ROTH SOUTHEAST
Automation • Energy Management • Lighting

CMC1250259

To: **Integ Miami LLC** **Date:** **May 11, 2020**
Attn: **Milagros Suarez** **Re:** **Riverglades ES**

Please see the responses to the returned controls submittal for Riverlades Elementary School dated 02/06/20.

1. **CX-2 Dwg #9: Describe hot gas reheat control sequence. Indicate leaving air temperature setpoints.** Sequence updated per manufacturer provided sequence of operations.
2. **CX-6 Dwg #11: Identify interlocked exhaust fans.** Exhaust fan interlock will not be determined until installation begins for field verification of interlocks. Interlock schedule will be added to as builts.
3. **CX-10 Dwg #13: indicate that during heating mode the CHW control valve shall be closed.** If heater is field verified, note will be added to as builts.
4. **CX-11 Dwg #14: There is no electric heater shown. Identify interlocked exhaust fans.** Will field verify if heater exists and, if so, what type. Exhaust fan interlock will not be determined until installation begins for field verification of interlocks. Interlock schedule will be added to as builts if required.
5. **CX-14 Dwg #16: indicate that during heating mode the CHW control valve shall be closed.** If heater is field verified, note will be added to as builts.
6. **CX-17 Dwg #17: Identify interlocked exhaust fans.** Exhaust fan interlock will not be determined until installation begins for field verification of interlocks. Interlock schedule will be added to as builts.
7. **CX-20 Dwg #19: indicate that during heating mode the CHW control valve shall be closed.** If heater is field verified, note will be added to as builts.
8. **CX-21 Dwg #21: There is no electric heater shown.** Will field verify if heater exists and, if so, what type.
9. **CX-24 Dwg #20: Identify interlocked exhaust fans.** Exhaust fan interlock will not be determined until installation begins for field verification of interlocks. Interlock schedule will be added to as builts.
10. **CX-27 Dwg #22: indicate that during heating mode the CHW control valve shall be closed.** If heater is field verified, note will be added to as builts.
11. **CX-28 Dwg #23: There is no electric heater shown.** Will field verify if heater exists and, if so, what type.
12. **CX-29 Dwg #23: Identify interlocked exhaust fans.** Exhaust fan interlock will not be determined until installation begins for field verification of interlocks. Interlock schedule will be added to as builts.
13. **CX-31 Dwg #25: Include heating control sequence if applicable.** Will field verify if heater exists and, if so, what type.
14. **CX-32 Dwg #26: Explain why would an outdoor air AFMS be required when the supply fan operates at constant speed. EOR to clarify with SBBC.** EOR to confirm whether or not OAFMS is necessary or can be removed.
15. **CX-33 Dwg #26: Control diagram not provided in permitted drawings. EOR to provide.** EOR to confirm if drawing provided in controls submittal is adequate for control of unit.
16. **CX-34 Dwg #26: Identify interlocked exhaust fans.** Exhaust fan interlock will not be determined until installation begins for field verification of interlocks. Interlock schedule will be added to as builts.
17. **CX-35 Dwg #29: CEP control diagram is incorrect on the chilled water side; there is no decoupling line shown. Control diagram is also incorrect on the design drawings.** Chilled water system layout will be field verified and drawings will be updated based on any changes found for as builts.
18. **CX-36 Dwg #29: CEP building differential pressure transmitter is not shown. Show the transmitter and exact physical location.** Will field verify if DP exists and, if so, drawings will be updated accordingly for as builts.
19. **CX-37 Dwg #31: CEP sequences of operation are incomplete. They do not represent a primary / secondary pumping system. Differential pressure / pump speed control sequence is missing. Chiller sequence is missing. Design drawings are also showing incomplete sequences of operation.** Chilled water system layout will be field verified and drawings will be updated based on any changes found for as builts.

Sincerely,

Dale Chung
Roth Southeast
Project Manager

ROTH SOUTHEAST
Automation • Energy Management • Lighting

CMC1250259

To: **Integ Miami LLC** **Date:** **May 11, 2020**
Attn: **Milagros Suarez** **Re:** **Riverglades ES**

Please see the responses to the returned controls submittal for Riverglades Elementary School dated 1/31/20.

1. **Dwg #9: The hot gas reheat control sequence for the 100% OA Unit can be obtained from the manufacturers of the 100% OA Unit. Resubmit with this control sequence shown for reference only.** Sequence updated per manufacturer provided sequence of operations.
2. **Dwg #13: Indicate that during heating mode the chw valve shall be closed.** Sequence shall be updated.
3. **Dwg #14: Show electric heat. Identify interlocked exhaust fans.** Any updates to the drawings based on field verification will be made to the as built drawings.
4. **Dwg #16: Indicate that during heating mode the chw valve shall be closed.** Sequence shall be updated.
5. **Dwg #17: Identify interlocked exhaust fans.** Any updates to the drawings based on field verification will be made to the as built drawings.
6. **Dwg #13: Indicate that during heating mode the chw valve shall be closed.** Sequence shall be updated.
7. **Dwg #20: Show electric heat.** Any updates to the drawings based on field verification will be made to the as built drawings.
8. **Dwg #22: Indicate that during heating mode the chw valve shall be closed.** Sequence shall be updated.
9. **Dwg #23: Show electric heat.** Any updates to the drawings based on field verification will be made to the as built drawings.
10. **Dwg #23: Provide the CCLA Temp Sensor shown in the permitted drawings.** Sensor to be added for units that have electric heat.
11. **Dwg #25: Show electric heat.** Any updates to the drawings based on field verification will be made to the as built drawings.
12. **Dwg #26: Identify interlocked exhaust fans.** Any updates to the drawings based on field verification will be made to the as built drawings.
13. **Dwg #29: Provide a revised CEP control diagram.** Any updates to the drawings based on field verification will be made to the as built drawings.
14. **Dwg #31: Provide a revised CEP control diagram and sequence of operation.** Any updates to the drawings based on field verification will be made to the as built drawings.
15. **Provide responses to each commissioning comment in commissioning submittal review number CX-15900-2 with a "Date Returned" of 02-06-2020.** Will provide responses to commissioning sheet.

Sincerely,

Dale Chung
Roth Southeast
Project Manager

Riverglades Elementary School
#3019050

PROJECT LOCATION
7400 PARKSIDE DRIVE
PARKLAND, FL 33067

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

5/11/20

MATERIAL LIST

PRODUCT DATA SHEETS

SUBMITTAL DRAWINGS

ROTH SOUTHEAST	Project Information:	RIVERGLADES ELEMENTARY SCHOOL	Project Number:	3019050
2260 SW 66TH TERR.		7400 PARKSIDE DRIVE	Project Engineer:	B.V.
DAVIE, FL 33317		PARKLAND, FL 33067	Date:	8/9/2019
954-423-6640				

MATERIAL LIST

PART NUMBER	DESCRIPTION	MANUFACTURER	CUT SHEET #
SXWAUTSVR10001	AS CONTROLLER	SCHNEIDER	1-6
SXWTBASW10001	AS TERMINAL BASE	SCHNEIDER	1-6
SXWPS24VX10001	POWER SUPPLY	SCHNEIDER	7-10
SXWTBPS10001	POWER SUPPLY BASE	SCHNEIDER	7-10
SXWAO8XXX10001	AS AO MODULE	SCHNEIDER	11-15
SXWTBIOW110001	AS IO MODULE BASE	SCHNEIDER	11-15
SXWDOC8XX10001	AS DO MODULE	SCHNEIDER	16-17
SXWUI16XX10001	AS UI MODULE	SCHNEIDER	18-19
ESW105	5-PORT ETHERNET SWITCH	B&B ELECTRONICS	20-21
MP-C-15A	IP CONTROLLER	SCHNEIDER	22-38
MP-C-24A	IP CONTROLLER	SCHNEIDER	22-38
AS-B-24	SMARTX CONTROLLER	SCHNEIDER	39-49
ETD500-6	DUCT MOUNTED TEMP SENSOR	SCHNEIDER	50-53
ETA500-12	DUCT MOUNTED AVG TEMP SENSOR	SCHNEIDER	50-53
ETI500-6	IMMERSION TEMP SENSOR	SCHNEIDER	50-53
ETI-WELL-6S	WELL	SCHNEIDER	50-53
CDE	CO2 SENSOR	SCHNEIDER	54-55
EHD110-500	DUCT MOUNT TEMP/HUMIDITY SENSOR	SCHNEIDER	56-57
AFS-222	DIFFERENTIAL PRESSURE SWITCH	CLEVLAND CONTROLS	58-59
H608	CURRENT SENSORS	KELE	60-61
B325+ARB24-SR	3-WAY VALVE	BELIMO	62-64
B331+ARB24-SR	3-WAY VALVE	BELIMO	62-64
B339+ARB24-SR	3-WAY VALVE	BELIMO	62-64
AFB24-SR-S	DAMPER ACTUATOR	BELIMO	65-67
CKIT-VM1B-F24	RELAY KIT	VERIS	68-69
CMT-4	TERMINAL BLOCK	ALTEC	70
RET3826	ENCLOSURE	KELE	71
51012218	POWER RECEPTICAL	KELE	72
X100CAA	TRANSFORMER	VERIS	73-74
DCP-1.5-W	1.5A POWER SUPPLY	KELE	75

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/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 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.

Web Services support

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

EcoStruxure Web Services, Schneider Electric's Web Services standard, is natively supported in the Automation Server. 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

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.

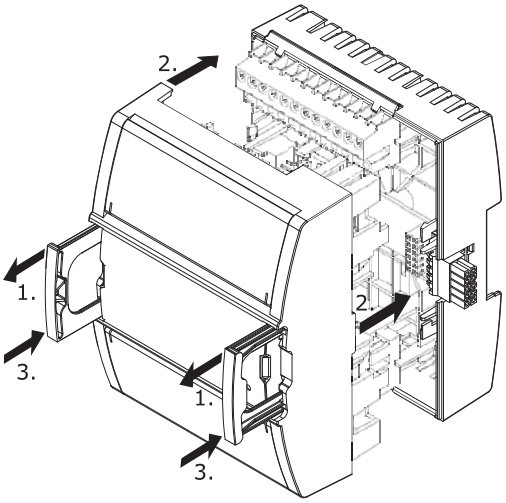


Figure: Two-piece design

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

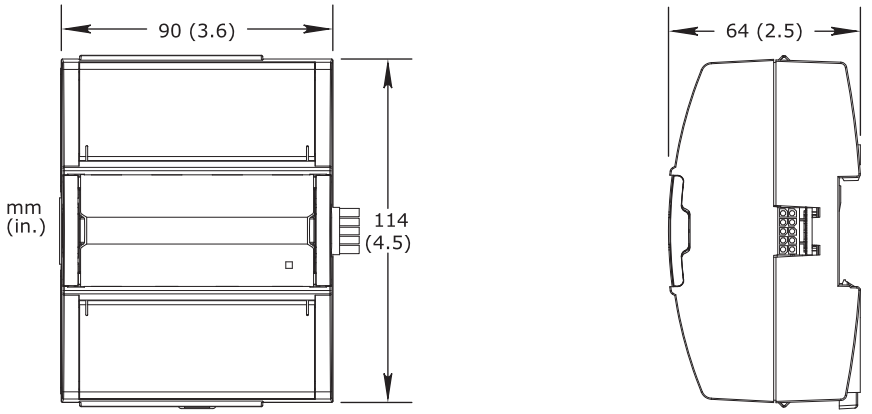
Plastic rating.....UL94-5VB

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.)



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

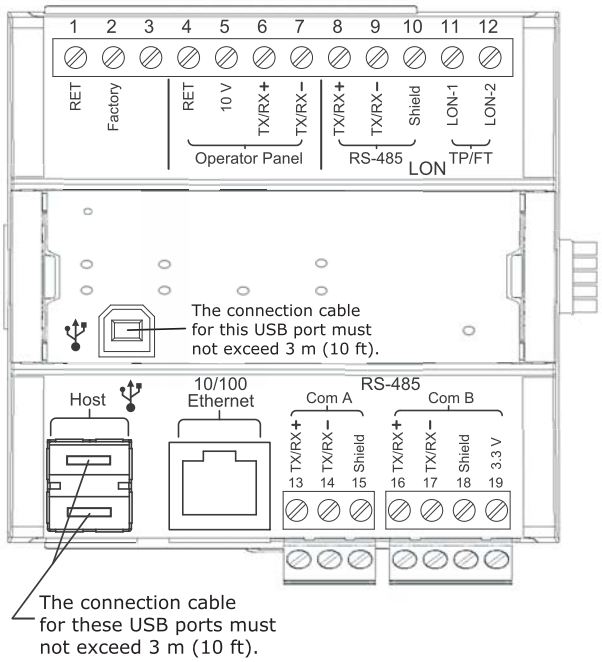
Real-time clock backup

.....30 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/TP
.....BTL B-BC (BACnet Building Controller)[a]
.....BTL 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.

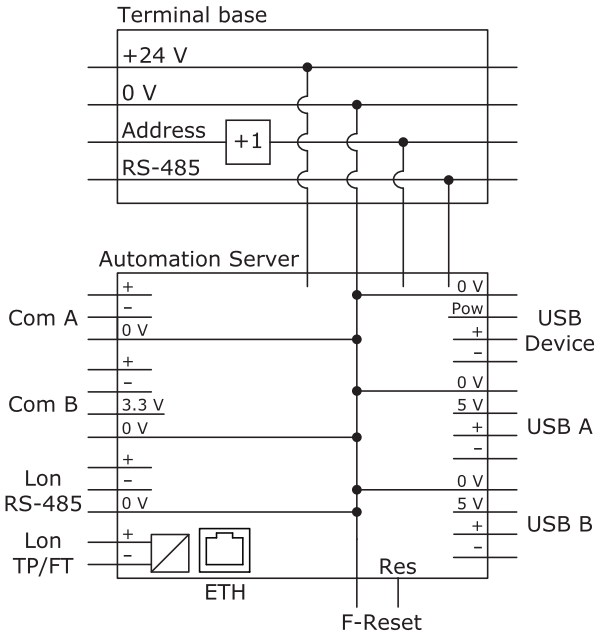


Figure: Automation Server internal configuration

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

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.

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 Unites States and Canada, Open Class Energy Management Equipment.

SmartStruxure
Compatible

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 energy℠

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.

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

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.

Polarity independent

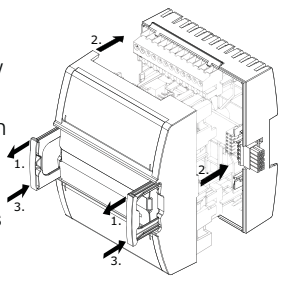
The power supply input (from main power) and output (to modules) are galvanically isolated. This removes the risk of damage due to earth currents and permits the input power to be wired without concern for polarity matching.

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, ±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)

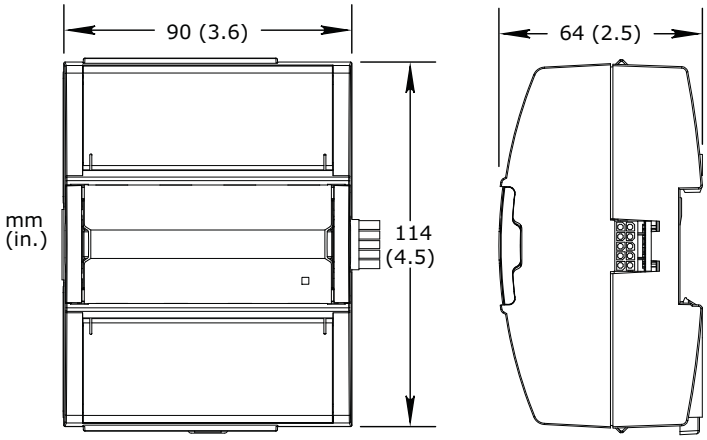
Ambient temperature, storage

–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

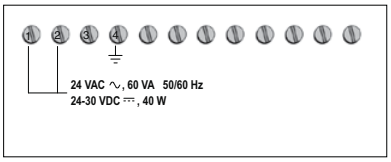
PS-24V, Power Supply 24 VAC/VDC

P/N: SXWPS24VX10001

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

P/N: SXWTBPSW110001

Connectors



OPEN ENERGY MANAGEMENT EQUIPMENT

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

I/O Modules AO-8 and AO-8-H

8 channel analog output

Introduction

The AO-8 and AO-8-H are analog output, 8 channel I/O modules.

The analog outputs are capable of supporting analog voltage or current point types. Therefore, analog outputs support a wide range of devices, such as actuators.

Function

Modular and scalable system

The modules are part of a modular system that 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.

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.

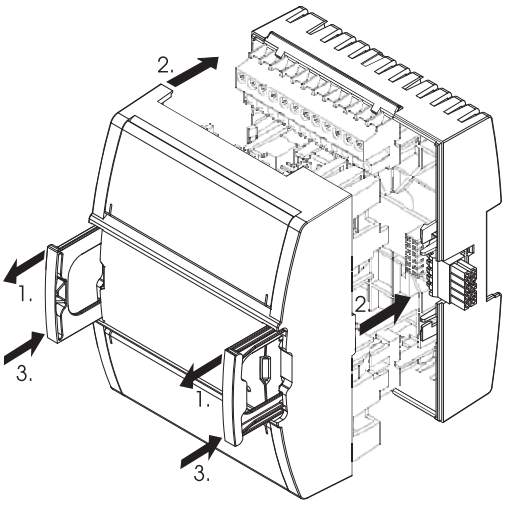


Figure: Two-piece design

Hot-connect and Hot-swap

Because critical applications require 24-hour operation, Schneider Electric designed the I/O modules for hot-connection of terminal bases and hot-swapping of the modules to 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 – 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.

Efficient terminal management

The I/O module terminals are clearly labelled and protected by transparent covers. The input and output terminals are at the top and bottom of each module and are accessible for maintenance without removing the module. The StruxureWare Building Operation WorkStation software can generate custom as-built labels for each module. Pre-perforated letter and A4 size label sheets are available as an accessory.

Accommodates multiple row panel installations

The Automation Server module family uses built-in connectors for single row connectivity, side by side. If a panel size requires multiple rows, extension cords are available.

LED status indicators

The I/O module has a status indicator that denotes the health and status of the module.

Hand/Off/Auto switches

The front panel of the AO-8-H includes Hand/Off/Auto (HOA) switches to provide override control of the analog outputs.

Each output also has a potentiometer to modulate the output signal when the switch is in the Hand position.

The position of the HOA switch is readable through user interfaces, such as the StruxureWare Building Operation WorkStation software, enabling more precise monitoring and control.

Protection

Protection components on the analog outputs protect against high-voltage short-duration transient events.

The analog outputs have current limits to protect against permanent short-circuit to ground.

Specifications

Output channels 8
DC input supply power .....4.9 W
DC input supply voltage .....24 VDC

Environment

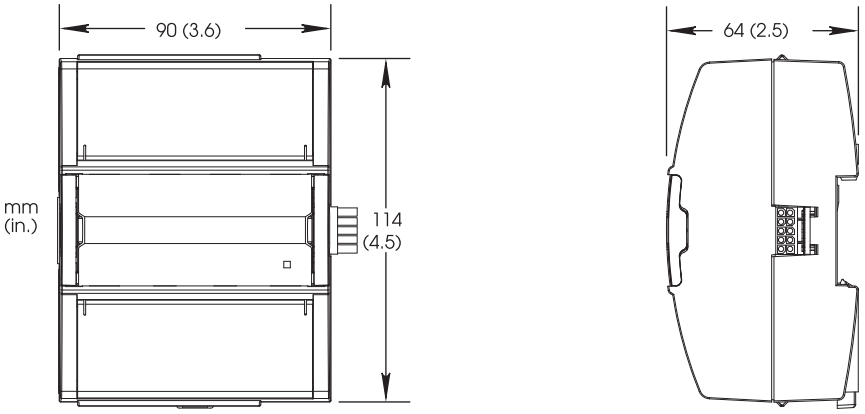
Ambient temperature, operating .....0 to 50 °C (32 to 122 °F)
Ambient temperature, storage .....-20 to +70 °C (-4 to +158 °F)
Maximum humidity.....95 % RH non-condensing

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.)



Weight including terminal base.....0.282 kg (0.62 lb)
Weight excluding terminal base.....0.159 kg (0.35 lb)
Terminal base TB-IO-W1

Part numbers

AO-8, I/O module
8 analog voltage/current outputs.....SXWAO8XXX10001

AO-8-H, I/O module with HOA switches
8 analog voltage/current outputs with Hand/Off/Auto override switches.....SXWAO8HXX10001

TB-IO-W1, terminal base for I/O module
(Required for each I/O module).....SXWTBIOW110001

Accessory part numbers

DIN-RAIL-CLIP, DIN-rail end clip
package of 25 pieces SXWDINEND10001

PRINTOUT-A4-W1, printout sheets for terminal labels
A4 sheet size, 100 sheets, 18 labels per sheet.....SXWTERLBL10011

PRINTOUT-LTR-W1, printout sheets for terminal labels
Letter sheet size, 100 sheets, 16 labels per sheet SXWTERLBL10012

S-CABLE-L, S-cable extension cord for Automation Server I/O bus L shaped connectors
1.5 m.....SXWSCABLE10002

Analog outputs

The analog outputs of the AO-8 and AO-8-H I/O modules are designed to be used for voltage or current outputs.

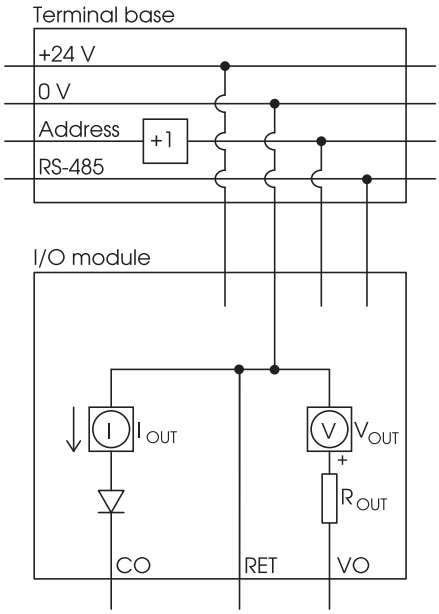


Figure: Analog output internal configuration

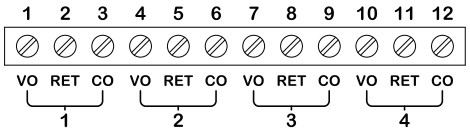
R_{OUT} is approximately equal to 10 ohm.

The I/O bus in the terminal base provides the I/O module with power and an address.

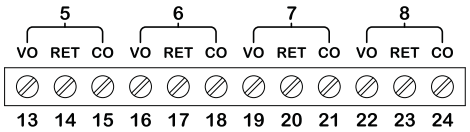
The address value in the I/O bus is increased by one for each terminal base. The I/O bus also enables RS-485 communication between the I/O module and the Automation Server.

Specifications

Analog outputs



AO-8(-H)



Voltage

Range.....0 to 10 VDC
Accuracy .....+/-100 mV
Resolution .....42 mV
Minimum load resistance .....5 kohm
Load range .....-1 to +2 mA
Reliability check .....Yes
Terminals.....Voltage Output (VO), Return (RET)

Current

Range.....0 to 20 mA
Accuracy .....+/-0.2 mA
Resolution .....0.1 mA
Load range .....0 to 650 ohm
Reliability check .....Yes
Terminals .....Current Output (CO), Return (RET)

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

- Connect one RET terminal on each of the I/O modules to a common chassis/power ground rail in the control panel using a size 16 AWG, 1.3 mm, or larger wire.
- Individual 24 VDC power sources to the field must be current limited to maximum of 4 amps for UL compliant installations, and no more than 6 amps in other areas.
- For more information on wiring, see Automation Server Family Hardware 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
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.

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 Unites States and Canada, Open Class Energy Management Equipment.

8 Channel Digital Output, Form-C (DO-FC-8), (DO-FC-8-H)

Automation Server I/O Module

I/O Module
DO-FC-8

I/O Module
DO-FC-8 -H

The DO-FC-8 and DO-FC-8-H are digital output 8-channel I/O modules. Each channel is capable of supporting digital (Form-C) point types.

Direct load applications

The Form-C relays in the DO-FC-8 and DO-FC-8-H are designed for direct load applications for up to 3 A per output.

Status indicators and overrides

The front panel of the DO-FC-8 and DO-FC-8-H modules includes a digital output indicator using a green LED. Additionally, the DO-FC-8-H module has Hand/Off/Auto (HOA) override switches.

DO-FC-8
DO-FC-8-H
Automation Server I/O Module Specifications

DC input power
24 VDC, 2.2 W

Output channels
8

Contact rating
250 VAC, 30 VDC, 3 A

Digital outputs

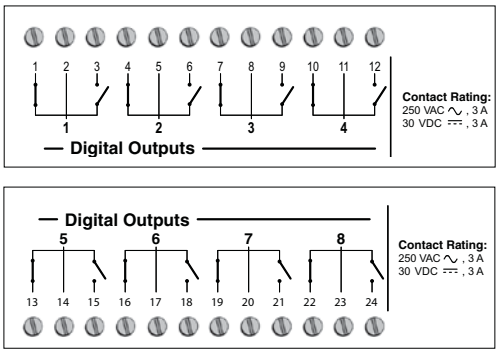
Form C Relay
Terminals
Common (C), Normally Open (NO), Normally Closed (NC)
Pulse width
100 ms minimum
Isolation
1500 VAC minimum, coil to contact

Mechanical
Weight including terminal base
0.332 kg (0.73 lb)
Weight excluding terminal base
0.209 kg (0.46 lb)

Terminal Base
TB-IO-W1

Part numbers
DO-FC-8, I/O Module
8 Form C digital outputs
P/N: SXWDOC8XX10001
DO-FC-8-H, I/O Module with HOA switches
8 Form C digital outputs with Hand/Off/Auto override switches
P/N: SXWDOC8HX10001
TB-IO-W1, Terminal Base for I/O Module
(Required for each I/O Module)
P/N: SXWTBIOW110001

Connectors



16 Channel Universal Input (UI-16)

Automation Server I/O Module

I/O Module
UI-16

The UI-16 is a universal input, 16-channel I/O module. Each channel is capable of supporting digital (contact, counter, and supervised) or analog (voltage, current, thermistor, and resistance) point types.

Analog and digital applications

This module is ideal for any mix of temperature, pressure, flow, status points, and similar inputs in a building control system. The UI-16 supports a 12 bit A/D conversion.

Counter applications

The maximum counter frequency is 25 Hz on all sixteen inputs with a minimum pulse width of 20 milliseconds. This input type is commonly used in energy metering applications.

Security applications

Supervised points 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 alarm and trouble conditions to the system.

Status indicators

Each channel has a dedicated two color (red and green) status LED that provides local monitoring of digital input types. The LED can be configured to display either red or green for each input state.

Protection

28 VDC unipolar transient voltage suppressors on all inputs protect against high-voltage short-duration transient events.

UI-16
Automation Server I/O Module Specifications

DC input power
24 VDC, 1.8 W

Input channels
16

Digital inputs

Contact
Pulse width
20 ms minimum
Range
Open collector/open drain, 24 VDC, 2.4 mA, dry contact switch closure

Counter
Range
Open collector/open drain, 24 VDC, 2.4 mA, dry contact switch closure
Pulse width
20 ms minimum
LED polarity
Software selectable, if the LED is activated when the input is high or low
LED color
Red or green, software selectable

Supervised
Detected resistor values
Open circuit, short circuit, contact open, and contact closed
5 VDC 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.

Analog inputs

Voltage
Range
0 to 10 VDC
Resolution
12 bit
Accuracy
+/- (0.7 mV + 0.2 % of reading)
Reliability
Ability to define the reliability level for upper and lower electrical limits
Impedance
100 kohm

Current
Range
0 to 20 mA
Resolution
12 bit
Accuracy
+/- (0.03 mA + 0.4 % of reading)
Reliability
Ability to define the reliability level for upper and lower electrical limits
Impedance
47 ohm

Resistance
10 ohm to 10 kohm
+/- $(7 + 4 \times 10^{-3} \times R)$ (ohm)
10 to 60 kohm
+/- $(0.4 + 7 \times 10^{-6} \times R)$ (%)
Reliability
Ability to define the reliability level for upper and lower electrical limits.

Thermistor
Range
-50 to 150 °C (-58 to 302 °F)
Resolution
12 bit
Supported thermistors
1.8 kohm, 10 kohm, and 1 kohm Balco temperature sensor

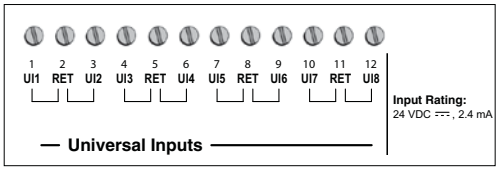
Internal pull-up resistor
10 kohm thermistors
10 kohm to 5 V
1.0 (Balco) and 1.8 kohm thermistors
1.5 kohm to 1 V

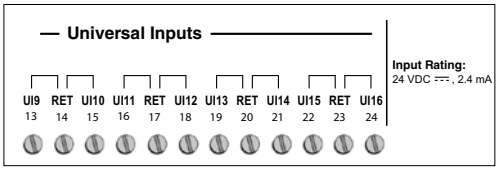
Mechanical
Weight including terminal base
0.269 kg (0.59 lb)
Weight excluding terminal base
0.146 kg (0.32 lb)

Terminal base
TB-IO-W1

Part numbers
UI-16, I/O Module
16 universal inputs
P/N: SXWUI16XX10001
TB-IO-W1,Terminal Base for I/O Module
(Required for each I/O Module)
P/N: SXWTBIOW110001

Connectors





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 hash 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

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				

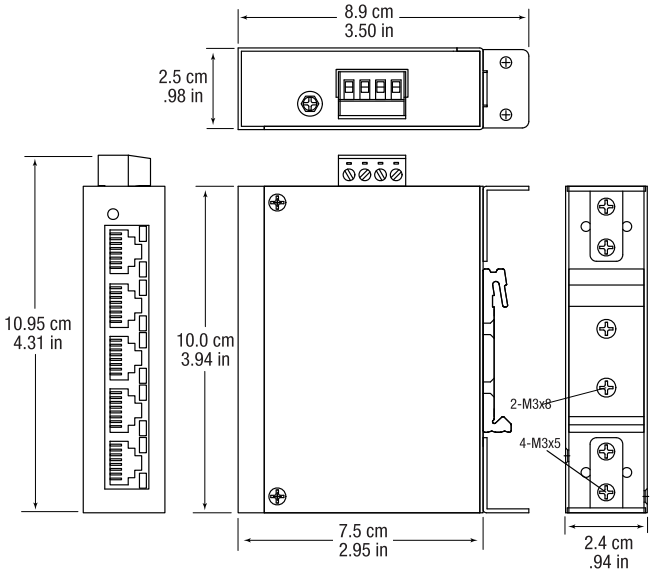
SPECIFICATIONS–LEVEL 3, EN 61000-6-2: 2006 GENERIC STANDARDS FOR {HEAVY) INDUSTRIAL ENVIRONMENTS

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

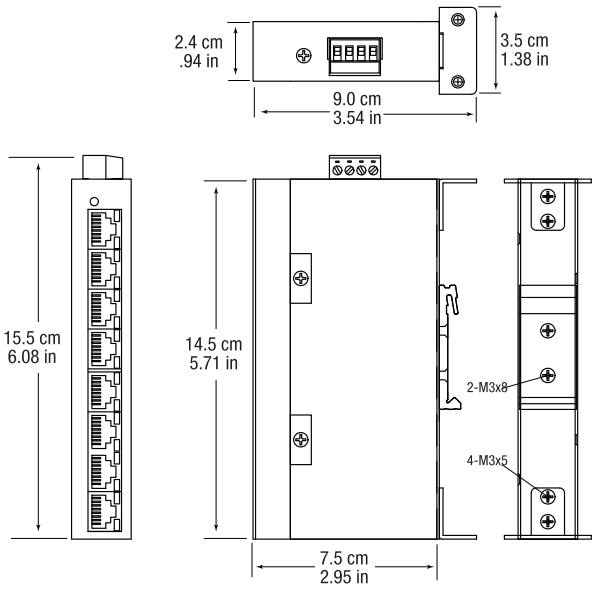
ENVIRONMENTAL SPECIFICATIONS

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 5 PORT MODEL



MECHANICAL DIAGRAM 8 PORT MODEL



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.

03-20035-01-en, May 2018

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 Type Ub	8	10	10	16	20
Universal I/O Type Uc	-	-	-	4	8
Triac outputs	6	4	8	-	-
Relay outputs Form A	-	3	-	4	8
High power relay outputs Form A	1	1	-	-	-

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, CO_2, 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.

03-20035-01-en, May 2018

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:

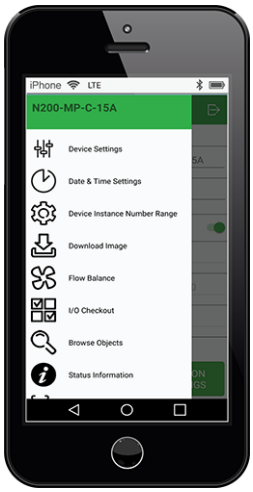
- Blank covers: Up to four sensors of any combination of sensor base types
- 3-button and touchscreen covers:
  - Up to two sensor bases with CO_2 option
  - Up to four sensor bases without CO_2 option
- SmartX LCD temperature sensors: Up to four sensors are supported

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.

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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.

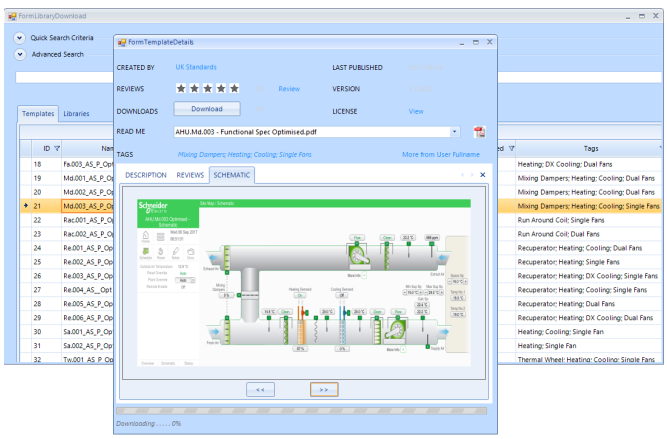
Engineering efficiency

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

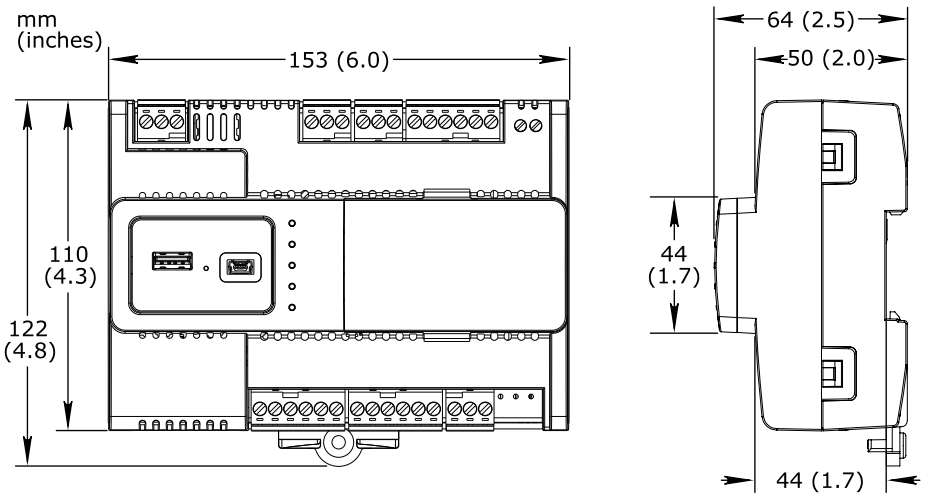
Material

Plastic flame rating UL94-5V

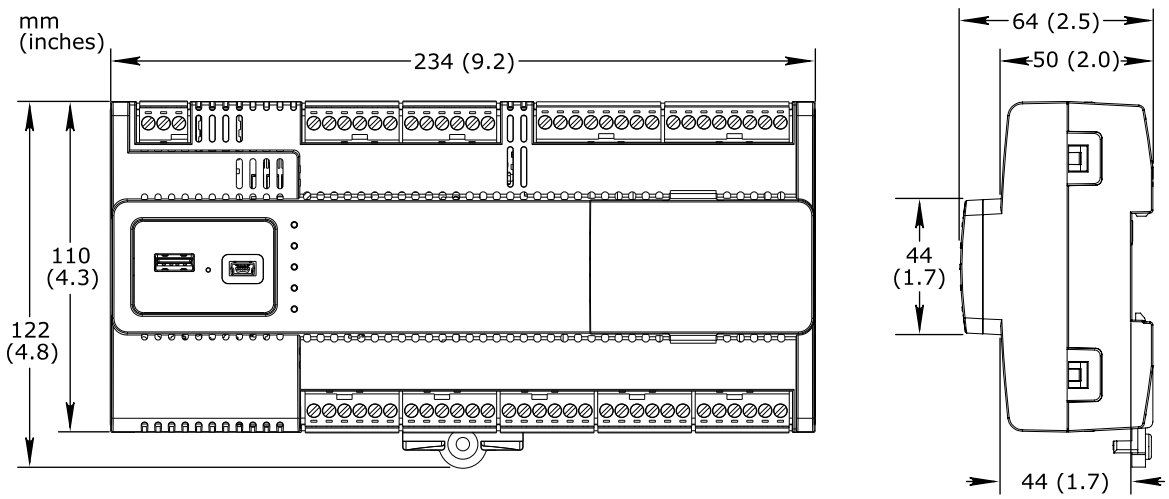
Ingress protection rating ..... IP 20

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 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

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)
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]

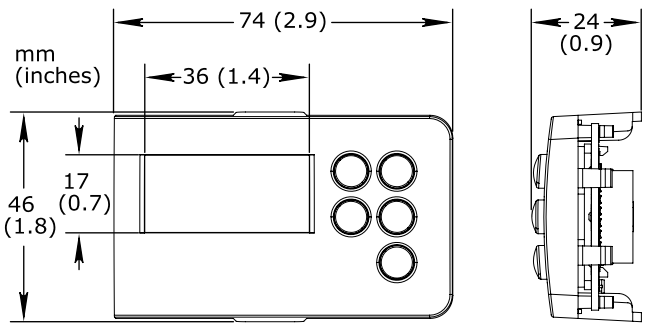
a) See the BTL Product Catalog for up-to-date details on BTL listed firmware revisions on BACnet International's home page.

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

MP-C Display (Optional)

Removable .....No
Dimensions .....74 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

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MP-C

SmartX IP Controller

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)
.....-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)

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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

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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.

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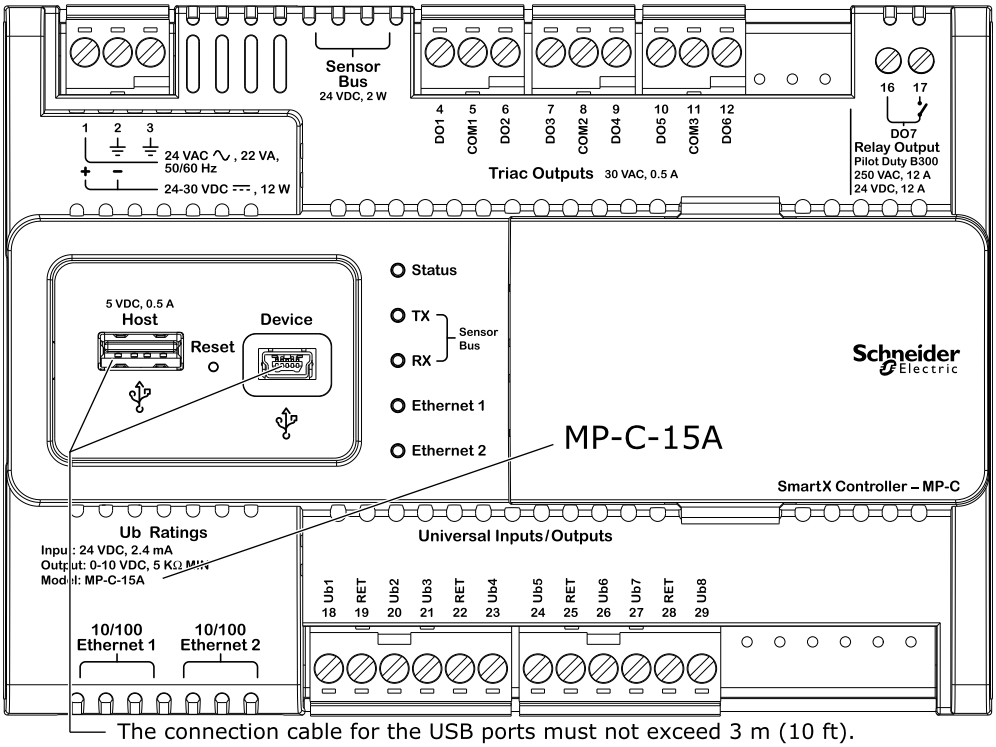
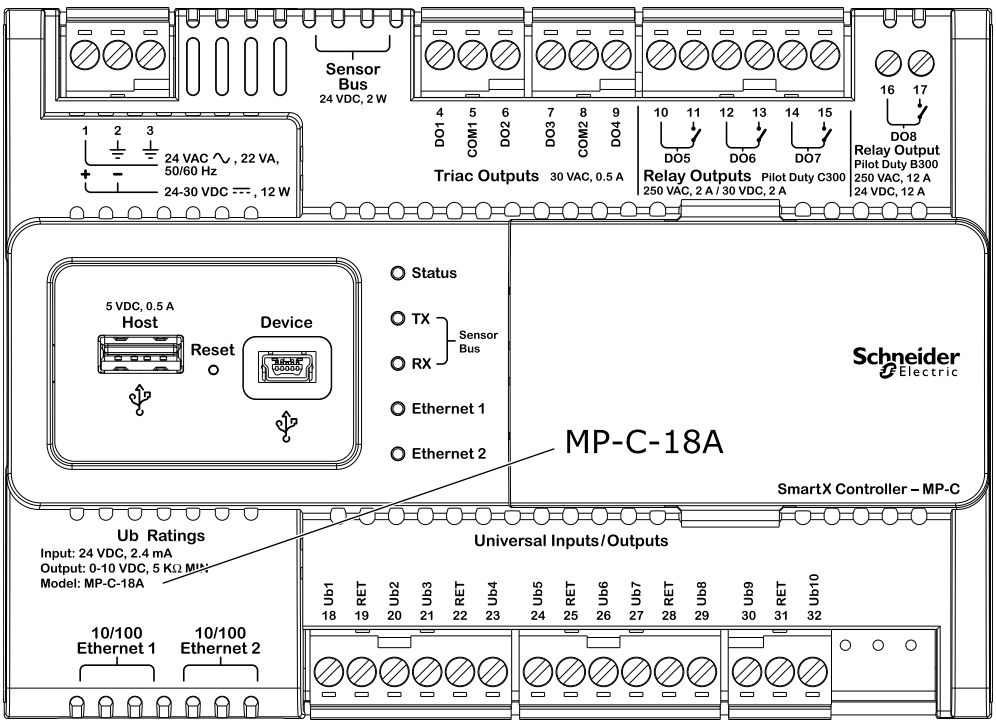
MP-C

SmartX IP Controller



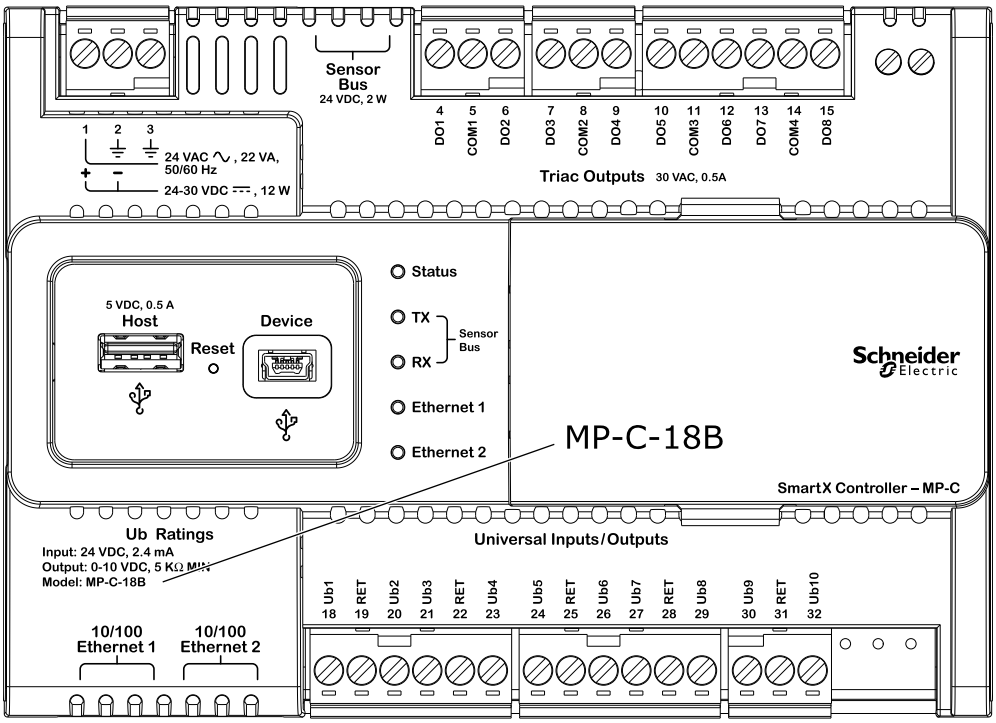
MP-C-15A



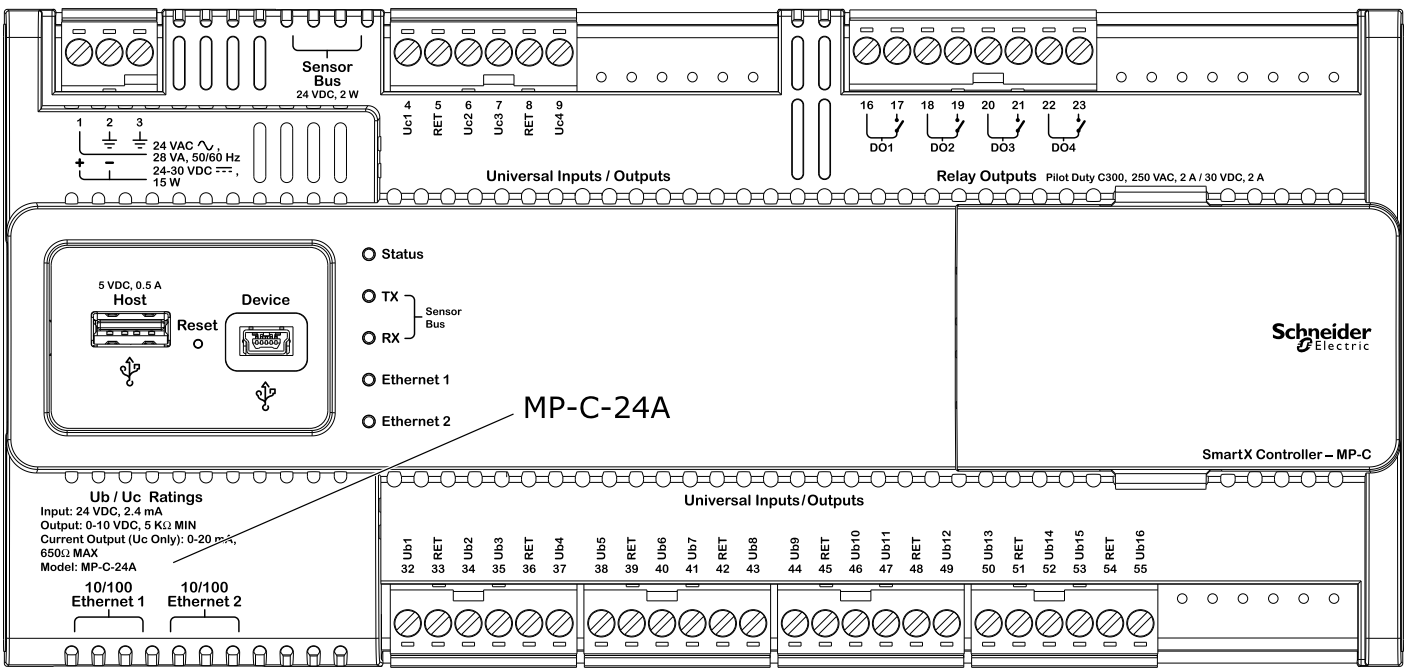
MP-C-18A

MP-C

SmartX IP Controller



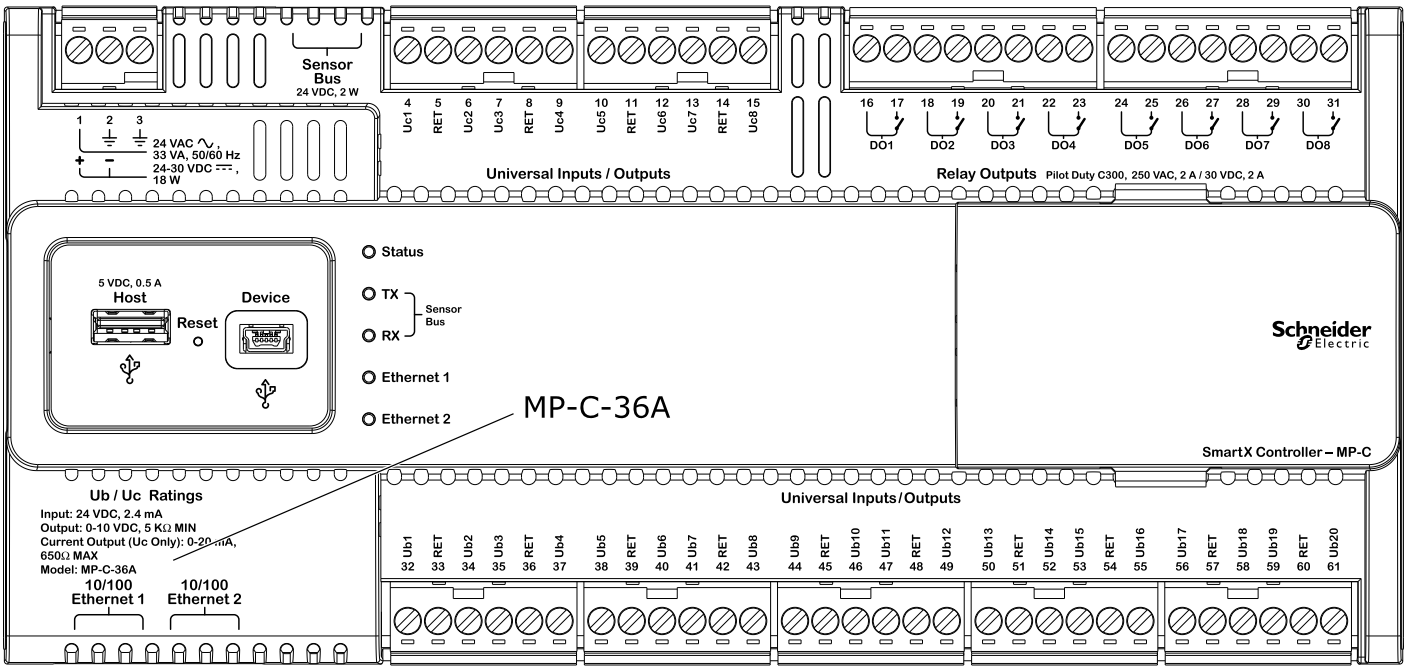
MP-C-18B



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)

MP-C
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)

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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.

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

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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

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 plugable 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.

Specifications

AC input

Nominal voltage ..... 24 VAC
Operating voltage range ..... +/-20 %
Frequency ..... 50/60 Hz
Maximum current ..... 0.5 A rms
Recommended transformer rating ..... ≥15 VA

DC input

Nominal voltage ..... 24 to 30 VDC
Operating voltage range ..... 21 to 33 VDC
Maximum power consumption ..... 10 W

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

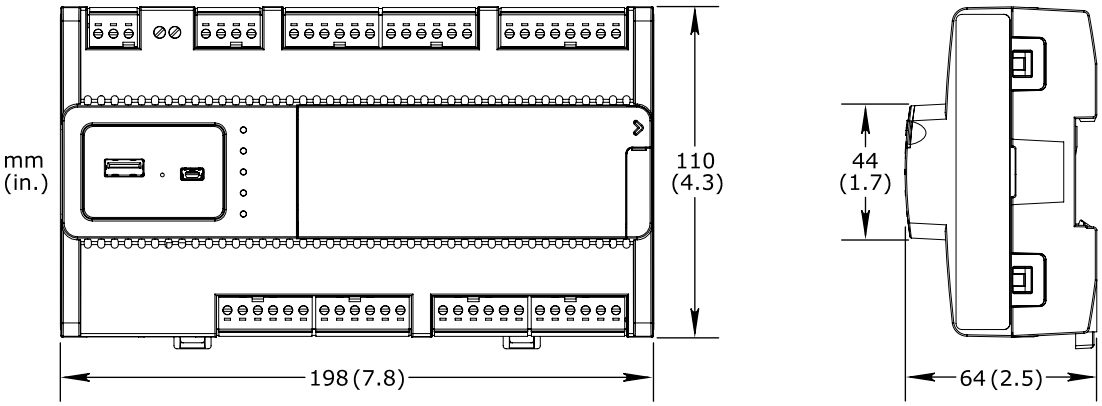
Plastic rating UL94-5VB

Enclosure .....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

Application alarm distribution using trap

CPU

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 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

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 ohm
.....Including 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

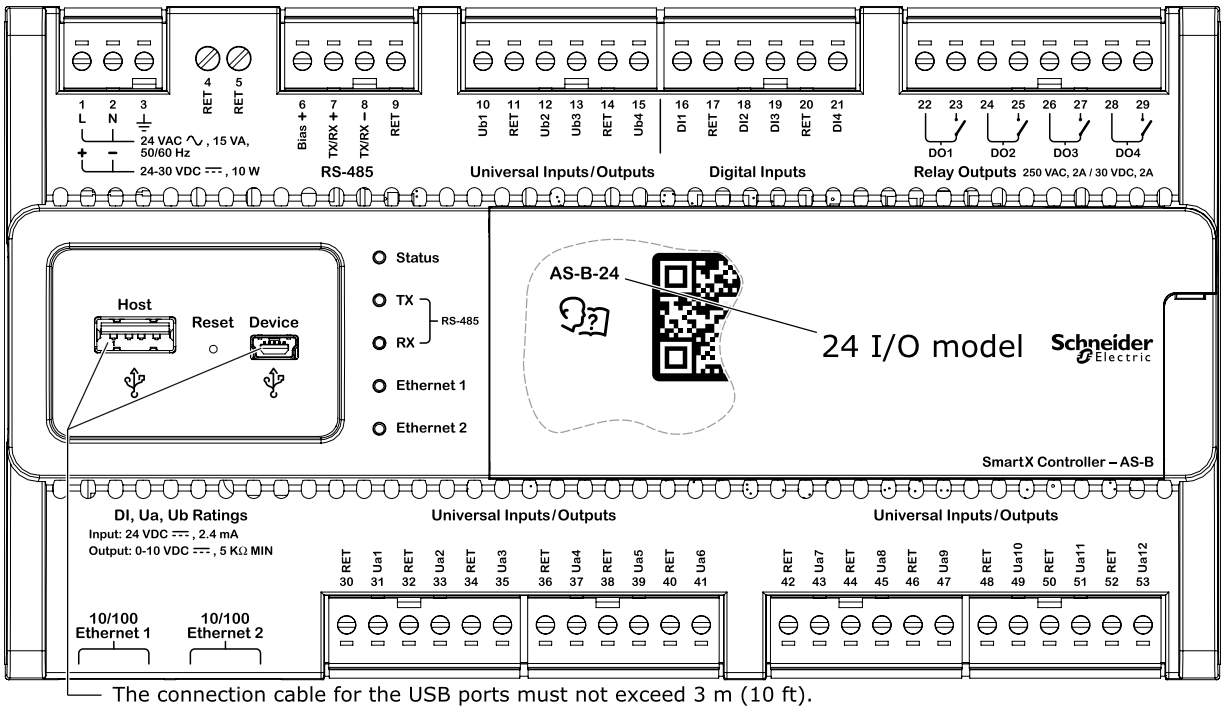


Figure: AS-B model with 24 I/O points

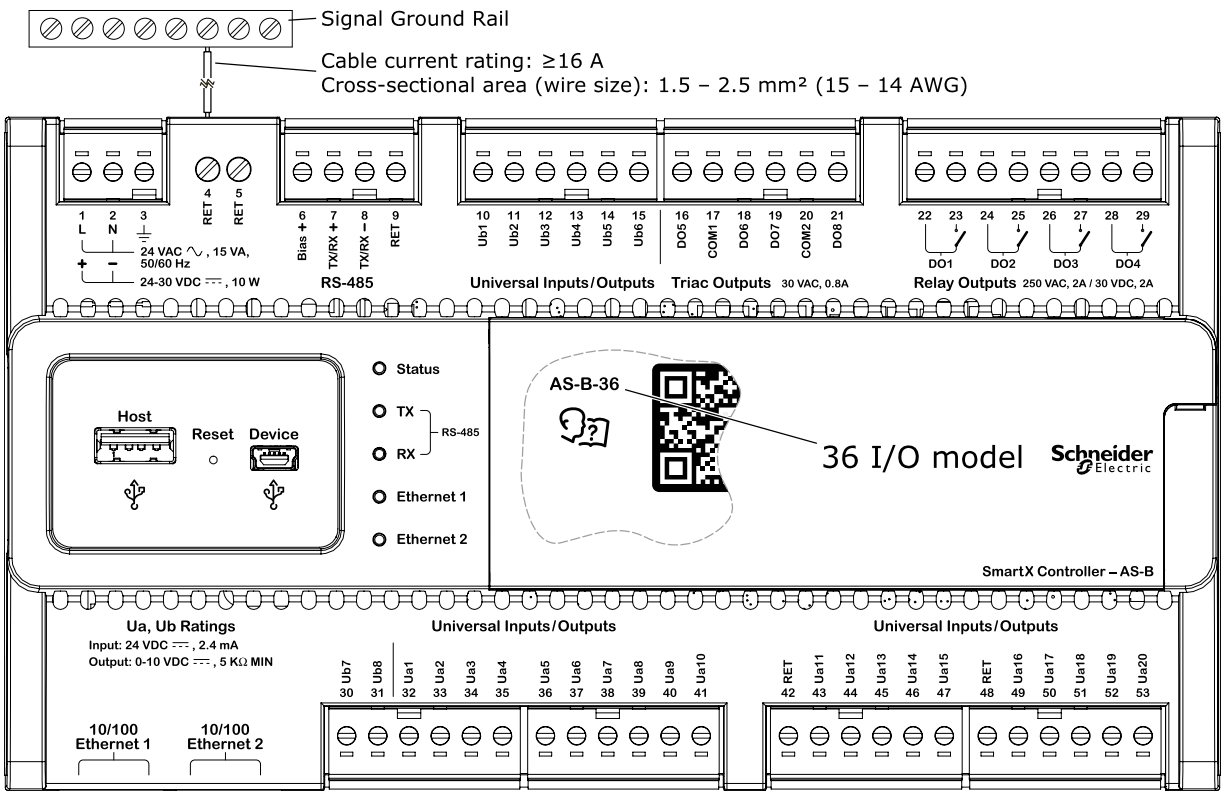


Figure: AS-B model with 36 I/O points

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 mm^2) 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.

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

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:

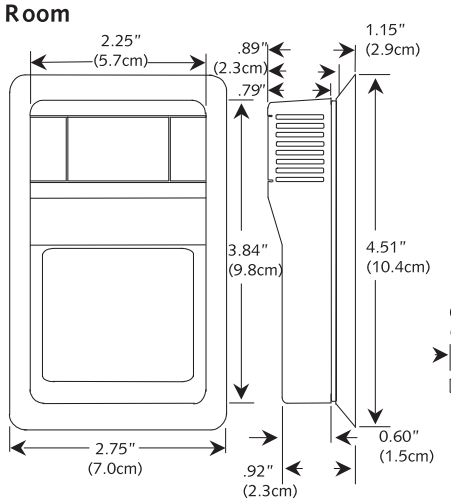
- Space
- Duct
- Immersion
- Averaging
- Strap-On
- Bead/Bullet
- Outdoor Air

Features

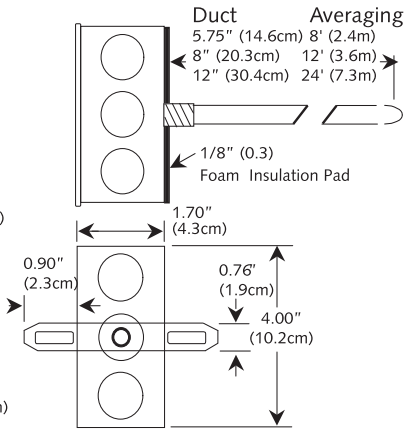
- Offer high accuracy and interchangeability over a wide temperature range.
- Non-polarity sensitive

DIMENSIONS

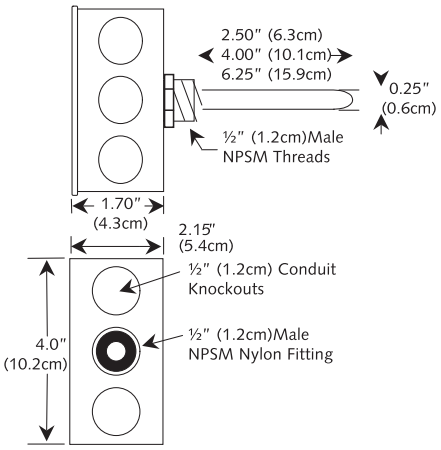
Room



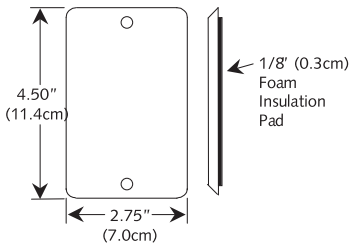
Duct / Averaging



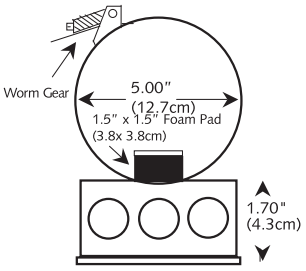
Immersion



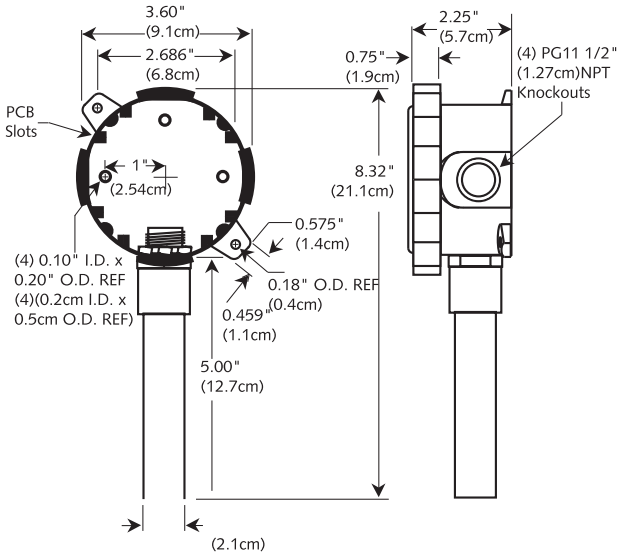
Stainless Plate



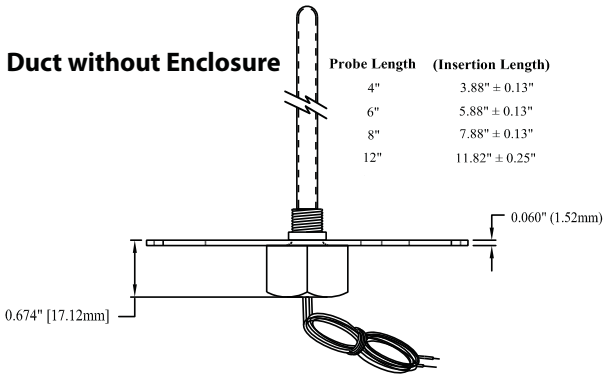
Strap-On



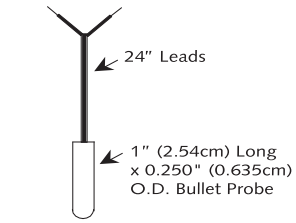
Outside Air



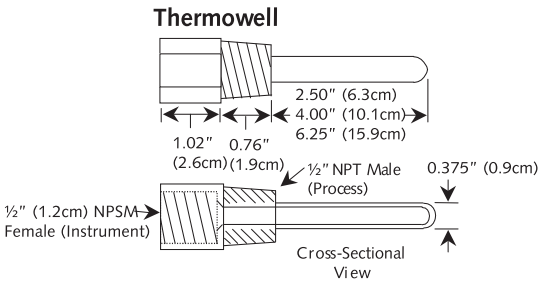
Duct without Enclosure



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 ½", 4", or 6 ¼" 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

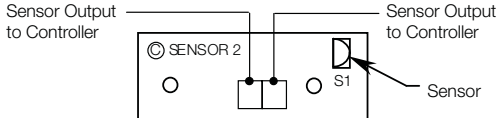
The TAC Stainless Plate temperature sensors are mounted on the back of a 1 Gang stainless steel plate. The foam pad will insulate the sensor from any drafts in the wall. (2) 6/32" x 1" machine screws are provided for junction box mounting. Be sure that the sensor is not mounted on an outside wall, due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

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

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.

CDE & CWE SERIES

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

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

NDIR

Non-dispersive infrared technology (NDIR) repeatable to ±20 ppm ±1% of measured value... high accuracy measurements

Self-calibrating

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

Sensitivity

Low ambient sensitivity

The CDE and CWE are non-dispersive infrared (NDIR) sensors designed for measuring environmental CO_2 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.

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.

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 2.5mm²) 28 to 20 AWG (0.08 to 0.5mm²)
Sensor Type	Non-dispersive infrared, diffusion sampling
Output Range	0 to 2000 ppm
Accuracy	±30 ppm ±2% of measured value*
Repeatability	±20 ppm ±1% of measured value
Response Time	<60 seconds for 90% step change

WARRANTY

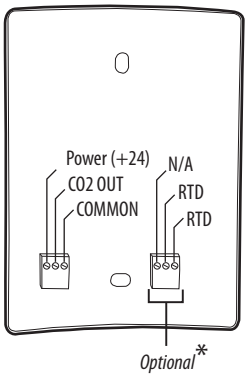
Limited Warranty	3 years

AGENCY APPROVALS

CE**

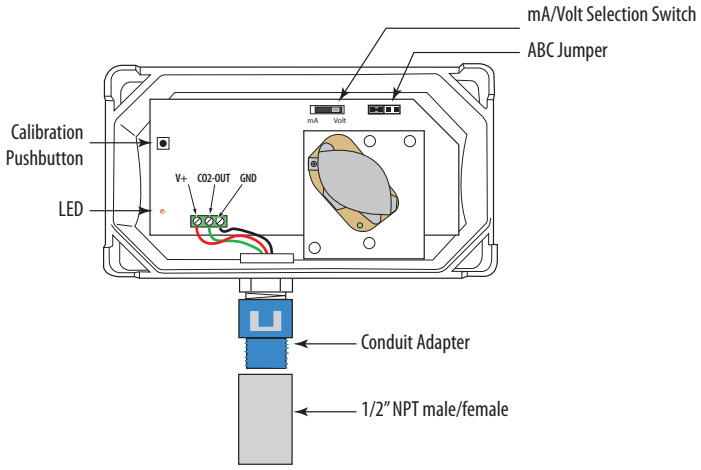
RTD/Thermistors in wall housings are not compensated for internal heating of product.
EMC Conformance: Low voltage directive 2014/35/EU and EMC directive 2014/30/EU.
EMC Special Note: Connect this product to a DC distribution network or an AC/DC power adaptor with proper surge protection (EN 61000-6-1 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 CO_2 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

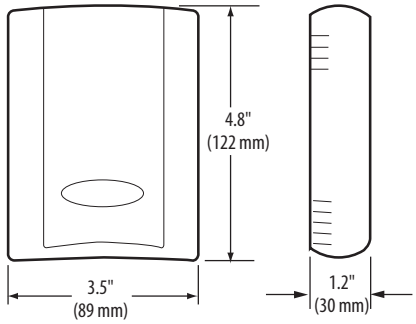


* Note: Connector blocks and headers for optional features are not included with non-option models.

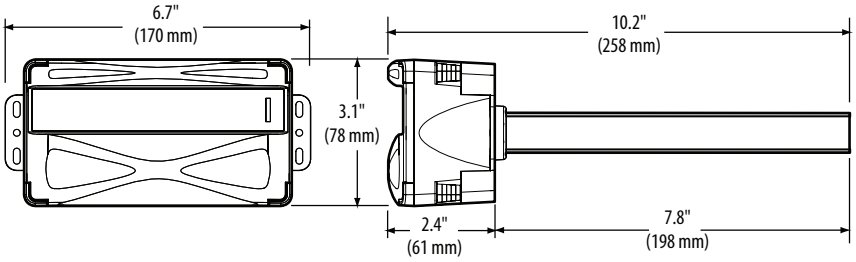
CDE DUCT MOUNT
Wiring Diagram



CWE WALL MOUNT
Dimensional Drawing



CDE DUCT MOUNT
Dimensional Drawing



ORDERING INFORMATION

Duct Mount

CDE (No Options)

Wall Mount, Temp. Option

Sensor Type

CWE [ ]

- **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

Housing

[ ]

Blank = Cloud white
B = Black

Example: CWE [SH] [B]

Wall Mount, No Temp. Option

Housing

CWE [ ]

Blank = Cloud white
B = Black

Example: CWE [B]

Data Sheet

DESCRIPTION

The EH Series Room, Duct and Outside hunidity 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 systens, humidity chambers, and OEM applications and is compatible with Vista, Continuum, I/Net and I/A Systens.

EH Series

FEATURES

- Single point Field Calibration
- Field selectable output signals
- ±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)

Printed in the U.S.A 6-10

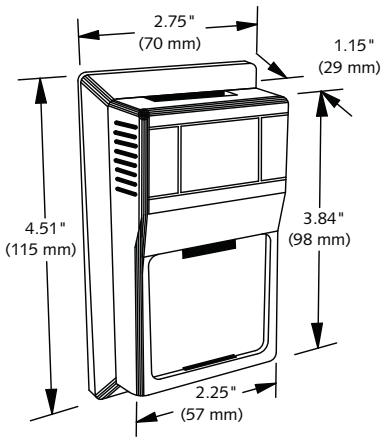
ORDERING INFORMATION

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	EHO110			
Outdoor-Humidity and Temperature	EHO110-100	EHO110-200	EHO110-500	EHO110-800

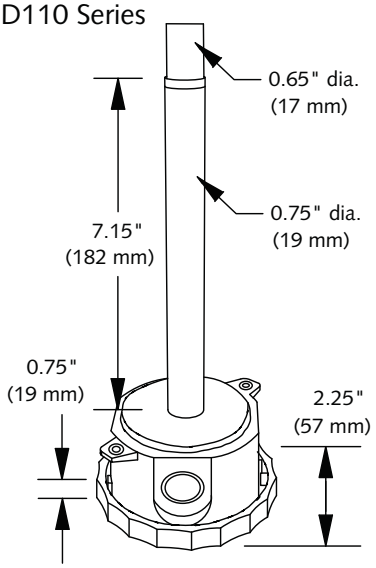
Miscellaneous Option	Code
LCD Display (Room Units Only. LCD displays humidity value.)	-LCD

DIMENSIONS

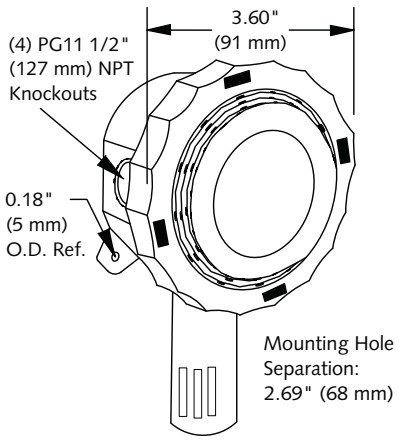
EHR110 Series



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.

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1354 Clifford Avenue
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Cleveland Controls
Division of UniControl Inc.

Model AFS–222

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

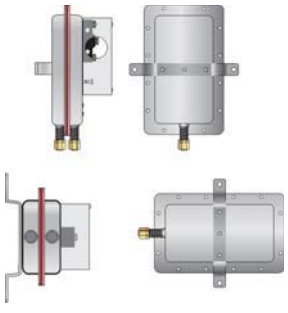
The plated housing contains a diaphragm, a calibration spring and a snap-acting SPDT switch.The sample connections located on each side of the diaphragm accept ¼" OD metallic tubing via the integral compression ferrule and nut.

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

MOUNTING (SEE FIGURE 1)

Select a mounting location which is free from vibration. The AFS-222 must be mounted with the diaphragm in any vertical plane in order to obtain the lowest specified operating set point. Avoid mounting with the sample line connections in the "up" position. Surface mount via the two 3⁄16" diameter holes in the integral mounting bracket. The mounting holes are 3-⅞" apart.

(Fig. 1)



AIR SAMPLING CONNECTION (SEE FIGURE 2)

The AFS-222 is designed to accept firm-wall sample lines of ¼" OD tubing by means of ferrule and nut compression connections. For sample lines of up to 10 feet, ¼" OD tubing is acceptable. For lines up to 20 feet, use ¼" ID tubing. For lines up to 60 feet, use ½" ID tubing. A ¼" OD adapter, suitable for slip-on flexible tubing is available: order part number 18311.

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

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

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Fax: 216-398-8558
Email:saleshvac@unicontrolinc.com
Web page: http://www.clevelandcontrols.com

ELECTRICAL CONNECTIONS (SEE FIGURE 3)

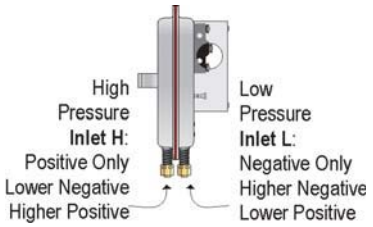
Before pressure is applied to the diaphragm, the switch contacts will be in the normally closed (NC) position. The snap switch has screw top terminals with cup washers. Wire alarm and control applications as shown in Figure 4.

FIELD ADJUSTMENT

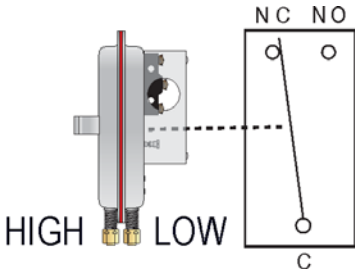
The adjustment range of an AFS-222 Air Switch is 0.05±.02" w.c. to 12.0" w.c. To adjust the set point, turn the adjusting screw counterclockwise until motion has stopped. Next, turn the adjusting screw 4 complete turns in a clockwise direction to engage the spring. From this point, the next ten turns 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.

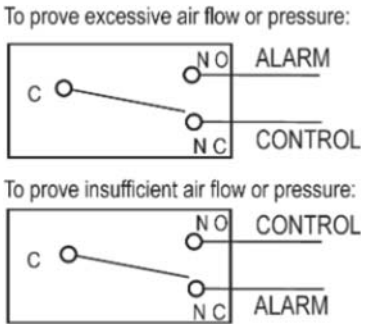
(Figure 2)

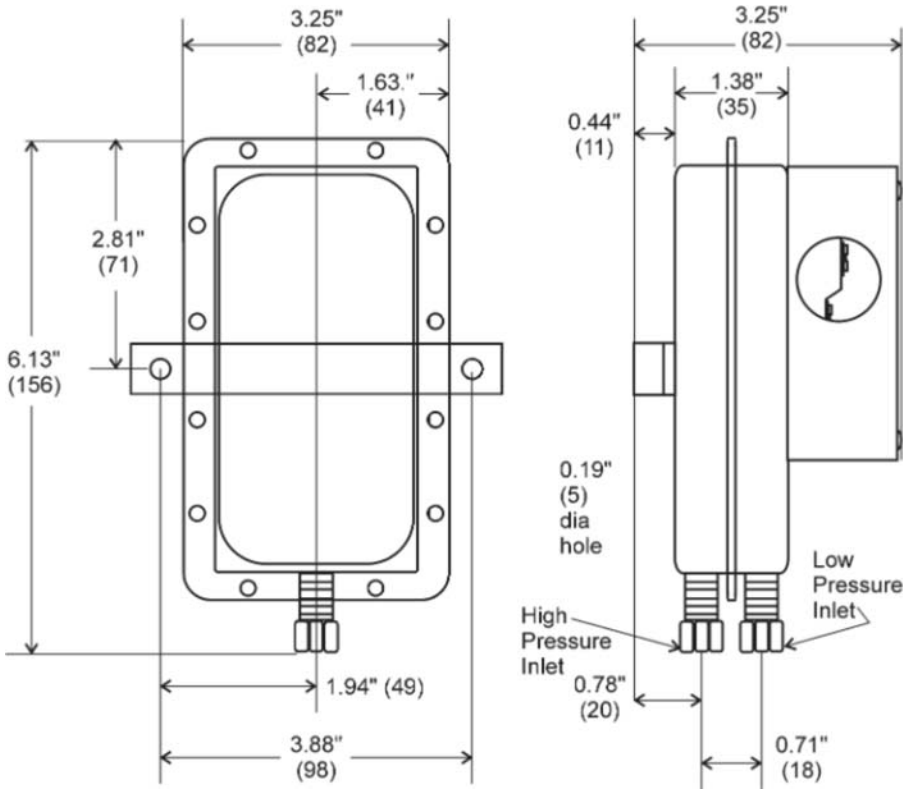


(Figure 3)



(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:
½ psi (0.03 bar).

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

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

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

Contact Arrangement: SPDT.

Electrical Connections:
Screw-type terminals with cup washers.

Conduit Opening:
⅞" diameter opening accepts ½" conduit.

Sample Line Connectors:
Male, externally threaded 7/16" -24 UNS 2A thread, complete with nuts and self-aligning ferrules.

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

Approvals: UL, FM, CSA.

Shipping Weight: 1.2 lbs.

Accessories:

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

HX08 SERIES & H701

Detect Belt Loss, Coupling Shear, and Mechanical Failure

Maximize Reliability
Minimize Installed Cost

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.

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

Self-gripping iris

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

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

Status LEDs

Status LEDs available for easy setup and local indication

APPLICATIONS

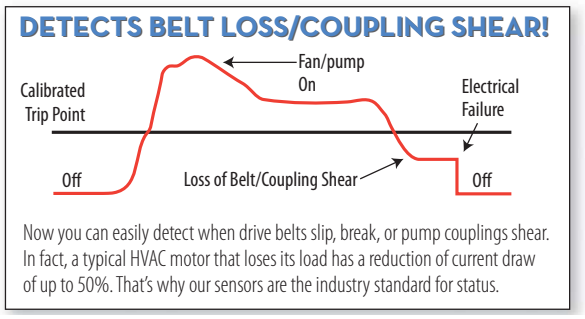
- Detecting belt loss, coupling shear, and mechanical failure
- Verifying lighting circuit and other electrical service run times
- Monitoring status of industrial process equipment
- Monitoring status of critical motors (compressor, fuel, etc.)
- VFD output on/off status

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 mm²) Others: 24-14 AWG (0.2 to 2.1 mm²)
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

CE c UL us LISTED E150462



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.

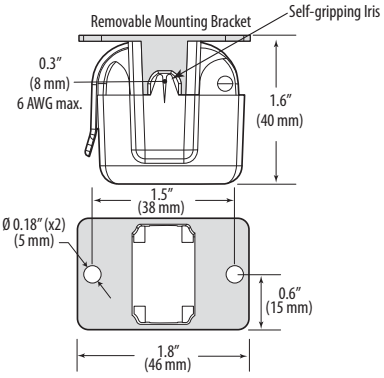
*The CE mark indicates RoHS2 compliance. Please refer to the CE Declaration of Conformity for additional details.

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

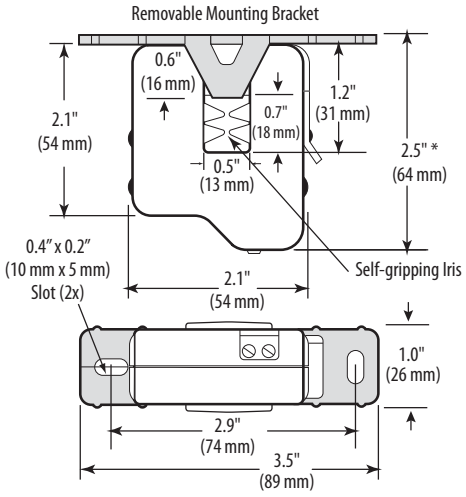
If using this switch in an application that includes an electronically commutated motor (ECM), see Veris Application Note VN61, at www.veris.com.

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

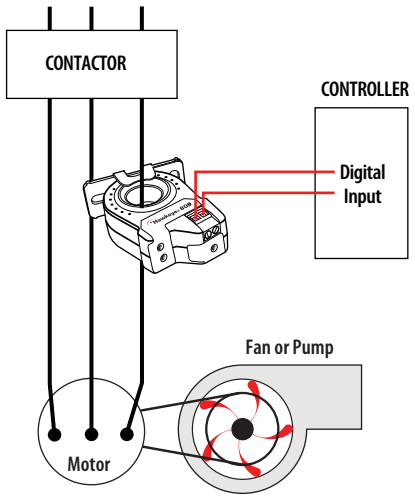
H308
Dimensional Drawing



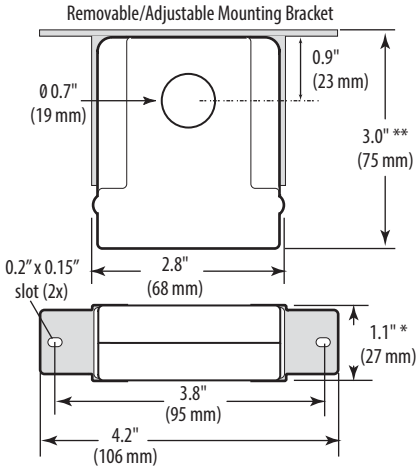
H608
Dimensional Drawing



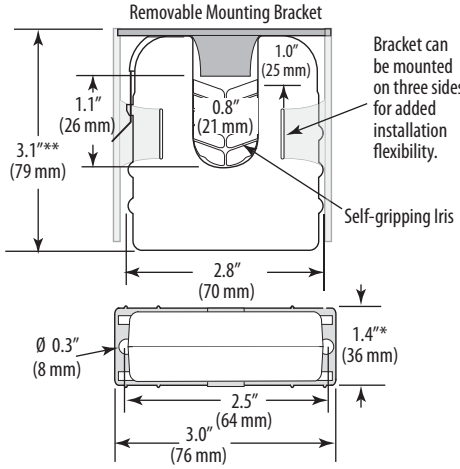
MONITORING FAN /PUMP MOTORS FOR POSITIVE PROOF OF FLOW
Wiring Diagram



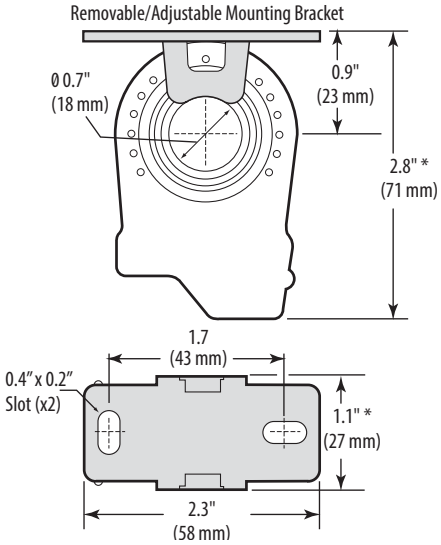
H708/701
Dimensional Drawing



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.

B3 Series, Three Way, Characterized Control Valve
Stainless Steel Ball and Stem

Application

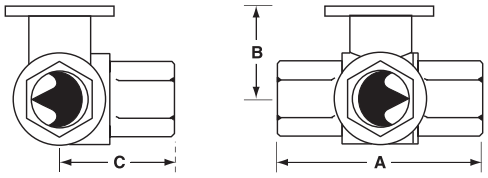
This valve is typically used in air handling units on heating or cooling coils, and fan coil unit heating or cooling coils. Some other common applications include Unit Ventilators, VAV box re-heat coils and bypass loops. This valve is suitable for use in a hydronic system with variable or constant flow.

Technical Data

Service	chilled or hot water, 60% glycol
Flow characteristic	A-port equal percentage B-port modified for constant common port flow
Controllable Flow Range	75°
Sizes	½", ¾", 1", 1¼", 1½", 2"
Type of end fitting	NPT female ends
Materials:	
Body	forged brass, nickel plated
Ball	stainless steel
Stem	stainless steel
Seats	PTFE
Characterizing disc	Tefzel®
Packing	2 EPDM O-rings, lubricated
Body pressure rating	
600 psi	½" - 1"
400 psi	1¼" - 2"
Media temp. range	0°F to 250°F [-18°C to 120°C]
Close off pressure	
200 psi	½" - 2"
Maximum differential pressure (ΔP)	50 psi for typical applications
Leakage	0% for A to AB <2.0% for B to AB
External leakage	according to EN 12266-1:2003
C_v rating	A-port: see product chart for values B-port: 70% of A to AB C_v

Tefzel® is a registered trademark of DuPont

Dimensions



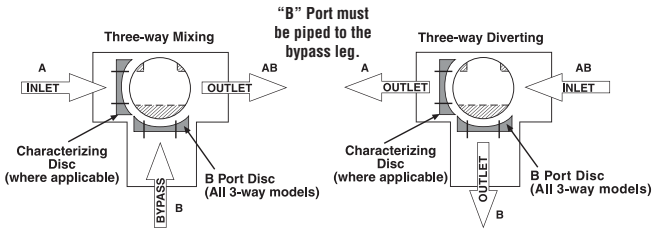
3WayValve-B307-B320

Valve Body	Valve Nominal Size Inches	DN [mm]	Dimensions (Inches [mm]) A	B	C
B307-B311	½"	15	2.41" [61.1]	1.39" [35.2]	1.20" [30.6]
B312-B316	½"	15	2.38" [60.4]	1.78" [45.2]	1.29" [32.8]
B317-B321	¾"	20	2.73" [69.3]	1.87" [47.4]	1.47" [37.3]
B322-B325	1"	25	3.09" [78.4]	1.87" [47.4]	1.59" [40.3]
B329-B331	1¼"	32	3.96" [100.6]	2.27" [57.7]	2.14" [54.3]
B338-B341	1½"	40	4.39" [111.6]	2.51" [63.7]	2.40" [61.1]
B347-B352	2"	50	4.90" [124.5]	2.73" [69.5]	2.74" [69.7]

C_v	Valve Nominal Size Inches	DN [mm]	Type 3-Way NPT	Suitable Actuators Non-Spring	Spring
0.3	½	15	B307	TR Series, LR Series, NR...N4 Series	TF Series, LF Series
0.46	½	15	B308		
0.8	½	15	B309		
1.2	½	15	B310		
1.9	½	15	B311		
3	½	15	B312		
4.7	½	15	B313		
10	½	15	B315		
14	½	15	B316		
4.7	¾	20	B317		
7.4	¾	20	B318		
14	¾	20	B320		
24	¾	20	B321		
7.4	1	25	B322		
10	1	25	B323		
30	1	25	B325*		
10	1¼	32	B329	AR Series, AR...N4 Series	AF Series
19	1¼	32	B330		
25	1¼	32	B331		
19	1½	40	B338		
29	1½	40	B339		
37	1½	40	B340		
46	1½	40	B341		
29	2	50	B347		
37	2	50	B348		
46	2	50	B349		
57	2	50	B350		
68	2	50	B351		
83	2	50	B352		

*Models without characterizing disc

Flow Patterns



5 YEAR WARRANTY

CE LISTED 94 D5 TEMP.IND. & REG.EQUIP. c UL us

BRUSHLESS dc motor

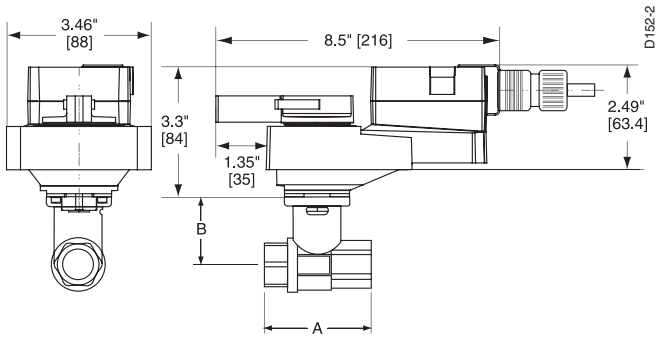
Models

ARB24-SR
ARX24-SR Flexible Version

Technical Data	
Power supply	24 VAC ± 20% 50/60 Hz 24 VDC ± 10%
Power consumption running	2.5 W
holding	0.4 W
Transformer sizing	5 VA (class 2 power source)
Electrical connection	½" conduit connector 18 GA plenum rated cable 3 ft [1m], 10 ft [3m], 16 ft [5m]
Overload protection	electronic throughout 0° to 95° rotation
Operating range Y	2 to 10 VDC, 4 to 20 mA
Feedback output U	1 to 10 VDC, max 0.5 mA
Input impedance	100 kΩ (0.1 mA), 500 Ω
Angle of rotation	90°, adjustable with mechanical stop
Torque	180 in-lb [20 Nm]
Direction of rotation	reversible with protected ↷/↶ switch
Position indication	handle
Manual override	external push button
Running time ARB24-SR... ARX24-SR...	 90 seconds 300, 150, 90 seconds, constant independent of load
Humidity	5 to 95% RH non-condensing (EN 60730-1)
Ambient temperature	-22°F to +122°F [-30°C to +50°C]
Storage temperature	-40°F to +176°F [-40°C to +80°C]
Housing	NEMA 2/IP54
Housing material	UL94-5VA
Agency listings†	cULus according to UL 60730-1A/-2-14, CAN/CSA E60730-1:02, CE according to 2004/108/EC and 2006/95/EC for line voltage and/or –S versions
Noise level	<45 dB(A)
Quality standard	ISO 9001

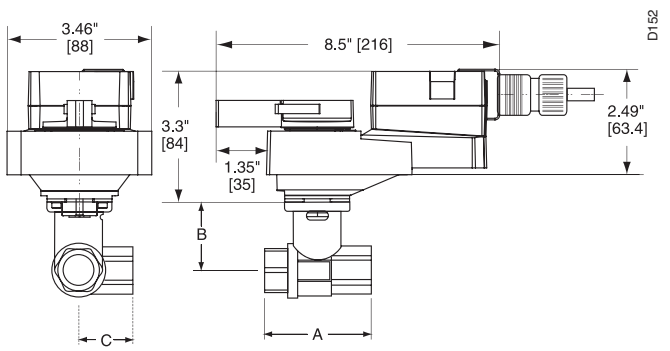
† Rated impulse voltage 800V, Control pollution degree 3, Type of action 1 (1.B for -S models)

Dimensions with 2-Way Valve



	Valve Nominal Size		Dimensions (Inches [mm])	
Valve Body	Inches	DN [mm]	A	B
B231-B232	1¼"	32	3.72" [94.6]	2.04" [51.9]
B238-B240	1½"	40	3.88" [98.5]	2.04" [51.9]
B248-B250	2"	50	4.21" [107.0]	2.27" [57.7]

Dimensions with 3-Way Valve



	Valve Nominal Size		Dimensions (Inches [mm])		
Valve Body	Inches	DN [mm]	A	B	C
B329-B331	1¼"	32	3.96" [100.6]	2.27" [57.7]	2.14" [54.3]
B338-B341	1½"	40	4.39" [111.6]	2.51" [63.7]	2.40" [61.1]
B347-B352	2"	50	4.90" [124.5]	2.73" [69.5]	2.74" [69.7]

Wiring Diagrams

INSTALLATION NOTES

△2 ***CAUTION** Equipment damage!*
Actuators may be connected in parallel.
Power consumption and input impedance must be observed.

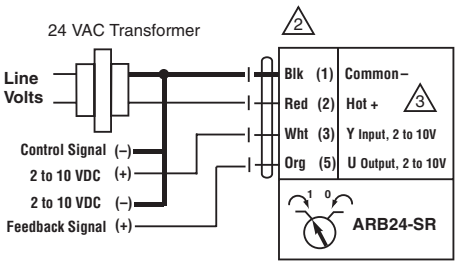
△3 Actuators may also be powered by 24 VDC.

△5 Only connect common to neg. (–) leg of control circuits.

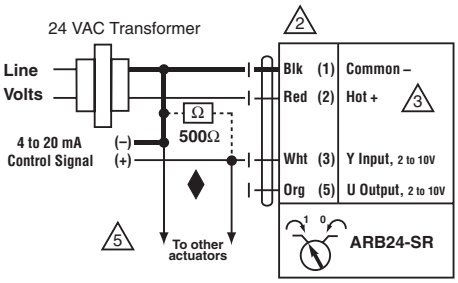
APPLICATION NOTES

◆ The ZG-R01 500 Ω resistor converts the 4 to 20 mA control signal to 2 to 10 VDC, up to 2 actuators may be connected in parallel.

⚠ ***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.



2 to 10 VDC control



4 to 20 mA control

AFB24-SR - Damper Actuator

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

Torque min. 180 in-lb, Control 2 to 10 VDC, Feedback 2 to 10 VDC

Application

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

Operation

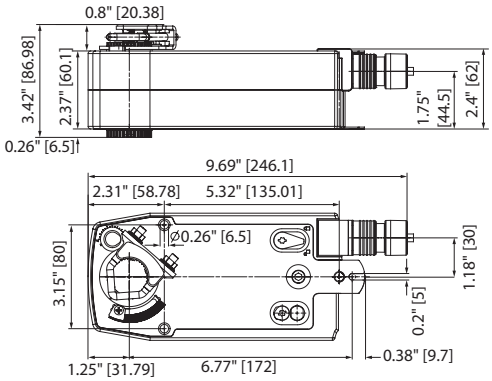
The AF..24-SR series actuators provide true spring return operation for reliable fail-safe application and positive close off on air tight dampers. The spring return system provides constant torque to the damper with, and without, power applied to the actuator. The AF..24-SR series provides 95° of rotation and is provided with a graduated position indicator showing 0° to 95°. The AF..24-SR uses a brushless DC motor which is controlled by an Application Specific Integrated Circuit (ASIC) and a microprocessor. The microprocessor provides the intelligence to the ASIC to provide a constant rotation rate and to know the actuator's exact fail-safe position. The ASIC monitors and controls the brushless DC motor's rotation and provides a digital rotation sensing function to prevent damage to the actuator in a stall condition. The actuator may be stalled anywhere in its normal rotation without the need of mechanical end switches. The AF..24-SR actuator is shipped at +5° (5° from full fail-safe) to provide automatic compression against damper gaskets for tight shut-off.

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

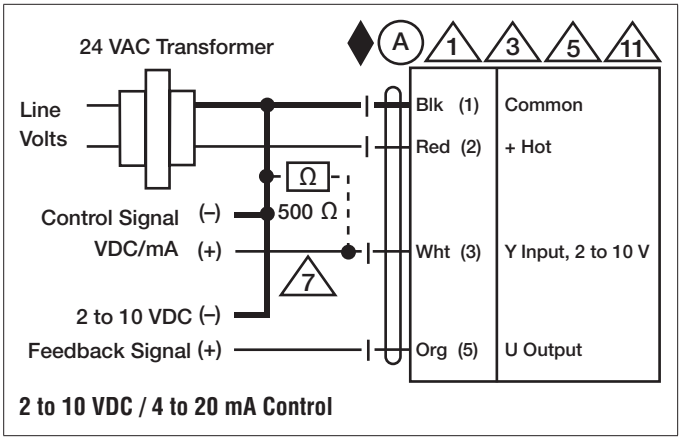
Technical Data	
Power Supply	24 VAC±20%, 50/60Hz, 24 VDC+20%/-10%
Power Consumption Running	5.5 W
Power Consumption Holding	3 W
Transformer Sizing	8.5 VA (class 2 power source)
Shaft Diameter	1/2" to 1.05" round, centers on 1/2" and 3/4" with insert, 1.05" without insert
Electrical Connection	3 ft [1 m], 18 GA appliance cable with 1/2" conduit connector
Overload Protection	electronic throughout 0° to 95° rotation
Electrical Protection	actuators are double insulated
Operating Range Y	2 to 10 VDC, 4 to 20 mA w/ ZG-R01 (500 Ω, 1/4 W resistor)
Input Impedance	100 k Ω for 2 to 10 VDC (0.1 mA), 500 Ω for 4 to 20 mA
Feedback Output U	2 to 10 VDC, 0.5 mA max
Angle of Rotation	95° (adjustable with mechanical end stop, 35° to 95°)
Torque	180 in-lbs [20 Nm] minimum
Direction of Rotation (Motor)	reversible with built-in switch
Direction of Rotation (Fail-Safe)	reversible with CW/CCW mounting
Position Indication	visual indicator, 0° to 95° (0° is full spring return position)
Manual Override	5 mm hex crank (3/16" Allen), supplied
Running Time (Motor)	95 sec
Running Time (Fail-Safe)	<20 sec @ -4°F to 122°F [-20°C to 50°C], < 60 sec @ -22°F [-30°C]
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, UL enclosure type 2
Housing Material	zinc coated metal and plastic casing
Agency Listings†	cULus acc. to UL60730-1A/-2-14, CAN/CSA E60730-1:02, CE acc. to 2004/108/EC
Noise Level (Motor)	≤40 dB (A)
Noise Level (Fail-Safe)	<62 dB (A)
Servicing	maintenance free
Quality Standard	ISO 9001
Weight	4.6 lb [2.1 kg]

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

Dimensions (Inches[mm])



Accessories	
AF-P	Anti-rotation bracket AF/NF.
AV8-25	9.8” shaft extension for 5/16” to 1” diameter shafts.
IND-AFB	AFB(X)/NFB(X) position indicator.
K7-2	Standard AFB(X)/NFB(X) clamp (1/2” to 1.05”).
KG10A	Ball joint for 3/8” diameter rod, zinc plated.
KG8	Ball joint for 5/16” diameter rod, 90°, galvanized steel.
KH10	Univ. crankarm, slot 21/64” w, for 9/16” to 1” dia. shafts.
KH12	Univ. crankarm, slot 21/64” w, for 3/4” to 1” dia. shafts.
KH8	Univ. crankarm,slot 21/64” w,for 3/8” to 11/16” dia. shafts.
KH-AFB	AFB(X)/NFB(X) crankarm (with 3/4” dia. shaft pass through).
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).
Z-AF	Classic AF/NF to AFB(X)/NFB(X) retrofit mounting bracket.
ZG-100	Univ. right angle bracket (17” H x 11-1/8” W x 6” base).
ZG-101	Univ. right angle bracket (13” H x 11” W x 7-7/16” base).
ZG-109	Right angle bracket for ZS-260.
ZG-110	Stand-off bracket for ZS-260.
ZG-118	AFB(X)/NFB(X) U bracket (5-7/8” H x 5-1/2” W x 2-19/32” D).
ZG-120	Jackshaft mounting bracket.
ZG-AFB	AFB(X)/NFB(X) crankarm adaptor kit.
ZG-AFB118	AFB(X)/NFB(X) crankarm adaptor kit.
ZG-DC1	Damper clip for damper blade, 3.5” width.
ZG-DC2	Damper clip for damper blade, 6” width.
ZG-JSA-1	1” diameter jackshaft adaptor (11” L).
ZG-JSA-2	1-5/16” diameter jackshaft adaptor (12” L).
ZG-JSA-3	1.05” diameter jackshaft adaptor (12” 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.
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).
TF-CC US	Cable conduit connector, 1/2”.
ZG-R01	4 to 20 mA adaptor, 500Ω, 1/4 W resistor w 6” pigtail wires.
ZG-SGF	Mounting plate for SGF.
ZG-X40	120 to 24 VAC, 40 VA transformer.



2 to 10 VDC / 4 to 20 mA Control

Typical Specification

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

Wiring Diagrams

WARNING! LIVE ELECTRICAL COMPONENTS!

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

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

(A) Actuators with appliance cables are numbered.

△1 Provide overload protection and disconnect as required.

△3 Actuators may also be powered by 24 VDC.

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

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

△11 Actuators may be connected in parallel if not mechanically linked. Power consumption and input impedance must be observed.

NFB24-SR Technical Data Sheet

Modulating, Spring Return, AC 24 V/DC, for DC 2…10 V or 4…20 mA Control Signal

Torque min. 90 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 up to 1.05" in diameter by means of its universal clamp. A crank arm and several mounting brackets are available for applications where the actuator cannot be direct coupled to the damper shaft. The actuator operates in response to a 2 to 10 VDC or, with the addition of a 500Ω resistor, a 4 to 20 mA control input from an electronic controller or positioner. A 2 to 10 VDC feedback signal is provided for position indication. Not to be used for a master-slave application.

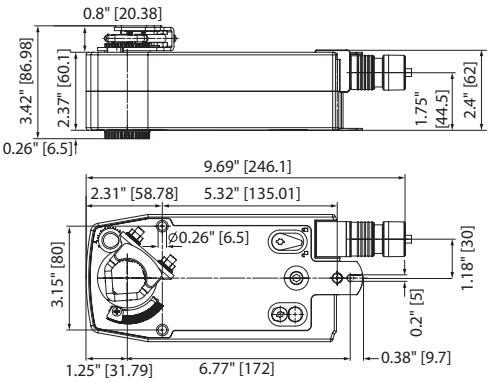
Operation

The NF..24-SR series actuators provide true spring return operation for reliable fail-safe application and positive close off on air tight dampers. The spring return system provides constant torque to the damper with, and without, power applied to the actuator. The NF..24-SR series provides 95° of rotation and is provided with a graduated position indicator showing 0° to 95°. The NF..24-SR uses a brushless DC motor which is controlled by an Application Specific Integrated Circuit (ASIC) and a microprocessor. The microprocessor provides the intelligence to the ASIC to provide a constant rotation rate and to know the actuator's exact fail-safe position. The ASIC monitors and controls the brushless DC motor's rotation and provides a digital rotation sensing function to prevent damage to the actuator in a stall condition. The actuator may be stalled anywhere in its normal rotation without the need of mechanical end switches. The NF..24-SR actuator is shipped at 5° (5° from full fail-safe) to provide automatic compression against damper gaskets for tight shut-off.

Technical Data	
Power Supply	24 VAC, ±20%, 50/60 Hz, 24 VDC, -10% / +20%
Power consumption in operation	3.5 W
Power consumption in rest position	2.5 W
Transformer sizing	6 VA (class 2 power source)
Shaft Diameter	1/2...1.05" round, centers on 1/2" and 3/4" with insert, 1.05" without insert
Electrical Connection	18 GA appliance cable, 3 ft [1 m], with 1/2" conduit connector
Overload Protection	electronic throughout 0...95° rotation
Electrical Protection	actuators are double insulated
Operating Range	DC 2...10 V, 4...20 mA w/ ZG-R01 (500 Ω, 1/4 W resistor)
Input Impedance	100 kΩ for DC 2...10 V (0.1 mA), 500 Ω for 4...20 mA
Position Feedback	DC 2...10 V, Max. 0.5 mA
Angle of rotation	95°, adjustable with mechanical end stop, 35...95°
Torque motor	90 in-lb [10 Nm]
Direction of rotation motor	reversible with built-in switch
Direction of motion fail-safe	reversible with cw/ccw mounting
Position indication	Mechanical
Manual override	5 mm hex crank (3/16" Allen), supplied
Running Time (Motor)	95 s
Running time fail-safe	<20 s @ -4...122°F [-20...50°C], <60 s @ -22°F [-30°C]
Ambient humidity	max. 95% r.H., non-condensing
Ambient temperature	-22...122°F [-30...50°C]
Storage temperature	-40...176°F [-40...80°C]
Degree of Protection	IP54, NEMA 2, UL Enclosure Type 2
Housing material	Galvanized steel and plastic housing
Agency Listing	cULus acc. to UL60730-1A/-2-14, CAN/CSA E60730-1:02, CE acc. to 2004/108/EC
Noise level, motor	40 dB(A)
Noise level, fail-safe	62 dB(A)
Maintenance	maintenance-free
Quality Standard	ISO 9001
Weight	4.9 lb [2.2 kg]

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

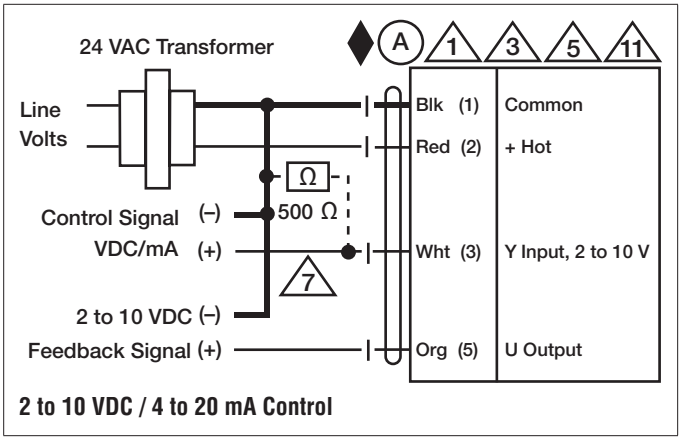
Dimensions (Inches[mm])



Safety Notes

WARNING: For Belimo products sold in California: these products do or may contain chemicals which are known to the State of California to cause cancer and or birth defects or other reproductive harms. For more information see www.p65warnings.ca.gov.

Accessories	
AF-P	Anti-rotation bracket AF/NF.
AV8-25	Shaft extension
IND-AFB	End stop indicator
K7-2	Shaft clamp reversible
KG10A	Ball joint
KG8	Ball joint
KH10	Damper crank arm
KH8	Damper crank arm
KH-AFB	Actuator arm
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.
ZG-100	Univ. right angle bracket 17"x11-1/8"x6" (HxWxbase).
ZG-101	Univ. right angle bracket 13x11x7-7/16" (HxWxbase).
ZG-109	Right angle bracket for ZS-260.
ZG-110	Stand-off bracket for ZS-260.
ZG-118	AFB(X)/NFB(X) U bracket 5-7/8x5-1/2x2-19/32" (HxWxD).
ZG-120	Jackshaft mounting bracket.
ZG-AFB	Mounting and linkage kit
ZG-AFB118	AFB(X)/NFB(X) crankarm adaptor kit.
ZG-DC1	Damper clip for damper blade, 3.5" width.
ZG-DC2	Damper clip for damper blade, 6" width.
ZG-JSA-1	1" diameter jackshaft adaptor (11" L).
ZG-JSA-2	1-5/16" diameter jackshaft adaptor (12" L).
ZG-JSA-3	1.05" diameter jackshaft adaptor (12" L).
ZS-100	Weather shield - galvaneal 13x8x6" (LxWxD).
ZS-101	Base plate for ZS-100.
ZS-150	Weather shield - PC w/ foam seal 16x8-3/8x4" (LxWxD).
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).
Z-SF	Base plate extension
ADS-100	Analog to digital switch for modulating actuators.
IRM-100	Input rescaling module for modulating actuators.
P475	Shaft mount, non-Mercury aux. switch for 1/2" dia. shafts.
P475-1	Shaft mount, non-Mercury aux. switch for 1" dia. shafts.
PS-100	Actuator power supply and control simulator.
PTA-250	Pulse width modulation interface for modulating actuators.
SGA24	Positioners suitable for use with the modulating damper actuators LM..A-SR, NM..A-SR, SM..A-SR and GM..A-SR
SGF24	Positioners suitable for use with the modulating damper actuators LM..A-SR, NM..A-SR, SM..A-SR and GM..A-SR
TF-CC US	Cable conduit connector, 1/2".
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.



2 to 10 VDC / 4 to 20 mA Control

NFB24-SR Technical Data Sheet

Modulating, Spring Return, AC 24 V/DC, for DC 2...10 V or 4...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 jackshaft up to a 1.05" diameter. The actuator must provide modulating damper control in response to a 2 to 10 VDC or, with the addition of a 500Ω resistor, a 4 to 20 mA control input from an electronic controller or positioner. The actuators must be designed so that they may be used for either clockwise or counter clockwise fail-safe operation. Actuators shall use a brushless DC motor controlled by a microprocessor and be protected from overload at all angles of rotation. Run time shall be constant, and independent of torque. A 2 to 10 VDC feedback signal shall be provided for position feedback. Actuators with auxiliary switches must be constructed to meet the requirements for Double Insulation so an electrical ground is not required to meet agency listings. Actuators shall be cULus listed and have a 5 year warranty, and be manufactured under ISO 9001 International Quality Control Standards. Actuators shall be as manufactured by Belimo.

Wiring Diagrams

WARNING! LIVE ELECTRICAL COMPONENTS!

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

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

A Actuators with appliance cables are numbered.

1 Provide overload protection and disconnect as required.

3 Actuators may also be powered by 24 VDC.

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

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

11 Actuators may be connected in parallel if not mechanically linked. Power consumption and input impedance must be observed.

LF24-SR US Technical Data Sheet

Modulating, Spring Return, AC 24 V/DC, for DC 2…10 V or 4…20 mA Control Signal

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.

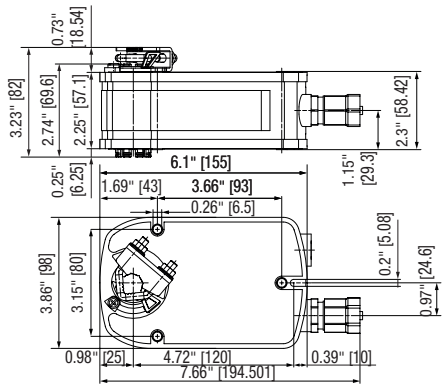
Operation

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 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.

Technical Data	
Power Supply	24 VAC, ±20%, 50/60 Hz, 24 VDC, ±10%
Power consumption in operation	2.5 W
Power consumption in rest position	1 W
Transformer sizing	5 VA (class 2 power source)
Shaft Diameter	3/8...1/2" round, centers on 1/2"
Electrical Connection	18 GA plenum cable, 3 ft [1 m], with 1/2" conduit connector
Overload Protection	electronic throughout 0...95° rotation
Electrical Protection	actuators are double insulated
Operating Range	DC 2...10 V, 4...20 mA w/ ZG-R01 (500 Ω, 1/4 W resistor)
Input Impedance	100 kΩ for DC 2...10 V (0.1 mA), 500 Ω for 4...20 mA
Position Feedback	DC 2...10 V, Max. 0.7 mA
Angle of rotation	Max. 95°,
Torque motor	35 in-lb [4 Nm]
Direction of rotation motor	reversible with built-in switch
Direction of motion fail-safe	reversible with cw/ccw mounting
Position indication	Mechanical
Running Time (Motor)	150 s constant, independent of load
Running time fail-safe	<25 s @ -4...122°F [-20...50°C], <60 s @ -22°F [-30°C]
Ambient humidity	max. 95% r.H., non-condensing
Ambient temperature	-22...122°F [-30...50°C]
Storage temperature	-40...176°F [-40...80°C]
Degree of Protection	IP54, NEMA 2
Housing material	galvanized steel
Agency Listing	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	3.4 lb [1.5 kg]

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

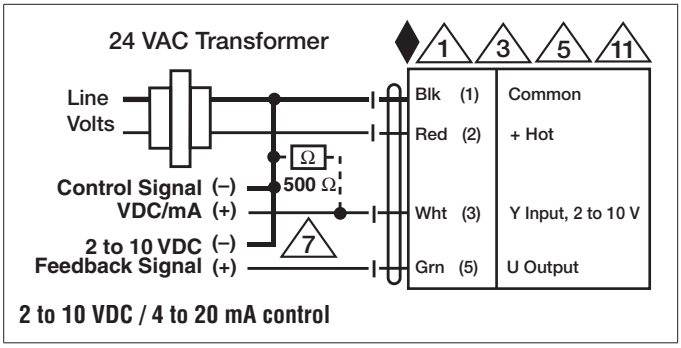
Dimensions (Inches[mm])



Safety Notes

WARNING: For Belimo products sold in California: these products do or may contain chemicals which are known to the State of California to cause cancer and or birth defects or other reproductive harms. For more information see www.p65warnings.ca.gov.

Accessories	
AV6-20	Shaft extension
K6 US	Standard LF clamp (3/8” to 1/2”).
K6-1	Shaft clamp reversible
KG10A	Ball joint
KG8	Ball joint
KH8	Damper crank arm
KH-LF	Actuator arm
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
ZF8-LF	Form fit adapter
ZG-109	Right angle bracket for ZS-260.
ZG-110	Stand-off bracket for ZS-260.
ZG-112	LF right angle bracket 4-1/2x5-1/2x2-1/2” (HxWxD).
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 13x8x6” (LxWxD).
ZS-101	Base plate for ZS-100.
ZS-150	Weather shield - PC w/ foam seal 16x8-3/8x4” (LxWxD).
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.
P475	Shaft mount, non-Mercury aux. switch for 1/2” dia. shafts.
P475-1	Shaft mount, non-Mercury aux. switch for 1” dia. shafts.
PS-100	Actuator power supply and control simulator.
PTA-250	Pulse width modulation interface for modulating actuators.
SGA24	Positioners suitable for use with the modulating damper actuators LM..A-SR, NM..A-SR, SM..A-SR and GM..A-SR
SGF24	Positioners suitable for use with the modulating damper actuators LM..A-SR, NM..A-SR, SM..A-SR and GM..A-SR
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.



2 to 10 VDC / 4 to 20 mA control

LF24-SR US Technical Data Sheet

Modulating, Spring Return, AC 24 V/DC, for DC 2...10 V or 4...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.

1 Provide overload protection and disconnect as required.

3 Actuators may also be powered by 24 VDC.

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

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

11 Actuators may be connected in parallel if not mechanically linked. Power consumption and input impedance must be observed.

VMD1B-C & VMD1B-F SERIES

Socket Relays in a Wide Range of Coil Voltages

Color-coded pushbutton

Allows manual operation of relay, AC coils red or DC coils blue (-F Series only)

Override lever

When activated, locks push-button and contacts in the powered position (-F Series only)

LED status lamp

Shows coil "ON" or "OFF" status (-F Series only)

Flag indicator

Shows relay status in manual or powered condition (-F Series only)

2-way mounting

Side or DIN rail mounting system…retrofits existing panel mounting and 35 mm DIN rail

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.

TYPICAL COIL PERFORMANCE	
	Power Consumption
AC Coils	0.9 VA
DC Coils	0.7 VA

CONTACT RATINGS	
Standard (F & C Series)	
Resistive	15 A @ 120 Vac
	15 A @ 277 Vac
	15 A @ 28 Vdc
Motor	1/3 @ 120 Vac
	3/4 @ 277 Vac
Pilot Duty	B300

SPECIFICATIONS

Operating Temp. Range	-40 to 55 °C (-40 to 131 °F)
Coil Operating Range	85% to 110% of rated voltage
Coil 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	1500 Vac RMS
WARRANTY	
Limited Warranty	5 years

AGENCY APPROVALS

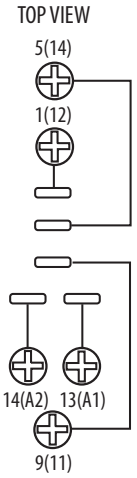
E198453

*The CE mark indicates RoHS2 compliance. Note: These relays are UL Listed when used with Veris sockets.

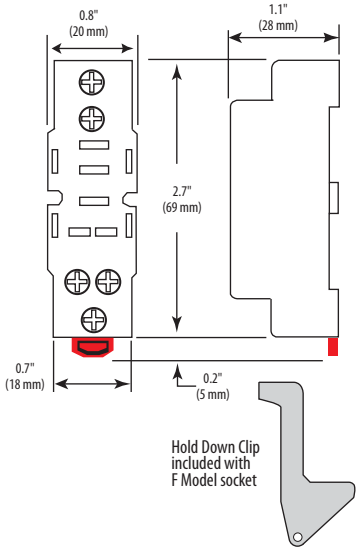
VBD1B SOCKET
Wiring Diagram

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

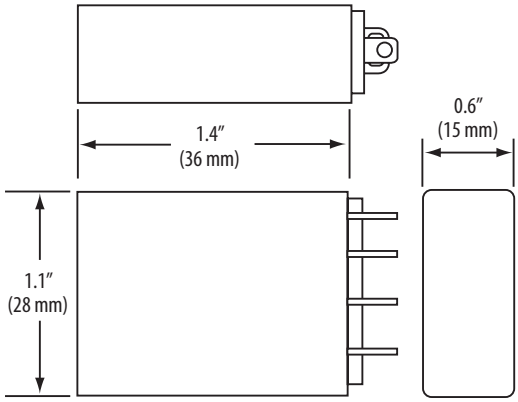
** NOTE: Observe polarity for relays with DC coil voltages only.*



VMD1B SOCKET
Dimensional Drawing



VMD1B RELAYS
Dimensional Drawing



ORDERING INFORMATION

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

SOCKET ORDERING INFORMATION

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

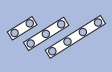
When relays and sockets are used together, amperage rating is the lesser of the two ratings.

Mini Feed-Through 15mm

For wire-to-wire connecting in control, automation, instrumentation and power distribution applications.

Altech "miniature" terminal blocks offer tremendous space advantage as demanded by certain wiring configurations.

	CMT4			CGMT4		
						
Terminal Width	6 mm			6 mm		
Height x Length	29 x 27 mm			28.5 x 27 mm		
Stripping Length	9 mm			9 mm		
Insulation Material	Polyamide 6.6			Polyamide 6.6		
Type of Connection	2 screw clamps & 1 tapped hole for cross connection			2 screw clamps		
Approvals	c SA us	IEC 60947-7-1	c UL us E220514	c SA us	IEC 60947-7-1	c UL us E220514
Wire Range	22-10 AWG	0.2-4 sq.mm	22-10 AWG	22-10 AWG	0.2-4 sq.mm	22-10 AWG
Voltage Rating	300 V	500 V	300 V		400 V	
Current Rating	35 A	32 A	35 A		32 A	
Torque	7 lb-in	0.5 Nm	7 lb-in	7 lb-in	0.5 Nm	7 lb-in
Other Approvals	RoHS, IECEx, Ex, CE, VDE			RoHS, IECEx, Ex, CE, VDE, AEx ell Ex ell U		

		Cat. No.	Std. Pk.	Cat. No.	Std. Pk.
Terminal Block		**CMT4**	100	**CGMT4**	50
End Plate		EPCMT4	50		
Isolation Partition		PPCMT4	50		
DIN Rail for ordering information refer to pages 90-91					
End Stop for ordering information refer to page 92		CA602	100		
Internal Jumper	 2 pole 3 pole 4 pole 10 pole	CA727/2 CA727/3 CA727/4 CA727/10	100 100 100 10		
Insulated Internal Jumper	 2 pole 3 pole 4 pole 10 pole	CA747/2 CA747/3 CA747/4 CA747/10	100 100 100 10		
Current Bars	 2 pole 3 pole 4 pole 10 pole 10 pole (breakable) 100 pole	CA703/1 CA704/1 CA705/1 CA732/10 CA732/10-A CA732/100	100 100 100 100 100 10		
Shorting Sleeve & Screw		CA607/S/Q	100		
External Jumper	 2 pole 3 pole 4 pole 10 pole	CA714/2 CA714/3 CA714/4 CA714/10	100 100 100 20		
Marking Tags		MT2	100	MT2	100

COLOR BLOCKS
(other than standard grey)

When ordering please add color suffix to Cat. No.

Example for color Red: ***Cat.No./R***

Color	Ordering Suffix
Red	R
Yellow	Y
Blue	BU
Green	G

Consult Altech for availability:

Orange	O
Beige	BG
Dark Brown	DB
Black	BL
White	W

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KELE NEMA 1 ENCLOSURES

RET SERIES

DESCRIPTION

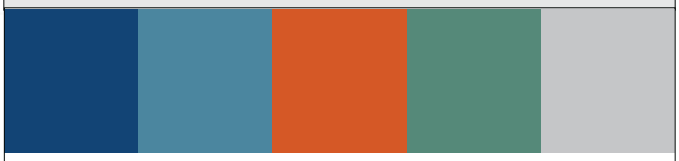
The **Kele RET Series** includes attractive, economical NEMA 1 enclosures designed to house controls and instruments in areas which do not require oil-tight and dust-tight ratings. The **RET Series** enclosures are furnished with a perforated metal subpanel for easy mounting of components. No drilling or layout is needed. Simply set the control components on the panel and attach with #7 or #8 self-tapping screws in the prepunched holes. The **RET Series** is also available in a UL listed version.

RET2018

FEATURES

- ***Low-cost NEMA 1 enclosure***
- ***Mounted with door hinged on left or right side***
- ***Removable door***
- ***Attractive powder-coated finish***
- ***Standard brown enclosure with brown door***
- ***Optional colors available***
- ***Key lock, two keys, and attractive gray powder-coated perf panel furnished***
- ***Mounting components simplified with perf panel***

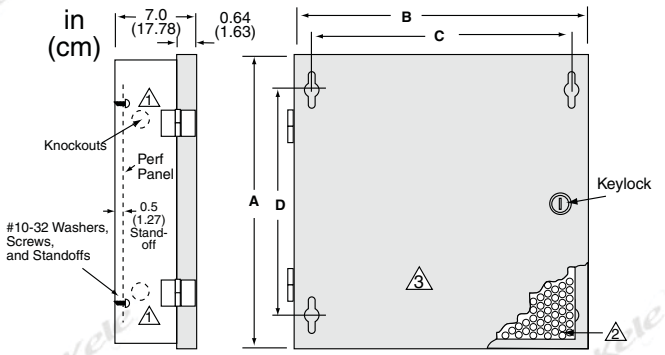
RET OPTIONAL COLOR CHART



Dark Blue | **Powder Blue** | **Orange** | **Green** | **Gray**

Optional colors shown in approximate hue

DIMENSIONS



1 Knockouts are for 3/4" conduit, two knockouts on both sides, three knockouts top and bottom (except two on RET 1812).

2 Perf Panel is 16-ga powder-coated steel.

3 Standard color is brown enclosure with tan door.

ORDERING INFORMATION

ENCLOSURE MODEL	DIMENSIONS in (cm) A	B	C	D	ENCLOSURE MATERIAL	PERF PANEL	WEIGHT lb (Kg)	PERF PANEL H x W in (cm)
RET2620†	26 (66)	20 (51)	18.75 (47)	17.75 (51)	16-ga steel	Included	36 (16.4)	23.5 x 17.5 (60 x 44)
RET3826†	38 (97)	26 (66)	24.75 (62)	29.75 (81)	16-ga steel	Included	61 (27.8)	35.5 x 23.5 (90 x 60)
RET4230†	42 (107)	30 (76)	28.75 (66)	33.75 (97)	14-ga steel	Included	83 (37.8)	39.5 x 27.5 (100 x 70)
RET1812ULP†	18 (46)	12 (31)	10.75 (28)	9.75 (36)	16-ga steel	Included	16 (7.3)	15.5 x 9.0 (39 x 23)
RET2018ULP†	20 (51)	18 (46)	16.75 (42)	11.75 (36)	16-ga steel	Included	27 (12.3)	17.5 x 15.5 (44 x 39)
RET2620ULP†	26 (66)	20 (51)	18.75 (47)	17.75 (51)	14-ga steel	Included	41 (18.6)	23.5 x 17.5 (60 x 44)
RET3626ULP†	36 (91)	26 (66)	24.75 (62)	27.75 (76)	14-ga steel	Included	69 (31.3)	33.5 x 23.5 (85 x 60)

† **-DB**: Dark Blue, **-PB**: Powder Blue, **-OR**: Orange, **-GN**: Green, **-GY**: Gray (Note: No suffix - Brown/Tan)

ACCESSORIES

RET-KEY	Replacement Key for Ret-Lock
RET-LOCK	Lock with key for RET enclosure

PANEL FABRICATION

PANEL RECEPTACLE AND DISCONNECT SWITCH ASSEMBLIES

MODELS PDK, PRK, 51012218

DESCRIPTION

These **Panel Receptacle** and **Disconnect Switch Assemblies** combine convenience and function. **Models PRK-S, PRK-FS**, and **PRK-FLS** provide constant power to the receptacle and can be used to power down the rest of the panel with the toggle switch. **Models PRK-FS** and **PRK-FLS** include a fuse holder for circuit protection (fuse sold separately). **Models PDK** and **PRK** are standard single-gang configuration, and **Models PRK-FLS, PRK-FS,** and **PRK-S** are double-gang configuration. The **51012218** offers DIN rail mounting and convenient push-on wiring.

FEATURES

- ***Prewired***
- ***Handy box included***
- ***Cost effective***
- ***Always hot receptacle***
- ***Panel disconnect switch***
- ***Pilot light option to indicate closed switch***

CAUTION: Receptacle is always hot.

PRK-GFI

PRK-S

PRK

PRK-FS

PDK

51012218

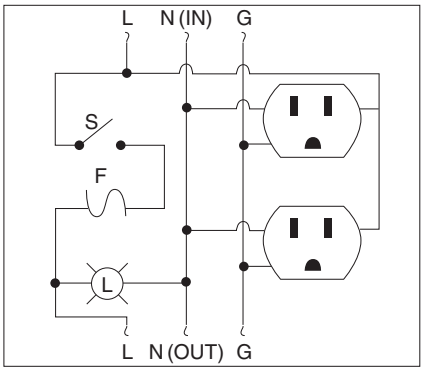
PRK-FLS

PDK-L

SPECIFICATIONS

Power Rating	120 VAC
Receptacles	Non-GFI 20A @ 120 VAC GFI 15A @ 120 VAC
Switch	20A @ 120 VAC
Light	25 mA @ 120 VAC
Fuse	250V 0.5-15A (ordered separately)
Wire	12 AWG (UL) MTW 600V
Dimensions	
PRK, PDK, 51012218, PRK-GFI	4.75"H x 2.75"W (12.07 x 6.99 cm)
PRK-S, PRK-FS, PRK-FLS	4.50"H x 4.50"W (11.43 x 11.43 cm)
Warranty	1 year

WIRING



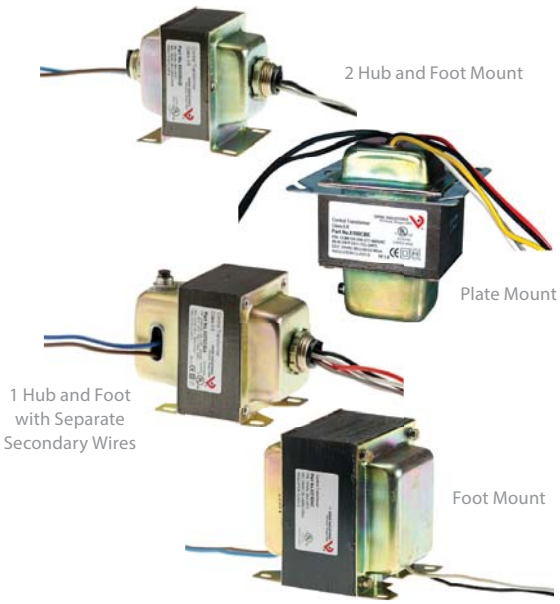
ORDERING INFORMATION

MODEL	DESCRIPTION
PDK	Panel disconnect switch assembly
PDK-L	Panel disconnect switch assembly with green light
PRK	Panel receptacle assembly
PRK-S	Panel switch and receptacle assembly
PRK-FS	Panel switch and receptacle assembly with fuse holder
PRK-FLS	Panel switch and receptacle assembly with fuse holder and green light
PRK-GFI	Panel receptacle assembly with GFI receptacle
51012218	DIN mount duplex receptacle with disconnect power input terminal block

RELATED PRODUCTS

GF Series Fuses (fuses ordered separately)

X SERIES



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

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.

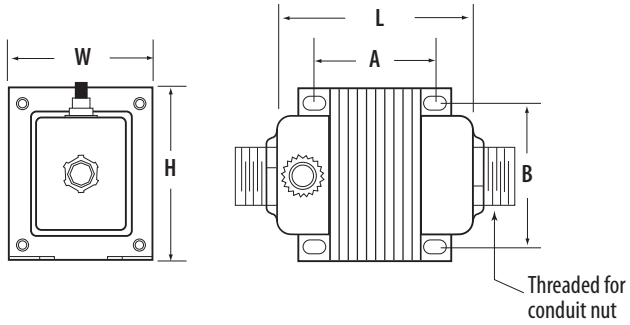
SPECIFICATIONS

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	

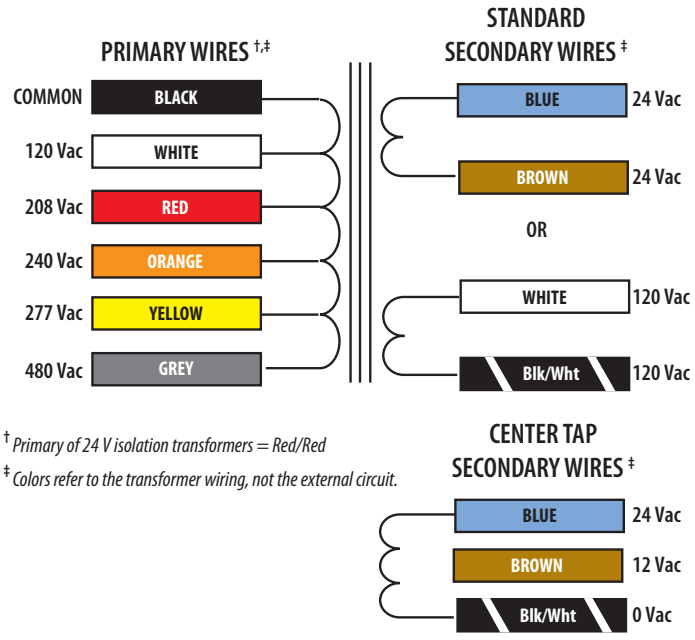
CE ** c UL us LISTED

*X085AAA, X375DAC have 14 AWG secondary wires.
**The CE mark indicates RoHS2 compliance.

DIMENSIONAL DRAWING



WIRE COLORS



† *Primary of 24 V isolation transformers = Red/Red*
‡ *Colors refer to the transformer wiring, not the external circuit.*

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		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	12/24	Fuse	2	Foot	•	•	•	2.7	2.2	2.9	1.98	1.81
X050BAA	50	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		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	24	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		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	85	120		Inherent	General	1HUB+FT		•	•	3.2	3.8	3.2	2.2	3.14
X100CAA	99	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	120	Circuit Breaker	General	2HUB+FT	•	•	•	4.1	2.5	3.1	2.51	2.03
X100CLB		220	24	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		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		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

KELE DC POWER SUPPLY

DCP-1.5-W

DESCRIPTION

The **Kele DCP-1.5-W** is a regulated 1.5A power supply that accepts 24 VAC at the input and provides 24 VDC at the output. The **DCP-1.5-W** can be ordered with any output voltage from 1.5V to 27 VDC. Field voltage adjustments may also be made using only a screwdriver. The power supply is provided with a mounting track for easy field application. This low cost power supply features good regulation and has full overcurrent protection.

FEATURES

- ***Low cost***
- ***Regulated DC output***
- ***Snap-track mounted***
- ***Screw terminals with pressure plates***
- ***Adjustable DC output***
- ***Full-wave rectified***

DCP-1.5-W

APPLICATION

In general, the output current rating will be reduced by the ratio of the output voltage divided by the input voltage. For example, a 6 VDC supply powered by a 24 VAC transformer will have a reduced-rated output current of 375 mA. (6/24) x 1.5 = 0.375

To obtain the full-rated output current at reduced output voltages, the standard power supply input voltage must be reduced. It is a good practice to maintain the same AC input voltage as the desired DC output voltage.

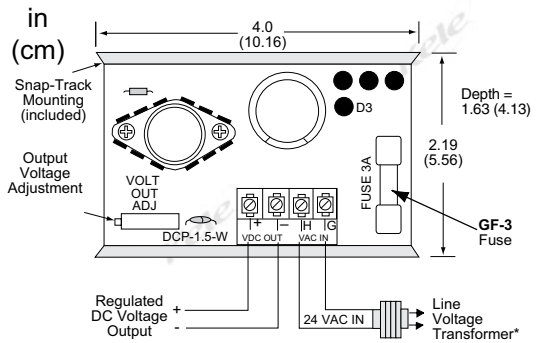
A grounded DC minus terminal and a grounded secondary 24 VAC input transformer will blow the unit's fuse. If this is a problem, there are three possible solutions:

Option 1: Remove the ground on the transformer secondary to float the voltage output, or use a separate ungrounded transformer.

Option 2: Add a Model Y65G13-0 40 VA isolation transformer. This option reduces the power supply capacity to 920 mA.

Option 3: Remove diode D3 (marked on board). Jumper the VDC OUT (-) terminal to the VAC IN (G) terminal. The grounded side of the AC supply should be wired to the VAC IN (G) terminal. This option reduces the power supply capacity to 400 mA. (Sometimes call "1/2 wave" option)

DIMENSIONS / WIRING



* Input Transformer Required VA Rating @ 24 VAC = 43.2 x Desired DC Output Current
For full 1.5A capacity, use a 75 VA transformer.

SPECIFICATIONS

Supply Voltage	24 VAC
Output Voltage	24 VDC (full wave rectified and regulated), Adjustable 1.5 - 27 VDC (full wave rectified and regulated)
Supply Frequency	50/60 Hz
Regulation	1.5% at full rated current
Output Current	1.5A (with 75 VA transformer)
Over Current Protection	3A fuse (GF-3)
Mounting	Snap track (included)
Temperature Stability	1%
Operating Temperature	32° to 130°F (0° to 55°C)
Operating Humidity	95% RH non-condensing
Dimensions	1.63"H x 2.19"W x 4.0"D (4.13 x 5.56 x 10.16 cm)
Weight	0.4 lb (0.18 Kg)
Warranty	1 year

ORDERING INFORMATION

MODEL	DESCRIPTION
DCP-1.5-W	Power supply, 24 VAC IN to 24 VDC OUT
DCP-1.5-W-C	Power supply, 24 VAC In to special DC output (Specify output voltage when ordering, 1.5-27 VDC)

ROTH SOUTHEAST

Automation • Energy Management • Lighting

OPERATIONAL STANDARDS:

1. CONDUIT FILL - CONDUIT FILL IS DONE ON A POINT SYSTEM. ½" CONDUIT IS RATED AT 12 POINTS AND ¾" 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

DIGITAL OUTPUTS WIRE COLOR - PURPLE

ANALOG INPUTS WIRE COLOR - YELLOW

DIGITAL INPUTS WIRE COLOR - ORANGE

YEL 3 WIRE ANALOG INPUT

PUR 2 WIRE DIGITAL OUTPUT

TAN 3 WIRE ANALOG OUTPUT

ORG 2 WIRE DIGITAL INPUT

N2 WIRE COLOR - BLUE

BACNET - GREEN

LON - PINK

MODBUS - GREY

INFINET - ORANGE

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.

DRAWING INDEX

CONTACTS:

NEIL CAPORALE
ROTH SOUTHEAST
2260 SW 66TH TERRACE
DAVIE, FL 33317
OPERATIONS MANAGER

PHONE: 954-423-6640 EXT 228
FAX: 954-423-6684
WWW.ROTHSOUTEAST.COM

DALE CHUNG
ROTH SOUTHEAST
2260 SW 66TH TERRACE
DAVIE, FL 33317
PROJECT MANAGER

PHONE: 954-423-6640 EXT 436
FAX: 954-423-6684
WWW.ROTHSOUTEAST.COM

PROJECT SCOPE:

Building 1
- (3) CHW AHU (EXISTING)
- (1) CHW/DX AHU (NEW)
- (3) EXHAUST FAN
- (1) SUPPLY FAN

Building 1 Chiller Plant
- (1) SINGLE CELL COOLING TOWER (EXISTING)
- (2) WATER COOLED CHILLERS (EXISTING)
- (6) PUMPS (EXISTING / CONSTANT FLOW)

Building 2
- (1) OA PRETREATMENT UNIT (NEW)
- (2) CHW AHU (EXISTING)

Building 3
- (2) CHW AHU (EXISTING)

Building 4
- (1) DX AHU (EXISTING)

RIVERGLADES ELEMENTARY SCHOOL #3019002

7400 PARKSIDE DRIVE
PARKLAND, FL 33067

DRAWING LEGENDS

RIVERGLADES ELEMENTARY
7400 PARKSIDE DRIVE
PARKLAND, FL 33067

DRAWING	
DRWG #	0
REV.	0
INIT. DATE	3/19/18
DRAWN BY:	JS
APPL. ENGINEER	NC
PROJECT MANAGER	NC
SALES ENGINEER	NC
JOB/CONT #	
FILE:	

ROTH SOUTHEAST
Automation • Energy Management • Lighting

REV	DESCRIPTION	DATE
1	REVISED PER DESIGN REVIEW	1/28/20
2	REVISED PER DESIGN REVIEW	5/11/20

APPROVED

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

NOTES:

1. AWAITING MORE INFORMATION FROM RFI XX REGARDING PIPE SIZE AND GPM FOR THE COIL.

SYMBOL LEGEND:

- # — NOTE NUMBER
- L1 — LINE 1 (HOT)
- N — NEUTRAL (COMMON)
- T — THERMOSTAT
- CO — CARBON MONOXIDE SENSOR
- CO2 — CARBON DIOXIDE SENSOR
- PS — PRESSURE SENSOR
- MOTOR STARTER
- VFD — VARIABLE FREQUENCY DRIVE
- FAN
- PUMP
- COOLING COIL
- DX COOLING COIL
- HEATING COIL
- REHEAT COIL
- ELECTRIC DUCT HEATER
- DUCT MOUNT TEMPERATURE / HUMIDITY SENSOR
- IMMERSION TEMPERATURE SENSOR
- FM — FLOW METER
- DP — DIFFERENTIAL PRESSURE SENSOR
- DUCT STATIC PRESSURE SENSOR
- FILTER SWITCH PRESSURE SENSOR
- AIR FLOW MONITORING STATION (AFMS)
- DAMPER
- ROOM SENSOR / THERMOSTAT
- CONTROLLER ENCLOSURE
- VAV BOX

VALVE SCHEDULE:

1

UNIT	GPM	DESIRED DELTA P	DESIRED COEFF.	PIPE SIZE	VALVE COEFF	VALVE DELTA P	VALVE SIZE	VALVE MANU.	VALVE MODEL	SPRING RETURN	ACTUATOR TYPE
AC-1	70.5	5	31.5285584	?	30	5.5225	1"	BELIMO	B325+AFRB24-SR	YES	MODULATING
AC-2	75.3	5	33.67518374	?	30	5.5225	1"	BELIMO	B325+AFRB24-SR	YES	MODULATING
AC-3	64.3	5	28.75583419	?	29	5.5225	1.5"	BELIMO	B339+AFRB24-SR	YES	MODULATING
AC-4	66.3	5	29.65026138	?	29	5.5225	1.5"	BELIMO	B339+AFRB24-SR	YES	MODULATING
AC-5		5		?		5.5225		BELIMO		YES	MODULATING
AC-6		5		?		5.5225		BELIMO		YES	MODULATING
AC-7		5		?		5.5225		BELIMO		YES	MODULATING
AC-8	47.8	5	21.37680986	?	25	5.5225	1.25"	BELIMO	B331+AFRB24-SR	YES	MODULATING

DRAWING LEGENDS

RIVERGLADES ELEMENTARY
7400 PARKSIDE DRIVE
PARKLAND, FL 33067

DRAWING	1
DRWG #	0
REV.	
INIT. DATE	3/19/18
DRAWN BY:	JS
APPL. ENGINEER	NC
PROJECT MANAGER	NC
SALES ENGINEER	NC
JOB/CONT #	
FILE:	

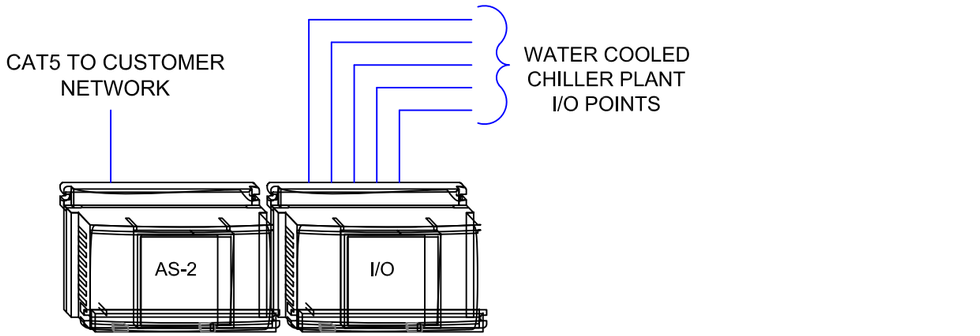
ROTH SOUTHEAST — Innovative • Energy Management • Lighting

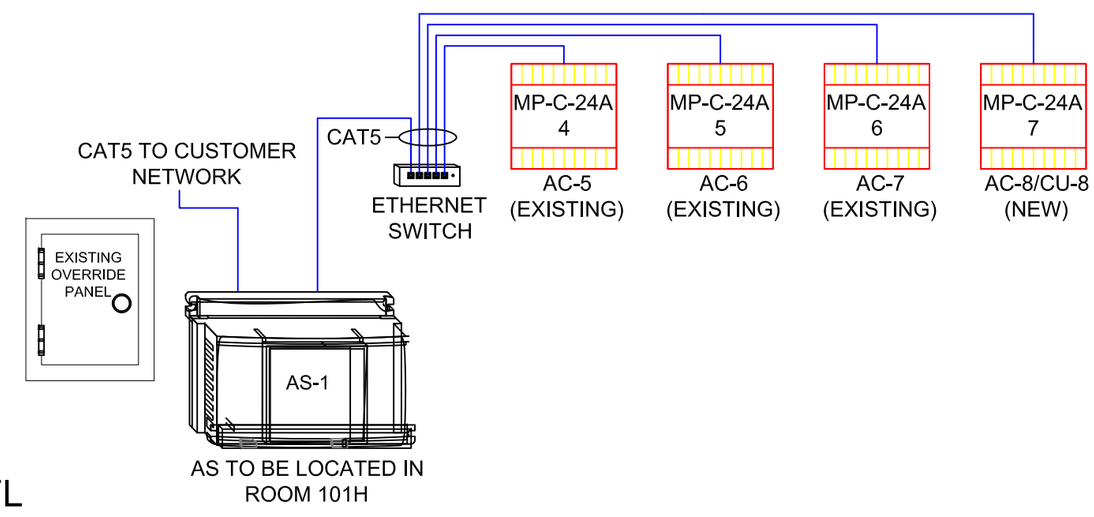
APPROVED | DATE | DESCRIPTION | REV

QTY	PART NUMBER	DESCRIPTION	MANUFACTURER
1	SXWAUTSVR100001	AS CONTROLLER	SCHNEIDER
1	SXWTBASW100001	AS TERMINAL BASE	SCHNEIDER
1	SXWPS24VX100001	POWER SUPPLY	SCHNEIDER
1	SXWTBPSW100001	POWER SUPPLY BASE	SCHNEIDER
3	ESW105	5-PORT ETHERNET SWITCH	B&B ELECTRONICS

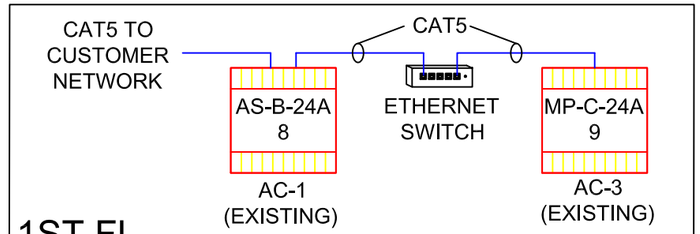
NOTES:

1. **EXISTING CONTINUUM CONTROLS FOR SECURITY TO REMAIN IN PLACE.**
2. **EXISTING OVERRIDE PANEL TO BE UPGRADED FOR CONNECTION TO STRUXUREWARE.**

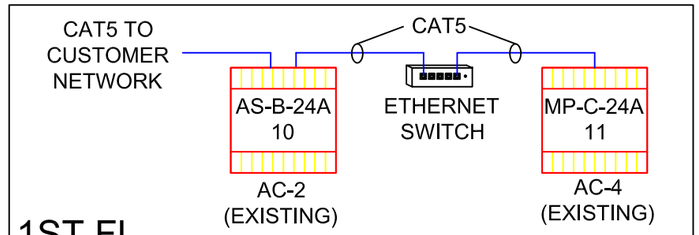




BUILDING 1



BUILDING 2



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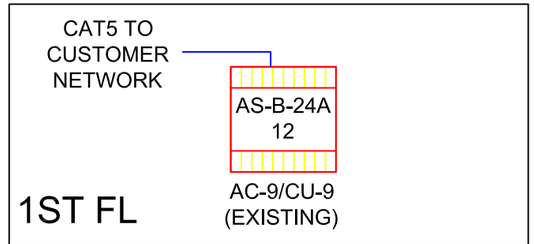


BUILDING 4

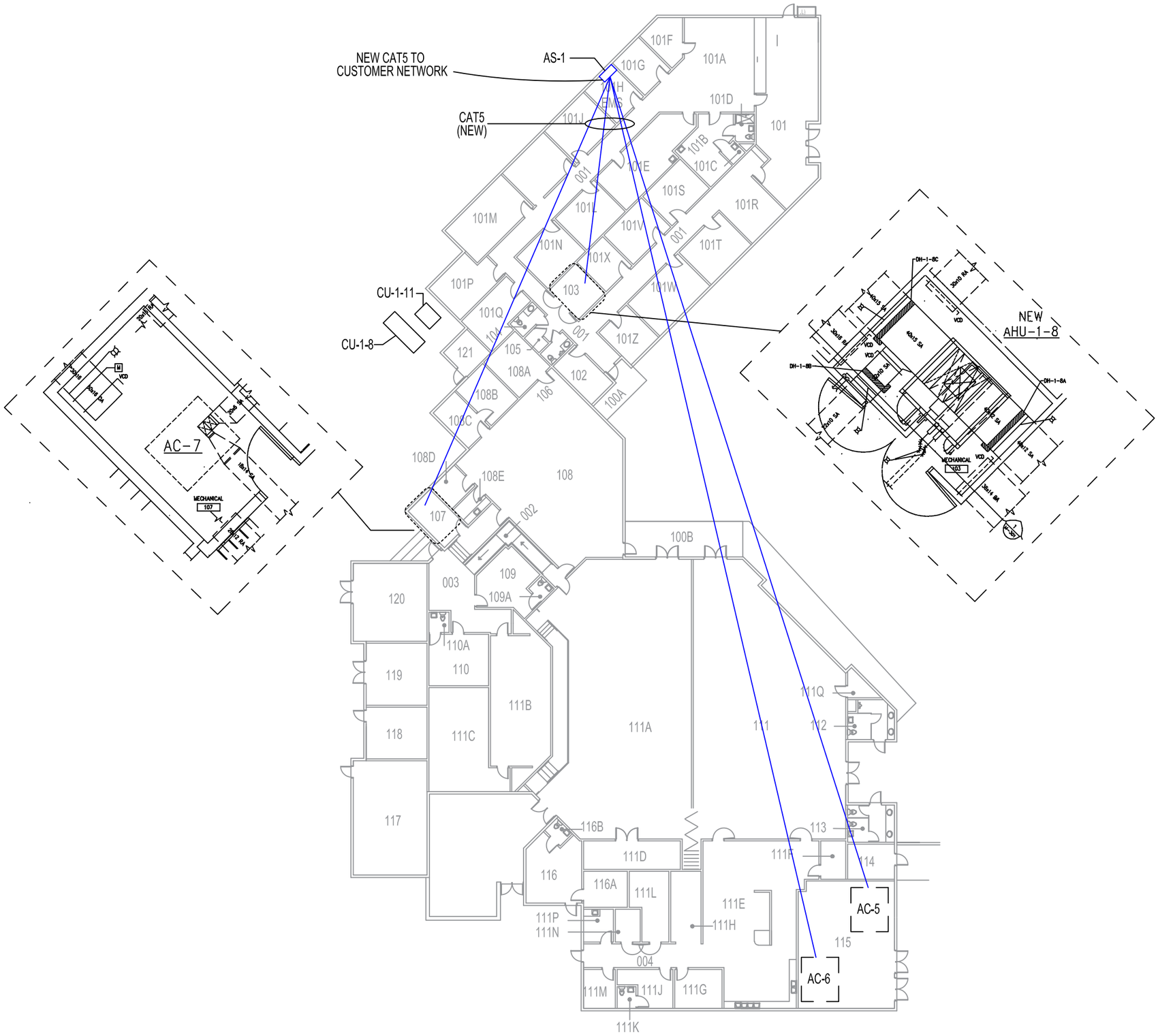
DRAWING
DRWG # 2
REV. 0
INIT. DATE 3/19/18
DRAWN BY: JS
APPL. ENGINEER NC
PROJECT MANAGER NC
SALES ENGINEER NC
JOB/CONT #
FILE:

RISER DIAGRAM

RIVERGLADES ELEMENTARY
7400 PARKSIDE DRIVE
PARKLAND, FL 33067

ROTH SOUTHEAST

APPROVED
DATE
DESCRIPTION
REV



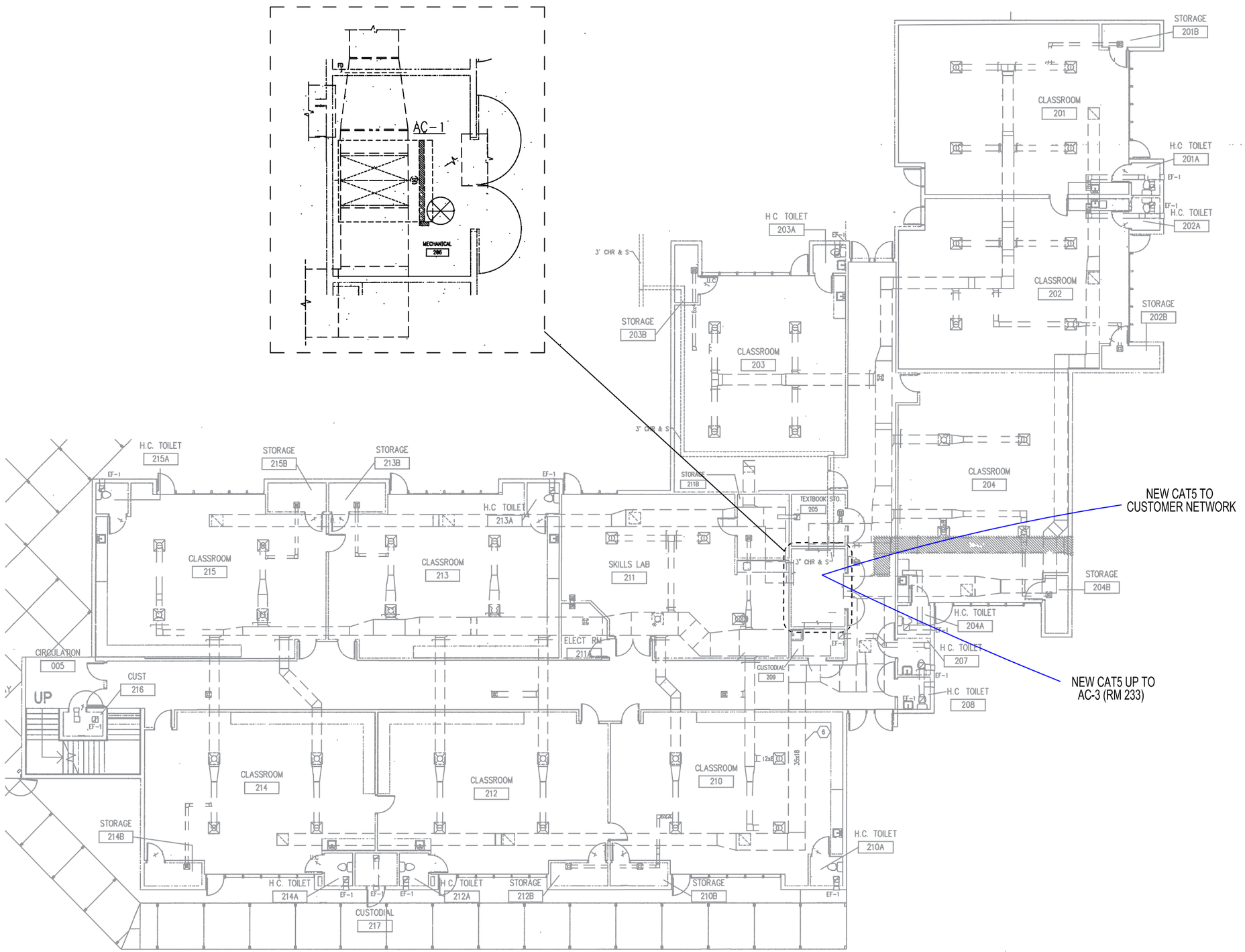
FILE:	
JOB/CONT #	
SALES ENGINEER	NC
PROJECT MANAGER	NC
APPL. ENGINEER	NC
DRAWN BY:	JS
DRAWING	
DRWG #	3
REV.	0
INIT. DATE	3/19/18

BLDG 1 LAYOUT

RIVERGLADES ELEMENTARY
7400 PARKSIDE DRIVE
PARKLAND, FL 33067

ROTH SOUTHEAST
Innovative • Energy Management • Lighting

REV	DESCRIPTION	DATE	APPROVED



BLDG 2 FIRST FLOOR LAYOUT

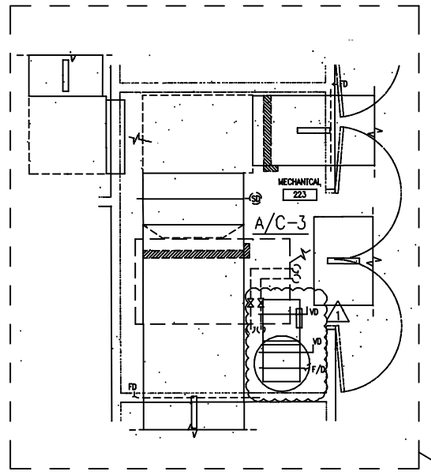
RIVERGLADES ELEMENTARY
7400 PARKSIDE DRIVE
PARKLAND, FL 33067

ROTH SOUTHEAST
Maintenance • Energy Management • Lighting

FILE:	JOB/CONT #	SALES ENGINEER	PROJECT MANAGER	APPL. ENGINEER	DRAWN BY:
		NC	NC	NC	JS

DRAWING	DRWG #	REV.	INIT DATE
	4	0	3/19/18

REV	DESCRIPTION	DATE	APPROVED



BLDG 2 SECOND FLOOR LAYOUT

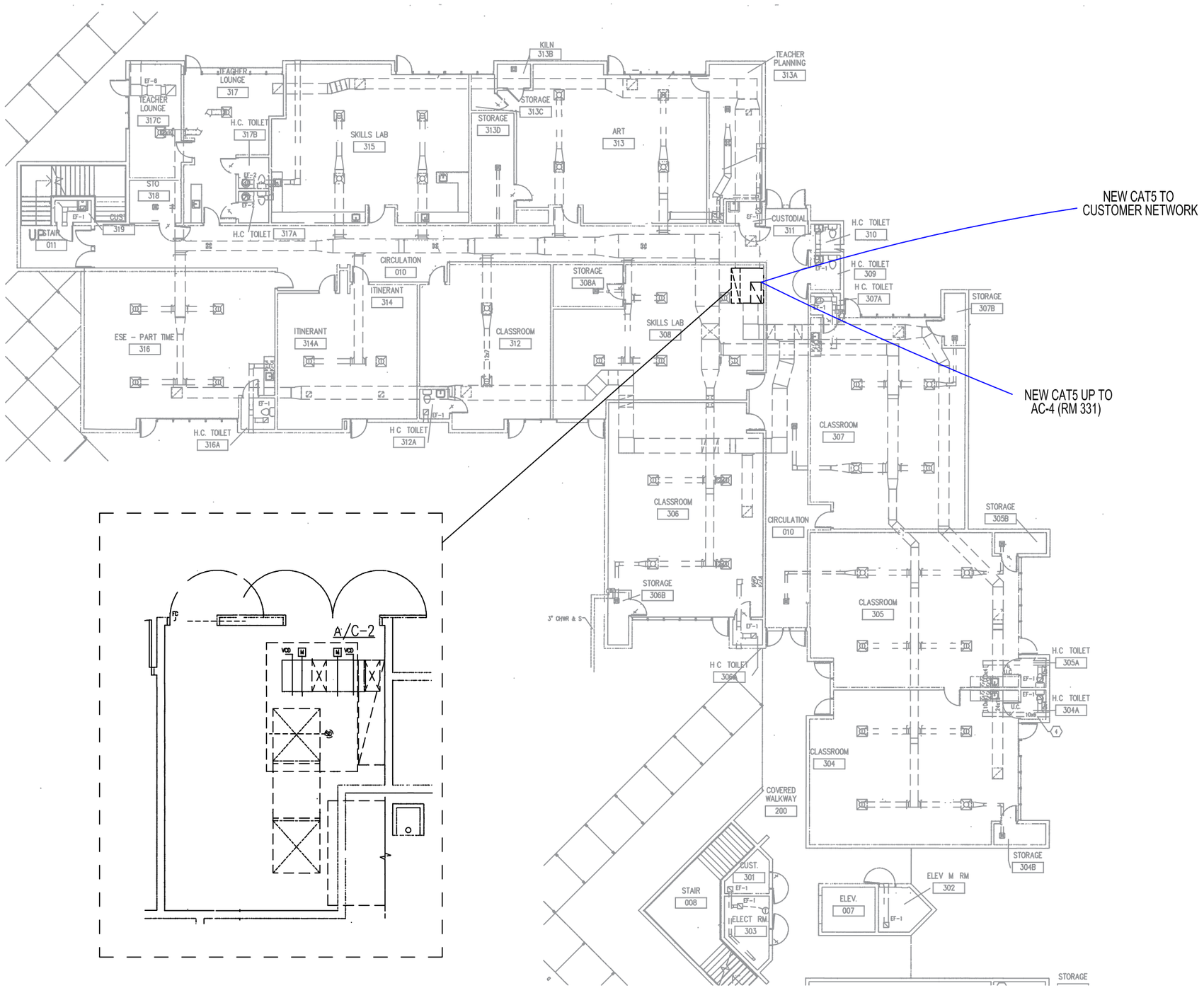
RIVERGLADES ELEMENTARY
7400 PARKSIDE DRIVE
PARKLAND, FL 33067

ROTH SOUTHEAST
Innovative • Energy Management • Lighting

FILE:	JOB/CONT #	SALES ENGINEER	PROJECT MANAGER	APPL. ENGINEER	DRAWN BY:
		NC	NC	NC	JS

DRAWING	DRWG #	REV.	INIT. DATE
	5	0	3/19/18

REV	DESCRIPTION	DATE	APPROVED



BLDG 3 FIRST FLOOR LAYOUT

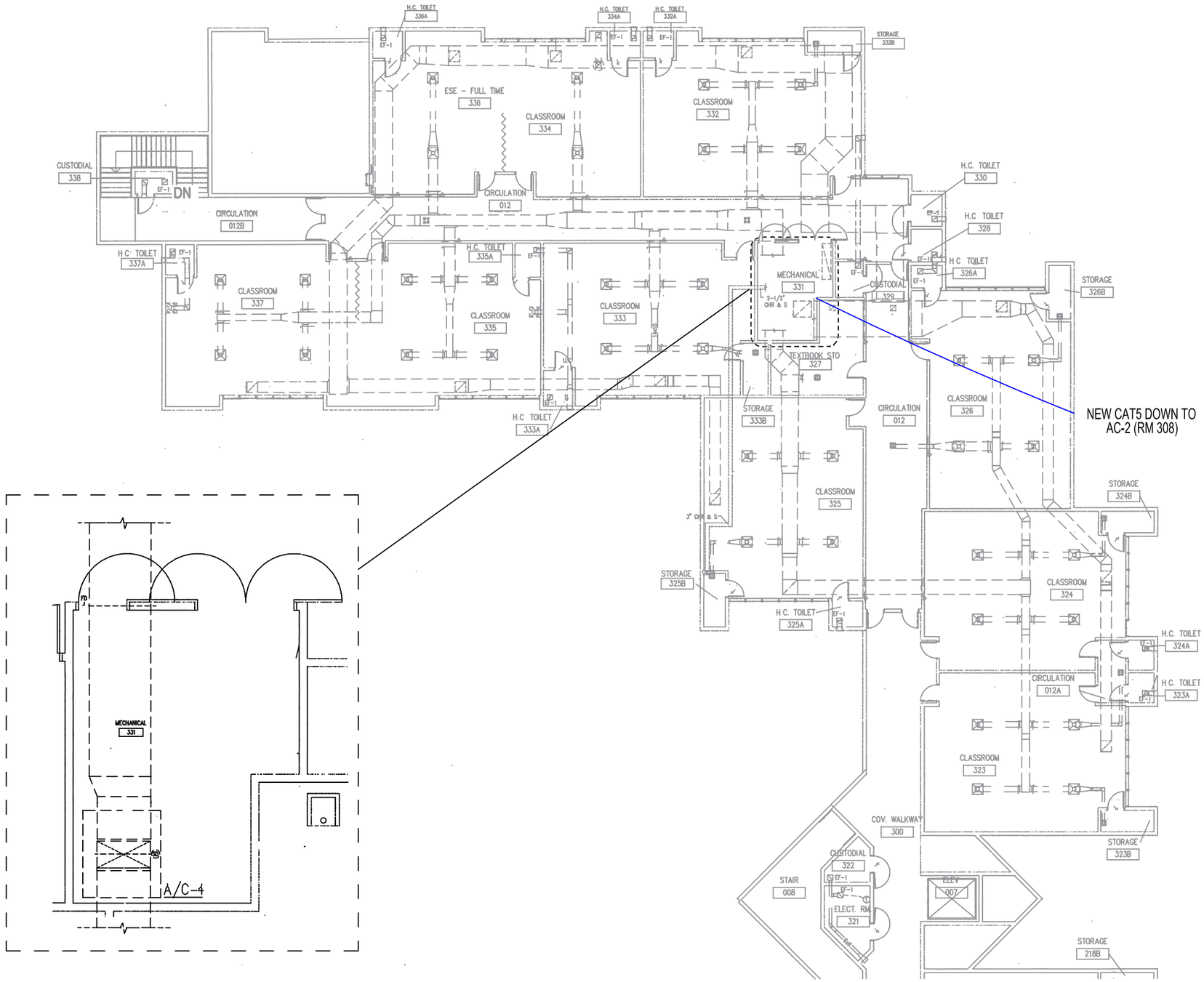
RIVERGLADES ELEMENTARY
7400 PARKSIDE DRIVE
PARKLAND, FL 33067

FILE:	JOB/CONT #	SALES ENGINEER	PROJECT MANAGER	APPL. ENGINEER	DRAWN BY:
		NC	NC	NC	JS

DRAWING	DRWG #	REV.	INIT. DATE
	6	0	3/19/18

ROTH SOUTHEAST
Innovative • Energy Management • Lighting

REV	DESCRIPTION	DATE	APPROVED



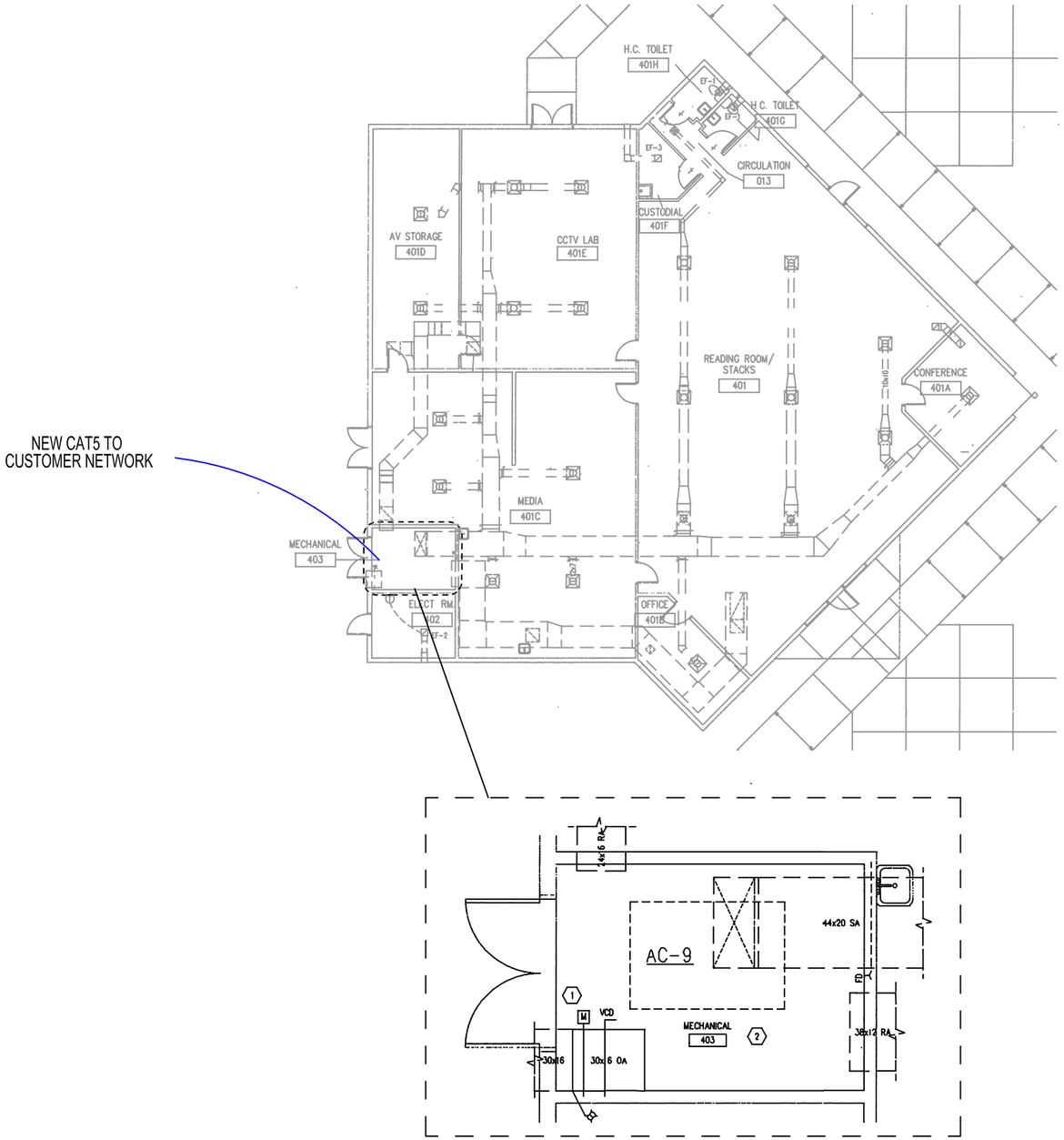
FILE:	JOB/CONT #	SALES ENGINEER	PROJECT MANAGER	APPL. ENGINEER	DRAWN BY:	DRWG #	REV.	INIT. DATE
		NC	NC	NC	JS	7	0	3/19/18

BLDG 3 SECOND FLOOR LAYOUT

RIVERGLADES ELEMENTARY
7400 PARKSIDE DRIVE
PARKLAND, FL 33067

ROTH SOUTHEAST
Innovative • Energy Management • Lighting

REV	DESCRIPTION	DATE	APPROVED



FILE:	DRAWING
JOB/CONT #	DRWG # 8
SALES ENGINEER: NC	REV. 0
PROJECT MANAGER: NC	INIT. DATE 3/19/18
APPL. ENGINEER: NC	
DRAWN BY: JS	

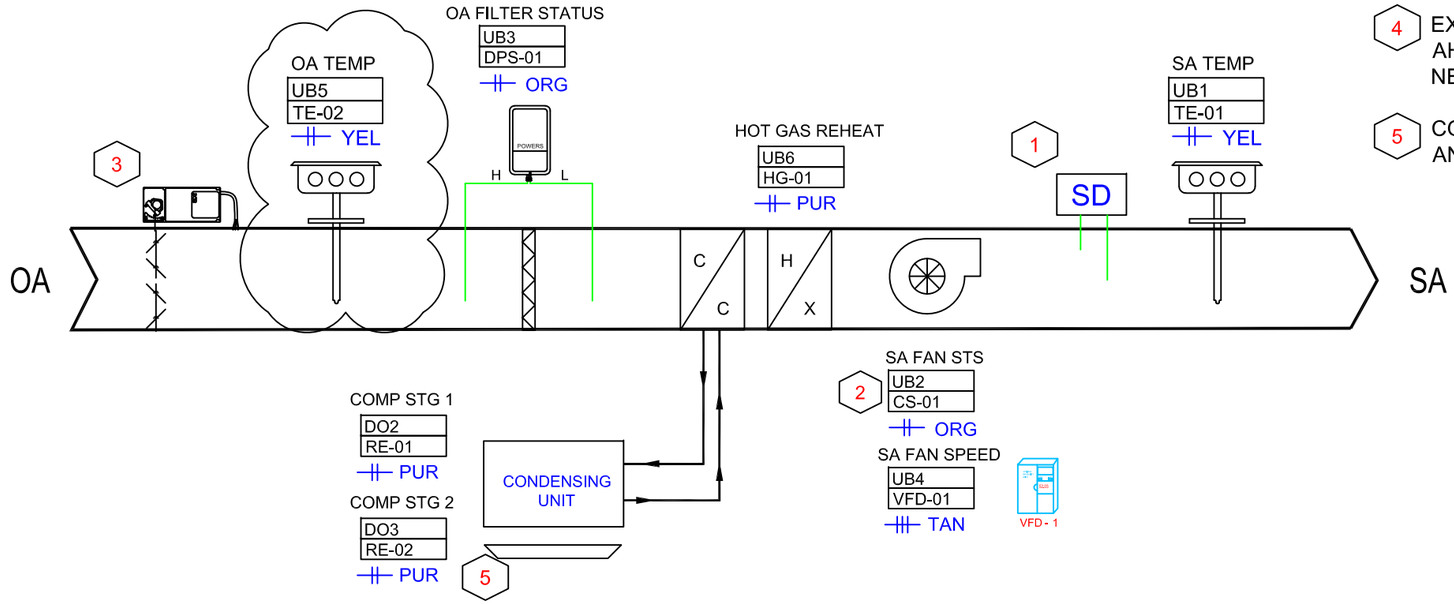
BLDG 4 LAYOUT

RIVERGLADES ELEMENTARY
7400 PARKSIDE DRIVE
PARKLAND, FL 33067

ROTH SOUTHEAST
Innovative • Energy Management • Lighting

REV	DESCRIPTION	DATE	APPROVED

SYMBOL	QTY	PART #	DESCRIPTION	MANU.	SIGNAL	RANGE
	1	MP-C-15A	IP CONTROLLER	SCHNEIDER		
RE-01-02	5	CKIT-VMD1B-F24	RELAY KIT	VERIS	24 VAC COIL	NORMALLY OPEN
CS-01	1	H608	CURRENT SWITCH	VERIS	DRY CONTACT	NORMALLY OPEN
TE-01-02	2	ETD500-6	DUCT MOUNT TEMP SENSOR	SCHNEIDER	10K OHMS	-40°F TO 302°F
DPS-01	1	AFS-222	DIFFERENTIAL PRESSURE SWITCH	CLEVLAND CONTROLS	DRY CONTACT	NORMALLY OPEN
AE-01	1	NFB24-S	DAMPER ACTUATOR	BELIMO	ON/OFF	OPEN/CLOSE
	2	CMT-4	TERMINAL BLOCK	ALTEC		



NOTES:

TYPICAL OF DOAS-2-1

1. TERMINATED, WIRED AND PROVIDED BY OTHERS.
2. SUPPLY FAN INTERLOCKED WITH OUTSIDE AIR DAMPER END SWITCH.
3. OA DAMPER OPENED AND CLOSED VIA OVERRIDE PANEL.
4. EXISTING OUTSIDE AIR DUCTS SERVING EXISTING AHUS SHALL BE REMOVED AND REPLACED WITH NEW EQUIPMENT.
5. CONDENSATE OVERFLOW SWITCH PROVIDED AND INSTALLED BY OTHERS.

SEQUENCE OF OPERATIONS:

DOAS Enable: The OA damper position for the two AHUs in Bldg2 shall be controlled by the EMS. When the two AHU OA dampers are open, the supply fan of DOAS 2-1 shall go to a preset speed to provide the rated airflow of DOAS 2-1 as shown in the 100% OA schedule on M-001. Both OA dampers must be open for DOAS 2-1 to start. If one or both OA dampers are closed, DOAS 2-1 shall be off.

Supply Fan: If the supply fan fails to prove status for 30 seconds (adj.), the fan shall be commanded off, the outside air damper shall close and an alarm shall be annunciated at the BAS. A manual reset shall be required to restart the fan. The controller shall monitor the supply air temperature and stage the fan speed to maintain a the supply air setpoint (75°F).

Filter Status: A differential pressure switch shall monitor the differential pressure across the filter when the fan is running. If the switch closes during normal operation a dirty filter alarm shall be annunciated at the BAS.

Hot Gas Reheat (Dehumidification Mode): Dehumidification Mode is enabled when the Outdoor Air Dewpoint is above the Outdoor Air Dewpoint Setpoint (58°F). Dehumidification Mode is locked out when the Outdoor Air Temperature is below the Outdoor Air Heating Setpoint (50°F). During Dehumidification Mode, Cooling Capacity is adjusted to maintain the Dehumidification Temperature Active (75°F). Purge:: Following continuous 30-minute hot gas reheat operation at less than 50% reheat capacity a purge cycle will be initiated. During the purge cycle, the hot gas reheat signal is set and held at 100% for a period of three minutes. Following the purge cylce, normal operation resumes.

Smoke Detector Shutdown (by Fire Alarm Contractor): The unit shall shutdown in response to a signal from the smoke detector indicating the presence of smoke. The smoke detector shall be interlocked to the unit through the dry contact of the smoke detector. A manual reset of the smoke detector shall be required to restart the unit.

OUTSIDE AIR PRETREATMENT UNIT

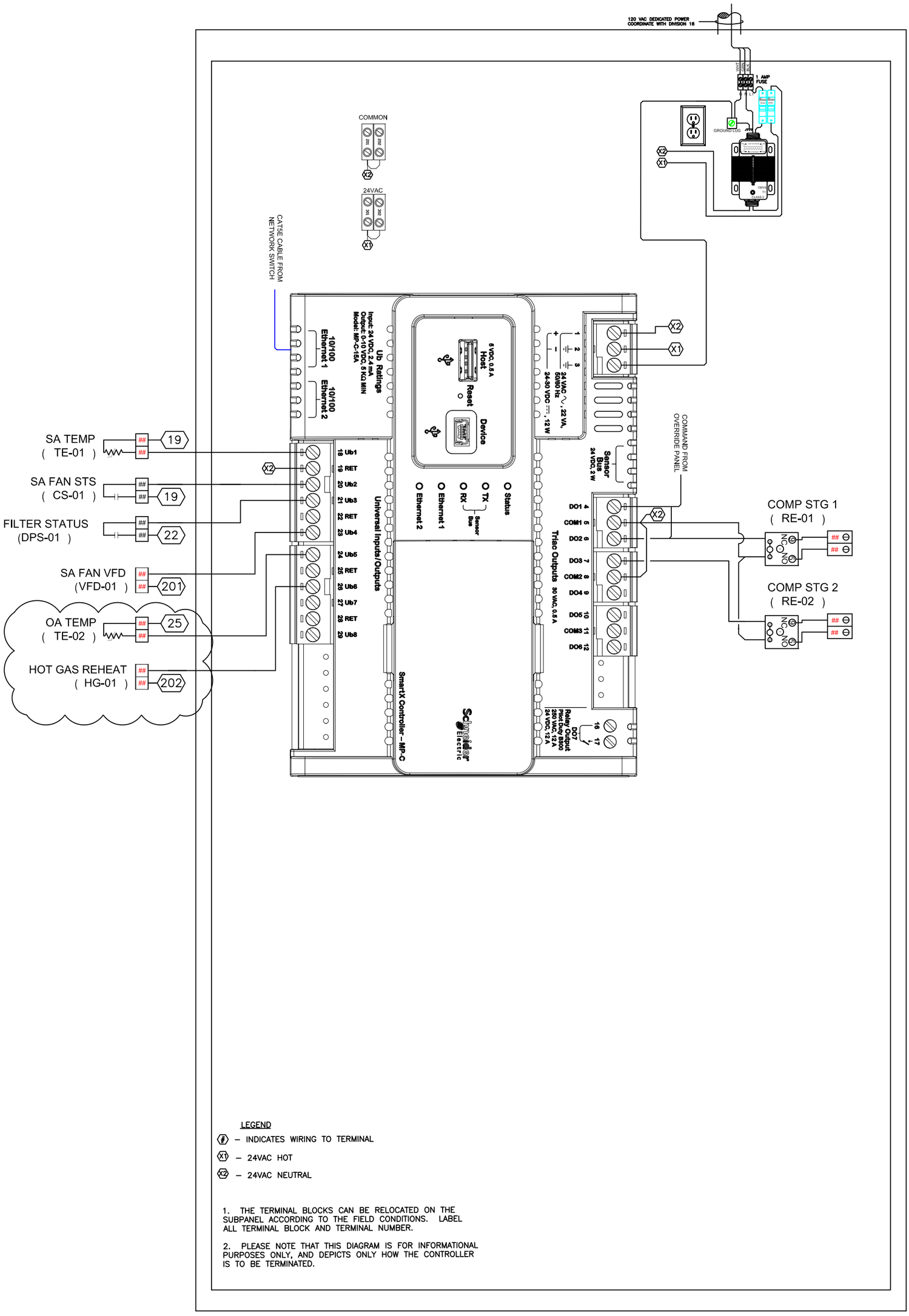
RIVERGLADES ELEMENTARY
7400 PARKSIDE DRIVE
PARKLAND, FL 33067

ROTH SOUTHEAST

FILE:	JOB/CONT #	SALES ENGINEER	PROJECT MANAGER	APPL. ENGINEER	DRAWN BY:
		NC	NC	NC	JS

DRAWING	DRWG #	REV.	INIT	DATE
	9	0		3/19/18

REV	DESCRIPTION	DATE	APPROVED
1	REVISED PER DESIGN REVIEW	1/28/20	
2	REVISED PER DESIGN REVIEW	5/11/20	



LEGEND

(#) – INDICATES WIRING TO TERMINAL

(X1) – 24VAC HOT

(X2) – 24VAC NEUTRAL

1. THE TERMINAL BLOCKS CAN BE RELOCATED ON THE SUBPANEL ACCORDING TO THE FIELD CONDITIONS. LABEL ALL TERMINAL BLOCK AND TERMINAL NUMBER.

2. PLEASE NOTE THAT THIS DIAGRAM IS FOR INFORMATIONAL PURPOSES ONLY, AND DEPICTS ONLY HOW THE CONTROLLER IS TO BE TERMINATED.

REV	DESCRIPTION	DATE	APPROVED
2	REVISED PER DESIGN REVIEW	5/11/20	

ROTH SOUTHEAST
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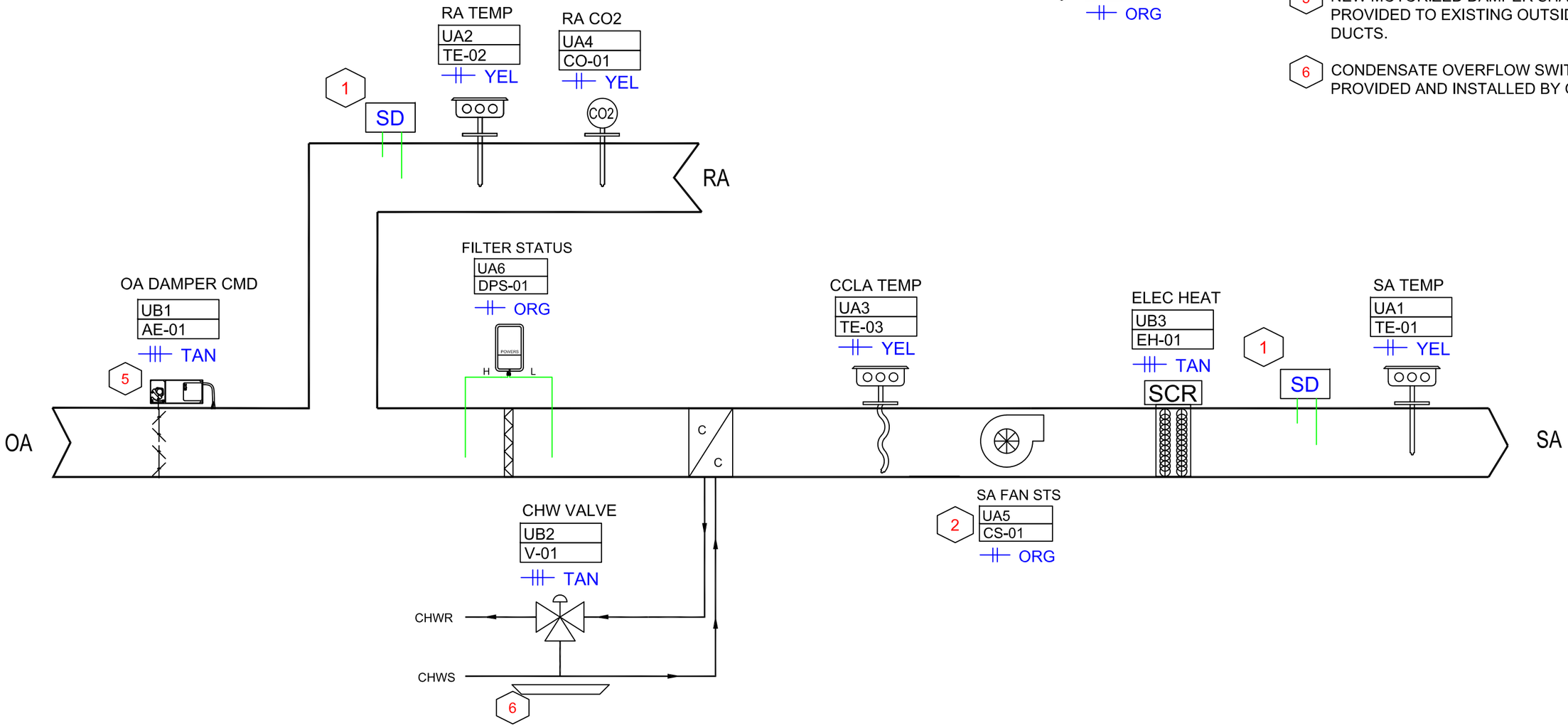
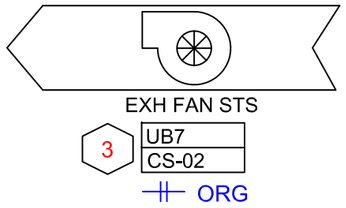
OA PRETREATMENT UNIT WIRING

RIVERGLADES ELEMENTARY
7400 PARKSIDE DRIVE
PARKLAND, FL 33067

FILE:				DRAWING	
JOB/CONT #				DRWG #	10
SALES ENGINEER	PROJECT MANAGER	APPL. ENGINEER	DRAWN BY:	REV.	0
NC	NC	NC	JS	INIT DATE	3/19/18





NOTES:

1. TERMINATED, WIRED AND PROVIDED BY OTHERS.
2. SUPPLY FAN STARTED AND STOPPED FROM OVERRIDE PANEL.
3. FIELD VERIFY EXHAUST FAN INTERLOCKS
4. CONTROLS SHALL BE UPGRADED. ALL OTHER EQUIPMENT IS EXISTING TO REMAIN.
5. NEW MOTORIZED DAMPER SHALL BE PROVIDED TO EXISTING OUTSIDE AIR DUCTS.
6. CONDENSATE OVERFLOW SWITCH PROVIDED AND INSTALLED BY OTHERS.

AC-1 CV CHW AHU DIAGRAM

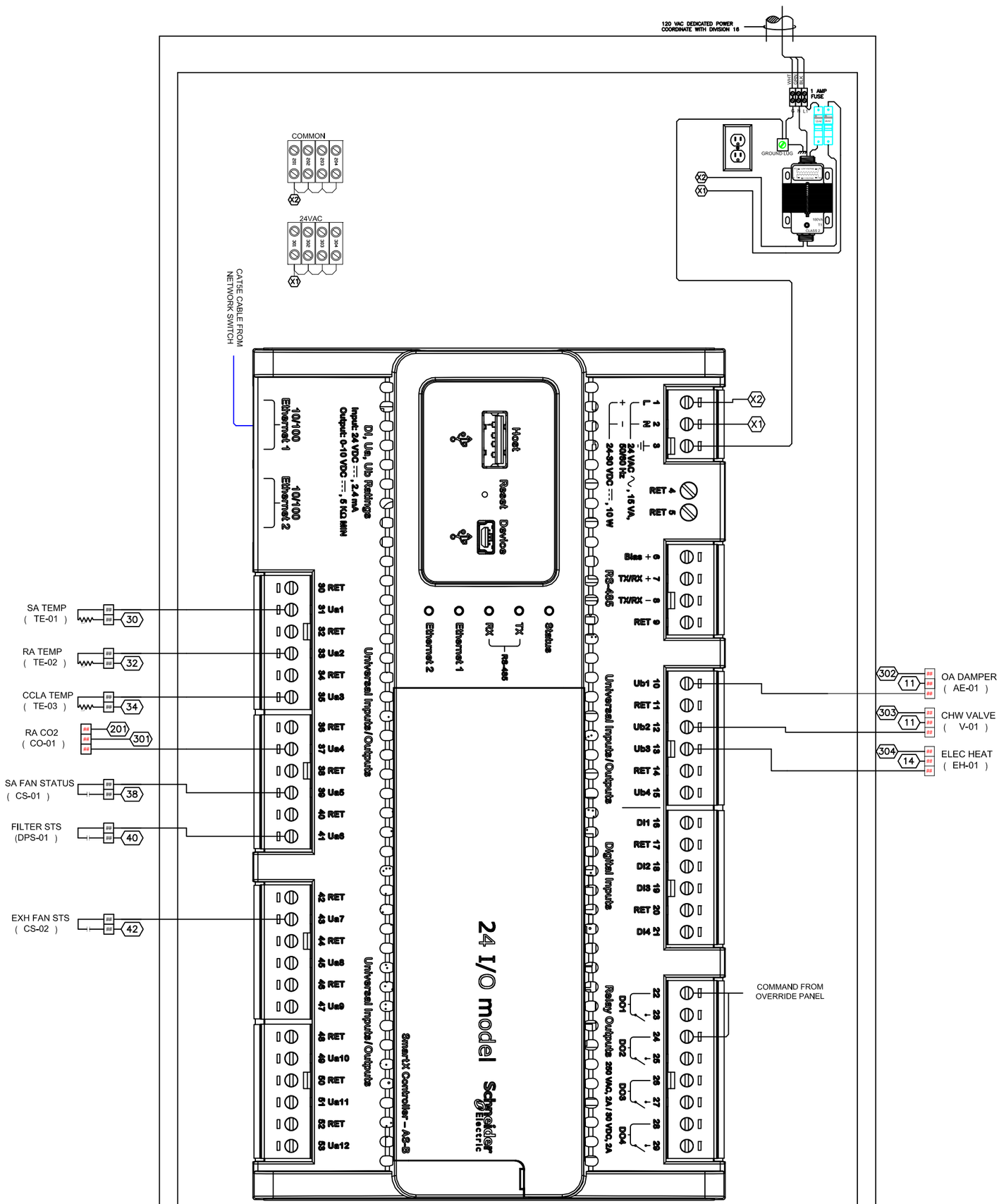
RIVERGLADES ELEMENTARY
7400 PARKSIDE DRIVE
PARKLAND, FL 33067

ROTH SOUTHEAST
Automation • Energy Management • Lighting

REV	DESCRIPTION	DATE	APPROVED
1	REVISED PER DESIGN REVIEW	1/28/20	

FILE:	JOB/CONT #	SALES ENGINEER	PROJECT MANAGER	APPL. ENGINEER	DRAWN BY:
		NC	NC	NC	JS

DRAWING	DRWG #	REV.	INIT. DATE
	11	0	3/19/18



LEGEND

(#) – INDICATES WIRING TO TERMINAL

(X1) – 24VAC HOT

(X2) – 24VAC NEUTRAL

1. THE TERMINAL BLOCKS CAN BE RELOCATED ON THE SUBPANEL ACCORDING TO THE FIELD CONDITIONS. LABEL ALL TERMINAL BLOCK AND TERMINAL NUMBER.

2. PLEASE NOTE THAT THIS DIAGRAM IS FOR INFORMATIONAL PURPOSES ONLY, AND DEPICTS ONLY HOW THE CONTROLLER IS TO BE TERMINATED.

REV	DESCRIPTION	DATE	APPROVED
1	REVISED PER DESIGN REVIEW	1/28/20	

ROTH SOUTHEAST
Automation • Energy Management • Lighting

AC–1 CV CHW AHU WIRING DIA

RIVERGLADES ELEMENTARY
7400 PARKSIDE DRIVE
PARKLAND, FL 33067

FILE:
JOB/CONT #

SALES ENGINEER	PROJECT MANAGER	APPL. ENGINEER	DRAWN BY:
NC	NC	NC	JS

DRAWING

DRWG #	12
REV.	0
INIT DATE	3/19/18

SYMBOL	QTY	PART #	DESCRIPTION	MANU.	SIGNAL	RANGE
	1	AS-B-24A	SMARTX CONTROLLER	SCHNEIDER		
RE-01	3	CKIT-VMD1B-F24	RELAY KIT	VERIS	24 VAC COIL	NORMALLY OPEN
CS-01-02	2	H608	CURRENT SWITCH	VERIS	DRY CONTACT	NORMALLY OPEN
TE-01-02	2	ETD500-6	DUCT MOUNT TEMP SENSOR	SCHNEIDER	10K OHMS	-40°F TO 302°F
TE-03	1	ETA500-12	DUCT MOUNT AVG TEMP SENSOR	SCHNEIDER	10K OHMS	-40°F TO 302°F
CO-01	1	CDE	DUCT MOUNT CO2 SENSOR	VERIS	4-20mA	0-2000 PPM
DPS-01	1	AFS-222	DIFFERENTIAL PRESSURE SWITCH	CLEVLAND CONTROLS	DRY CONTACT	NORMALLY OPEN
AE-01	1	NFB24-SR-S	DAMPER ACTUATOR	BELIMO	2-10VDC	
V-01	1	SEE SCHEDULE	3-WAY BALL VALVE W/ ACTUATOR	SIEMENS	0-10VDC	SEE SEQUENCE
	8	CMT-4	TERMINAL BLOCK	ALTEC		
	1	X100CAA	TRANSFORMER	VERIS		
	1	RET3826	ENCLOSURE	KELE		
	1	51012218	POWER RECEPTICAL	KELE		
	1	DCP-1.5-W	1.5A POWER SUPPLY	KELE	24VAC	1.5-27 VDC

CONSTANT VOLUME AHU SEQUENCE OF OPERATIONS:

A. The air handling unit is to be started and stopped by a zone on the Central Control Panel. The time schedule for enabling the system to start in the morning and shutdown in the evening will be controlled by the school based TAC-Andover Energy Management/Security (EM/S) system.

B. In the cooling mode when the building is occupied, the supply fan will run continuously and the low leakage, motor-operated outside air damper will be opened to the minimum setting to provide makeup air to replace air exhausted by the exhaust fans and to ensure positive pressure within the zone or space served. During the unoccupied period, ensure the low leakage, motor-operated outside air damper fully closes and the supply fan will continue to run in a re-circulation mode until it is shutdown by the EM/S system at a pre-selected time. When operating during the unoccupied period and with the exception of the custodian room exhaust fan, ensure all other exhaust fans are commanded off so as not to cause the interior space to become negatively pressurized with respect to the outdoors.

C. In the heating mode when the building is occupied, ensure the supply fan runs continuously and the low leakage, motor-operated outside air damper will be in the minimum setting to provide makeup air to replace air exhausted by the exhaust fans and to ensure positive pressure within the zone or space served. Provide the electric resistance heaters with a minimum of 5 KW stages of control. During the unoccupied period, ensure the low leakage, motor-operated outside air damper fully closes and the supply fan will continue to run in a re-circulation mode until it is shutdown by the EM/S system.

D. Provide the electric resistance heaters with a high limit temperature switch and an air flow safety switch to prevent operation when the evaporator air is not operating.

E. The chilled water valve will be modulated to maintain return air temperature setpoint.

F. The outside air damper shall modulate to maintain the return air CO2 setpoint. Min and max OA to be set by T&B.

G. When the temperature falls below the cooling set point and the chilled water valve is fully closed the duct heater will be energized to satisfy the space heating requirements.

H. Smoke detectors located upstream of the duct heater on the supply air duct of each air handling unit will signal the building fire alarm system upon sensing products of combustion. All of the air handling units shall shutdown upon activation of any station of the fire alarm system and shall be provided with a time delay relay to allow startup after all smoke damper have reopened. Provide the smoke detectors and the interlock/shutdown electrical wiring under provisions of Division 16.

DRAWING 13 | DRWG # 0 | REV. | INIT. DATE 3/19/18

FILE: | JOB/CONT # | SALES ENGINEER NC | PROJECT MANAGER NC | APPL. ENGINEER NC | DRAWN BY: JS

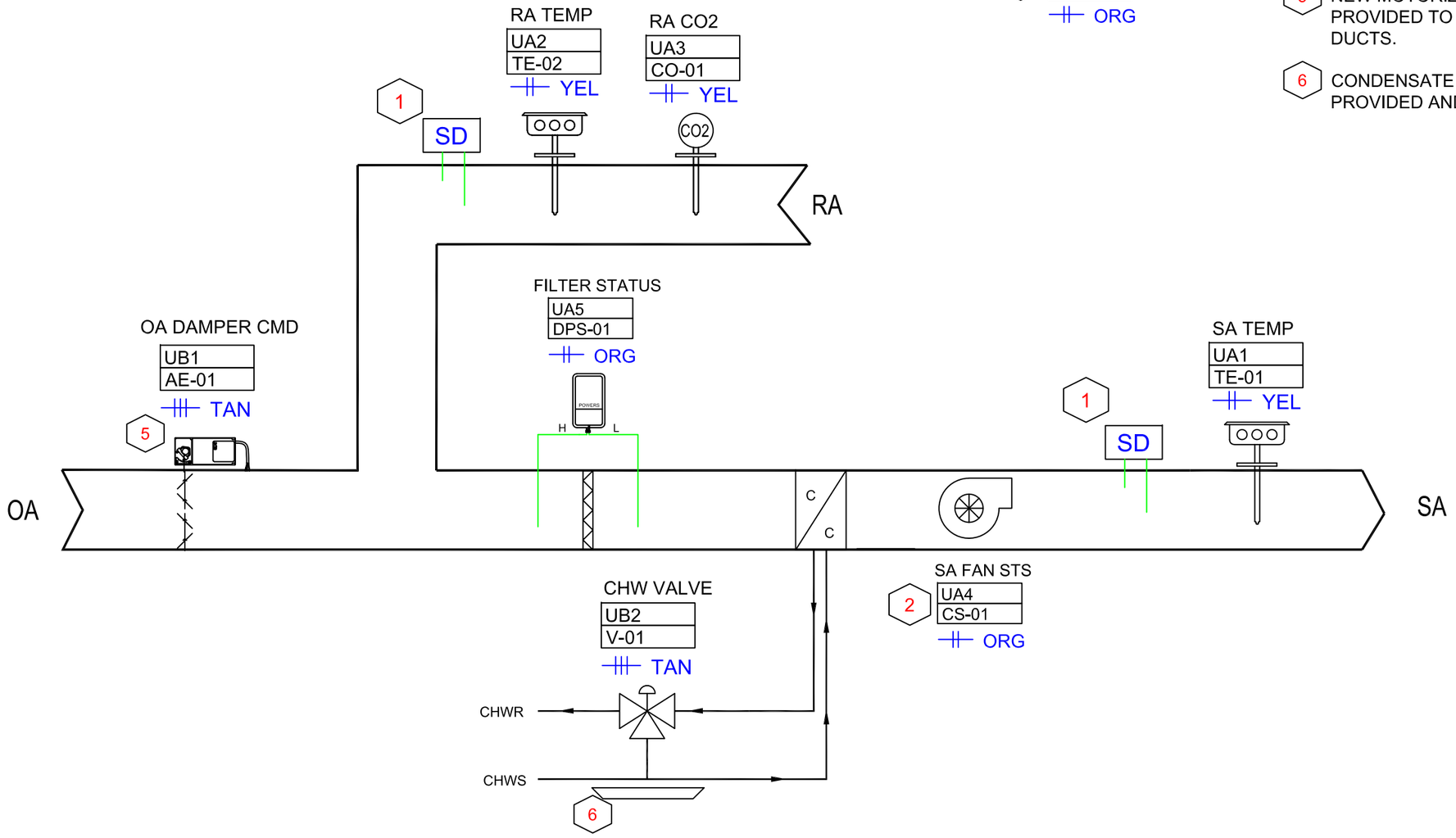
AC-1 CV CHW AHU PARTS/SOP

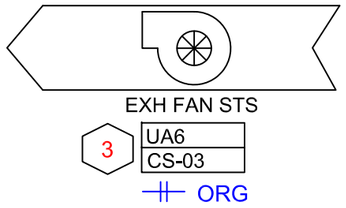
RIVERGLADES ELEMENTARY
7400 PARKSIDE DRIVE
PARKLAND, FL 33067

ROTH SOUTHEAST

APPROVED

REV	DESCRIPTION	DATE
1	REVISED PER DESIGN REVIEW	1/28/20
2	REVISED PER DESIGN REVIEW	5/11/20





NOTES:

1. TERMINATED, WIRED AND PROVIDED BY OTHERS.
2. SUPPLY FAN STARTED AND STOPPED FROM OVERRIDE PANEL.
3. FIELD VERIFY EXHAUST FAN INTERLOCKS
4. CONTROLS SHALL BE UPGRADED. ALL OTHER EQUIPMENT IS EXISTING TO REMAIN.
5. NEW MOTORIZED DAMPER SHALL BE PROVIDED TO EXISTING OUTSIDE AIR DUCTS.
6. CONDENSATE OVERFLOW SWITCH PROVIDED AND INSTALLED BY OTHERS.

DRAWING
DRWG # 14
REV. 0
INIT. DATE 3/19/18
DRAWN BY: JS
APPL. ENGINEER NC
PROJECT MANAGER NC
SALES ENGINEER NC
JOB/CONT #
FILE:

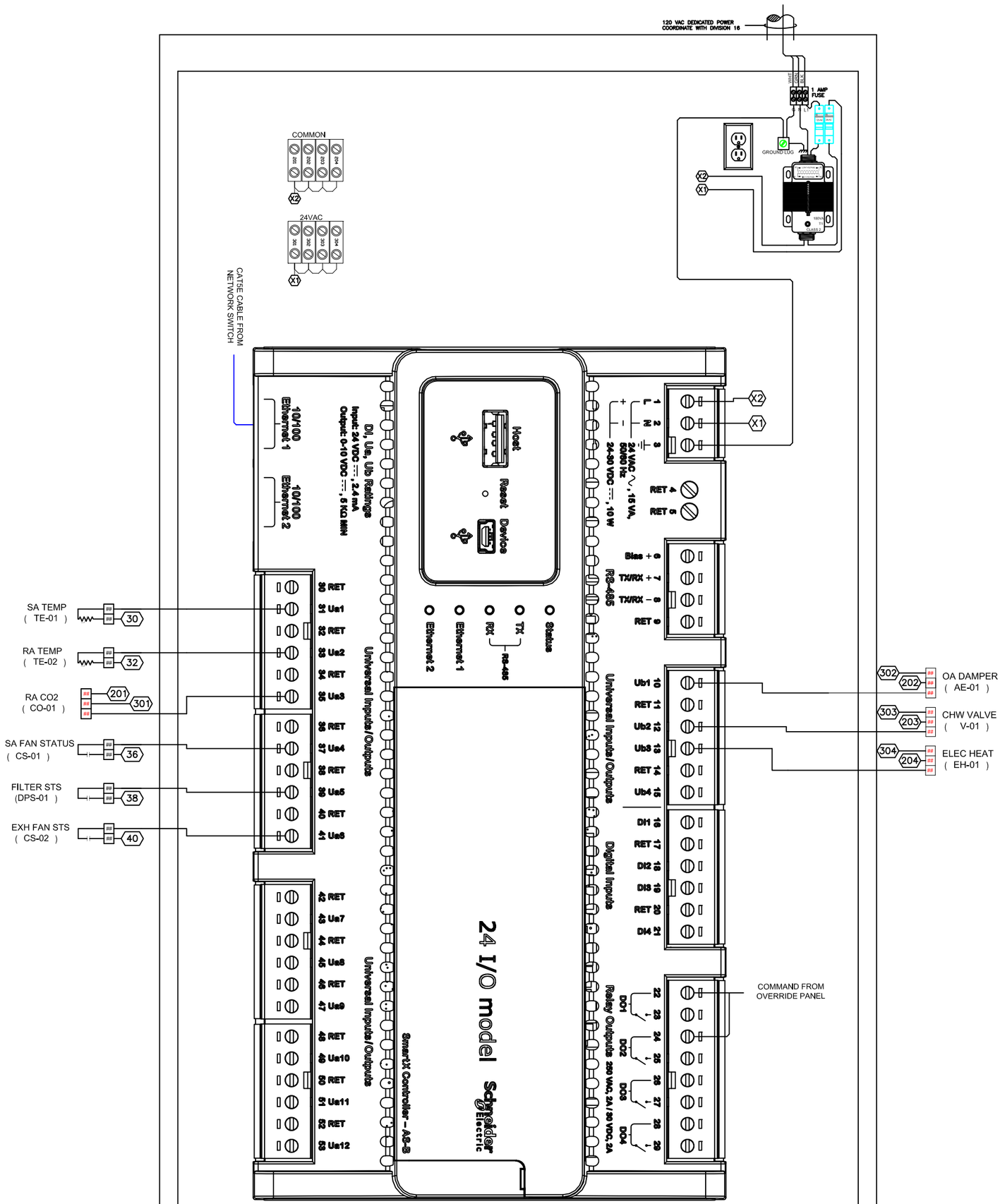
AC-2 CV CHW AHU DIAGRAM

RIVERGLADES ELEMENTARY
7400 PARKSIDE DRIVE
PARKLAND, FL 33067

ROTH SOUTHEAST
Automation • Energy Management • Lighting

APPROVED
DATE 1/28/20

REV	DESCRIPTION
1	REVISED PER DESIGN REVIEW



LEGEND

(#) – INDICATES WIRING TO TERMINAL

(X1) – 24VAC HOT

(X2) – 24VAC NEUTRAL

1. THE TERMINAL BLOCKS CAN BE RELOCATED ON THE SUBPANEL ACCORDING TO THE FIELD CONDITIONS. LABEL ALL TERMINAL BLOCK AND TERMINAL NUMBER.

2. PLEASE NOTE THAT THIS DIAGRAM IS FOR INFORMATIONAL PURPOSES ONLY, AND DEPICTS ONLY HOW THE CONTROLLER IS TO BE TERMINATED.

REV	DESCRIPTION	DATE	APPROVED
1	REVISED PER DESIGN REVIEW	1/28/20	

ROTH SOUTHEAST
Automation • Energy Management • Lighting

AC-2 CV CHW AHU WIRING DIA

RIVERGLADES ELEMENTARY
7400 PARKSIDE DRIVE
PARKLAND, FL 33067

FILE:
JOB/CONT #

SALES ENGINEER	PROJECT MANAGER	APPL. ENGINEER	DRAWN BY:
NC	NC	NC	JS

DRAWING

DRWG #	15
REV.	0
INIT DATE	3/19/18

SYMBOL	QTY	PART #	DESCRIPTION	MANU.	SIGNAL	RANGE
	1	AS-B-24A	SMARTX CONTROLLER	SCHNEIDER		
RE-01	2	CKIT-VMD1B-F24	RELAY KIT	VERIS	24 VAC COIL	NORMALLY OPEN
CS-01-02	2	H608	CURRENT SWITCH	VERIS	DRY CONTACT	NORMALLY OPEN
TE-01-02	2	ETD500-6	DUCT MOUNT TEMP SENSOR	SCHNEIDER	10K OHMS	-40°F TO 302°F
CO-01	1	CDE	DUCT MOUNT CO2 SENSOR	VERIS	4-20mA	0-2000 PPM
DPS-01	1	AFS-222	DIFFERENTIAL PRESSURE SWITCH	CLEVLAND CONTROLS	DRY CONTACT	NORMALLY OPEN
AE-01	1	LFB24-SR-S	DAMPER ACTUATOR	BELIMO	2-10VDC	
V-01	1	SEE SCHEDULE	3-WAY BALL VALVE W/ ACTUATOR	SIEMENS	0-10VDC	SEE SEQUENCE
	8	CMT-4	TERMINAL BLOCK	ALTEC		
	1	X100CAA	TRANSFORMER	VERIS		
	1	RET3826	ENCLOSURE	KELE		
	1	51012218	POWER RECEPTICAL	KELE		
	1	DCP-1.5-W	1.5A POWER SUPPLY	KELE	24VAC	1.5-27 VDC

CONSTANT VOLUME AHU SEQUENCE OF OPERATIONS:

A. The air handling unit is to be started and stopped by a zone on the Central Control Panel. The time schedule for enabling the system to start in the morning and shutdown in the evening will be controlled by the school based TAC-Andover Energy Management/Security (EM/S) system.

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C. The chilled water valve will be modulated to maintain return air temperature setpoint.

D. The outside air damper shall modulate to maintain the return air CO2 setpoint.Min and max OA to be set by T&B.

E. Smoke detectors located upstream of the duct heater on the supply air duct of each air handling unit will signal the building fire alarm system upon sensing products of combustion. All of the air handling units shall shutdown upon activation of any station of the fire alarm system and shall be provided with a time delay relay to allow startup after all smoke damper have reopened. Provide the smoke detectors and the interlock/shutdown electrical wiring under provisions of Division 16.

DRAWING
DRWG # 16
REV. 0
INIT. DATE 3/19/18
DRAWN BY: JS
APPL. ENGINEER NC
PROJECT MANAGER NC
SALES ENGINEER NC
JOB/CONT #
FILE:

AC-2 CV CHW AHU PARTS/SOP

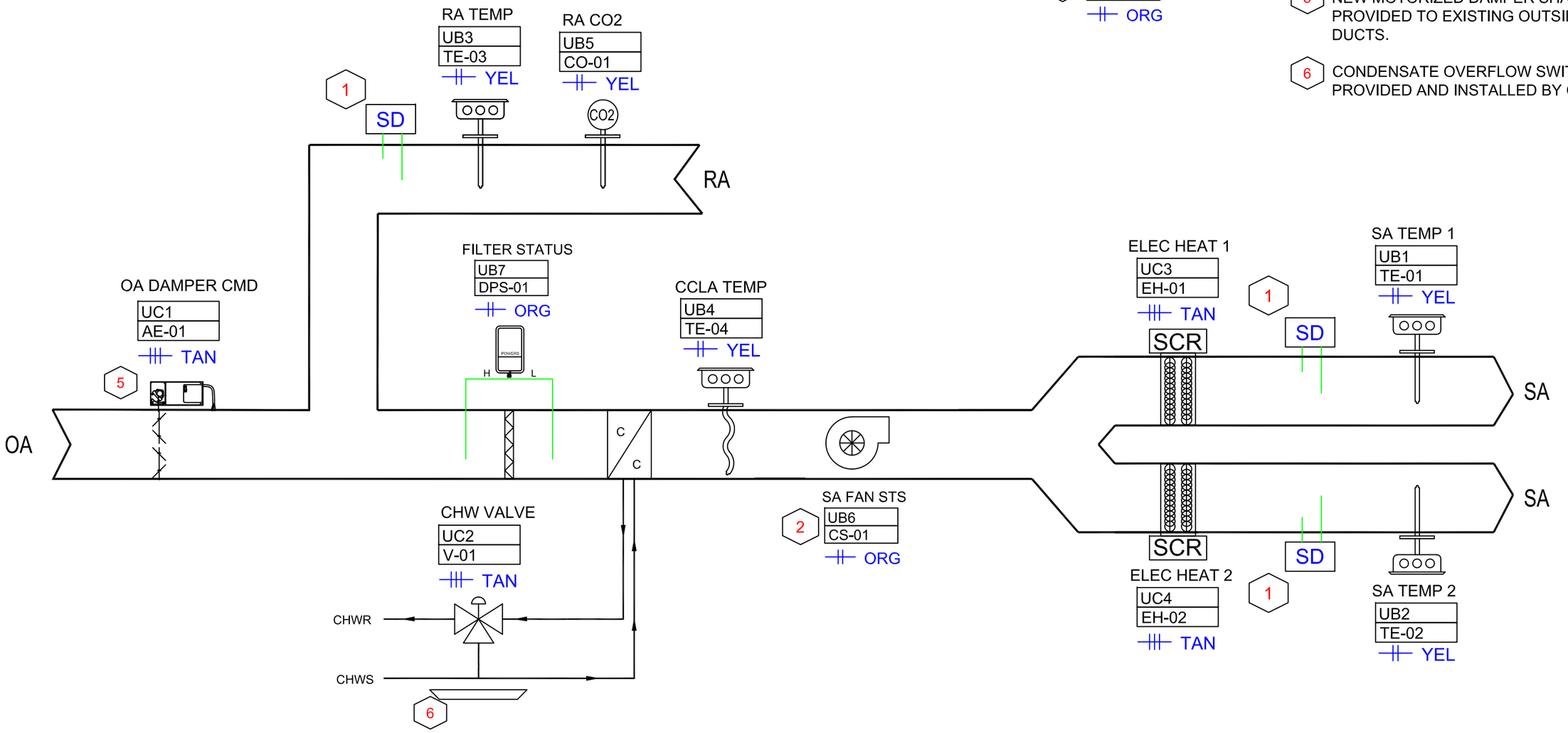
RIVERGLADES ELEMENTARY
7400 PARKSIDE DRIVE
PARKLAND, FL 33067

ROTH SOUTHEAST
Innovation • Energy Management • Comfort

APPROVED
DATE 1/28/20
DESCRIPTION
REV 1 REVISED PER DESIGN REVIEW

NOTES:

1. TERMINATED, WIRED AND PROVIDED BY OTHERS.
2. SUPPLY FAN STARTED AND STOPPED FROM OVERRIDE PANEL.
3. FIELD VERIFY EXHAUST FAN INTERLOCKS
4. CONTROLS SHALL BE UPGRADED. ALL OTHER EQUIPMENT IS EXISTING TO REMAIN.
5. NEW MOTORIZED DAMPER SHALL BE PROVIDED TO EXISTING OUTSIDE AIR DUCTS.
6. CONDENSATE OVERFLOW SWITCH PROVIDED AND INSTALLED BY OTHERS.



DRAWING

DRWG #	REV.	INIT	DATE
17	0	JS	3/19/18

FILE:

JOB/CONT #	SALES ENGINEER	PROJECT MANAGER	APPL. ENGINEER	DRAWN BY:
	NC	NC	NC	JS

AC-3 CV CHW AHU DIAGRAM

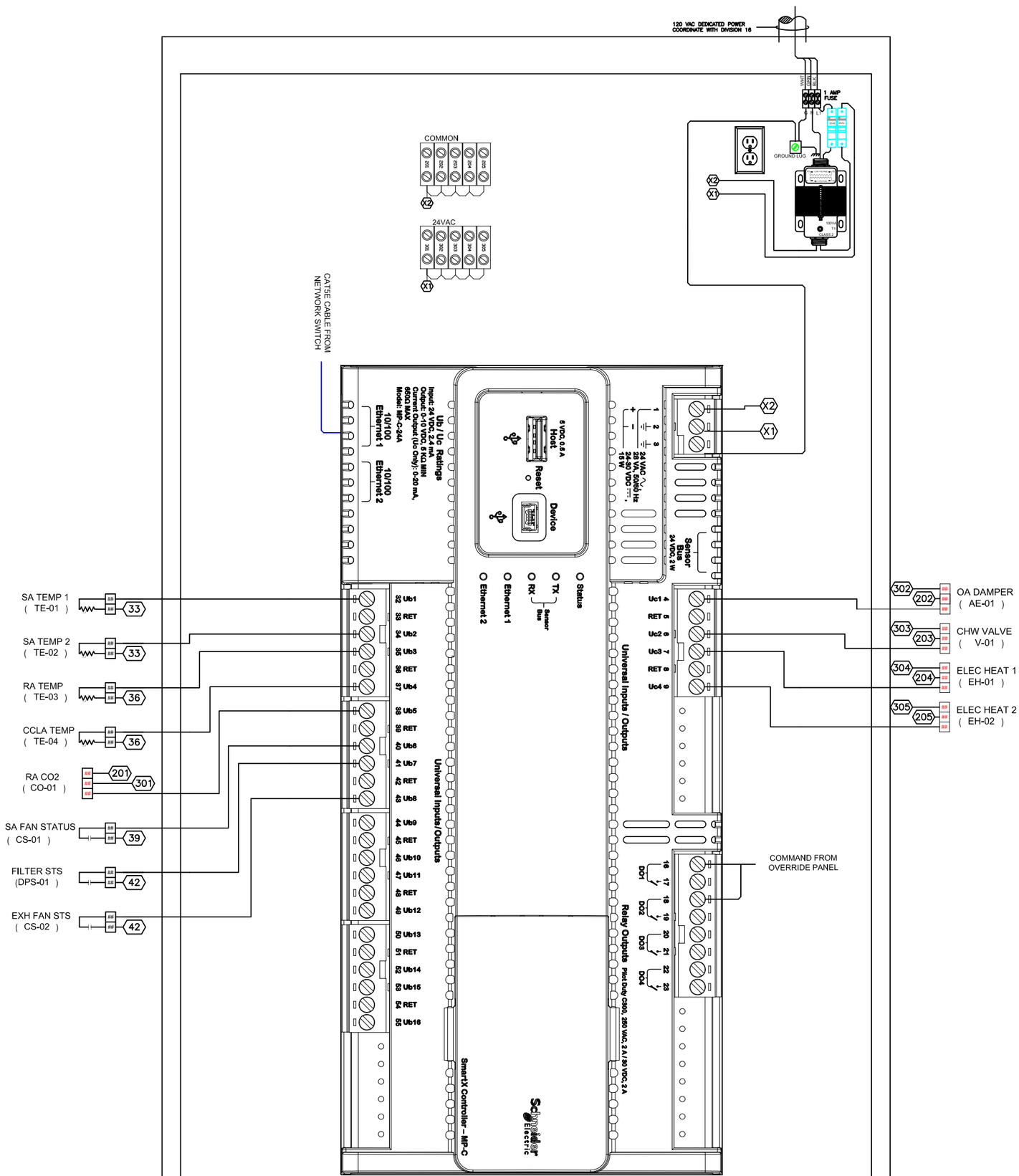
RIVERGLADES ELEMENTARY
7400 PARKSIDE DRIVE
PARKLAND, FL 33067

ROTH SOUTHEAST
Innovative • Energy Management • Lighting

APPROVED

DATE 1/28/20

REV	DESCRIPTION	DATE
1	REVISED PER DESIGN REVIEW	1/28/20



LEGEND

(#) – INDICATES WIRING TO TERMINAL

(X1) – 24VAC HOT

(X2) – 24VAC NEUTRAL

1. THE TERMINAL BLOCKS CAN BE RELOCATED ON THE SUBPANEL ACCORDING TO THE FIELD CONDITIONS. LABEL ALL TERMINAL BLOCK AND TERMINAL NUMBER.

2. PLEASE NOTE THAT THIS DIAGRAM IS FOR INFORMATIONAL PURPOSES ONLY, AND DEPICTS ONLY HOW THE CONTROLLER IS TO BE TERMINATED.

REV	DESCRIPTION	DATE	APPROVED
1	REVISED PER DESIGN REVIEW	1/28/20	

ROTH SOUTHEAST
Automation • Energy Management • Lighting

AC-3 CV CHW AHU WIRING DIA

RIVERGLADES ELEMENTARY
7400 PARKSIDE DRIVE
PARKLAND, FL 33067

FILE:
JOB/CONT #

SALES ENGINEER	PROJECT MANAGER	APPL. ENGINEER	DRAWN BY:
NC	NC	NC	JS

DRAWING

DRWG #	18
REV.	0
INIT DATE	3/19/18

SYMBOL	QTY	PART #	DESCRIPTION	MANU.	SIGNAL	RANGE
	1	MP-C-24A	IP CONTROLLER	SCHNEIDER		
RE-01	4	CKIT-VMD1B-F24	RELAY KIT	VERIS	24 VAC COIL	NORMALLY OPEN
CS-01-02	2	H608	CURRENT SWITCH	VERIS	DRY CONTACT	NORMALLY OPEN
TE-01-03	3	ETD500-6	DUCT MOUNT TEMP SENSOR	SCHNEIDER	10K OHMS	-40°F TO 302°F
TE-04	1	ETA500-12	DUCT MOUNT AVG TEMP SENSOR	SCHNEIDER	10K OHMS	-40°F TO 302°F
CO-01	1	CDE	DUCT MOUNT CO2 SENSOR	VERIS	4-20mA	0-2000 PPM
DPS-01	1	AFS-222	DIFFERENTIAL PRESSURE SWITCH	CLEVLAND CONTROLS	DRY CONTACT	NORMALLY OPEN
AE-01	1	LFB24-SR-S	DAMPER ACTUATOR	BELIMO	2-10VDC	
V-01	1	SEE SCHEDULE	3-WAY BALL VALVE W/ ACTUATOR	SIEMENS	0-10VDC	SEE SEQUENCE
	10	CMT-4	TERMINAL BLOCK	ALTEC		
	1	X100CAA	TRANSFORMER	VERIS		
	1	RET3826	ENCLOSURE	KELE		
	1	51012218	POWER RECEPTICAL	KELE		
	1	DCP-1.5-W	1.5A POWER SUPPLY	KELE	24VAC	1.5-27 VDC

CONSTANT VOLUME AHU SEQUENCE OF OPERATIONS:

A. The air handling unit is to be started and stopped by a zone on the Central Control Panel. The time schedule for enabling the system to start in the morning and shutdown in the evening will be controlled by the school based TAC-Andover Energy Management/Security (EM/S) system.

B. In the cooling mode when the building is occupied, the supply fan will run continuously and the low leakage, motor-operated outside air damper will be opened to the minimum setting to provide makeup air to replace air exhausted by the exhaust fans and to ensure positive pressure within the zone or space served. During the unoccupied period, ensure the low leakage, motor-operated outside air damper fully closes and the supply fan will continue to run in a re-circulation mode until it is shutdown by the EM/S system at a pre-selected time. When operating during the unoccupied period and with the exception of the custodian room exhaust fan, ensure all other exhaust fans are commanded off so as not to cause the interior space to become negatively pressurized with respect to the outdoors.

C. In the heating mode when the building is occupied, ensure the supply fan runs continuously and the low leakage, motor-operated outside air damper will be in the minimum setting to provide makeup air to replace air exhausted by the exhaust fans and to ensure positive pressure within the zone or space served. Provide the electric resistance heaters with a minimum of 5 KW stages of control. During the unoccupied period, ensure the low leakage, motor-operated outside air damper fully closes and the supply fan will continue to run in a re-circulation mode until it is shutdown by the EM/S system.

D. Provide the electric resistance heaters with a high limit temperature switch and an air flow safety switch to prevent operation when the evaporator air is not operating. When heater is enabled, chw vallve shall be closed.

E. The chilled water valve will be modulated to maintain return air temperature setpoint.

F. The outside air damper shall modulate to maintain the return air CO2 setpoint. Min and max OA to be set by T&B.

G. When the temperature falls below the cooling set point and the duct heater will be energized to satisfy the space heating requirements.

H. Smoke detectors located upstream of the duct heater on the supply air duct of each air handling unit will signal the building fire alarm system upon sensing products of combustion. All of the air handling units shall shutdown upon activation of any station of the fire alarm system and shall be provided with a time delay relay to allow startup after all smoke damper have reopened. Provide the smoke detectors and the interlock/shutdown electrical wiring under provisions of Division 16.

DRAWING 19 | DRWG # 0 | REV. | INIT. DATE 3/19/18

FILE: | JOB/CONT # | SALES ENGINEER NC | PROJECT MANAGER NC | APPL. ENGINEER NC | DRAWN BY: JS

AC-3 CV CHW AHU PARTS/SOP

RIVERGLADES ELEMENTARY
7400 PARKSIDE DRIVE
PARKLAND, FL 33067

ROTH SOUTHEAST

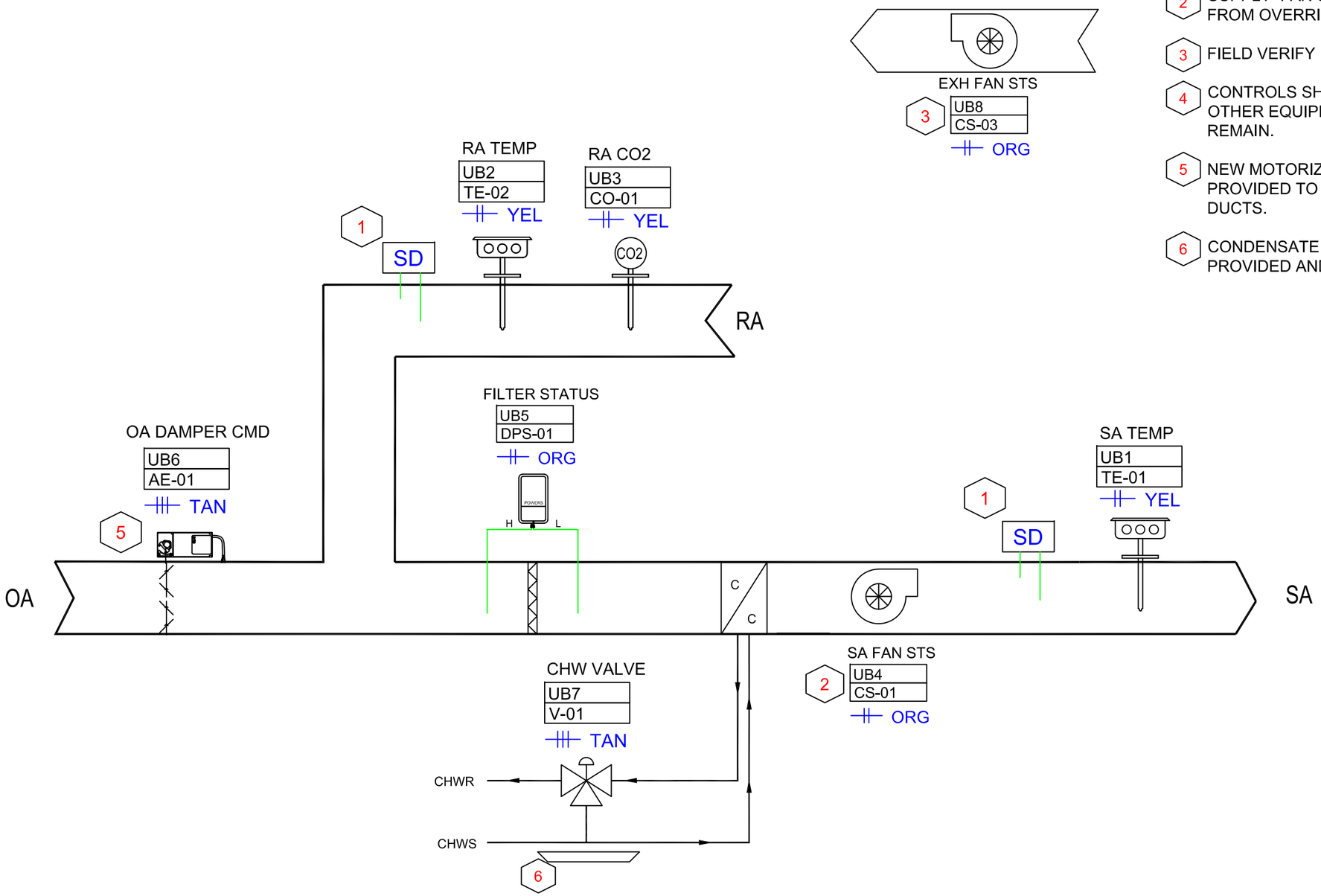
APPROVED | DATE 1/28/20

REV	DESCRIPTION	DATE
1	REVISED PER DESIGN REVIEW	1/28/20

NOTES:

- TYPICAL OF AC-4,-5, -6 & -7

1. TERMINATED, WIRED AND PROVIDED BY OTHERS.
2. SUPPLY FAN STARTED AND STOPPED FROM OVERRIDE PANEL.
3. FIELD VERIFY EXHAUST FAN INTERLOCKS
4. CONTROLS SHALL BE UPGRADED. ALL OTHER EQUIPMENT IS EXISTING TO REMAIN.
5. NEW MOTORIZED DAMPER SHALL BE PROVIDED TO EXISTING OUTSIDE AIR DUCTS.
6. CONDENSATE OVERFLOW SWITCH PROVIDED AND INSTALLED BY OTHERS.



TYPICAL CAL CV CHW AHU DIAGRAM

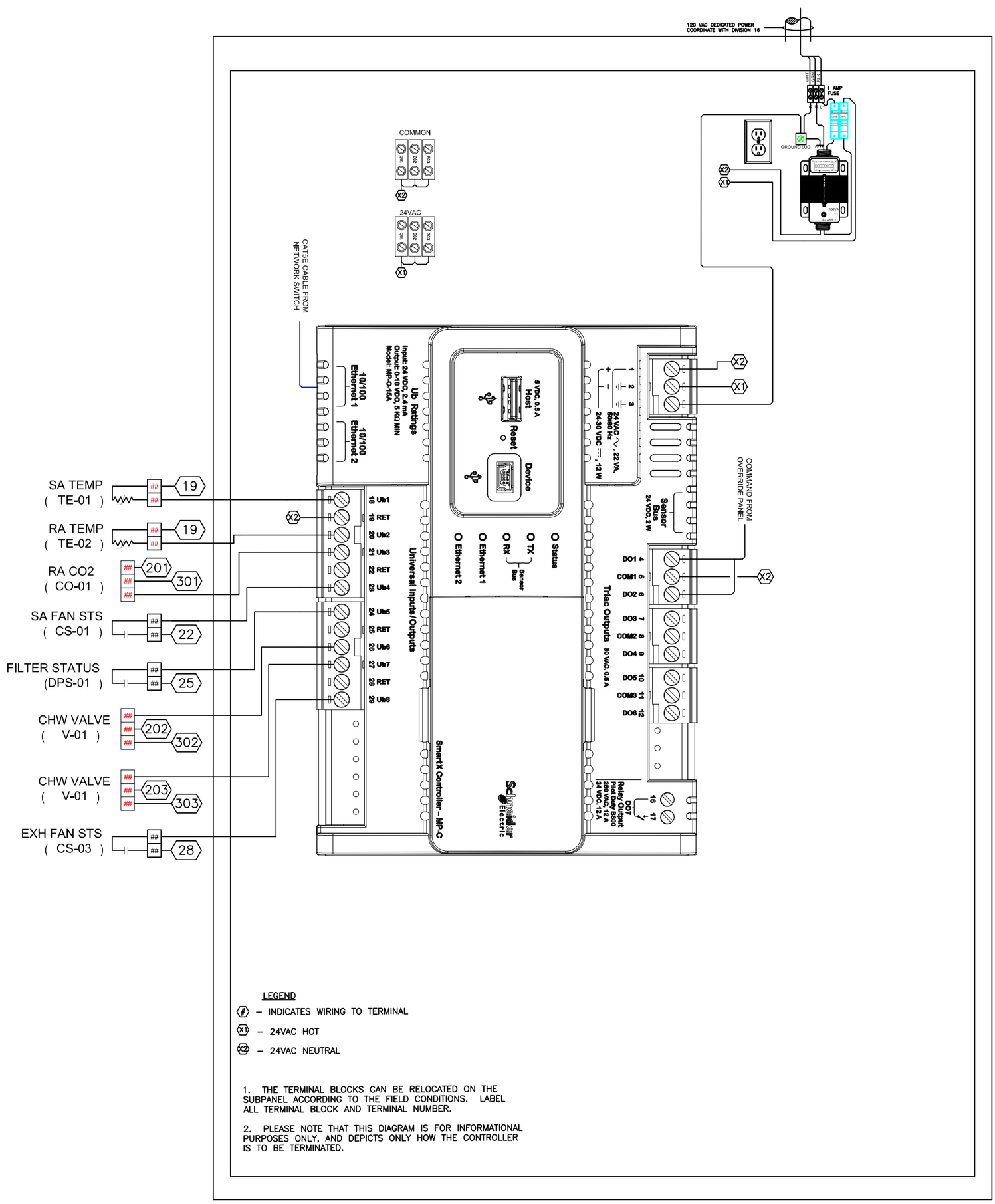
RIVERGLADES ELEMENTARY
7400 PARKSIDE DRIVE
PARKLAND, FL 33067

FILE:	JOB/CONT #	SALES ENGINEER	PROJECT MANAGER	APPL. ENGINEER	DRAWN BY:
		NC	NC	NC	JS

DRAWING	DRWG #	REV.	INIT. DATE
	20	0	3/19/18

ROTH SOUTHEAST
Automation • Energy Management • Lighting

REV	DESCRIPTION	DATE	APPROVED
1	REVISED PER DESIGN REVIEW	1/28/20	



LEGEND

(#) – INDICATES WIRING TO TERMINAL

(X1) – 24VAC HOT

(X2) – 24VAC NEUTRAL

1. THE TERMINAL BLOCKS CAN BE RELOCATED ON THE SUBPANEL ACCORDING TO THE FIELD CONDITIONS. LABEL ALL TERMINAL BLOCK AND TERMINAL NUMBER.

2. PLEASE NOTE THAT THIS DIAGRAM IS FOR INFORMATIONAL PURPOSES ONLY, AND DEPICTS ONLY HOW THE CONTROLLER IS TO BE TERMINATED.

REV	DESCRIPTION	DATE	APPROVED
1	REVISED PER DESIGN REVIEW	1/28/20	

ROTH SOUTHEAST
Automation • Energy Management • Lighting

TYP CV CHW AHU WIRING DIA

RIVERGLADES ELEMENTARY
7400 PARKSIDE DRIVE
PARKLAND, FL 33067

FILE:				DRAWING	
JOB/CONT #				DRWG #	21
SALES ENGINEER	PROJECT MANAGER	APPL. ENGINEER	DRAWN BY:	REV.	0
NC	NC	NC	JS	INIT DATE	3/19/18

SYMBOL	QTY	PART #	DESCRIPTION	MANU.	SIGNAL	RANGE
	4	MP-C-15A	IP CONTROLLER	SCHNEIDER		
RE-01	8	CKIT-VMD1B-F24	RELAY KIT	VERIS	24 VAC COIL	NORMALLY OPEN
CS-01-02	8	H608	CURRENT SWITCH	VERIS	DRY CONTACT	NORMALLY OPEN
TE-01-02	14	ETD500-6	DUCT MOUNT TEMP SENSOR	SCHNEIDER	10K OHMS	-40°F TO 302°F
CO-01	4	CDE	DUCT MOUNT CO2 SENSOR	VERIS	4-20mA	0-2000 PPM
DPS-01	4	AFS-222	DIFFERENTIAL PRESSURE SWITCH	CLEVLAND CONTROLS	DRY CONTACT	NORMALLY OPEN
AE-01	4	LFB24-SR-S	DAMPER ACTUATOR	BELIMO	2-10VDC	
V-01	4	SEE SCHEDULE	3-WAY BALL VALVE W/ ACTUATOR	SIEMENS	0-10VDC	SEE SEQUENCE
	24	CMT-4	TERMINAL BLOCK	ALTEC		
	4	X100CAA	TRANSFORMER	VERIS		
	4	RET3826	ENCLOSURE	KELE		
	4	51012218	POWER RECEPTICAL	KELE		
	4	DCP-1.5-W	1.5A POWER SUPPLY	KELE	24VAC	1.5-27 VDC

CONSTANT VOLUME AHU SEQUENCE OF OPERATIONS:

A. The air handling unit is to be started and stopped by a zone on the Central Control Panel. The time schedule for enabling the system to start in the morning and shutdown in the evening will be controlled by the school based TAC-Andover Energy Management/Security (EM/S) system.

B. In the cooling mode when the building is occupied, the supply fan will run continuously and the low leakage, motor-operated outside air damper will be opened to the minimum setting to provide makeup air to replace air exhausted by the exhaust fans and to ensure positive pressure within the zone or space served. During the unoccupied period, ensure the low leakage, motor-operated outside air damper fully closes and the supply fan will continue to run in a re-circulation mode until it is shutdown by the EM/S system at a pre-selected time. When operating during the unoccupied period and with the exception of the custodian room exhaust fan, ensure all other exhaust fans are commanded off so as not to cause the interior space to become negatively pressurized with respect to the outdoors.

C. The chilled water valve will be modulated to maintain return air temperature setpoint.

D. The outside air damper shall modulate to maintain the return air CO2 setpoint. Min and max OA to be set by T&B.

E. Smoke detectors located upstream of the duct heater on the supply air duct of each air handling unit will signal the building fire alarm system upon sensing products of combustion. All of the air handling units shall shutdown upon activation of any station of the fire alarm system and shall be provided with a time delay relay to allow startup after all smoke damper have reopened. Provide the smoke detectors and the interlock/shutdown electrical wiring under provisions of Division 16.

DRAWING 22 | DRWG # 0 | REV. | INIT. DATE 3/19/18

FILE: | JOB/CONT # | SALES ENGINEER NC | PROJECT MANAGER NC | APPL. ENGINEER NC | DRAWN BY: JS

CV CHW AHU PARTS/SOP

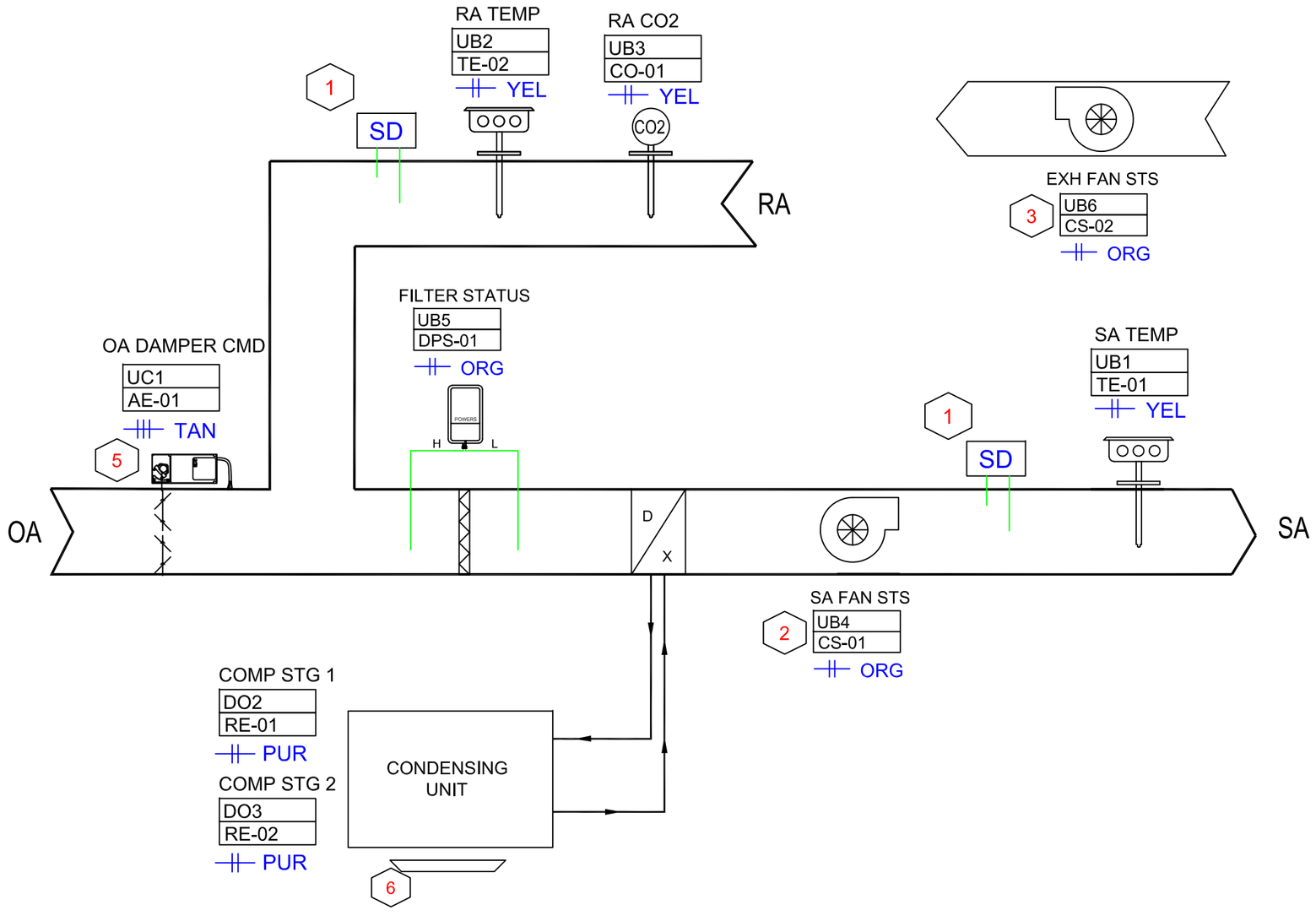
TYP CV

RIVERGLADES ELEMENTARY
7400 PARKSIDE DRIVE
PARKLAND, FL 33067

ROTH SOUTHEAST Innovation • Energy Management • Lighting

APPROVED

REV	DESCRIPTION	DATE
1	REVISED PER DESIGN REVIEW	1/28/20



NOTES:

1. TERMINATED, WIRED AND PROVIDED BY OTHERS.
2. SUPPLY FAN STARTED AND STOPPED FROM OVERRIDE PANEL.
3. FIELD VERIFY EXHAUST FAN INTERLOCKS
4. CONTROLS SHALL BE UPGRADED. ALL OTHER EQUIPMENT IS EXISTING TO REMAIN.
5. NEW MOTORIZED DAMPER SHALL BE PROVIDED TO EXISTING OUTSIDE AIR DUCTS.
6. CONDENSATE OVERFLOW SWITCH PROVIDED AND INSTALLED BY OTHERS.

AC-9 DX AHU DIAGRAM

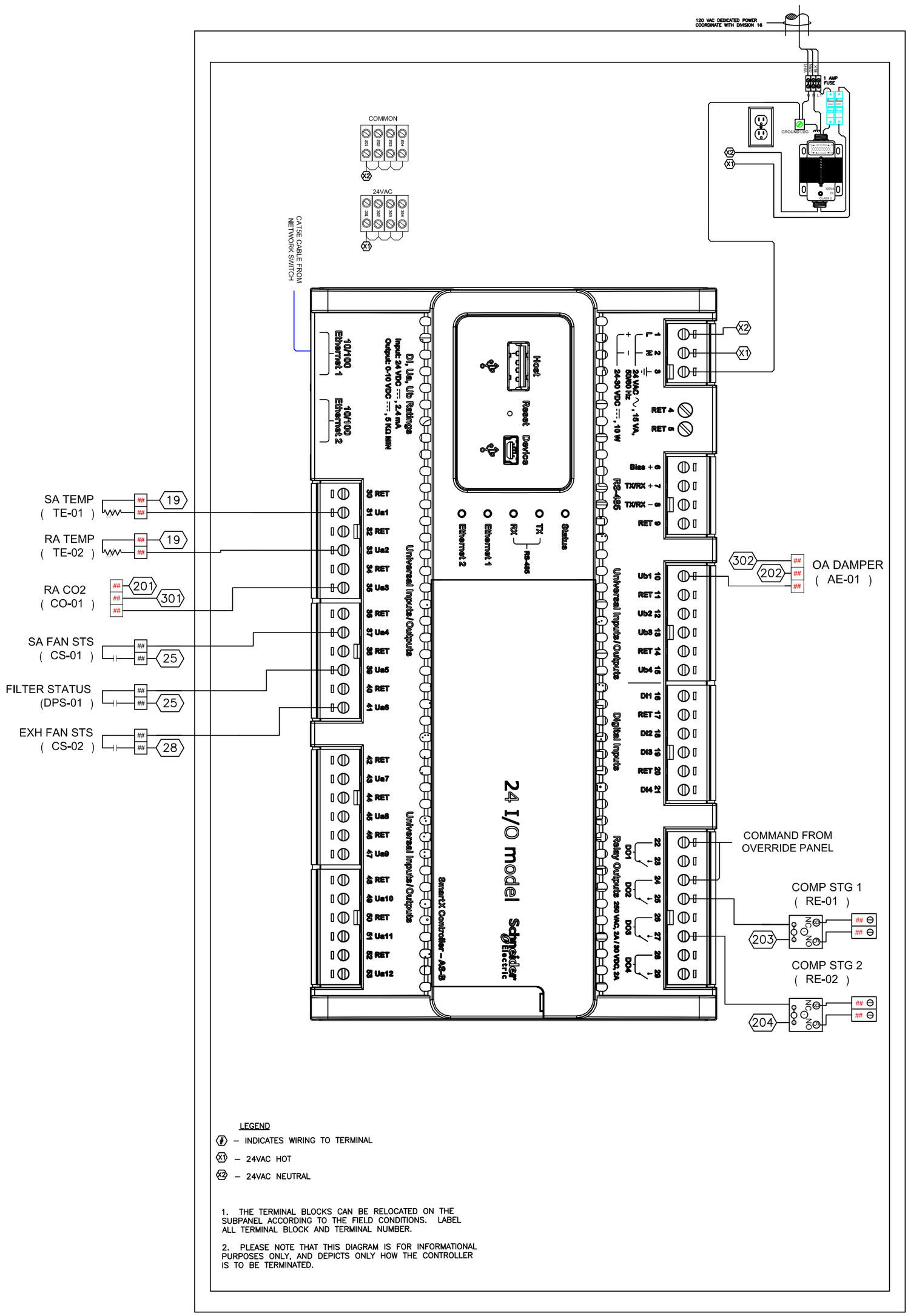
RIVERGLADES ELEMENTARY
7400 PARKSIDE DRIVE
PARKLAND, FL 33067

FILE:	JOB/CONT #	SALES ENGINEER	PROJECT MANAGER	APPL. ENGINEER	DRAWN BY:
		NC	NC	NC	JS

DRAWING	DRWG #	REV.	INIT. DATE
	23	0	3/19/18

ROTH SOUTHEAST
Automation • Energy Management • Lighting

REV	DESCRIPTION	DATE	APPROVED
1	REVISED PER DESIGN REVIEW	1/28/20	



LEGEND

(#) – INDICATES WIRING TO TERMINAL

(X1) – 24VAC HOT

(X2) – 24VAC NEUTRAL

1. THE TERMINAL BLOCKS CAN BE RELOCATED ON THE SUBPANEL ACCORDING TO THE FIELD CONDITIONS. LABEL ALL TERMINAL BLOCK AND TERMINAL NUMBER.

2. PLEASE NOTE THAT THIS DIAGRAM IS FOR INFORMATIONAL PURPOSES ONLY, AND DEPICTS ONLY HOW THE CONTROLLER IS TO BE TERMINATED.

REV	DESCRIPTION	DATE	APPROVED

ROTH SOUTHEAST
Automation • Energy Management • Lighting

AC–9 DX AHU WIRING DIAGRAM

RIVERGLADES ELEMENTARY
7400 PARKSIDE DRIVE
PARKLAND, FL 33067

FILE:
JOB/CONT #

SALES ENGINEER	PROJECT MANAGER	APPL. ENGINEER	DRAWN BY:
NC	NC	NC	JS

DRAWING

DRWG #	24
REV.	0
INIT DATE	3/19/18

SYMBOL	QTY	PART #	DESCRIPTION	MANU.	SIGNAL	RANGE
	1	AS-B-24A	IP CONTROLLER	SCHNEIDER		
RE-01-02	4	CKIT-VMD1B-F24	RELAY KIT	VERIS	24 VAC COIL	NORMALLY OPEN
CS-01-02	2	H608	CURRENT SWITCH	VERIS	DRY CONTACT	NORMALLY OPEN
TE-01-02	2	ETD500-6	DUCT MOUNT TEMP SENSOR	SCHNEIDER	10K OHMS	-40°F TO 302°F
CO-01	1	CDE	DUCT MOUNT CO2 SENSOR	VERIS	4-20mA	0-2000 PPM
DPS-01	1	LFS-222	DIFFERENTIAL PRESSURE SWITCH	CLEVLAND CONTROLS	DRY CONTACT	NORMALLY OPEN
AE-01	1	LFB24-SR-S	DAMPER ACTUATOR	BELIMO	2-10VDC	
	2	CMT-4	TERMINAL BLOCK	ALTEC		
	1	X100CAA	TRANSFORMER	VERIS		
	1	RET3826	ENCLOSURE	KELE		
	1	51012218	POWER RECEPTICAL	KELE		
	1	DCP-1.5-W	1.5A POWER SUPPLY	KELE	24VAC	1.5-27 VDC

SEQUENCE OF OPERATIONS:

A. The air handling unit is to be started and stopped by a zone on the Central Control Panel. The time schedule for enabling the system to start in the morning and shutdown in the evening will be controlled by the school based TAC-Andover Energy Management/Security (EM/S) system.

B. In the cooling mode when the building is occupied, the supply fan will run continuously and the low leakage, motor-operated outside air damper will be opened to the minimum setting to provide makeup air to replace air exhausted by the exhaust fans and to ensure positive pressure within the zone or space served. During the unoccupied period, ensure the low leakage, motor-operated outside air damper fully closes and the supply fan will continue to run in a re-circulation mode until it is shutdown by the EM/S system at a pre-selected time. When operating during the unoccupied period and with the exception of the custodian room exhaust fan, ensure all other exhaust fans are commanded off so as not to cause the interior space to become negatively pressurized with respect to the outdoors.

C. The outside air damper shall modulate to maintain the return air CO2 setpoint. Min and max OA to be set by T&B.

D. The compressors shall stage on to maintain return air temperature setpoint.

DRAWING
DRWG # 25
REV. 0
INIT. DATE 3/19/18
DRAWN BY: JS
APPL. ENGINEER NC
PROJECT MANAGER NC
SALES ENGINEER NC
JOB/CONT #
FILE:

AC-9 DX AHU PARTS/SOP

RIVERGLADES ELEMENTARY
7400 PARKSIDE DRIVE
PARKLAND, FL 33067

AC-9

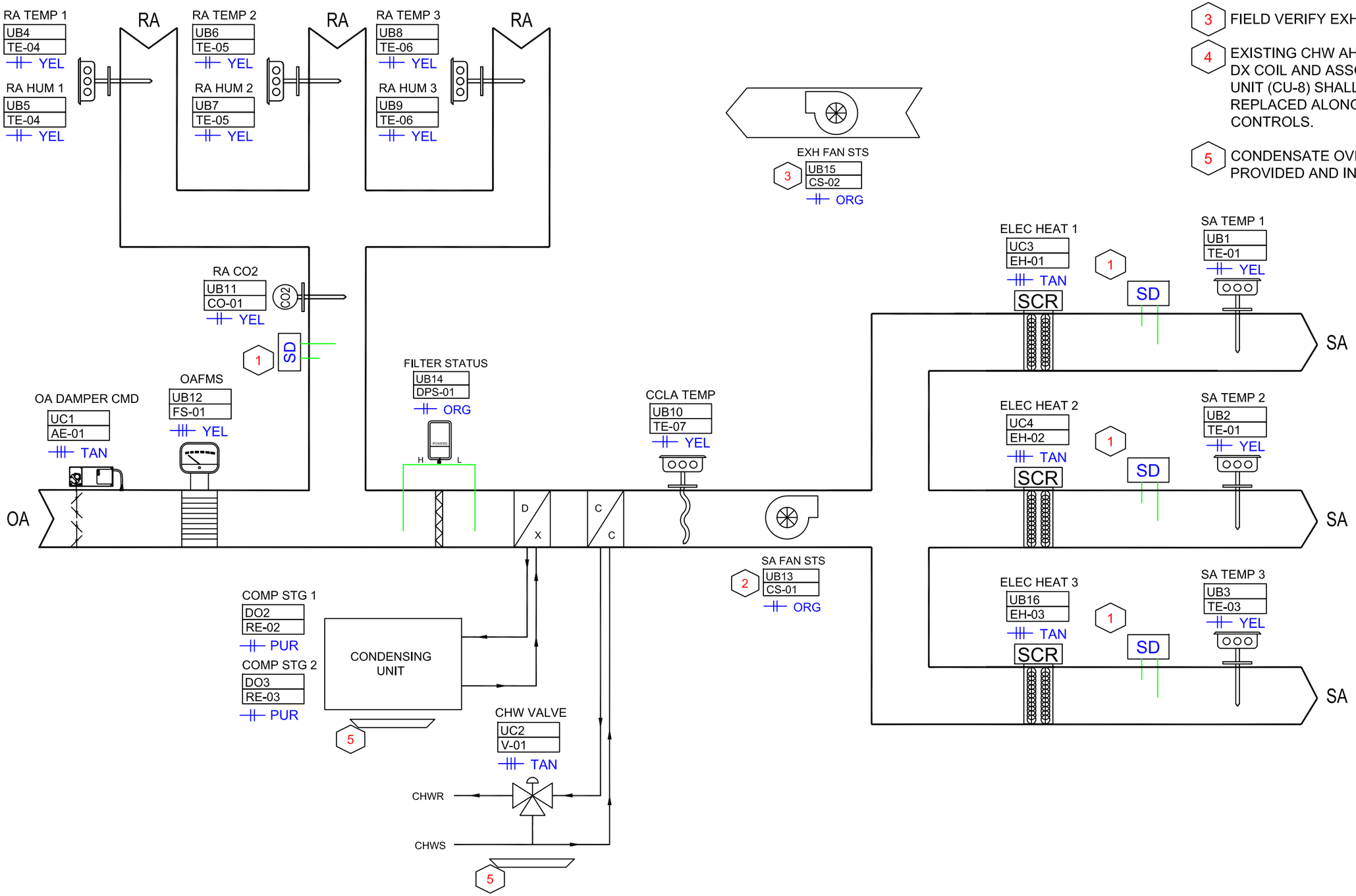
ROTH SOUTHEAST

APPROVED

REV	DESCRIPTION	DATE
1	REVISED PER DESIGN REVIEW	1/28/20

NOTES:

1. TERMINATED, WIRED AND PROVIDED BY OTHERS.
2. SUPPLY FAN STARTED AND STOPPED FROM OVERRIDE PANEL.
3. FIELD VERIFY EXHAUST FAN INTERLOCKS
4. EXISTING CHW AHU (AC-8) WITH AUXILIARY DX COIL AND ASSOCIATED CONDENSING UNIT (CU-8) SHALL BE REMOVED AND REPLACED ALONG WITH UPGRADED CONTROLS.
5. CONDENSATE OVERFLOW SWITCH PROVIDED AND INSTALLED BY OTHERS.



DRAWING
DRWG # 26
REV. 0
INIT. DATE 3/19/18
DRAWN BY: JS
APPL. ENGINEER NC
PROJECT MANAGER NC
SALES ENGINEER NC
JOB/CONT #
FILE:

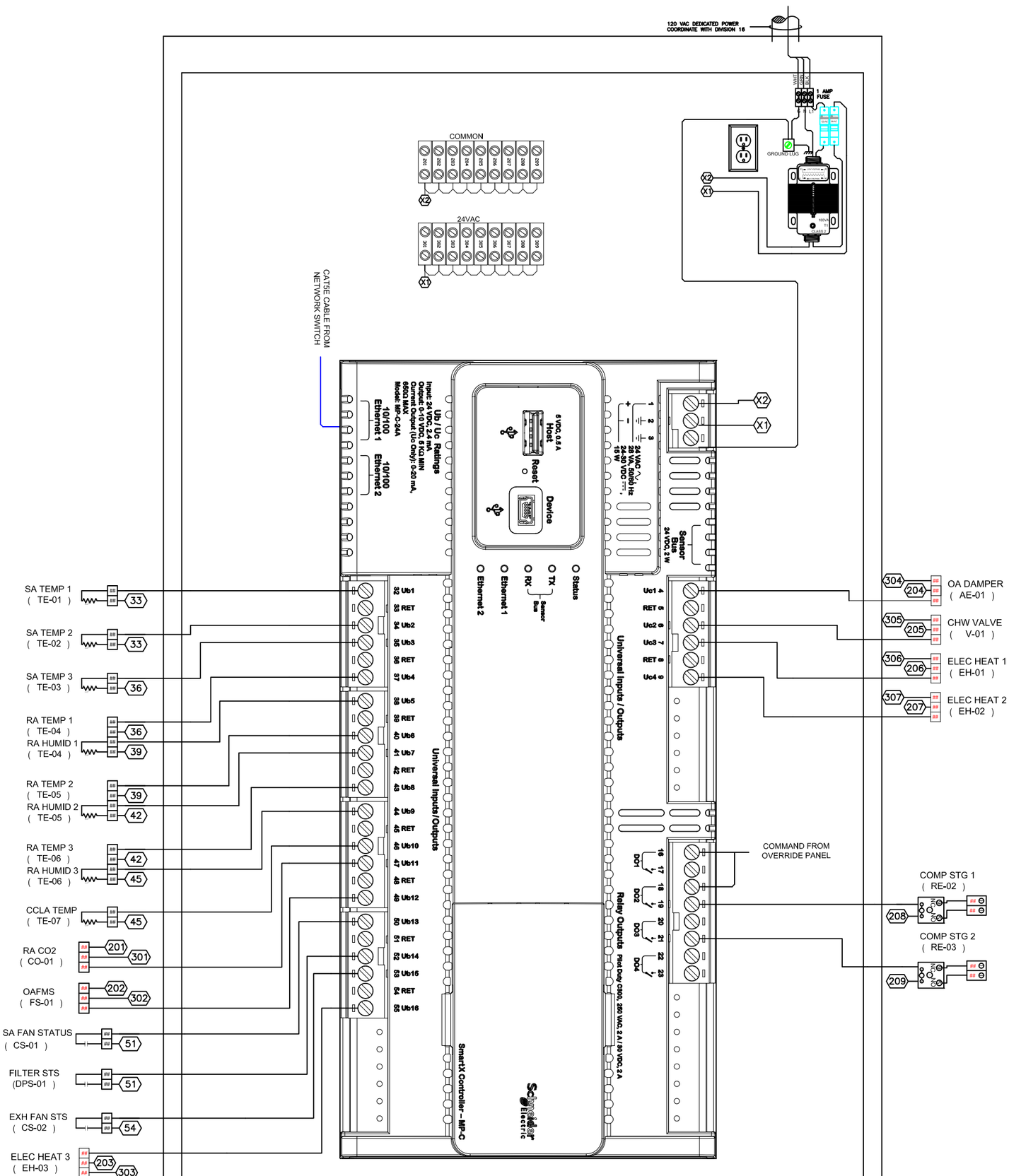
AC-8 CHW/DX AHU DIAGRAM

RIVERGLADES ELEMENTARY
7400 PARKSIDE DRIVE
PARKLAND, FL 33067

ROTH SOUTHEAST
Innovative • Energy Management • Lighting

APPROVED
DATE 1/28/20

REV	DESCRIPTION
1	REVISED PER DESIGN REVIEW



LEGEND

(#) – INDICATES WIRING TO TERMINAL

(X1) – 24VAC HOT

(X2) – 24VAC NEUTRAL

1. THE TERMINAL BLOCKS CAN BE RELOCATED ON THE SUBPANEL ACCORDING TO THE FIELD CONDITIONS. LABEL ALL TERMINAL BLOCK AND TERMINAL NUMBER.

2. PLEASE NOTE THAT THIS DIAGRAM IS FOR INFORMATIONAL PURPOSES ONLY, AND DEPICTS ONLY HOW THE CONTROLLER IS TO BE TERMINATED.

REV	DESCRIPTION	DATE	APPROVED

ROTH SOUTHEAST
Automation • Energy Management • Lighting

AC-8 CHW/DX AHU WIRING DIA

RIVERGLADES ELEMENTARY
7400 PARKSIDE DRIVE
PARKLAND, FL 33067

FILE:

JOB/CONT #

SALES ENGINEER	PROJECT MANAGER	APPL. ENGINEER	DRAWN BY:
NC	NC	NC	JS

DRAWING

DRWG #	27
REV.	0
INIT DATE	3/19/18

SYMBOL	QTY	PART #	DESCRIPTION	MANU.	SIGNAL	RANGE
	1	MP-C-24A	IP CONTROLLER	SCHNEIDER		
RE-01-03	7	CKIT-VMD1B-F24	RELAY KIT	VERIS	24 VAC COIL	NORMALLY OPEN
CS-01-02	2	H608	CURRENT SWITCH	VERIS	DRY CONTACT	NORMALLY OPEN
TE-01-03	3	ETD500-6	DUCT MOUNT TEMP SENSOR	SCHNEIDER	10K OHMS	-40°F TO 302°F
TE-04-06	3	EHD110-500	DUCT MOUNT TEMP & HUMIDITY SENSOR	SCHNEIDER	10K OHMS	-40°F TO 302°F 0 TO 95% RH
TE-07	1	ETA500-12	DUCT MOUNT AVG TEMP SENSOR	SCHNEIDER	10K OHMS	-40°F TO 302°F
CO-01	1	CDE	DUCT MOUNT CO2 SENSOR	VERIS	4-20mA	0-2000 PPM
DPS-01	1	AFS-222	DIFFERENTIAL PRESSURE SWITCH	CLEVLAND CONTROLS	DRY CONTACT	NORMALLY OPEN
AE-01	1	LFB24-SR-S	DAMPER ACTUATOR	BELIMO	2-10VDC	
FS-01	1	GTC116-F	AIR FLOW MEASURING STATION	EBTRON	4-20mA	0-5000 FPM
V-01	1	SEE SCHEDULE	3-WAY BALL VALVE W/ ACTUATOR	SIEMENS	0-10VDC	SEE SEQUENCE
	1	CMT-4	TERMINAL BLOCK	ALTEC		
	1	X100CAA	TRANSFORMER	VERIS		
	1	RET3826	ENCLOSURE	KELE		
	1	51012218	POWER RECEPTICAL	KELE		
	1	DCP-1.5-W	1.5A POWER SUPPLY	KELE	24VAC	1.5-27 VDC

SEQUENCE OF OPERATIONS:

Mode Control: The associated mechanical equipment's mode of operation will be controlled through the Facility Management System (FMS) computer.
Occupied Mode: The fan runs continuously with the outside air damper open.
Unoccupied Mode: The AHU will remain off in unoccupied mode with outside air damper closed.

Optimal Start: The system will use and optimal start algorithm to start algorithm to start the AHU at the precise time required to achieve comfort conditions at the desired occupied time. The outside air damper is closed during this mode.

Fan control: The fan will be commanded on continuously during occupied mode. When the fan status is on the control sequences will be enabled. Provide two stages of fan control in accordance with section C403.3.1.1 of the 2017 FECC.

Cooling Valve Control: The chilled water valve will be modulated to maintain the cooling coil air temperature at setpoint. The setpoint will be reset from 55°F up to 62°F based on the return air temperature. when the outdoor air temperature drops below 65°F, the supply air setpoint can be reset up to 72°F.

Fan Speed Control: The fan VFD will be modulated to maintain the return air temperature at the cooling setpoint. During heating mode, the fan speed will be at a constant speed.

Dehumidification Mode Control: The unit will always dehumidify normally, but the cooling coil setpoint reset will be disabled if the relative humidity is above a high limit, 60% RH. During this mode, the electric heat would be energized to maintain return air temperature at the cooling setpoint. Once the relative humidity drops down to 55% RH, the unit will go out of dehumidification mode.

Heating Mode: The electric heat will be energized to maintain return air temperature at teh heating setpoint. 68°F.

After Hours DX Cooling Control: When the chiller plant is disabled, the DX will cycle on if the return air relative humidity is above the high limit 60% RH, and cycle off when the relative humidity drops below 55% RH. The fan speed will be set at a constant predetermined after hours speed during this mode.

Set Point Control: The setpoints will be adjustable through the FMS computer.

Outside Air Ventilation Control: The outside air damper will be modulated between minimum and maximum schedule outside air flow to maintain the return air CO2 level at setpoint, 950 PPM. The damper will be closed in unoccupied mode.

Shutdown Control: The fan will run subject to the building fire alarm system. The fire alarm start and shutdown is provided and wired by the project electrical contractor.

Toilet Exhaust Fan Controls: The building toilet and janitor exhaust fans will be interlocked to run when the building is in occupied mode.

Duct Heater Sequence of Operations: Temperature control: The unit will control to maintain the zone temperature setpoint at sensed by the zone temperature sensor.
Occupied Mode: The occupancy mode will be controlled via a network input.
Electric Heat Coil: The electric heat coil will be staged in sequence to maintain the temperature setpoint.

DRAWING
DRWG # 28
REV. 0
INIT DATE 3/19/18
DRAWN BY: JS
APPL. ENGINEER NC
PROJECT MANAGER NC
SALES ENGINEER NC
JOB/CONT #
FILE:
AC-8 CHW/DX AHU PARTS/SOP
RIVERGLADES ELEMENTARY
7400 PARKSIDE DRIVE
PARKLAND, FL 33067
ROTH SOUTHEAST
APPROVED
DATE
DESCRIPTION
REV

NOTES:

1. CONTROLS SHALL BE UPGRADED. ALL OTHER EQUIPMENT IS EXISTING TO REMAIN.

CT-1
1 CELL

CT-1 S/S
S3-DO-1
RE-01
PUR

CT-1 STS
S1-IN-5
CS-01
ORG

CT-1 SPEED
S2-AO-1
VFD-01
PUR

VFD- 1

CWR TEMP
S1-IN-3
TE-03
YEL

CWS TEMP
S1-IN-4
TE-04
YEL

EF 5 S/S
S4-DO-2
RE-10
PUR

EF 5 STS
S1-IN-12
CS-08
ORG

CWP-1 S/S
S3-DO-4
RE-04
PUR

CWP-1 STS
S1-IN-6
CS-02
ORG

CHILLER 1

CH-1 S/S
S3-DO-2
RE-02
PUR

CH-1 ALARM
S1-IN-13
AL-01
ORG

PCHWP-1 S/S
S3-DO-6
RE-06
PUR

PCHWP-1 STS
S1-IN-8
CS-04
ORG

CWP-2 S/S
S3-DO-5
RE-05
PUR

CWP-2 STS
S1-IN-7
CS-03
ORG

CHILLER 2

CH-2 S/S
S3-DO-3
RE-03
PUR

CH-2 ALARM
S1-IN-14
AL-02
ORG

PCHWP-2 S/S
S3-DO-7
RE-07
PUR

PCHWP-2 STS
S1-IN-9
CS-05
ORG

CHWR TEMP
S1-IN-1
TE-01
YEL

CHWS TEMP
S1-IN-2
TE-02
YEL

FROM BUILDING

TO BUILDING

SCHWP-3 S/S
S3-DO-8
RE-08
PUR

SCHWP-3 STS
S1-IN-10
CS-06
ORG

SCHWP-4 S/S
S4-DO-1
RE-09
PUR

SCHWP-4 STS
S1-IN-11
CS-07
ORG

DRAWING
DRWG # 29
REV. 0
INIT. DATE 3/19/18
DRAWN BY: JS
APPL. ENGINEER NC
PROJECT MANAGER NC
SALES ENGINEER NC
JOB/CONT #
FILE:

CHILLER PLANT DIAGRAM

RIVERGLADES ELEMENTARY
7400 PARKSIDE DRIVE
PARKLAND, FL 33067

ROTH SOUTHEAST
Commissioning • Energy Management • Lighting

APPROVED
DATE
DESCRIPTION
REV

3/4" EMT FOR CONTROL WIRES

120 VAC DEDICATED POWER
COORDINATE WITH DIVISION 16

RS 485 MS/TP NETWORK

WHT
ORN
BLK

1 AMP
FUSE

GROUNDED

X1
X2

CHWR TEMP (TE-01)
CHWS TEMP (TE-02)
CWR TEMP (TE-03)
CWS TEMP (TE-04)
CT-1 STATUS (CS-01)
CWP-1 STS (CS-02)
CWP-2 STS (CS-03)
PCHWP-1 STS (CS-04)
CT-1 SPEED (VFD-01)

CT-1 STOP/START (RE-01)
CH-1 STOP/START (RE-02)
CH-2 STOP/START (RE-03)
CWP-1 STOP/START (RE-04)
SCHWP-4 STOP/START (RE-09)
EF-5 STOP/START (RE-10)

2 2 2 5 8 11 11 11

201 202 203 204 209 210

1 2 3 4 5 6 7 8 9 10 11 12

L
N
24VAC 60VA 50/60 HZ
+
-
24VDC 40 W

PS A
MAIN POWER
SCHNEIDER ELECTRIC
STATUS

RET
FACTORY
RET
10 V
TX/RX +
TX/RX -
OPERATOR PANEL

AS 1
RESET
TX TX
1 3
RS-485
A B
RX RX
ETHERNET
LINK/ACT
SPEED
SCHNEIDER ELECTRIC
STATUS
DEVICE
HOST
10/100 ETHERNET
RS-485
COM A
COM B
TX/RX +
TX/RX -
SHIELD
13 14 15 16 17 18 19

UI RET UI UI RET UI UI RET UI UI RET UI

UNIVERSAL INPUTS - TB 1-1

XP UI-16 A
SCHNEIDER ELECTRIC
SLOT 1
STATUS

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16

UNIVERSAL INPUTS - TB 1-1

UI RET UI UI RET UI UI RET UI UI RET UI

9 10 11 12 13 14 15 16

13 14 15 16 17 18 19 20 21 22 23 24

VO RET CO VO RET CO VO RET CO VO RET CO

ANALOG OUTPUTS - TB 1-2

XP AO-8 A
SCHNEIDER ELECTRIC
SLOT 2
STATUS

1 2 3 4 5 6 7 8

ANALOG OUTPUTS - TB 1-2

VO RET CO VO RET CO VO RET CO VO RET CO

5 6 7 8

13 14 15 16 17 18 19 20 21 22 23 24

1 2 3 4 5 6 7 8 9 10 11 12

DIGITAL OUTPUTS - TB 1-2

XP DO-FC-8 A
SCHNEIDER ELECTRIC
SLOT 3
STATUS

1 2 3 4 5 6 7 8

DIGITAL OUTPUTS - TB 1-2

5 6 7 8

9 10 11 12 13 14 15 16

1 2 3 4 5 6 7 8 9 10 11 12

DIGITAL OUTPUTS - TB 1-2

XP DO-FC-8 B
SCHNEIDER ELECTRIC
SLOT 4
STATUS

1 2 3 4 5 6 7 8

DIGITAL OUTPUTS - TB 1-2

5 6 7 8

9 10 11 12 13 14 15 16

COMMON

202 203 204 209 210

X2

TWIST SHIELDS TOGETHER AND TAPE

14 14 17 17 20 20

PCHWP-2 STS (CS-05)
SCHWP-3 STS (CS-06)
SCHWP-4 STS (CS-07)
EXH FAN 5 STS (CS-08)
CH-1 ALARM (AL-01)
CH-2 ALARM (AL-02)

205 206 207 208

CWP-2 STOP/START (RE-05)
PCHWP-1 STOP/START (RE-06)
PCHWP-2 STOP/START (RE-07)
SCHWP-3 STOP/START (RE-08)

CHILLER PLANT WIRING DIAGRAM

RIVERGLADES ELEMENTARY
7400 PARKSIDE DRIVE
PARKLAND, FL 33067

FILE:	JOB/CONT #	SALES ENGINEER	PROJECT MANAGER	APPL. ENGINEER	DRAWN BY:
		NC	NC	NC	JS

DRAWING	DRWG #	REV.	INIT DATE
	30	0	3/19/18

ROTH SOUTHEAST
Innovation • Energy Management • Lighting

REV	DESCRIPTION	DATE	APPROVED

SYMBOL	QTY	PART #	DESCRIPTION	MANU.	SIGNAL	RANGE
	1	SXWAUTSVR10001	AUTOMATION SERVER	SCHNEIDER		
	1	SXWTBASW110001	AS BASE	SCHNEIDER		
	1	SXWPS24VX10001	AS POWER SUPPLY	SCHNEIDER		
	1	SXWTBPSW110001	AS POWER SUPPLY BASE	SCHNEIDER		
	1	SXWAO8XXX10001	AS AO MODULE	SCHNEIDER		
	2	SXWDOC8XX10001	AS DO MODULE	SCHNEIDER		
	1	SXWUI16XX10001	AS UI MODULE	SCHNEIDER		
	4	SXWTBIOW110001	AS IO MODULE BASE	SCHNEIDER		
RE-01-10	10	CKIT-VMD1B-F24	RELAY KIT	VERIS	24 VAC COIL	NORMALLY OPEN
CS-01-08	8	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		
	1	X100CAA	TRANSFORMER	VERIS		
	1	RET3826	ENCLOSURE	KELE		
	10	CMT-4	TERMINAL BLOCK	ALTEC		
	1	51012218	POWER RECEPTICAL	KELE		
	1	DCP-1.5-W	1.5A POWER SUPPLY	KELE	24VAC	1.5-27VDC

SEQUENCE OF OPERATION:

A. The chiller is to be started and stopped by the BAS. The chiller will be enabled on a call for cooling by the AHUs.

B. The chiller is to start in the following sequence:
   1. Lead Chilled Water Pump: Lead chilled water pump to start.
   2. Air Handling Unit: Air handling unit to start.
   3. Chiller: Chiller to start once the chilled water and condenser water flows are proven by flow switches.

C. The condenser water pump is to start on demand upon activation of one air handling unit which will allow the cooling tower fan to start. Cooling tower VFD will modulate to maintain condenser water supply temperature of 85°F (adj.)

D. Chilled water and condenser water pumps will operate on a lead/lag basis based on run time. The pump with the lowest run time will be the lead pump. Pumps will be rotated weekly.

DRAWING
DRWG # 31
REV. 0
INIT. DATE 3/19/18
DRAWN BY: JS
APPL. ENGINEER NC
PROJECT MANAGER NC
SALES ENGINEER NC
JOB/CONT #
FILE:

PLANT PARTS/SOP

CHILLER PLANT

RIVERGLADES ELEMENTARY
7400 PARKSIDE DRIVE
PARKLAND, FL 33067

ROTH SOUTHEAST

APPROVED
DATE
DESCRIPTION
REV