DUCT AVG TEMP SENSOR	SCHNEIDER	10K OHMS	-40°F TO 302°F
TE-04	2	ETO500	OUTSIDE AIR TEMP SENSOR	SCHNEIDER	10K OHMS	-40°F TO 302°F
TH-01	2	EHD110-500	DUCT TEMP/HUM SENSOR	SCHNEIDER	10K OHMS	-40°F TO 302°F
CO-01	2	CDE	CO SENSOR	VERIS	0-10V	0-2000 PPM
DPS-01	2	AFS-222	FILTER SWITCH	KELE	DRY CONTACT	NORMALLY OPEN
	8	21122	IMPACT TUBING			
AE-01-03	4	LFB24-SR-S	ACTUATOR	BELIMO	2-10V	MODULATING
FM-01	2	GTC-116-P OR EF-2000-T	OA AIRFLOW MEASURING STATION	EBTRON	DRY CONTACT	
V-01	2	SEE SCHEDULE	PICC VALVE	BELIMO	2-10V	MODULATING
	8	ZS6-RD	RED TERMINAL STRIP	ABB/KELE		
	8	ZS6-BK	BLACK TERMINAL STRIP	ABB/KELE		
	4	ZS6-PE	GROUND TERMINAL STRIP	ABB/KELE		
	8	ZS6	TERMINAL STRIP	ABB/KELE		
	8	JB6-2	JUMPER BAR	ABB/KELE		
	2	HC16124	ENCLOSURE	KELE		
	8	CS	CIRCUIT SEPERATOR	ABB/KELE		
	4	ES4	TERMINAL STRIP END STOP	ABB/KELE		

SEQUENCE OF OPERATION

RUN CONDITIONS - SCHEDULED: THE UNIT SHALL RUN BASED UPON AN OPERATOR ADJUSTABLE SCHEDULE IN ONE OF THE FOLLOWING MODES:

- OCCUPIED MODE: UNIT SHALL BE ENABLED AND OUTSIDE AIR DAMPER SHALL OPEN TO MINIMUM OPEN POSITION.
- UNOCCUPIED MODE: UNIT SHALL BE DISABLED AND OUTSIDE AIR DAMPER SHALL CLOSE.
- 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.
- EMERGENCY/SMOKE DETECTION SHUTDOWN: THE UNIT SHALL SHUT DOWN AND GENERATE AN ALARM UPON RECEIVING AN EMERGENCY/SMOKE DETECTION SIGNAL SMOKE DETECTOR PROVIDED AND INSTALLED BY FIRE ALARM CONTRACTOR.
- SUPPLY FAN: THE SUPPLY FAN SHALL RUN ON CONTINUOUS DUTY ANYTIME THE UNIT IS COMMENDED TO RUN BY THE ATC, UNLESS SHUTDOWN ON SAFETIES. TO PREVENT SHORT CYCLING, THE SUPPLY FAN SHALL HAVE A USER DEFINABLE (ADJ.) MINIMUM RUNTIME. ALARMS SHALL BE PROVIDED AS FOLLOWS:
 - SUPPLY FAN FAILURE: COMMENDED ON, BUT THE STATUS IS OFF.
 - SUPPLY FAN IN HAND: COMMENDED OFF, BUT THE STATUS IS ON.
 - SUPPLY FAN RUNTIME EXCEEDED: STATUS RUNTIME EXCEEDS A USER DEFINABLE LIMIT (ADJ.).

SUPPLY AIR CONTROL: THE SUPPLY AIR FAN SHALL OPERATED ON CONSTANT VOLUME.

COOLING MODE: WHEN THE AHU IS ENABLED BY THE ATC AND THE RETURN AIR TEMPERATURE RISES ABOVE THE SETPOINT OF (74) DEGREES F. (ADJ), THE COOLING MODE SHALL BE ENABLED , THE ATC CONTROLLER SHALL MONITOR THE COIL LEAVING AIR TEMPERATURE SENSOR, MODULATE THE COOLING COIL CONTROL VALVE TO MAINTAIN THE COIL LEAVING AIR TEMPERATURE SETPOINT OF (55) DEGREES F. (ADJ) AND MODULATE THE COIL FACE AND BY-PASS DAMPERS TO MAINTAIN THE RETURN AIR TEMPERATURE SETPOINT.

HEATING MODE: THE HEATING MODE IS ENABLED BASED ON RETURN AIR TEMPERATURE SENSOR SETPOINT OF (68) DEGREES F. (ADJ) IF THE SUPPLY AIR TEMPERATURE IS LOWER THAN THE SETPOINT THEN THE HEATING MODE SHALL

BE ENABLED. IN THE HEATING MODE THE "SCR" ELECTRIC DUCT HEATER SHALL BE ENERGIZED AND MODULATED AS REQUIRED TO MAINTAIN THE RETURN AIR TEMPERATURE SETPOINT, THE CHW COIL CONTROL VALVE SHALL BE FULLY CLOSED. WHEN THE RETURN AIR TEMPERATURE SETPOINT !SATISFIED THE EDH SHALL BE DE-ENERGIZED. THE UNIT SHALL SWITCH BETWEEN HEATING AND COOLING MODE AS NECESSARY TO MAINTAIN THE RETURN AIR TEMPERATURE SETPOINT. CHW COOLING COIL CONTROL VALVE SHALL BE FULLY CLOSED WHEN HEATING MODE IS ENABLED.

SUPPLY/ RETURN /MIXED/ COIL LEAVING AIR TEMPERATURE: THE SYSTEM SHALL MONITOR THE SUPPLY/ RETURN/ MIXED/ COIL LEAVING AIR TEMPERATURES.

RETURN AIR HUMIDITY: THE CONTROLLER SHALL MONITOR THE RETURN AIR HUMIDITY. IF THE RA HUMIDITY SENSOR IS GREATER THAN 60% (ADJ), THE EDH SHALL BE ENERGIZED AND THE COOLING COIL CONTROL VALVE SHALL BE FULLY OPEN UNTIL THE RA HUMIDITY SENSOR REACHES THE SETPOINT 50% (ADJ), THEN EDH SHALL BE DE-ENERGIZED AND COOLING COIL CONTROL VALVE SHALL MODULATE TO SATISFY RETURN AIR TEMPERATURE SET POINT.

OUTSIDE-AIR (OA) / RETURN-AIR (RA) MOTORIZED DAMPERS: DURING OCCUPIED MODE THE OA DAMPER SHALL OPEN TO MAINTAIN THE MINIMUM OA REQUIREMENTS. DURING UNOCCUPIED MODE AND OPTIMAL START UP TIME THE OA DAMPER SHALL CLOSE AND THE RA DAMPER SHALL OPEN ALLOWING MAXIMUM AIR RECIRCULATION.

RELIEF AIR DAMPER A BAROMETRIC (GRAVITY TYPE) PRESSURE DAMPER: SHALL BE BALANCED TO MAINTAIN A POSITIVE BUILDING PRESSURE OF 0.1 IN WG,

MINIMUM OUTSIDE AIR VENTILATION -CARBON DIOXIDE (CO2) DEMAND CONTROLLED: WHEN IN THE OCCUPIED MODE, THE CONTROLLER SHALL MONITOR THE RA CO2 CONCENTRATION LEVELS. THE CONTROLLER SHALL MODULATE THE OUTSIDE AIR DAMPER OPEN AND THE RETURN AIR DAMPER CLOSE ON RISING CO2 CONCENTRATIONS, OVERRIDING NORMAL DAMPER OPERATION, TO MAINTAIN A RA CO2 CONCENTRATION SETPOINT OF 900 PPM (ADJ.). AN ALARM SHALL BE SENT TO THE WORKSTATION IF THE CO2 LEVELS ARE GREATER THAN 10 % OF THE SETPOINT (ADJ).

AIR FLOW MEASURING STATION (AFMS): THE CONTROLLER SHALL MEASURE THE OA FLOW AND MODULATE THE OA AND RA DAMPERS TO MAINTAIN THE MINIMUM OA VENTILATION REQUIREMENTS. THE CONTROLLER SHALL GENERATE AN ALARM WHEN THE SYSTEM IS 10 % BELOW OF THE DESIGN MINIMUM VENTILATION.

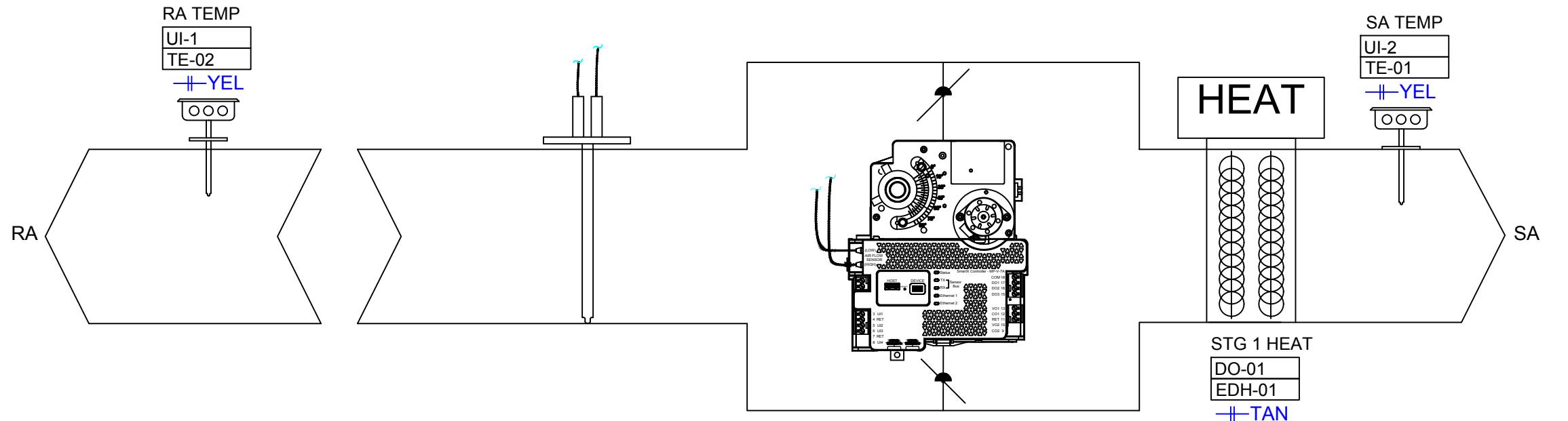
FILTER STATUS: A DIFFERENTIAL PRESSURE SWITCH SHALL MONITOR THE DIFFERENTIAL PRESSURE ACROSS THE FILTERS WHEN THE FAN IS RUNNING. ALARMS SHALL BE PROVIDED AS FOLLOWS:

LOADED (DIRTY) FILTER - PRESSURE DIFFERENTIAL GREATER THAN OF ONE (1") INCH (ADJ).

TITLE: TYP F&B AHU SOP & PRT		DRAWING # 17	
FILE:	JOB/CONT #	SALES PROJECT	APPL. DRAWN BY:
DATE:	ENGINEER MANAGER	PROJECT ENGINEER	REV.
APPROVED:	DATE:	INIT DATE	
ROTH		Norcrest Elementary School 3951 NE 16th Ave Pompano Beach, FL 33064	
DESCRIPTION:	REV 1		
DATE:	REV:		
APPROVED:	DATE:		
S U T H E A B T		Approved by User Management Drawing	

SYMBOL	QTY	PART #	DESCRIPTION	MANU.	SIGNAL	RANGE
	8	MP-V-7A	IP CONTROLLER	SCHNEIDER		
TE-01-02	10	ETD500-8	DUCT MOUNT TEMP SENSOR	SCHNEIDER	10K OHMS	-40°F TO 302°F

TYPICAL OF VAV-6-2, 6-3, 6-4



SEQUENCE OF OPERATION:

VAVS BOXES:

MODE CONTROL

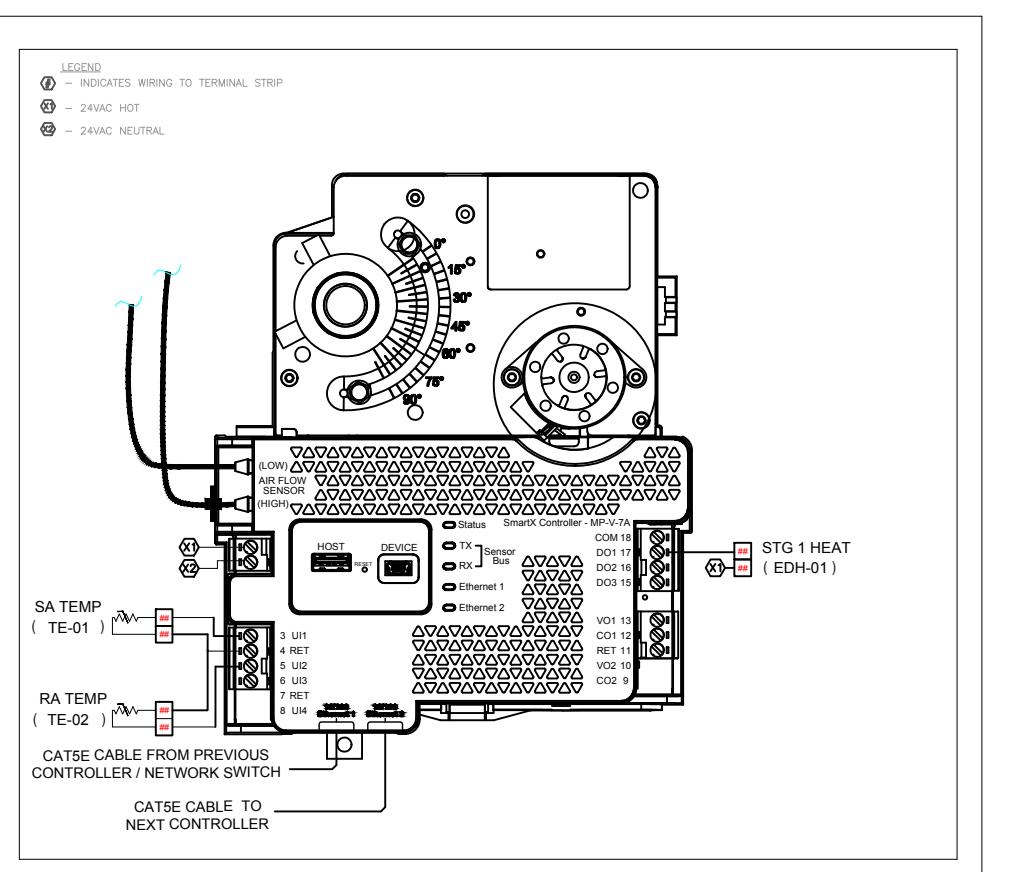
THE VAV BOX SHALL BE INDEXED TO THE OCCUPIED OR UNOCCUPIED MODE BY ITS ASSOCIATED AHU. WHEN THE AHU IS IN OCCUPIED MODE, THE VAV BOX SHALL BE IN OCCUPIED MODE. WHEN THE AHU IS IN UNOCCUPIED MODE, THE VAV BOX SHALL BE IN UNOCCUPIED MODE. DURING UNOCCUPIED MODE, THE BOX SHALL BE CLOSED. DURING UNOCCUPIED MODE, UPON AHU ACTIVATION, THE BOX SHALL GO TO OCCUPIED MODE OPERATION.

COOLING MODE

COOLING MODE
WHEN THE SPACE TEMPERATURE EXCEEDS THE COOLING TEMPERATURE SETPOINT, THE BOX SHALL MODULATE OPEN TO INCREASE AIRFLOW. WHEN THE SPACE TEMPERATURE DROPS BELOW THE COOLING TEMPERATURE SETPOINT, THE BOX SHALL MODULATE TO ITS MINIMUM AIRFLOW POSITION.

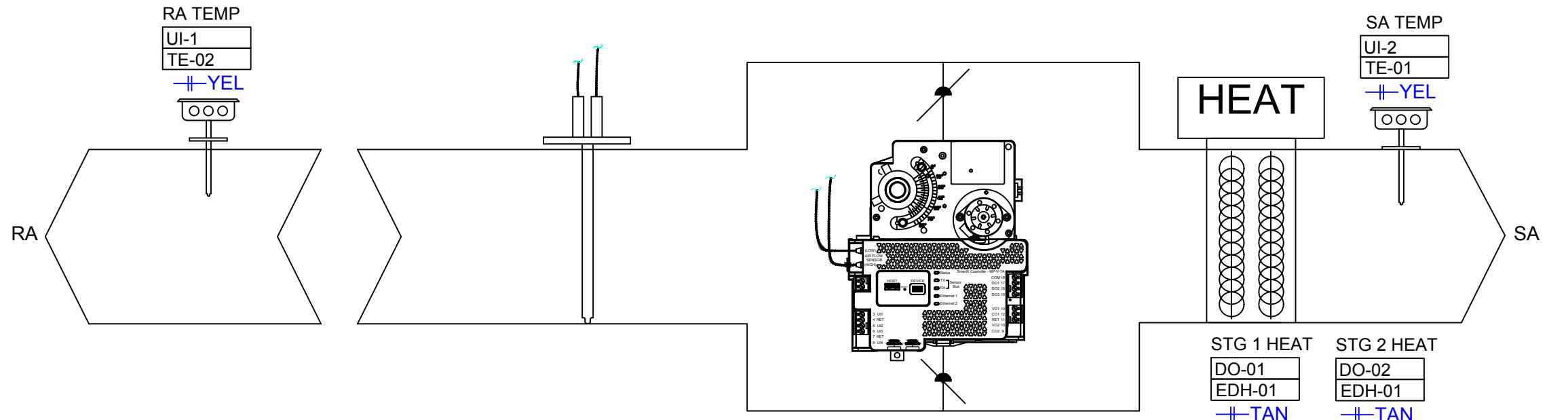
HEATING MODE (VAV BOXES WITH ELECTRIC HEAT)

WHEN THE SPACE TEMPERATURE DROPS BELOW THE HEATING TEMPERATURE SETPOINT AND THE BOX IS AT ITS MINIMUM HEATING AIRFLOW POSITION, THE ELECTRIC HEAT SHALL BE ENABLED AND MODULATE TO MAINTAIN THE HEATING TEMPERATURE SETPOINT. WHEN THE SPACE TEMPERATURE RISES ABOVE THE HEATING SETPOINT, THE ELECTRIC HEAT SHALL BE DISABLED AND THE VAV BOX WILL MODULATE TO ITS MINIMUM AIRFLOW POSITION.



SYMBOL	QTY	PART #	DESCRIPTION	MANU.	SIGNAL	RANGE
	8	MP-V-7A	IP CONTROLLER	SCHNEIDER		
TE-01-02	10	ETD500-8	DUCT MOUNT TEMP SENSOR	SCHNEIDER	10K OHMS	-40°F TO 302°F

TYPICAL OF VAV-6-1A, 6-1B, 6-1C,
-1-1, 9-1-2



SEQUENCE OF OPERATION:

VAVS BOXES:

MODE CONTROL

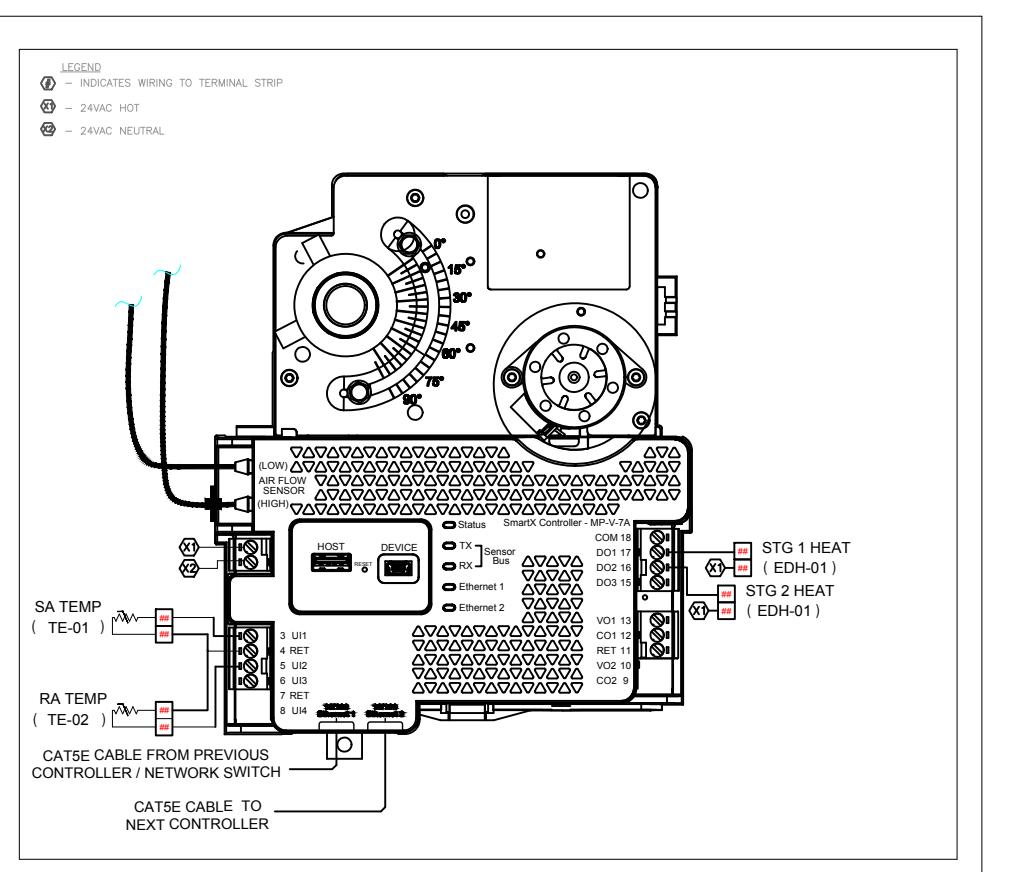
THE VAV BOX SHALL BE INDEXED TO THE OCCUPIED OR UNOCCUPIED MODE BY ITS ASSOCIATED AHU. WHEN THE AHU IS IN OCCUPIED MODE, THE VAV BOX SHALL BE IN OCCUPIED MODE. WHEN THE AHU IS IN UNOCCUPIED MODE, THE VAV BOX SHALL BE IN UNOCCUPIED MODE. DURING UNOCCUPIED MODE, THE BOX SHALL BE CLOSED. DURING UNOCCUPIED MODE, UPON AHU ACTIVATION, THE BOX SHALL GO TO OCCUPIED MODE OPERATION.

COOLING MODE

COOLING MODE
WHEN THE SPACE TEMPERATURE EXCEEDS THE COOLING TEMPERATURE SETPOINT, THE BOX SHALL MODULATE OPEN TO INCREASE AIRFLOW. WHEN THE SPACE TEMPERATURE DROPS BELOW THE COOLING TEMPERATURE SETPOINT, THE BOX SHALL MODULATE TO ITS MINIMUM AIRFLOW POSITION.

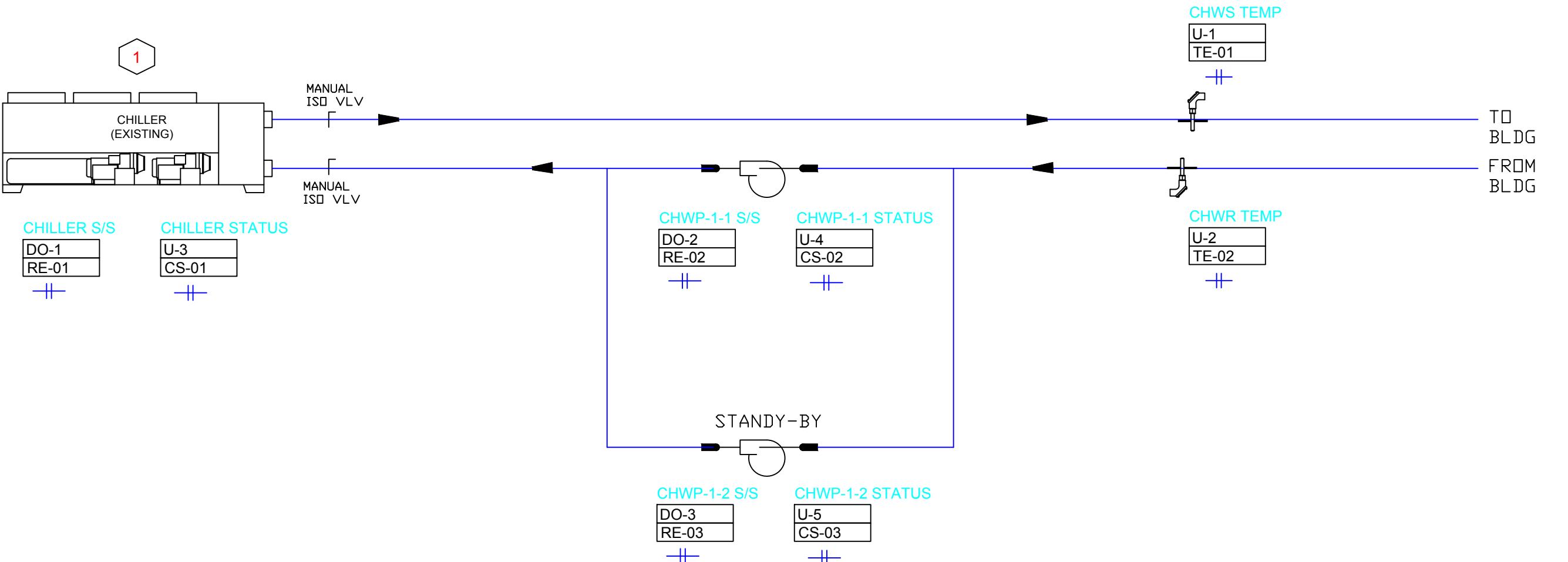
HEATING MODE (VAV BOXES WITH ELECTRIC HEAT)

WHEN THE SPACE TEMPERATURE DROPS BELOW THE HEATING TEMPERATURE SETPOINT AND THE BOX IS AT ITS MINIMUM HEATING AIRFLOW POSITION, THE ELECTRIC HEAT SHALL BE ENABLED AND MODULATE TO MAINTAIN THE HEATING TEMPERATURE SETPOINT. WHEN THE SPACE TEMPERATURE RISES ABOVE THE HEATING SETPOINT, THE ELECTRIC HEAT SHALL BE DISABLED AND THE VAV BOX WILL MODULATE TO ITS MINIMUM AIRFLOW POSITION.



NOTES:
TYPICAL OF BLDG 10 CHILLER

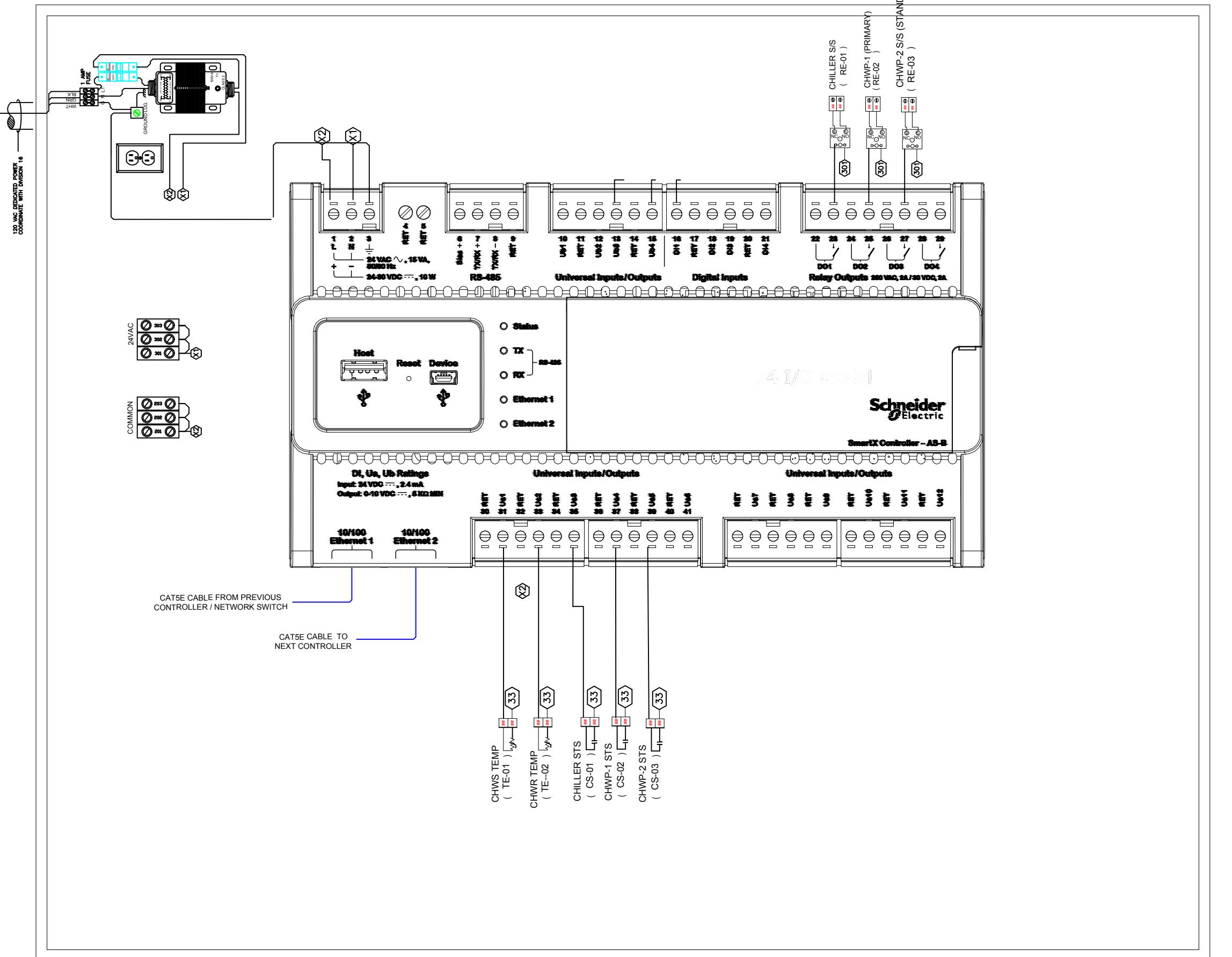
① EXISTING CHILLER IS TO REMAIN



POINT LIST

POINT NUMBER	POINT NAME	AI	DI	AO	DO	ALARM	TREND
U-1	CHILLER STATUS		X			X	
U-2	CHWP-1-1 STATUS		X			X	
U-3	CHWP-1-2 STATUS		X			X	
U-4	CHWS TEMP	X				X	X
U-5	CHWR TEMP	X				X	X
DO-1	CHILLER S/S				X	X	X
DO-2	CHWP-1-1 S/S				X	X	X
DO-3	CHWP-1-2 S/S				X	X	X

REV	DESCRIPTION	DRAWING	
		DRWG #	INIT DATE
	BLDG 10 CHILLER DIA	20	
	Norcrest Elementary School 3951 NE 16th Ave Pompano Beach, FL 33064		



REV	DESCRIPTION	DATE	APPROVED	JOB/CONT #	FILE:
				SALES PROJECT	JOB/CONT #
				ENGINEER MANAGER	APPL.
	ROTH	BLDG 10 CHILLER WIR DIA			

Norrest Elementary School
3951 NE 16th Ave
Pompano Beach, FL 33064



DRAWING
21

Normal • User Management • Logging

SYMBOL	QTY	PART #	DESCRIPTION	MANU.	SIGNAL	RANGE
	1	AS-B-24	AS CONTROLLER	SCHNEIDER		
	1	SXWASBCON10001	AS-B CONNECTOR KIT			
RE-01-03	3	CKIT-VMD1B-F24	RELAY KIT	VERIS	24 VAC COIL	NORMALLY OPEN
CS-01-03	3	H608	CURRENT SWITCH	VERIS	DRY CONTACT	NORMALLY OPEN
TE-01-02	2	ETI500-6	IMMERSION TEMP SENSOR	SCHNEIDER	10K OHMS	-40°F TO 302°F
TE-01-02	2	ETI-WELL-6S	WELL	SCHNEIDER		
	5	CMT-4	TERMINAL BLOCK	ALTEC		
	1	X100CAA	TRANSFORMER	VERIS		
	1	A-30R2410HCR	ENCLOSURE	NEMA		
	1	51012218	POWER RECEPICAL	KELE		

SEQUENCE OF OPERATION FOR CHILLER PLANT:

SEQUENCE OF OPERATIONS:

- RUN CONDITIONS: THE CHILLER AND CHILLED-WATER PUMPS SHALL BE ENABLED WHEN ANY OF THE CHILLED-WATER SOURCE AHU(S) OR FC(S) ARE ENABLED.
- CHILLER SHALL NOT START UNTIL WATER FLOW HAS BEEN PROVEN THROUGH THE EVAPORATOR.
- THE LEAD CHILLED-WATER PUMP SHALL START AND RUN CONTINUOUSLY ANY TIME THE CHILLED WATER SYSTEM HAS BEEN ACTIVATED. WHEN THE FLOW SWITCH INDICATES FLOW CONDITIONS, THE CHILLER SHALL RUN. WHEN THE LEAD CHILLED-WATER PUMP FAILS, THE STAND-BY PUMP SHALL BE ENABLED AND OPERATE AS A BACK UP TO THE LEAD PUMP. THE ATC CONTROLS SYSTEM SHALL ALTERNATE THE LEAD/ STAND-BY DESIGNATIONS ON A DAILY BASIS.
- CHILLED WATER SHALL BE MAINTAINED AT 42 DEGREES F. BY THE INTERNAL CONTROLLERS IN THE CHILLER.
- CHILLER AND CHILLED-WATER PUMPS SHALL BE DISABLED WHEN ALL OF THE AHU(S) AND FC(S) ARE DISABLED. ON SHUT-DOWN ALLOW CHILLED-WATER PUMP TO RUN AN ADDITIONAL FIVE (5) MINUTES AFTER THE CHILLER HAVE STOPPED. FIVE MINUTES AFTER THE CHILLER HAVE STOPPED, THE CHILLED-WATER PUMP SHALL BE DISABLED.

ALARMS SHALL BE PROVIDED AS FOLLOWS:

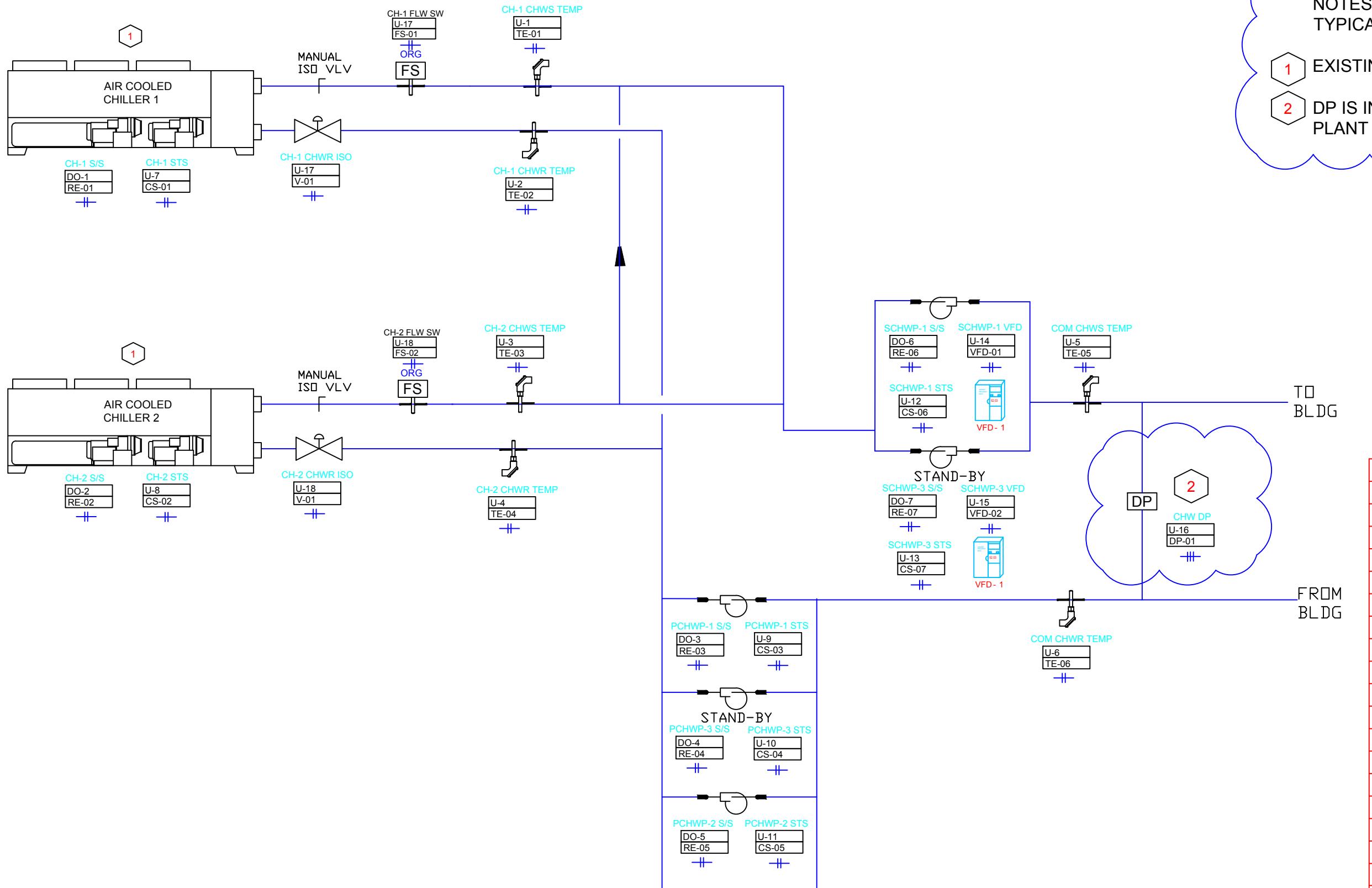
CHILLED-WATER PUMPS FAILURE: COMMANDED ON, BUT THE STATUS IS OFF.

CHILLER FAILURE: COMMANDED ON, BUT THE STATUS IS OFF.

REV	DESCRIPTION	DATE	APPROVED	BLDG	10	CHILLER	SOP & PRT	FILE:	DRAWING
				JOB/CONT #	SALES	PROJECT	APPL.	DRWG #	22
				ENGINEER	MANAGER	ENGINEER	DRAWN BY:	REV.	
									INIT DATE
Norcrest Elementary School 3951 NE 16th Ave Pompano Beach, FL 33064									
 ROTH Roth Construction General Contracting • Residential • Commercial Residential • Commercial • Institutional General Contracting • Residential • Commercial Residential • Commercial • Institutional									

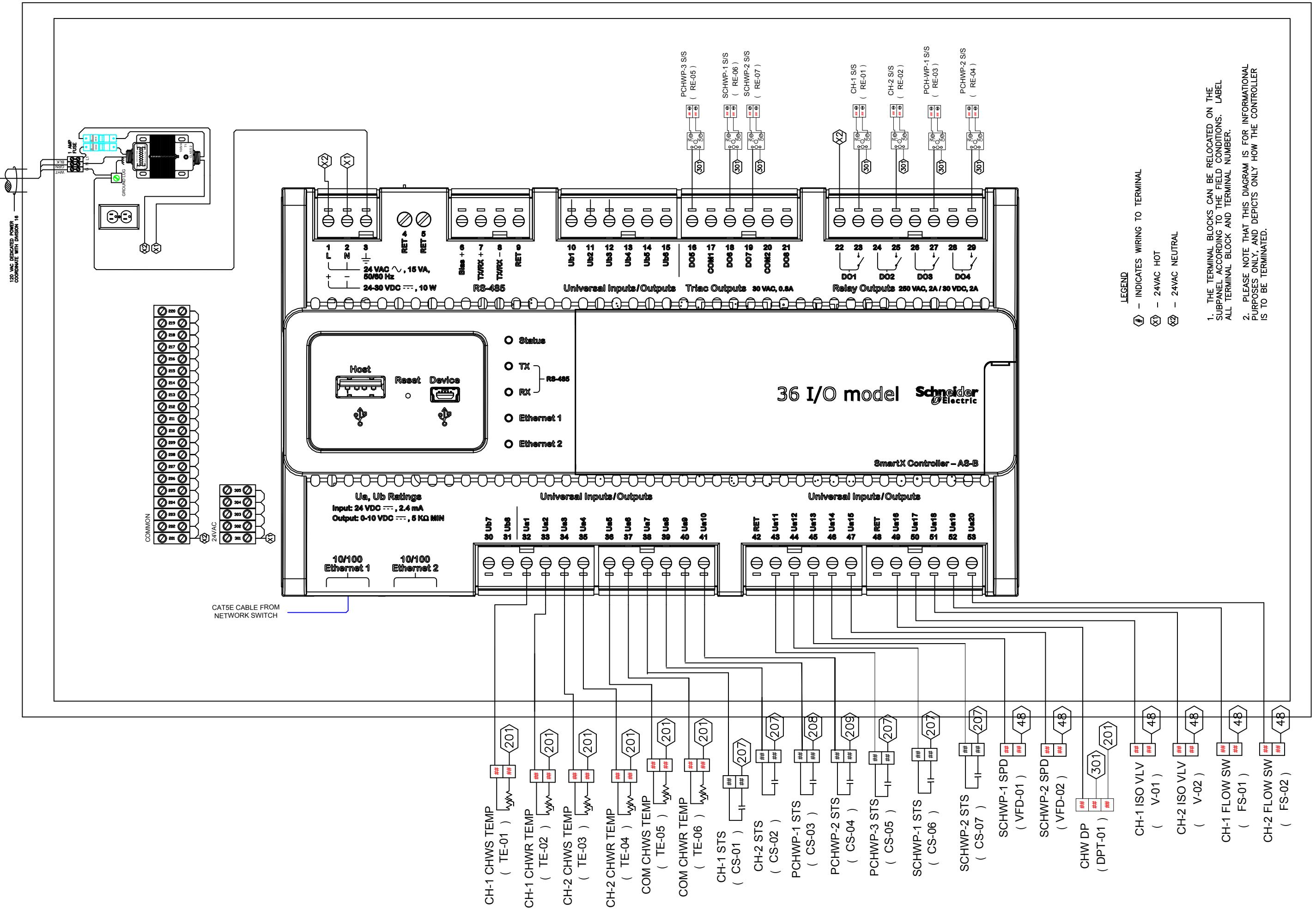
NOTES:
TYPICAL OF BLDG 17 CHILLER

- 1 EXISTING CHILLER IS TO REMAIN
2 DP IS INSTALLED AT THE CHILLER PLANT



POINT LIST						
POINT NAME	AI	DI	AO	DO	ALARM	TREND
CH-1 CHWS TEMP	X				X	X
CH-1 CHWR TEMP	X				X	X
CH-2 CHWS TEMP	X				X	X
CH-2 CHWR TEMP	X				X	X
COM CHWS TEMP	X				X	X
COM CHWR TEMP	X				X	X
CH-1 STATUS		X			X	
CH-2 STATUS		X			X	
PCHWP-1 STS		X			X	
PCHWP-2 STS		X			X	
PCHWP-3 STS		X			X	
SCHWP-1 STS		X			X	
SCHWP-2 STS		X			X	
CH-1 FLOW SWITCH	X				X	
CH-2 FLOW SWITCH	X				X	
CHW DP	X				X	X
SCHWP-1 VFD		X			X	X
SCHWP-2 VFD		X			X	X
CH-1 CHWR ISO VLV	X				X	X
CH-2 CHWR ISO VLV	X				X	X
CH-1 S/S		X	X	X		
CH-2 S/S		X	X	X		
PCHWP-1 S/S		X	X	X		
PCHWP-2 S/S		X	X	X		
PCHWP-3 S/S		X	X	X		
SCHWP-1 S/S		X	X	X		
SCHWP-2 S/S		X	X	X		

REV	DESCRIPTION	REV 1
	APPROVED	
	DATE	
	REVIEWED	
	INITIAL	
	MANUFACTURED	
	TESTED	
	SHIPPED	
	RECEIVED	
	INSPECTED	
	MAINTAINED	
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REVISION		DESCRIPTION	DATE	APPROVED	BLDG	17 CHILLER WIR	DIA	FILE:	DRAWING
					Norcrest Elementary School 3951 NE 16th Ave Pompano Beach, FL 33064	Sales Engineer	Project Manager	Appl. Engineer	Drawn By: REV.
ROTH									DRWG # 24
									INIT DATE

ROTH
SOUTH EAST AUTOMATION • CTC Management • Lighting

SYMBOL	QTY	PART #	DESCRIPTION	MANU.	SIGNAL	RANGE
	1	AS-B-36	AS CONTROLLER	SCHNEIDER		
	1	SXWASBCON10001	AS-B CONNECTOR KIT			
RE-01-07	7	CKIT-VMD1B-F24	RELAY KIT	VERIS	24 VAC COIL	NORMALLY OPEN
CS-01-07	7	H608	CURRENT SWITCH	VERIS	DRY CONTACT	NORMALLY OPEN
TE-01-04	4	ETI500-6	IMMERSION TEMP SENSOR	SCHNEIDER	10K OHMS	-40°F TO 302°F
TE-01-04	4	ETI-WELL-6S	WELL	SCHNEIDER		
DPT-01	1	2301-050PD-2F-2D-B	DIFFERENTIAL PRESSURE	SETRA		
FS-01 - 02	2	LU28-01-B	FLOW SWITCH	KELE		
	5	CMT-4	TERMINAL BLOCK	ALTEC		
	1	X100CAA	TRANSFORMER	VERIS		
	1	A-30R2410HCR	ENCLOSURE	NEMA		
	1	51012218	POWER RECEPTICAL	KELE		

SEQUENCE OF OPERATION FOR CHILLER PLANT:

- RUN CONDITIONS: THE CHILLERS AND CHILLED-WATER PUMPS SHALL BE ENABLED AND/OR DISABLED BY EMS WHEN ANY OF THE CHILLED-WATER SOURCE AHU(S) OR FC(S) ARE ENABLED.
 - CHILLERS SHALL NOT START UNTIL WATER FLOW HAS BEEN PROVEN THROUGH THE EVAPORATOR .
 - CH-1 MOTORIZED VALVE SHALL OPEN, CH-2 MOTORIZED VALVE SHALL REMAIN CLOSED. CHILLED-WATER PUMPS PCHWP-1 AND SCHWP-1 SHALL START AND RUN CONTINUOUSLY ANY TIME THE CHILLED WATER SYSTEM IS ACTIVATE SWITCH (FS-1) INDICATES FLOW CONDITIONS, CHILLER CH-1 SHALL RUN, CH-2 REMAINS OFF.
 - WHEN THE SET POINTS ARE NOT MET BY CH-1, CH-2 WILL COME ONLINE. CH-2 MOTORIZED VALVE SHALL OPEN, CH-1 MOTORIZED VALVE SHALL REMAIN OPEN. CHILLED-WATER PUMP PCHWP-2 SHALL START AND RUN CONTINUOUSLY
 - SWITCH (FS-2) INDICATES FLOW CONDITIONS, CHILLER CH-2 SHALL RUN, CH-1 REMAINS ON. WHEN CH-2 COMPRESSOR UNLOADS 100%, CH-2 SHALL SHUT DOWN. PCHWP-2 SHUTS DOWN AND CH-2 MOTORIZED VALVE CLOSES
 - WHEN THE LEAD CHILLED-WATER PUMP (SCHWP-1) FAILS, THE LAG (STAND-BY) PUMP SCHWP-2 SHALL BE ENABLED AND OPERATE AS A BACK UP TO THE LEAD PUMP. THE ATC CONTROLS SYSTEM SHALL ALTERNATE THE LEAD/ LAG DESIGNATIONS ON A DAILY BASIS.
 - SCHWP-1 SHALL BE MODULATED BY VFD BASED ON THE DPT SENSOR.
 - CHILLED WATER SHALL BE MAINTAINED AT 42 °F. BY THE MANUFACTURER'S INTERNAL CONTROLLERS IN THE CHILLERS.
 - CHILLERS AND CHILLED-WATER PUMPS SHALL BE DISABLED WHEN ALL OF THE AHU(S) AND FC(S) ARE DISABLED. ON SHUT-DOWN ALLOW CHILLED-WATER PUMP TO RUN AN ADDITIONAL FIVE (5) MINUTES AFTER THE CHILLERS HAVE STOPPED. THEN THE CHILLED-WATER PUMP SHALL BE DISABLED.

ALARMS: ALARMS SHALL BE PROVIDED AS FOLLOWS:

- CHILLED-WATER PUMPS FAILURE: COMMANDED ON, BUT THE STATUS IS OFF.
 - CHILLERS FAILURE: COMMANDED ON, BUT THE STATUS IS OFF.
 - CHILLED-WATER PUMPS TROUBLE: COMMANDED OFF, BUT THE STATUS IS ON.
 - CHILLERS TROUBLE: COMMANDED ON, BUT THE STATUS IS OFF.



