SUBMITTAL REVIEW

CLIENT NAME: Vails Gate Fire Department

PROJECT TITLE: Vails Gate FD - New Firehouse

SUBMITTAL No.: 230923-1.1 **H2M PROJECT No.:** VGFD2001

SUBMITTAL NAME: Building Control Systems Package

SUBMITTAL REVIEW

REVIEW IS FOR GENERAL COMPLIANCE WITH CONTRACT DOCUMENTS.
NO RESPONSIBILITY IS ASSUMED FOR CORRECTNESS
OF DIMENSIONS OR DETAILS

- [x] NO EXCEPTIONS TAKEN
- [ ] SUBMIT SPECIFIED ITEM
- [ ] MAKE CORRECTIONS NOTED (RESUBMISSION NOT REQUIRED)
- [ ] NO ACTION TAKEN (REVIEW IS THE RESPONSIBILITY OF ANOTHER PARTY)
- [ ] REVISE & RESUBMIT
- [ ] NO ACTION TAKEN (THIS SUBMITTAL IS NOT REQUIRED BY THE CONTRACT)
- [ ] REJECTED - SEE REMARKS
- [ ] RECEIVED FOR RECORD

Corrections or comments made on the shop drawings during this review do not relieve contractor from compliance with requirements of the drawings and specifications. This check is only for review of general conformance with the design concept of the project and general compliance with the information given in the contract documents. The contractor is responsible for: confirming and correlating all quantities and dimensions; selecting fabrication processes and techniques of construction; coordinating their work with that of all other trades; and performing the work in a safe and satisfactory manner.

H2M architects + engineers

Date: 09/13/2023 By: MJV

Rev.: 2020-05-20

Comments:

NOTES ADDED BELOW - NO REVISIONS NEEDED.

CONTRACTOR'S COMPANY NAME
ADDRESS

SUBMISSION TRANSMITTAL FORM
CLIENT NAME: Vails Gate Fire District
PROJECT TITLE: VGFD2001-New Firehouse

H2M PROJECT NO.: VGFD2001

Product, Item, or System Submitted:	Building Control System Package		
Submission Date:	9/1/2023	Submission Log No.:	230923-1.1
Specification Section:	230923/230991/230993	Paragraph Reference:	--
Contract Drawing Reference(s):			
Manufacturer's Name:			
Manufacturer's Mailing Address:			
Manufacturer's Contact Information:	*Name*	( ) *Tel. no.*	*Email*
Supplier's Name:	Joseph Lombardo Plumbing & Heating		
Supplier's Mailing Address:			
Supplier's Contact Information:	*Name*	( ) *Tel. no.*	*Email*
This item is a substitution for the specified item:		☑ No	☐ Yes
KEY CONSTRUCTION SERVICES, LLC **Project No: VGFD2001** Reviewed for General Acceptance Only. This review does not relieve the Subcontractors or Suppliers of responsibility for making the work conform to the requirements of the contract. The Subcontractor and Suppliers are responsible for all dimensions, correct fabrication and accurate fit with the work of other trades. **SUBJECT TO ARCHITECT AND OR ENGINEER APPROVAL** **Signed** *Joseph Manfredi*(PM) **Date: 9/1/2023** Contractor's Approval Stamp with Signature & Date		Contractor's Brief Comments or Remarks (attach separate letter as needed): By making this submission, we represent that we have determined and verified all field measurements and dimensions, field construction criteria, site and building constraints in terms of limitations in moving the item into the enclosed space, materials, catalog and model numbers and similar data and that we have checked and coordinated this submission with other work at or adjacent to the installed location in accordance with the requirements contained in the Contract Documents.	

END OF SECTION 013300

Joe Lombardo

Plumbing & Heating of Rockland, Inc.

321 Spook Rock Road
Suffern, NY 10901
Ph. 845-357-6537 Fx 845-357-8529
E: info@josephlombardo.com
Website: www.josephlombardo.com

Rockland Cty. Plumbing #1000 *Rockland Cty. Cooling # 1468*
Westchester Cty. Plumbing #460 *New Jersey State Plumbing #12702*

LETTER OF TRANSMITTAL

DATE: 8-25-23	JOB NO.
ATTENTION: Joe Manfredi	
RE: Vails Gate Firehouse	

TO: Key Construction
4246 Albany Post Rd. Suite 1
Hyde Park, NY 12538

WE ARE SENDING YOU ☐ Attached ☐ Under separate cover via _____ the following items:

☐ Shop Drawings ☐ Prints ☐ Plans ☐ Samples ☐ Specifications
☐ Copy of letter ☐ Change order ☐ _____

EMAIL	DATE	NO.	DESCRIPTION
1	8-25-23	230923	AUTOMATIC TEMPERATURE CONTROLS AND BUILDING AUTOMATION
			REVISION #1 MADE CORRECTIONS AND NOTES

THESE ARE TRANSMITTED as checked below:

☐ For approval ☐ No Exceptions Taken ☐ Resubmit _____ copies for review
☐ For your use ☐ Make Corrections Noted ☐ Submit _____ copies for distribution
☐ As requested ☐ Rejected ☐ Return _____ corrected prints
☐ For review and comment ☐ _____
☐ FOR BIDS DUE _____ 20___ ☐ PRINTS RETURNED AFTER LOAN TO US

COPY TO: Joe Manfredi

SIGNED: Ronald J. Lombardo

Resubmittal

Joe Lombardo Plumbing & Heating

Date: 08/16/2023
Project Name: Vails Gate Fire District BAS
Project Location: 872 Blooming Grove Turnpike, New Windsor, NY 10901

Prepared For:

Joe Lombardo Plumbing & Heating
321 Spook Rock Road
Suffern, NY 10901

Customer PO Number: 37820
Customer Project Number:
Sold To: Joe Lombardo Plumbing & Heating

Trane Sales Office:

Albany
301 Old Niskayuna Road, Suite 1
LATHAM, NY 12110

Phone: 518-785-1315
Fax: 518-785-4359
Web: http://www.trane.com

Mechanical Engineer:

Architect:

Trane Contracting Team:

Account Manager: Jacob Schatz
Jacob.Schatz@trane.com

Project Manager: Joseph Pierpoint
Joseph.Pierpoint@trane.com

Design By: Mark Livsey
mark.livsey@trane.com

Submittal Contents

The following is a list of documents included in this submittal in the order that they appear.

THIS WORK IS DONE INTERNAL BY LOMBARDO TECHNICIANS FOR LOCAL CONTROLS NOT TIED INTO THE TRANE BMS SYSTEM

Response to engineer comments dated 7/14/23.

- Provide Sequence of Operations for:
  - TX Fans
    - Stand Alone Operation via Light Switch or Time Clock that is to be provided & wired by others
  - HVLS Fans
    - Stand Alone Operation Propeller fan to have self-contained controls provided by equipment manufacturer and wired by others
  - IU-1
    - Is a part of the VRF System which is included in the submittal & connected to the BAS
  - VX
    - Vehicle Exhaust is not on schedule or sequence of operations due to being a stand-alone system provided and wired by others
  - GX-4
    - Stand Alone Operation via Light Switch or Time Clock that is to be provided & wired by others
  - KX/MAU
    - Kitchen System is stand-alone self-contained controls system provided by equipment manufacturer and wired by others
  - ***Typically, if the equipment/system is designed for stand-alone operation then it is not added to the BAS submittal since it is not controlled directly from the Trane BAS.***

- Provide submittal for review and approval of gas monitoring system (Dwg 6 of 46)
  - The gas monitoring system is provided and controlled through the Trane BAS. Data sheets for gas sensors are included in the data sheet section of the submittal.
- Provide submittal for review and approval of gas monitoring system (Dwg 7 of 46)
  - The gas monitoring system is provided and controlled through the Trane BAS. Data sheets for gas sensors are included in the data sheet section of the submittal.
- Storage Building (Dwg 11 of 46)
  - Minor changes with color of strobes and local occupant control on space sensor (Changes Made)
- Gas Fired Radiant Tube Heaters (Dwg 15 of 46)
  - Minor changes for setpoint (Changes Made)
- Hot Water System (Dwg 17 of 46)
  - Add additional supply water temperature sensors per zone (Changes Made)
- Hot Water System (Dwg 18 of 46)
  - The gas monitoring system is provided and controlled through the Trane BAS. Data sheets for gas sensors are included in the data sheet section of the submittal.
  - Add additional supply water temperature sensors per zone (Changes Made)
  - Add additional programming for boiler interlock through gas monitoring sensor (Changes Made)
  - Minor changes with color of Strobes (Changes Made)
- Hot Water System (Dwg 19 of 46)
  - Minor sequence changes (Changes Made)

- *One item of note, Radiant Floor is called for 124 deg F setpoint, this seems too high and could be in danger of damaging the floor. Typical system keeps temperature at 90 deg F.*

- DOAS-1 (Dwg 23 of 46)
  - *Markup note is calling for a motorized damper on the exhaust air but DOAS-1 is a packaged unit coming with a gravity exhaust damper. Since the unit is a packaged piece of equipment, modifications should not be done in the field and if a motorized damper is required then the unit manufacturer will need to make the change.*

OK

- DOAS-1 (Dwg 24 of 46)
  - Minor sequence changes (Changes Made)
- RTU-207 (Dwg 29 of 46)
  - *Markup note is calling for a motorized damper on the exhaust air but RTU – 207 is a packaged unit coming with a gravity exhaust damper. This is in conformance with the job specification of (238100, 2.01, I, 1.) which requires a barometric (gravity) damper for exhaust air.*

OK

- Apparatus Bay (Dwg 33 of 46)
  - The gas monitoring system is provided and controlled through the Trane BAS. Data sheets for gas sensors are included in the data sheet section of the submittal.
  - Minor changes with color of Strobes and local occupant control on space sensor (Changes Made)
- (Dwg 36 of 46)
  - *Markup note for ERXF-122 calls to monitor status but this fan is controlled by a stand-alone thermostat and is not part of the BAS.*
  - *Markup note for UH-4 calls to be monitored and interlocked with Radiant Floor & Garage Doors but UH-4 is controlled by a stand-alone thermostat. Interlock between Radiant Floor and Overhead Garage doors and monitoring is not part of the Trane controls scope nor was it called out in the specifications.*
- Unit Heaters (Dwg 37 of 46)
  - *UH-1,2,3 Calls for status to be monitored and units to be interlocked with Garage Doors but UH's are controlled by stand-alone thermostats. Interlocks between Overhead Garage doors and monitoring was not part of the Trane controls scope nor was it called out in the specifications.*
- Radiant Floor System (Dwg 38 of 46)
  - *Approved Equipment Submittal is designed as a self-contained control thermostat control system. Comments are to add monitoring of each zone and staging control but the Radiant Floor System is not part of the Trane controls scope nor was it called out in the specifications.*

ALL OKAY. UH'S INTERLOCKED WITH GARAGE DOORS ON LINE VOLTAGE SIDE, BY ELECTRICIAN.

Vails Gate Fire District BAS
872 Blooming Grove Turnpike
New Windsor, NY 10901

Customer Contact

Joe Lombardo Plumbing & Heating
321 Spook Rock Road
Suffern, NY 10901

TRANE PROJECT TEAM

SALESPERSON:
Jacob Schatz
Jacob.Schatz@trane.com

PROJECT MANAGER:
Joseph Pierpoint
Joseph.Pierpoint@trane.com

DESIGNED BY:
Mark Livsey
mark.livsey@trane.com

TITLE PAGE

	NUM.	REVISION	DATE:	BY:
CID: 00107802				
PID: 00116358				
PROJECT: C109951				
SALESPERSON: J Schatz				
DESIGNED BY: M Livsey	2	Re-Submittal	8/16/2023	MCL
CHECKED BY:	1	Submittal	4/21/2023	MCL

Albany
301 Old Niskayuna Road, Suite 1
LATHAM, NY 12110
518-785-1315

PROJECT: Vails Gate Fire District BAS

872 Blooming Grove Turnpike
New Windsor NY 10901

FILE: Vails Gate Fire Dept.vsdx

INDEX OF CONTROL SYSTEM DRAWINGS (1 of 2)				
DWG #	DRAWING TITLE	REVISION LEVEL	REVISION DATE	COMMENTS
1	TITLE PAGE	2	8/16/2023	
2	DRAWING INDEX	2	8/16/2023	
3	LEGEND	2	8/16/2023	
4	WIRING NOTES	2	8/16/2023	
5	RISER	2	8/16/2023	
6	STORAGE BUILDING GAS SYSTEM FLOOR PLAN	2	8/16/2023	
7	MAIN BLDG, APPARATUS BAY GAS SYSTEM FLOOR PLAN	2	8/16/2023	
8	ADDRESS SCHEDULE	2	8/16/2023	
9	GAS MONITORING CONTROLS ENCLOSURES	2	8/16/2023	
10	MECHANICAL RM 121 CONTROLS ENCLOSURE	2	8/16/2023	
11	STORAGE BUILDING GAS MONITOR SYSTEM FLOW	2	8/16/2023	
12	STORAGE BUILDING UC600 - 1 CONTROLLER	2	8/16/2023	
13	STORAGE BUILDING XM70 - 1 CONTROLLER	2	8/16/2023	
14	STORAGE BUILDING XM32 - 1-2 CONTROLLER	2	8/16/2023	
15	GAS MONITOR SYSTEM DISPLAYS	2	8/16/2023	
16	GAS FIRED RADIANT HEATERS - STORAGE BUILDING	2	8/16/2023	
17	SC - 1 CONTROLLER	2	8/16/2023	
18	HW SYSTEM UC600 - 3 FLOW	2	8/16/2023	
19	HW SYSTEM PUMP SETS FLOW	2	8/16/2023	
20	HW SYSTEM UC600 - 3 SEQUENCE	2	8/16/2023	
21	HW SYSTEM UC600 - 3 CONTROLLER	2	8/16/2023	
22	HW SYSTEM XM70 - 3-1 CONTROLLER	2	8/16/2023	
23	HW SYSTEM XM32 - 3-2 CONTROLLER	2	8/16/2023	
24	BOILER 1 CONTROLLER	2	8/16/2023	
25	DOAS - 1 UC600 - 4 FLOW	2	8/16/2023	
26	DOAS - 1 UC600 - 4 SEQUENCE	2	8/16/2023	
27	DOAS - 1 UC600 - 4 CONTROLLER	2	8/16/2023	
28	DOAS - 1 XM90 - 4-1 CONTROLLER	2	8/16/2023	
29	DOAS - 1 XM30 - 4-2 CONTROLLER	2	8/16/2023	
30	DOAS - 1 XM30 - 4-3 CONTROLLER	2	8/16/2023	
31	RTU - 207 FLOW	2	8/16/2023	
32	RTU - 207 SEQUENCE	2	8/16/2023	
33	RTU - 207 CONTROLLER	2	8/16/2023	
34	RTU - 207 UC400 - 1 CONTROLLER	2	8/16/2023	
35	APPARATUS BAY 101 MISC. EQUIPMENT FLOW PG 1	2	8/16/2023	
36	APPARATUS BAY 101 MISC. EQUIPMENT FLOW PG 2	2	8/16/2023	
37	APPARATUS BAY 101 UC600 - 2 CONTROLLER	2	8/16/2023	

INDEX OF CONTROL SYSTEM DRAWINGS (2 of 2)				
DWG #	DRAWING TITLE	REVISION LEVEL	REVISION DATE	COMMENTS
38	APPARTATUS BAY 101 XM32 - 2-1 CONTROLLER	2	8/16/2023	
39	APPARTATUS BAY 101 EQUIP XM30 - 2-2 CONTROLLER	2	8/16/2023	
40	ERXF-122, CUHS & UH - 4	2	8/16/2023	
41	UNIT HEATERS UH - 1 , 2 & 3	2	8/16/2023	
42	RADIANT FLOOR ZONE CONTROLLERS	2	8/16/2023	
43	VRF SYS 1 CONTROLLER	2	8/16/2023	
44	VRF SYS 2 CONTROLLER	2	8/16/2023	
45	VRF SYS 3 VRF - 3 CONTROLLER	2	8/16/2023	
46	VRF HW FIN TUBE 2ND STG HEAT	2	8/16/2023	
47	WATER VALVE SCHEDULE	2	8/16/2023	
48	DETAIL SHEET 1	2	8/16/2023	
49	DETAIL SHEET 2	2	8/16/2023	
50	DETAIL SHEET 3	2	8/16/2023	
51	BILL OF MATERIALS	2	8/16/2023	

THESE DRAWINGS ARE SCHEMATIC ONLY AND ARE NOT INTENDED TO SHOW ALL MECHANICAL AND ELECTRICAL REQUIREMENTS. CONSULT THE CONTRACT MECHANICAL AND ELECTRICAL DRAWINGS AS WELL AS EQUIPMENT SUBMITTAL INFORMATION FOR COMPLETE MECHANICAL AND ELECTRICAL REQUIREMENTS.

TRANE

DRAWING INDEX

CID: 00107802	NUM.	REVISION	DATE:	BY:
PID: 00116358				
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DESIGNED BY: M Livsey	2	Re-Submittal	8/16/2023	MCL
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Albany
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PROJECT: Vails Gate Fire District BAS

872 Blooming Grove Turnpike
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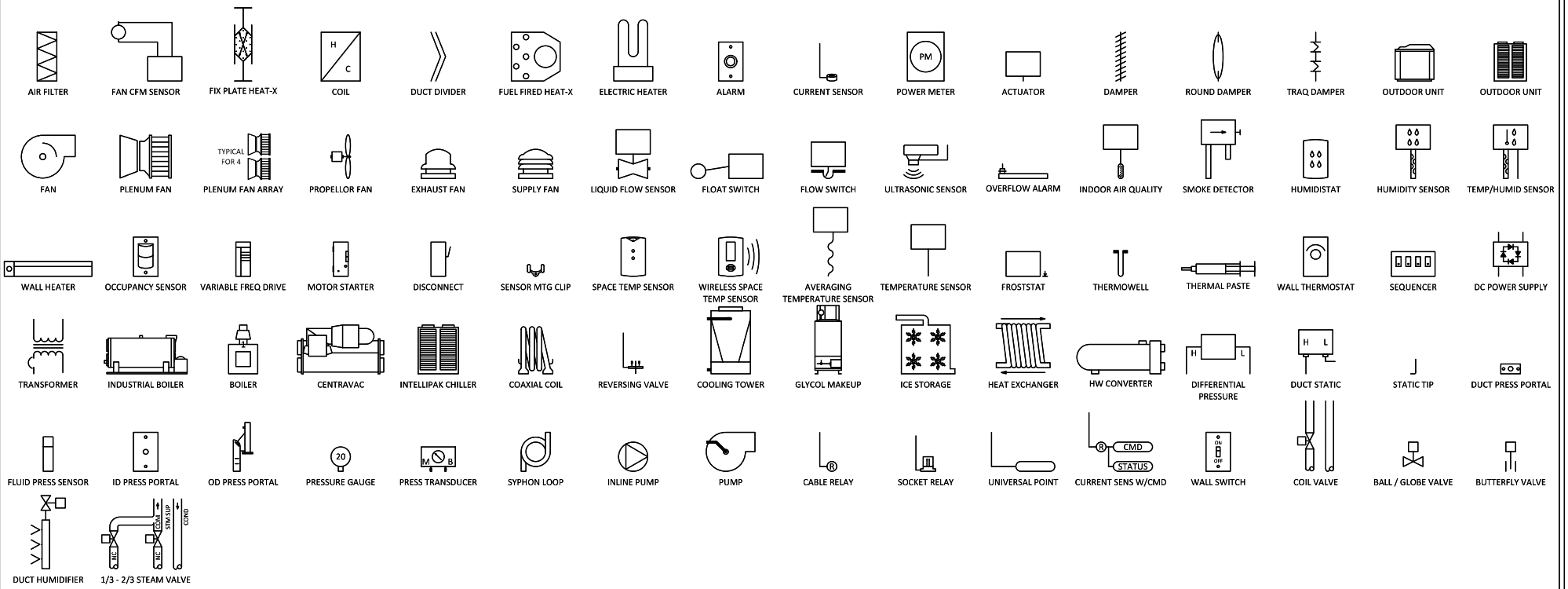
FILE: Vails Gate Fire Dept.vsdx

TYPICAL FLOW SHAPE SYMBOLS



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LEGEND

CID: 00107802	NUM.	REVISION	DATE:	BY:
PID: 00116358				
PROJECT: C109951				
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DESIGNED BY: M Livsey	2	Re-Submittal	8/16/2023	MCL
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TRANE

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FILE: Vails Gate Fire Dept.vsdx

DWG 3 OF 51

WIRING NOTES

ELECTRICAL CONTRACTOR FOR TRANE:

1. REFER TO DEVICE INSTALLATION MANUALS FOR SPECIFIC WIRING REQUIREMENTS.
2. FIELD WIRING MUST BE IN ACCORDANCE WITH NATIONAL ELECTRICAL CODE, STATE AND LOCAL BUILDING CODES, AND APPLICABLE SECTIONS OF PROJECT SPECIFICATION.
3. TAG ALL CONTROL WIRING AT EACH END OF THE CABLE OR WIRE PER TAGS SHOWN IN ATTACHED DRAWINGS.
4. AVOID OVER TIGHTENING CABLE TIES AND OTHER FORMS OF CABLE WRAPS. THIS CAN DAMAGE THE WIRES INSIDE THE CABLES.
5. DO NOT CABLE TIE TO INSULATED WATER, STEAM OR OTHER LINES.
6. IN OPEN PLENUMS, DO NOT RUN NEAR LIGHTING BALLASTS.
7. ALL PANELS AND FIELD DEVICES LISTED IN THIS DOCUMENT ARE TO BE INSTALLED BY CONTROL ELECTRICAL SUBCONTRACTOR UNLESS OTHERWISE NOTED ON DRAWINGS.
8. MOUNT ALL ROOM SENSORS AND SWITCHES AS SHOWN ON THE CONSTRUCTION DOCUMENTS, UNLESS OTHERWISE DIRECTED IN WRITING BY THE OWNER AND/ OR ENGINEER. IF NO DIRECTION IS PROVIDED IN THE CONSTRUCTION DOCUMENTS, THEN MOUNT AT 4FT (1.2M) ABOVE FINISHED FLOOR.
9. FLEXIBLE CONDUIT IS NOT TO EXCEED 24" IN LENGTH.
10. CONTROL PANELS ARE NOT TO BE USED AS JUNCTION BOXES OR RACEWAYS. WIRING THAT DOES NOT TERMINATE IN A CONTROL PANEL IS NOT TO BE RUN WITHIN THE PANEL.
11. BINARY INPUT LIMITS: 1000 FT (300 M).
12. 0~10 VDC ANALOG INPUT LIMITS: 300 FT (100 M).
13. 0~20 MA ANALOG INPUT LIMITS: 1000 FT (300 M).
14. VARIABLE RESISTANCE ANALOG INPUT LIMITS: 300 FT (100 M).
15. ANALOG OUTPUT LIMITS: 1000 FT (300 M).
16. BINARY OUTPUT LIMITS: 1000 FT (300 M).
17. WIRING POWER FROM THE AC OUT TERMINALS TO POWER ANALOG INPUT DEVICES WILL CAUSE IMMEDIATE CONTROLLER FAILURE IF INPUT DEVICE USES HALF-WAVE RECTIFICATION. WHEN UNSURE, USE A SEPARATE SUPPLY FOR DEVICE.

GENERAL COMMUNICATION GUIDE:

18. DO NOT RUN COMMUNICATION LINK WIRING IN THE SAME CONDUIT OR WIRE BUNDLE WITH AC-POWER WIRES (INCLUDING CONDUCTORS RUNNING FROM TRIAC-TYPE OUTPUTS). KEEP POLARITY CONSISTENT THROUGHOUT THE SITE. MAKE SURE THAT THE 24 VAC POWER SUPPLIES ARE CONSISTENT IN HOW THEY ARE GROUNDED.

    AVOID SHARING 24 VAC BETWEEN CONTROLLERS. USE ONLY ONE TYPE OF COMMUNICATION CABLE; DO NOT MIX CABLE. IF AN EXISTING JOB USED ALTERNATE CABLE, CONTINUE USING THE SAME CABLE AFTER APPROVAL FROM THE PROJECT MANAGER.
19. BACNET MS/TP COMMUNICATION CABLE MUST BE SHIELDED TWISTED PAIR, 18 AWG MINIMUM, STRANDED, TINNED COPPER CONDUCTORS. SHIELD MUST BE CONTINUOUS THROUGHOUT, ISOLATED FROM OTHER CONDUCTORS OR GROUND, AND GROUNDED AT THE SYSTEM CONTROLLER ONLY. MAXIMUM CAPACITANCE BETWEEN CONDUCTORS IS 24 PICOFARADS PER FOOT. MAXIMUM DISTANCE IS 4000 FT (1372 M).

    MAXIMUM OF 60 TRANE DEVICES PER LINK BUT LESS WHEN COMBINED WITH NON-TRANE DEVICES. A TRACER BACNET TERMINATOR IS REQUIRED AT EACH END OF THE COMMUNICATION LINK. EACH TERMINATOR REQUIRES 24 VDC POWER. EXPANSION MODULE LINK LIMIT IS 656 FT (200 M). TOPOLOGY MUST BE DAISY CHAINED.
20. LONTALK (COMM 5) COMMUNICATION CABLE MUST BE LEVEL 4 UNSHIELDED, 22 AWG WITH MAXIMUM CAPACITANCE BETWEEN CONDUCTORS OF 17 PICOFARADS PER FOOT. MAXIMUM DISTANCE IS 4500 FT (1400 M). MAXIMUM DEVICES IS 60 DEVICES WITHOUT REPEATER AND 120 WITH REPEATER. ONE REPEATER PER LINK CAN BE USED FOR AN ADDITIONAL 4500 FT (1400 M), 60 DEVICES.

    CCP III LINK LIMIT IS 3500 FT (1090 M). 105 OHMS, 1%, 1/4 WATT TERMINATION RESISTORS ARE REQUIRED AT EACH END FOR LEVEL 4 WIRE AND 82 OHMS, 1%, 1/ 4 WATT AT EACH END FOR 18 AWG SHIELDED (PURPLE) WIRE. EX2 LINK LIMIT IS 1000 FT (300 M). TOPOLOGY MUST BE DAISY CHAINED.
21. COMM 3 AND COMM 4 COMMUNICATION CABLE MUST BE SHIELDED TWISTED PAIR, 18 AWG MINIMUM, STRANDED, TINNED COPPER CONDUCTORS. SHIELD MUST BE CONTINUOUS THROUGHOUT, ISOLATED FROM OTHER CONDUCTORS OR GROUND, AND GROUNDED AT BCU ONLY.

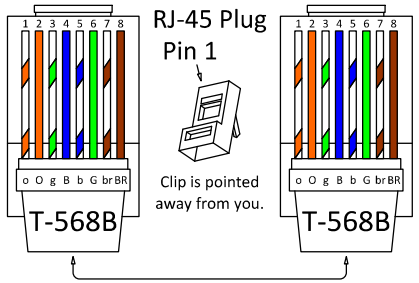
    MAXIMUM CAPACITANCE BETWEEN CONDUCTORS IS 24 PICOFARADS PER FOOT. MAXIMUM DISTANCE IS 5000 FT (1715 M). UNDER CERTAIN CONDITIONS, TERMINATION RESISTORS ARE REQUIRED ON A COMM 3 COMMUNICATION LINK.
22. ETHERNET LAN COMMUNICATION CABLE MAXIMUM DISTANCE IS 295 FT (90 M) PLUS 33 FT (10 M) FOR PATCH CABLES.
23. TRANE WIRELESS COMMUNICATION TYPICAL WCI TO WCI DISTANCE IS UP TO 200 FT (60 M) WITH COMMON BUILDING OBSTRUCTIONS. WCI IS POWERED BY 24 VDC OR 24 VAC. EACH NETWORK REQUIRES 1 WCI AS A NETWORK COORDINATOR AND SUPPORTS UP TO 30 TRANE BACNET CONTROLLERS EQUIPPED WITH WCI. TRACER SC SUPPORTS UP TO 8 NETWORK COORDINATORS AND UP TO 120 TRANE BACNET CONTROLLERS. TRACER SC NETWORK COORDINATORS MAY HAVE A COMBINED IMC WIRING LENGTH OF 656 FT (200 M). REFER TO IOM FOR DETAILS.
24. MODBUS. REFER TO MANUFACTURER DOCUMENTATION FOR SPECIFIC WIRING REQUIREMENTS, TERMINATION RESISTORS, AND THE MAXIMUM NUMBER OF DEVICES SUPPORTED PER LINK. IF THIRD-PARTY PRODUCT LITERATURE IS NOT AVAILABLE, GENERAL LOW-DATA RATE GUIDELINES ARE AS FOLLOWS:

    COMMUNICATION CABLE MUST BE 2-WIRE EIA/TIA-485 BRAID OR FOIL SHIELD TWISTED PAIR WIRE, 18 AWG, AND MAXIMUM CAPACITANCE BETWEEN CONDUCTIONS OF 24 PF/FT. MAXIMUM DISTANCE IS 4000FT (1200M). MAXIMUM DEVICES IS 30 DEVICES PER LINK. WIRING MUST BE ASSEMBLED IN A DAISY-CHAIN CONFIGURATION AND 1/2 WATT 120 OHM TERMINATION RESISTOR OR TRACER BACNET TERMINATOR MAY BE USED AT EACH END OF THE COMMUNICATION LINK.
25. M-NET COMMUNICATION CABLE MUST BE PLENUM RATED, SHIELDED TWISTED PAIR, 16 AWG MINIMUM, STRANDED, TINNED COPPER CONDUCTORS. SHIELD MUST BE CONTINUOUS THROUGHOUT, ISOLATED FROM OTHER CONDUCTORS OR GROUND AND 2 IN. OR MORE FROM ANY POWER SOURCE WIRING. MAXIMUM CAPACITANCE BETWEEN CONDUCTORS IS 59 PICOFARADS PER FOOT. MAXIMUM DISTANCE FOR OUTDOOR UNITS IS 1640 FT (500 M). MAXIMUM DISTANCE FOR INDOOR UNITS IS 656 FT (200 M). MAXIMUM DISTANCE FOR REMOTE CONTROLLERS IS 32 FT (10 M). TOPOLOGY MUST BE DAISY CHANGED.

MECHANICAL CONTRACTOR:

1. DAMPERS ARE TO BE INSTALLED BY SHEET METAL CONTRACTOR UNLESS OTHERWISE NOTED.
2. CONTROL VALVES AND ACCESSORIES INSTALLED DIRECTLY INTO PIPING (SENSOR WELLS, THREADOLETS, ETC.) ARE TO BE INSTALLED BY MECHANICAL CONTRACTOR.
3. FLOW DIAGRAMS SHALL NOT BE A GUIDE FOR PIPE AND VALVE INSTALLATION. REFER TO THE VALVE MANUFACTURER'S INSTALLATION INSTRUCTIONS FOR INSTALLATION GUIDANCE.

ETHERNET CAT6 T-568B WIRING DETAIL



FLAG POINT SYMBOLS

- 1 **FLAG.** FOR GENERAL NOTES.
- ⚠ **TRIANGLE.** FOR REVISIONS.
- ◇ **DIAMOND.** FOR RETROFIT NOTES.
- 1 **SQUARE.** MISCELANEOUS NOTE.
- 1 **OCTAGON.** MISCELANEOUS NOTE.
- 1 **PENTAGON.** MISCELANEOUS NOTE.

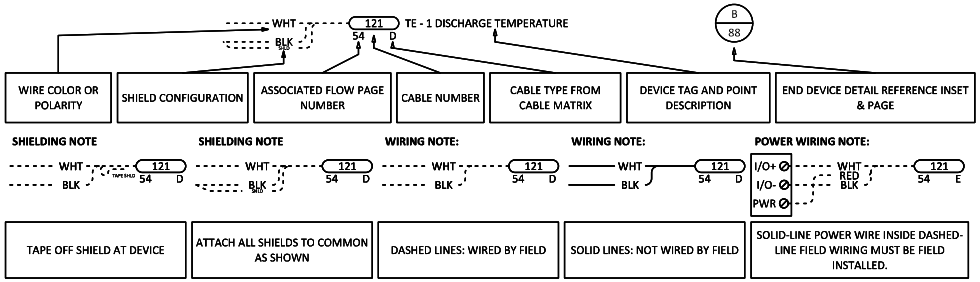
CABLE MATRIX

KEY	PART NO*	DESCRIPTION	WIRE COLORS
A	052003-S	18/2 TWIST SHLD VIOLET PLENUM CABLE	WHT, BLK
B	N/A	FACTORY PROVIDED CABLE	
C	105500	22/2 TWIST NON-SHLD BLUE COMM PLENUM CABLE	WHT, BLU/BLU
D	002320-S	18/2 TWIST SHLD WHITE PLENUM CABLE	WHT, BLK
E	002330-S	18/3 TWIST SHLD WHITE PLENUM CABLE	WHT, BLK, RED
F	002340-S	18/4 TWIST SHLD WHITE PLENUM CABLE	WHT, BLK, RED, GRN
G	002351	18/6 TWIST SHLD WHITE PLENUM CABLE	WHT, BLK, RED, GRN, BLU, BRN
H	6200FH	BELDEN 16/2 TWIST SHLD PLENUM CABLE	RED, BLK
J	N/A	1 PAIR #14 THHN STRANDED IN CONDUIT	
L	N/A	ETHERNET RG58 THNNET PLENUM CABLE	
M	555619-S	ETHERNET CAT-5 PLENUM CABLE	WHT, BLK, RED, GRN, BLU, YEL, ORN, BRN
O	002352-S	18/8 TWIST SHLD WHITE PLENUM CABLE	WHT, BLK, RED, GRN, BLU, YEL, ORN, BRN
P	106502-S	22/2 TWIST SHLD ORANGE COMM PLENUM CABLE	BLK, RED
Q	761360-S	16/2 SOLID RED SMOKE DETECTOR PLENUM CABLE	WHT, RED
2C	N/A	18/2 SOLID THERMOSTAT PLENUM CABLE	WHT, RED
3C	N/A	18/3 SOLID THERMOSTAT PLENUM CABLE	WHT, RED, GRN
5C	510005-S	18/5 SOLID THERMOSTAT PLENUM CABLE	WHT, RED, GRN, YEL, BLU
8C	510007-S	18/8 SOLID THERMOSTAT PLENUM CABLE	WHT, RED, GRN, YEL, BLU, ORN, BLK, BRN
10C	N/A	18/10 SOLID THERMOSTAT PLENUM CABLE	WHT, RED, GRN, YEL, BLU, ORN, BLK, BRN, PNK, GRY
12C	N/A	18/12 SOLID THERMOSTAT PLENUM CABLE	WHT, RED, GRN, YEL, BLU, ORN, BLK, BRN, PNK, GRY, PUR, TAN

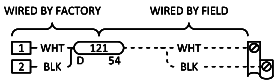
* TRANE APPROVED WINDY CITY PART NUMBERS. WHEN ORDERING CABLE SPECIFY JACKET COLOR. PART NUMBERS ARE SUBJECT TO CHANGE WITHOUT NOTICE.

CABLE MATRIX NOTES
ALL CABLE WIRING METHODS MUST BE TRANE RECOMMENDED. CONTACT TRANE FOR RECOMMENDED CABLES AND SPECIFICATIONS

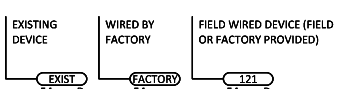
CABLE INFORMATION SHAPE (CIS)
EACH CABLE CONNECTION HAS A CIS WHICH PROVIDES SOME OR ALL OF THE INFORMATION INDICATED BELOW



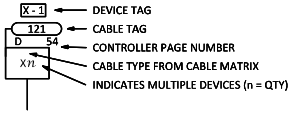
FACTORY MOUNTED DEVICE WITH FIELD MOUNTED CONTROLLER:



FIELD, FACTORY AND EXISTING DEVICE NOTES:

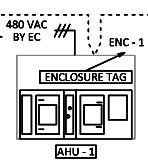


FLOW SHAPE NOTES:



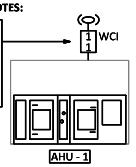
RISER 'WIRING BY' NOTE:

EC - ELECTRICAL CONTRACTOR
ESC - ELECTRICAL SUBCONTRACTOR
OTHER
TRANE
EXIST - EXISTING

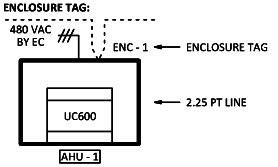


WIRELESS COMMUNICATION NOTES:

WIRELESS COMMUNICATION INTERFACE DISPLAYING GROUP ID (TOP) AND NETWORK ID (BOTTOM)



ENCLOSURE TAG:



INTERCONNECT WIRING DETAIL REFERENCE:

A / 12 INTERCONNECT WIRING DETAIL REFERENCE INSET
LETTER (TOP), PAGE NUMBER (BOTTOM)

RISER TERMINATION DEVICES

BT BACNET TERMINATOR

R TERMINATION RESISTOR

TRANE

WIRING NOTES

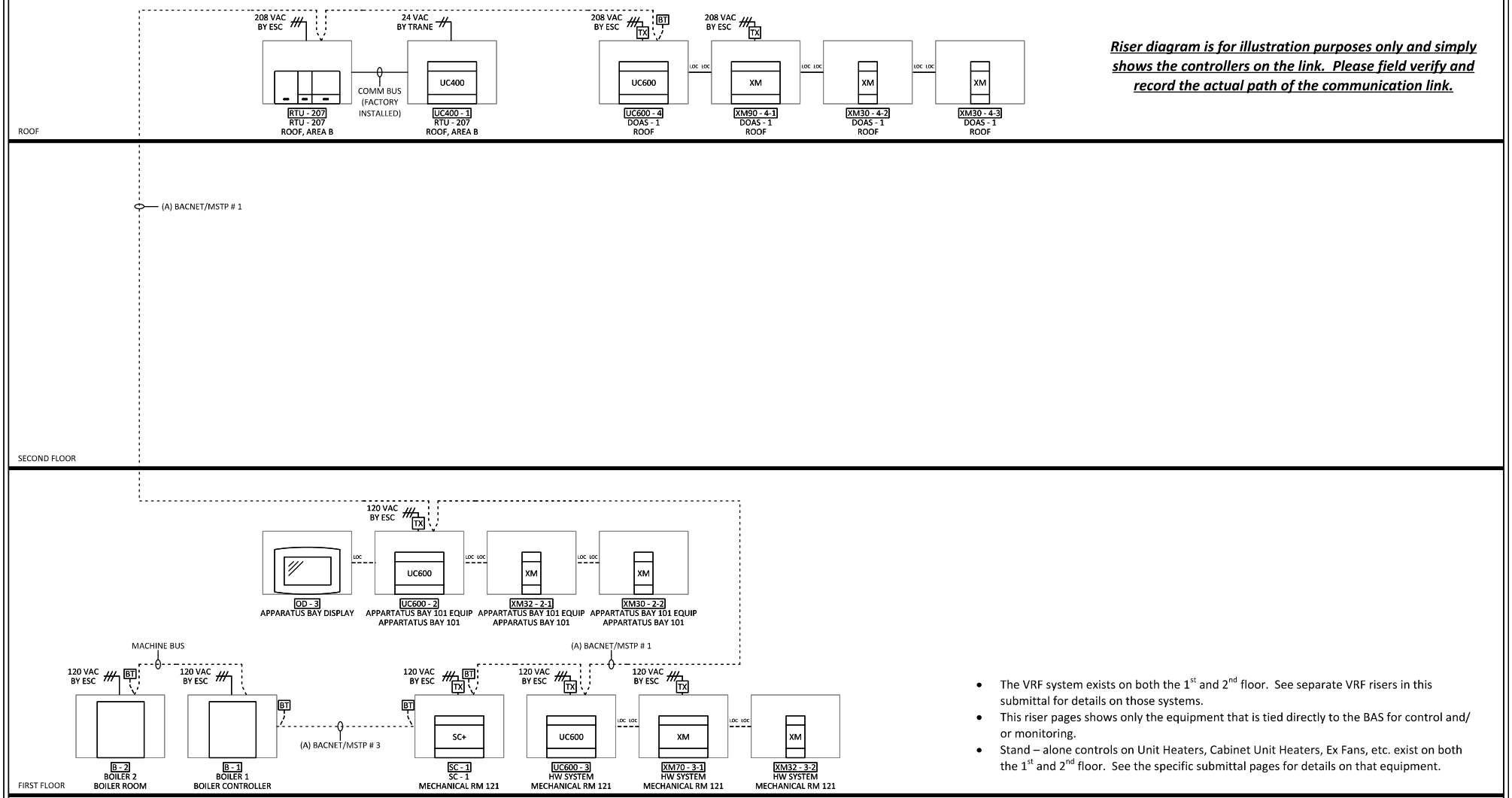
	NUM.	REVISION	DATE:	BY:
CID: 00107802				
PID: 00116358				
PROJECT: C109951				
SALESPERSON: J Schatz				
DESIGNED BY: M Livsey	2	Re-Submittal	8/16/2023	MCL
CHECKED BY:	1	Submittal	4/21/2023	MCL

Albany
301 Old Niskayuna Road, Suite 1
LATHAM, NY 12110
518-785-1315

PROJECT: Vails Gate Fire District BAS

872 Blooming Grove Turnpike
New Windsor NY 10901

FILE: Vails Gate Fire Dept.vsdx



Riser diagram is for illustration purposes only and simply shows the controllers on the link. Please field verify and record the actual path of the communication link.

- The VRF system exists on both the 1st and 2nd floor. See separate VRF risers in this submittal for details on those systems.
- This riser pages shows only the equipment that is tied directly to the BAS for control and/ or monitoring.
- Stand – alone controls on Unit Heaters, Cabinet Unit Heaters, Ex Fans, etc. exist on both the 1st and 2nd floor. See the specific submittal pages for details on that equipment.

RISER

	NUM.	REVISION	DATE:	BY:
CID: 00107802				
PID: 00116358				
PROJECT: C109951				
SALESPERSON: J Schatz				
DESIGNED BY: M Livsey	2	Re-Submittal	8/16/2023	MCL
CHECKED BY:	1	Submittal	4/21/2023	MCL

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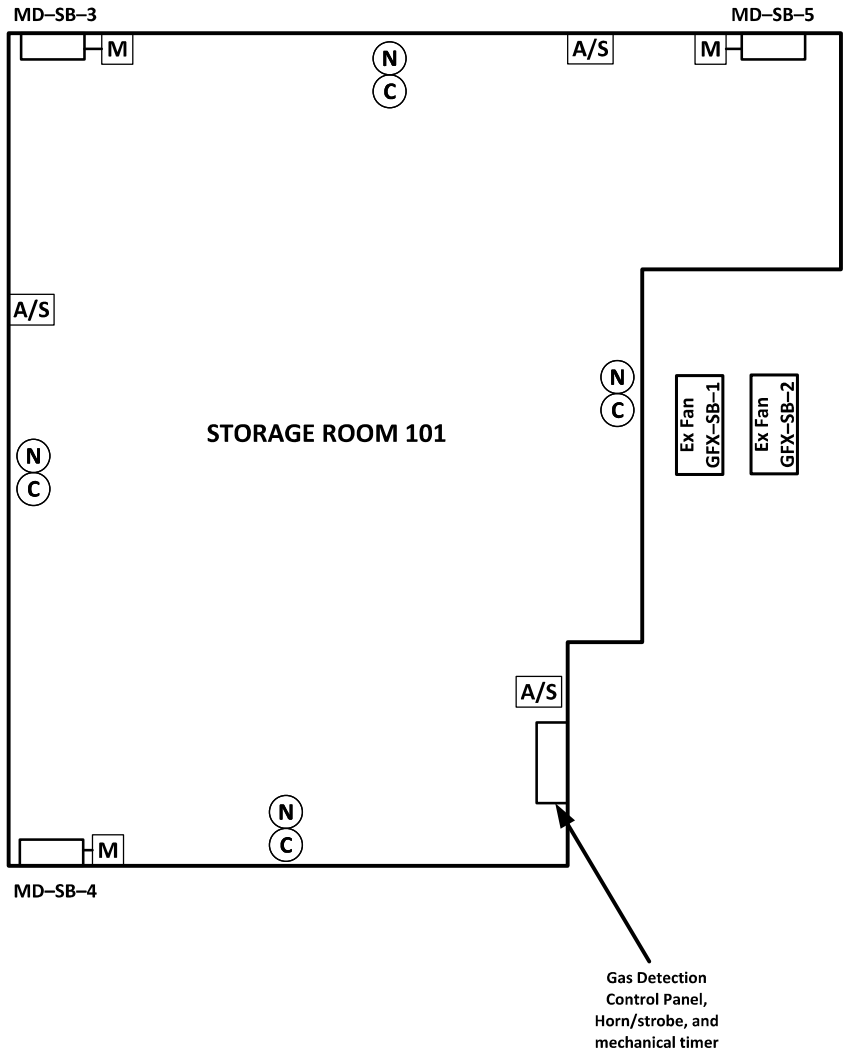
PROJECT: Vails Gate Fire District BAS

872 Blooming Grove Turnpike
New Windsor NY 10901

FILE: Vails Gate Fire Dept.vsdx



STORAGE BUILDING ROOM 101 GAS MONITORING SYSTEM ①

Legend	
C	CO Sensor Location
N	NO2 Sensor Location
M	Motorized Damper
A/S	Alarm Station (Horn & Strobe)

Installation Notes:

- Only (4X) gas sensors are required to provide coverage of the space, not the (6X) shown on the original mechanical plans. Installation should be one sensor per wall.
- Coordinate final location of all sensors in the field with the architect and VGFD.
- Mount sensors at approximately 4 ft, 6 in above finished floor.
- Confirm location of the Gas Monitor control panel and touch screen with Architect before installation.

① REFER TO PAGE 11 FOR THE FLOW, SEQUENCE AND CONTROLLER DETAILS OF THIS SYSTEM.

THESE DRAWINGS ARE SCHEMATIC ONLY AND ARE NOT INTENDED TO SHOW ALL MECHANICAL AND ELECTRICAL REQUIREMENTS. CONSULT THE CONTRACT MECHANICAL AND ELECTRICAL DRAWINGS AS WELL AS EQUIPMENT SUBMITTAL INFORMATION FOR COMPLETE MECHANICAL AND ELECTRICAL REQUIREMENTS.

TRANE

STORAGE BUILDING GAS SYSTEM FLOOR PLAN

	NUM.	REVISION	DATE:	BY:
CID: 00107802				
PID: 00116358				
PROJECT: C109951				
SALESPERSON: J Schatz				
DESIGNED BY: M Livsey	2	Re-Submittal	8/16/2023	MCL
CHECKED BY:	1	Submittal	4/21/2023	MCL

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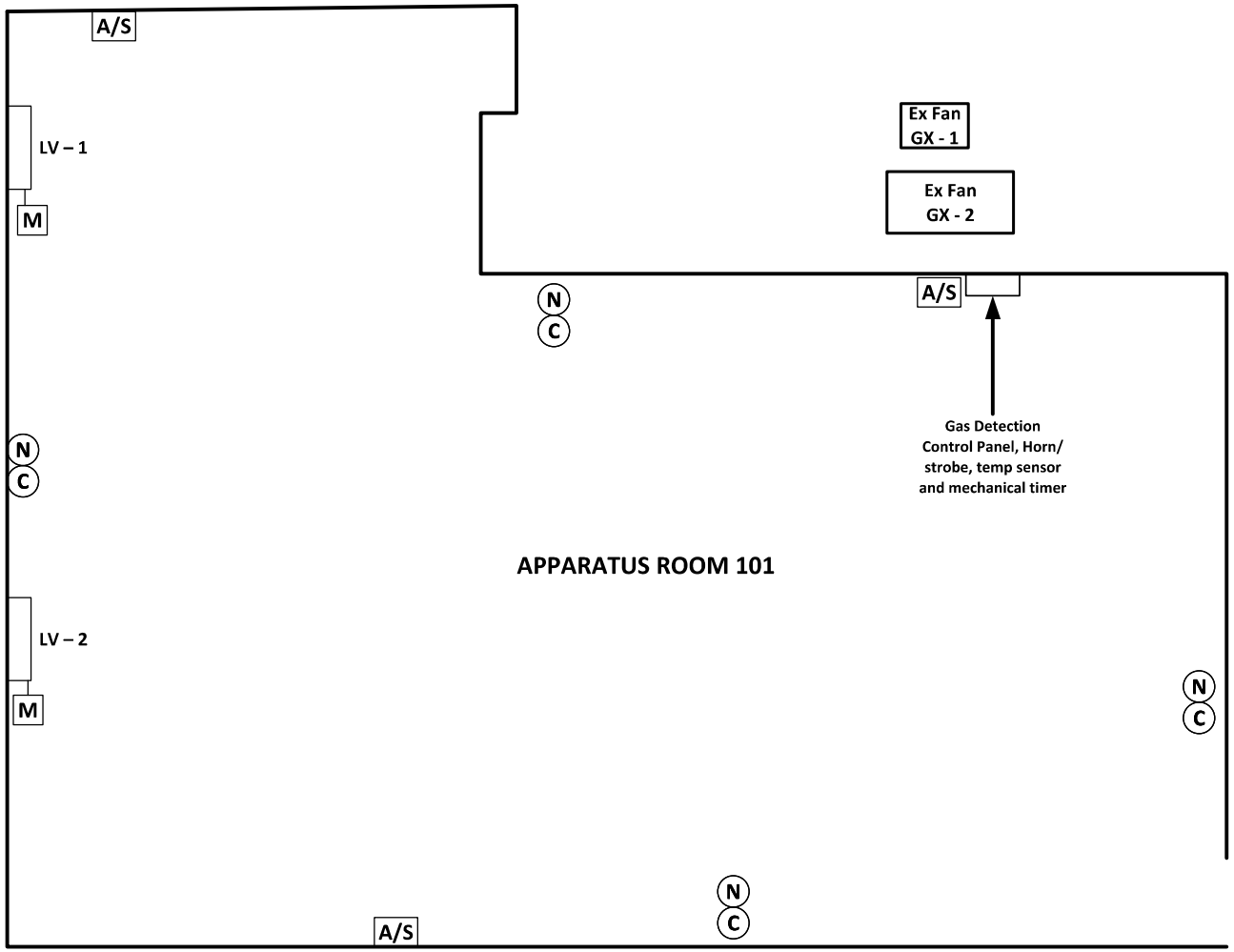
872 Blooming Grove Turnpike
New Windsor NY 10901

FILE: Vails Gate Fire Dept.vsdx

APPARATUS ROOM 101
1ST FLOOR GAS MONITORING SYSTEM ①



Legend

C	CO Sensor Location
N	NO2 Sensor Location
M	Motorized Damper
A/S	Alarm Station (Horn & Strobe)

Installation Notes:

- Only (4X) gas sensors are required to provide coverage of the space, not the (6X) shown on the original mechanical plans. Installation should be one sensor per wall.
- Coordinate final location of all sensors in the field with the architect and VGFD.
- Mount sensors at approximately 4 ft, 6 in above finished floor.
- Confirm location of the Gas Monitor control panel and touch screen with Architect before installation.

① REFER TO PAGE 35 FOR THE FLOW, SEQUENCE AND CONTROLLER DETAILS OF THIS SYSTEM.

MAIN BLDG, APPARATUS BAY GAS SYSTEM FLOOR PLAN

	NUM.	REVISION	DATE:	BY:
CID: 00107802				
PID: 00116358				
PROJECT: C109951				
SALESPERSON: J Schatz				
DESIGNED BY: M Livsey	2	Re-Submittal	8/16/2023	MCL
CHECKED BY:	1	Submittal	4/21/2023	MCL

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PROJECT: Vails Gate Fire District BAS

872 Blooming Grove Turnpike
New Windsor NY 10901

FILE: Vails Gate Fire Dept.vsdx

ADDRESS SCHEDULE

ITEM	LINK TYPE	LINK	RISER TAG	CONTROLLER/SYSTEM	LOCATION	AREA SERVED	GRP.	NET.	ADD.	WIRELESS SENSOR ADDRESS	IP ADDRESS	SUBNET MASK	GATEWAY	NOTE
1	BACnet	SC - 1 BACNET LINK 1	APPARTATUS BAY 101 EQUIP	UC600 - 2	STORAGE RM 101	STORAGE BUILDING			001					
2	BACnet	SC - 1 BACNET LINK 1	DOAS - 1	UC600 - 4	ROOF	OA FOR VRF SPACES			002					
3	BACnet	SC - 1 BACNET LINK 1	HW SYSTEM	UC600 - 3	MECHANICAL RM 121	HW SYSTEM			003					
4	BACnet	SC - 1 BACNET LINK 1	RTU - 207	RTU - 207	ROOF, AREA B	EXERCISE RM 207			004					
5	BACnet	SC - 1 BACNET LINK 3	BOILER 1 - 1	B - 1	BOILER ROOM	BOILER SYSTEM								
6	ETHERNET	ETHERNET	SC - 1	SC - 1	MECHANICAL RM 121	BUILDING			001					
7	ETHERNET	ETHERNET	STORAGE BUILDING	UC600 - 1	STORAGE RM 101	STORAGE BUILDING			002					
8	IMC	UC600 - 1 IMC	STORAGE BUILDING	XM70 - 1-1	STORAGE RM 101	STORAGE BUILDING			01					
9	IMC	UC600 - 1 IMC	STORAGE BUILDING	XM32 - 1-2	STORAGE RM 101	STORAGE RM 101			02					
10	IMC	UC600 - 2 IMC	APPARTATUS BAY 101 EQUIP	XM30 - 2-2	APPARTATUS BAY 101	APPARTATUS BAY 101			02					
11	IMC	UC600 - 2 IMC	APPARTATUS BAY 101 EQUIP	XM32 - 2-1	APPARATUS BAY 101	APPARATUS BAY 101			01					
12	IMC	UC600 - 3 IMC	HW SYSTEM	XM70 - 3-1	MECHANICAL RM 121	HW SYSTEM			01					
13	IMC	UC600 - 3 IMC	HW SYSTEM	XM32 - 3-2	MECHANICAL RM 121	HW SYSTEM			02					
14	IMC	UC600 - 4 IMC	DOAS - 1	XM30 - 4-3	ROOF	OA FOR VRF SPACES			03					
15	IMC	UC600 - 4 IMC	DOAS - 1	XM90 - 4-1	ROOF	OA FOR VRF SPACES			01					
16	IMC	UC600 - 4 IMC	DOAS - 1	XM30 - 4-2	ROOF	OA FOR VRF SPACES			02					

TRANE

ADDRESS SCHEDULE

CID: 00107802	NUM.	REVISION	DATE:	BY:
PID: 00116358				
PROJECT: C109951				
SALESPERSON: J Schatz				
DESIGNED BY: M Livsey	2	Re-Submittal	8/16/2023	MCL
CHECKED BY:	1	Submittal	4/21/2023	MCL

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LATHAM, NY 12110
518-785-1315

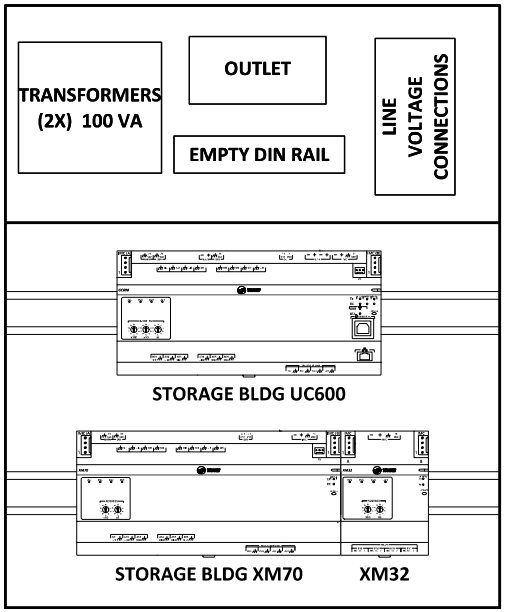
PROJECT: Vails Gate Fire District BAS

872 Blooming Grove Turnpike
New Windsor NY 10901

FILE: Vails Gate Fire Dept.vsdx

BILL OF MATERIAL				
TAG	QTY	VENDOR	PART NO	DESCRIPTION
HDW - 1	3	KELE	BAM-1000	DIN RAIL, AL , 39.4 IN
ENC - 2	1	KELE	NSTA2018VA100-GY	KELE INSTA-PANEL SMALL ENCLOSURE, NEMA 1, 20" X 18", GRAY
ENC - 1	1	KELE	NSTA2620VA200-GY	KELE INSTA-PANEL MEDIUM ENCLOSURE, NEMA 1, 26" X 20", GRAY

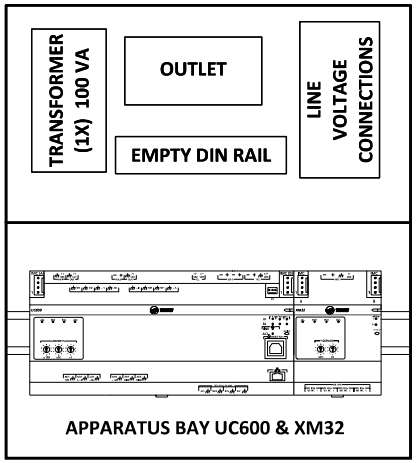
Storage Building Controls Enclosure



PANEL SIZE, OUTER DIMENSIONS:
26" HIGH x 20" WIDE X 7" DEEP
INTERIOR OPEN SPACE: 13" HIGH X 15" WIDE

Display Installation Note:
Install the TD – 7 on the door of this enclosure using the VESA mount hardware kit. Display will be powered by this controller as well, see display page for wiring details.

Apparatus Bay 101 Controls Enclosure



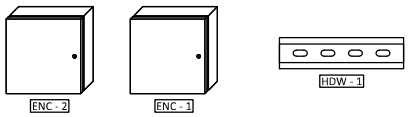
PANEL SIZE, OUTER DIMENSIONS:
20" HIGH x 18" WIDE X 7" DEEP
INTERIOR OPEN SPACE: 7.4" HIGH X 13" WIDE

Display Installation Note:
Install the TD – 7 on the door of this enclosure using the VESA mount hardware kit. Display will be powered by this controller as well, see display page for wiring details.

Installation Note #1:
These enclosures are semi-finished from the manufacturer (Kele) and contain a perforated panel, DIN rail, wire duct, transformers, and fuses for the 120 VAC.

Installation Note #2:
This is only a suggested layout. Install devices and wiring in a neat manner, in a way that is appropriately spaced out, etc.

Installation Note #3:
Plan on one 100VA transformer for each UC600, UC400, XM70, or XM90 (the XM30 or XM32 do not need a separate transformer). Power budgeting is planning on this. Additional transformers may be required to be installed in the panel, see controller wiring diagrams for further details.



GAS MONITORING CONTROLS ENCLOSURES

	NUM.	REVISION	DATE:	BY:
CID: 00107802				
PID: 00116358				
PROJECT: C109951				
SALESPERSON: J Schatz				
DESIGNED BY: M Livsey	2	Re-Submittal	8/16/2023	MCL
CHECKED BY:	1	Submittal	4/21/2023	MCL

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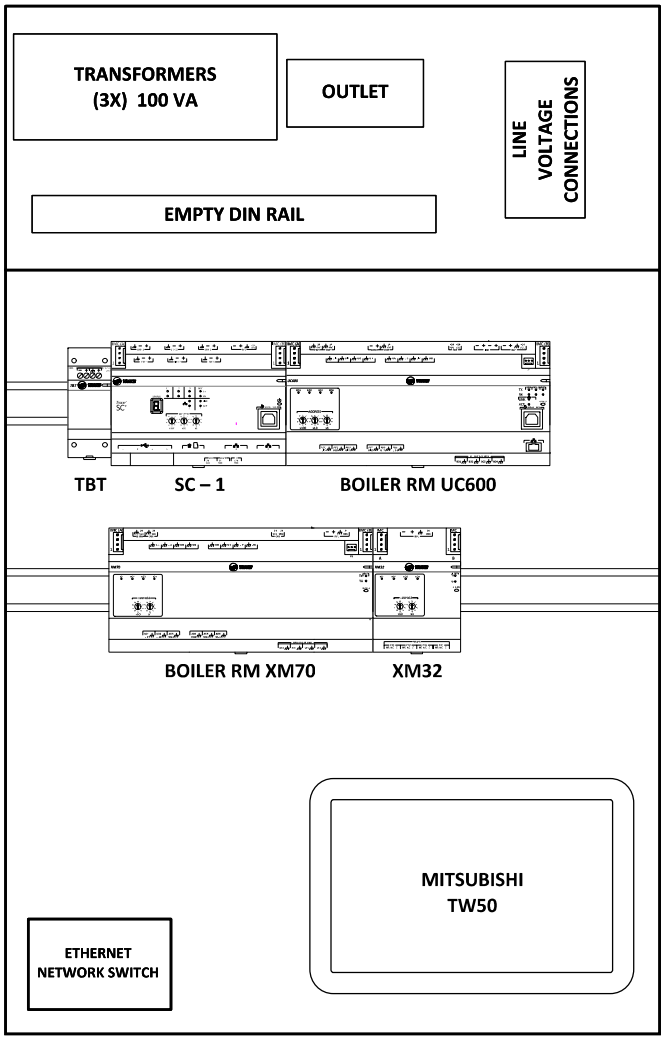
LATHAM, NY 12110
518-785-1315

PROJECT: Vails Gate Fire District BAS

872 Blooming Grove Turnpike
New Windsor NY 10901

FILE: Vails Gate Fire Dept.vsdx

Mechanical Rm 121
Controls Enclosure



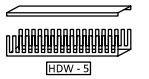
PANEL SIZE, OUTER DIMENSIONS: 36" HIGH X 26" WIDE X 7" DEEP
INTERIOR OPEN SPACE: 24" HIGH X 21" WIDE

BILL OF MATERIAL				
TAG	QTY	VENDOR	PART NO	DESCRIPTION
HDW - 4	2	KELE	BAM-1000	DIN RAIL, AL , 39.4 IN
ENC - 4	1	KELE	NSTA3626VA300-GY	KELE INSTA-PANEL LARGE ENCLOSURE, NEMA 1, 36" X 26", GRAY
HDW - 5	1	KELE	VD1-3W	WIRE DUCT, 1"W X 3"H, 6.5'L, WHITE W/ COVER

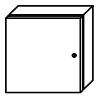
Installation Note #1:
These enclosures are semi-finished from the manufacturer (Kele) and contain a perforated panel, DIN rail, wire duct, transformers, and fuses for the 120 VAC.

Installation Note #2:
This is only a suggested layout. Install devices and wiring in a neat manner, in a way that is appropriately spaced out, etc.

Installation Note #3:
Plan on one 100VA transformer for each UC600, UC400, XM70, or XM90 (the XM30 or XM32 do not need a separate transformer). Power budgeting is planning on this. Additional transformers may be required to be installed in the panel, see controller wiring diagrams for further details.


HDW - 5

Installation Note:
This is additional wire duct to finish trimming out the panel. This will match the wire duct that has been pre-installed by Kele.


ENC - 4


HDW - 4

TRANE

MECHANICAL RM 121 CONTROLS ENCLOSURE

CID: 00107802	NUM.	REVISION	DATE:	BY:
PID: 00116358				
PROJECT: C109951				
SALESPERSON: J Schatz				
DESIGNED BY: M Livsey	2	Re-Submittal	8/16/2023	MCL
CHECKED BY:	1	Submittal	4/21/2023	MCL

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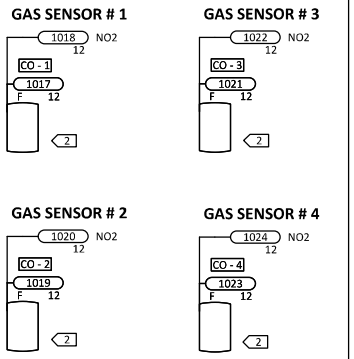
PROJECT: Vails Gate Fire District BAS
872 Blooming Grove Turnpike
New Windsor NY 10901

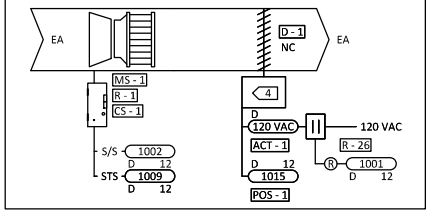
FILE: Vails Gate Fire Dept.vsdx

(STORAGE BUILDING)

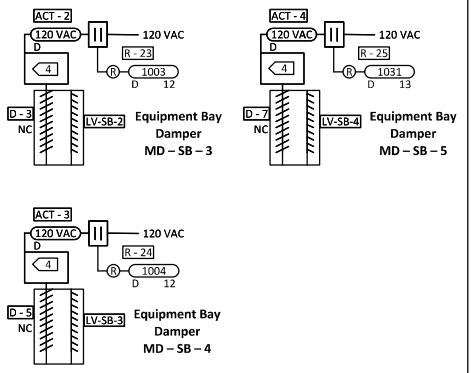
Main Storage Room 101 ①
Gas Monitoring System



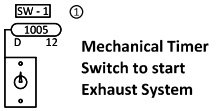
Exhaust Fan GXF – SB – 1 ①



Wall Ventilation Dampers ①

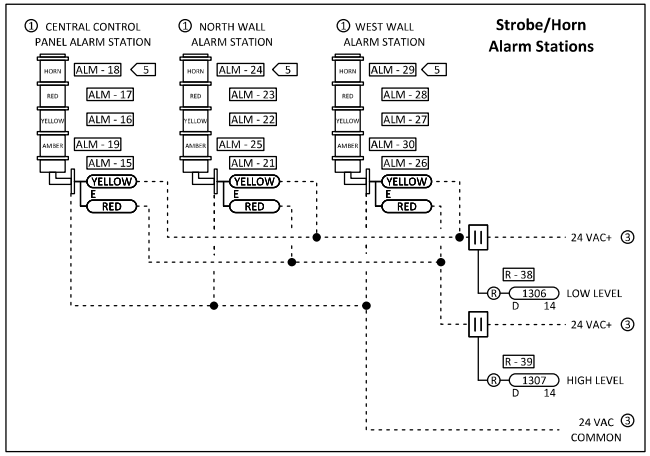


Mechanical Timer Switch to start Exhaust System



Storage Room 101 Space Temperature

Strobe/Horn Alarm Stations



Equipment Storage Room 101
Gas Monitoring & Exhaust System

Sequence of Operation:
The central controller will monitor and control all equipment associated with this system.

Gas Alarm: If the BAS senses CO above 25 PPM, or if NO2 rises above 0.7 PPM, the equipment bay dampers shall open, and the exhaust fan GXF – SB – 1, shall be enabled, and the low level (yellow) alarm light shall be enabled ON. If the BAS senses CO above 100 PPM, or if NO2 rises above 1.5 PPM, the high level (red) alarm light and horn shall be enabled ON.

The dampers shall remain open and the exhaust fan will run continuously while the system is in alarm, and for an additional 15 minutes after the gas levels have returned to normal. The BAS shall activate the remote horn/strobe alarm stations as long as the gas system is in alarm or until deactivated by an operator at the touch screen.

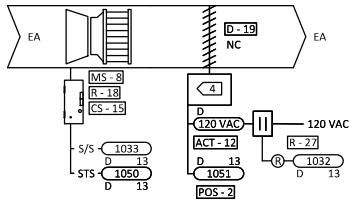
Temperature: If the BAS senses the space temperature of the Storage room above 85° F (adj.), all three equipment bay dampers shall open, and the exhaust fan GXF – SB – 1, shall be enabled. The dampers shall remain open and the fan will run continuously until the space temperature drops below the setpoint minus a 4° F (adj.) differential.

Manual Timer: The facility staff shall be able to enable the exhaust system via a mechanical timer (maximum time of 30 minutes). When the timer is activated all three equipment bay dampers shall open, and the exhaust fan GXF – SB – 1, shall be enabled. The dampers shall remain open and the fan will run continuously until the timer stops.

When none of the three sequences above are active, the equipment bay dampers shall remain closed, and exhaust fan GXF – SB – 1 shall be disabled.
When GXF-SB-1 is enabled on, the damper will be commanded OPEN, once the damper is confirmed OPEN via the end-switch, the fan shall be enabled. If the end-switch is not seen within 2 minutes (adj.) the BAS shall generate an alarm and disable the fan.

Alarms:
* CO gas low-level alarm
* CO gas high-level alarm
* NO2 gas low-level alarm
* NO2 gas high-level alarm
* Exhaust fan failure; fan commanded ON, status not seen for 2 minutes (adj.)
* Exhaust damper failure; damper commanded OPEN, status not seen for 2 minutes (adj.)
* High space temperature (above the exhaust system temperature enable setpoint)

Exhaust Fan GXF – SB – 2 ①



Equipment Storage Room 101
Exhaust Fan: "GXF – SB – 2"

Sequence of Operation:
The fan shall operate continuously 24/7.

Alarms:
* Exhaust fan failure; fan commanded ON, status not seen for 2 minutes (adj.)
* Exhaust damper failure; damper commanded OPEN, status not seen for 2 minutes (adj.)

BILL OF MATERIAL

TAG	QTY	VENDOR	PART NO	DESCRIPTION
TE - 16	1	TRANE	X1351152701	TEMP SENS, ZONE THERM O/U SP
SW - 1	1	KELE	93502	MECHANICAL TIMER SWITCH, 30 MINUTE, WALL-MOUNT
ALM - 18, ALM - 24, ALM - 29	3	KELE	TWS-A-GN	HORN, TOWER, 24 VAC
ALM - 19, ALM - 25, ALM - 30	3	KELE	TWS-BC	TOWER BOTTOM MODULE
ALM - 15, ALM - 21, ALM - 26	3	KELE	TWS-BP1	TOWER, SINGLE WALL BASE MOUNT
ALM - 17, ALM - 23, ALM - 28	3	KELE	TWS-LL3-G	TOWER, FLASHG LED, RED, 24 VAC
ALM - 16, ALM - 22, ALM - 27	3	KELE	TWS-LL5-G	TOWER, FLASHG LED, YELLOW, 24 VAC
CS - 1, CS - 15	2	SENVA	C-2320L	CUR SW, PRE-SET, 0.45-50A, SPLIT, NO
R - 1, R - 18	2	SENVA	PR2401B	SPDT RELAY
R - 23, R - 24, R - 25, R - 26, R - 27, R - 38, R - 39	7	SENVA	PRU1C	SPDT RELAY
CO - 1, CO - 2, CO - 3, CO - 4	4	SENVA	TGM-ACN-A	IAQ SENS, CO & NO2, WALL, LCD, METAL ENCLOSURE, NEMA-1

5 CONNECT THE HORN CONTACTS IN PARALLEL WITH THE HIGH LEVEL (RED LIGHT) CONTACT TO INTERLOCK THEIR OPERATION.

4 DAMPER & 120 VAC ACTUATOR PROVIDED BY OTHERS.

3 REFER TO PAGE 12 FOR THE CENTRAL, DEDICATED POWER TRANSFORMER FOR ALL ALARM STROBE/HORN STATIONS.

2 EACH GAS SENSOR HAS AN INTEGRAL HORN AND VISUAL STROBE LIGHT TO INDICATE AN ALARM.

1 REFER TO PAGE 6 FOR FLOOR PLAN OF GAS MONITORING SYSTEM END-DEVICE LOCATIONS.

STORAGE BUILDING GAS MONITOR SYSTEM FLOW

	NUM.	REVISION	DATE:	BY:
CID: 00107802				
PID: 00116358				
PROJECT: C109951				
SALESPERSON: J Schatz				
DESIGNED BY: M Livsey	2	Re-Submittal	8/16/2023	MCL
CHECKED BY:	1	Submittal	4/21/2023	MCL

Albany
301 Old Niskayuna Road, Suite 1
LATHAM, NY 12110
518-785-1315

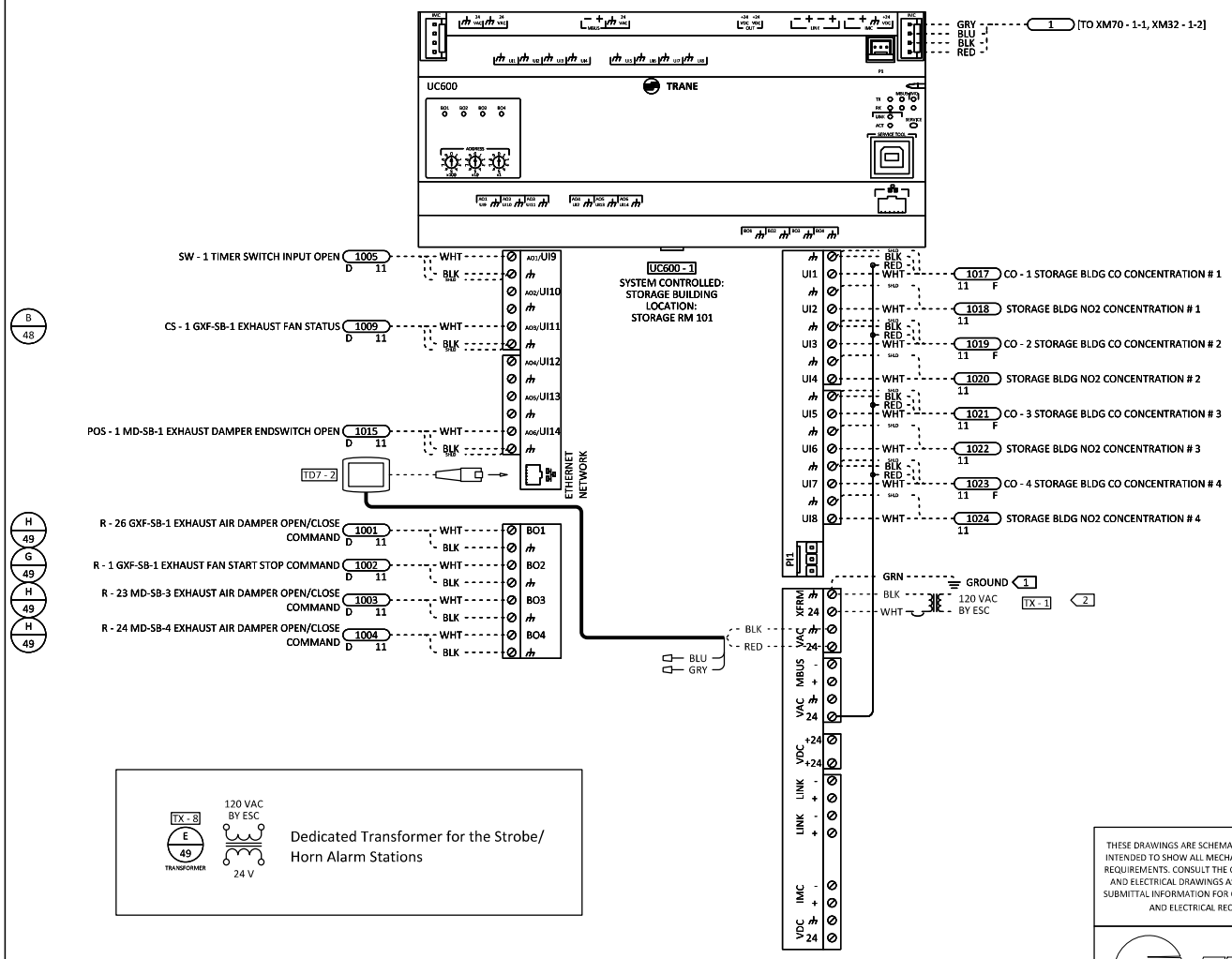
PROJECT: Vails Gate Fire District BAS

872 Blooming Grove Turnpike
New Windsor NY 10901

FILE: Vails Gate Fire Dept.vsdx

(STORAGE BUILDING)

BILL OF MATERIAL				
TAG	QTY	VENDOR	PART NO	DESCRIPTION
UC600 - 1	1	TRANE	BMUC600AAA0100011	UC600 CONTROLLER, DIN RAIL MOUNT
TX - 8	1	KELE	TR100VA002	XFMR, 120:24VAC, 100VA, CB



UC600 PORT CONFIGURATION	
BACNET DEVICE NAME	
ROTARY ADDRESS	
IP PORT - 1	
SUBNET MASK - 1	
DEFAULT GATEWAY - 1	
IP PORT – 2	
SUBNET MASK - 2	
DEFAULT GATEWAY - 2	
PREFERRED DNS SERVER	
ALTERNATE DNS SERVER	
UDP PORT (47808 DEFAULT)	
NETWORK NUMBER	
BBMD (1 PER NETWORK)	ENABLED \ DISABLED
MSTP 1 (76800 BPS DEFAULT)	
BACNET TIME SYNC	DISABLED

2 USE THE TRANSFORMER PROVIDED WITH THE ENCLOSURE TO POWER THE CONTROLLER.

1 DEVICE MUST BE GROUNDED WITH FACTORY PROVIDED GROUND WIRE AS DETAILED IN THE DEVICE INSTALLATION LITERATURE.

THESE DRAWINGS ARE SCHEMATIC ONLY AND ARE NOT INTENDED TO SHOW ALL MECHANICAL AND ELECTRICAL REQUIREMENTS. CONSULT THE CONTRACT MECHANICAL AND ELECTRICAL DRAWINGS AS WELL AS EQUIPMENT SUBMITTAL INFORMATION FOR COMPLETE MECHANICAL AND ELECTRICAL REQUIREMENTS.

STORAGE BUILDING UC600 - 1 CONTROLLER

CID: 00107802	NUM.	REVISION	DATE:	BY:
PID: 00116358				
PROJECT: C109951				
SALESPERSON: J Schatz				
DESIGNED BY: M Livsey	2	Re-Submittal	8/16/2023	MCL
CHECKED BY:	1	Submittal	4/21/2023	MCL

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518-785-1315

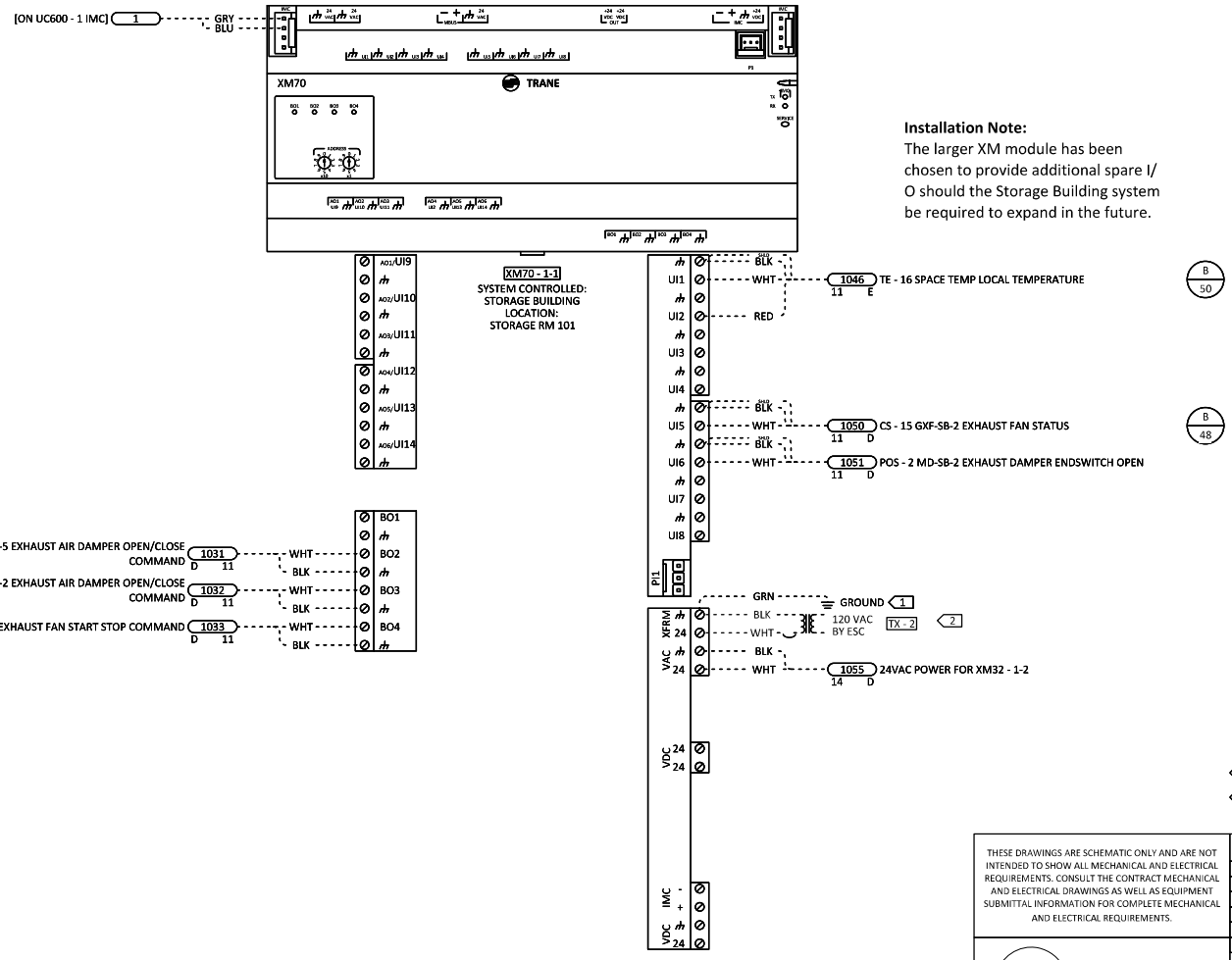
PROJECT: Vails Gate Fire District BAS

872 Blooming Grove Turnpike
New Windsor NY 10901

FILE: Vails Gate Fire Dept.vsdx

(STORAGE BUILDING)

BILL OF MATERIAL				
TAG	QTY	VENDOR	PART NO	DESCRIPTION
XM70 - 1-1	1	TRANE	X13651568010	XM70, 19 POINT EXPANSION MODULE



Installation Note:
The larger XM module has been chosen to provide additional spare I/O should the Storage Building system be required to expand in the future.

2 USE THE TRANSFORMER PROVIDED WITH THE ENCLOSURE TO POWER THE CONTROLLER.

1 DEVICE MUST BE GROUNDED WITH FACTORY PROVIDED GROUND WIRE AS DETAILED IN THE DEVICE INSTALLATION LITERATURE.

THESE DRAWINGS ARE SCHEMATIC ONLY AND ARE NOT INTENDED TO SHOW ALL MECHANICAL AND ELECTRICAL REQUIREMENTS. CONSULT THE CONTRACT MECHANICAL AND ELECTRICAL DRAWINGS AS WELL AS EQUIPMENT SUBMITTAL INFORMATION FOR COMPLETE MECHANICAL AND ELECTRICAL REQUIREMENTS.

STORAGE BUILDING XM70 - 1 CONTROLLER

	NUM.	REVISION	DATE:	BY:
CID: 00107802				
PID: 00116358				
PROJECT: C109951				
SALESPERSON: J Schatz				
DESIGNED BY: M Livsey	2	Re-Submittal	8/16/2023	MCL
CHECKED BY:	1	Submittal	4/21/2023	MCL

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LATHAM, NY 12110
518-785-1315

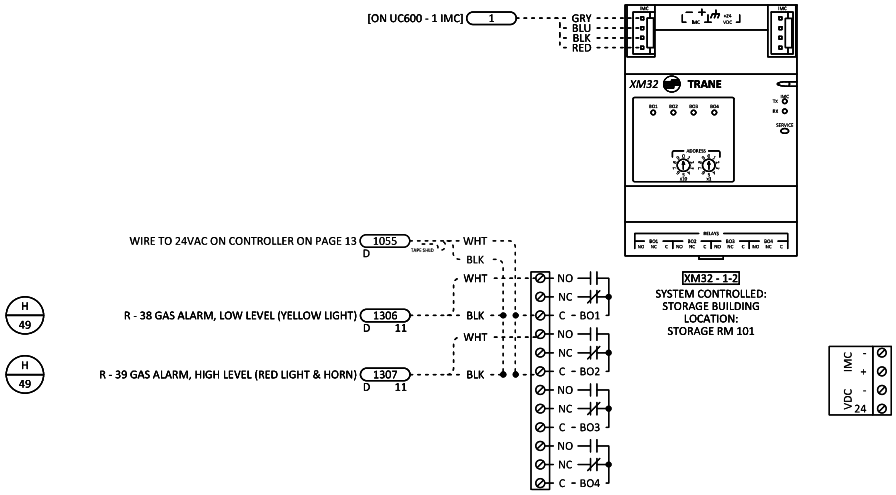
PROJECT: Vails Gate Fire District BAS

872 Blooming Grove Turnpike
New Windsor NY 10901

FILE: Vails Gate Fire Dept.vsdx

(STORAGE BUILDING)

BILL OF MATERIAL				
TAG	QTY	VENDOR	PART NO	DESCRIPTION
XM32 - 1-2	1	TRANE	X13651563010	XM32, 4 POINT BO EXPANSION MODULE



THESE DRAWINGS ARE SCHEMATIC ONLY AND ARE NOT INTENDED TO SHOW ALL MECHANICAL AND ELECTRICAL REQUIREMENTS. CONSULT THE CONTRACT MECHANICAL AND ELECTRICAL DRAWINGS AS WELL AS EQUIPMENT SUBMITTAL INFORMATION FOR COMPLETE MECHANICAL AND ELECTRICAL REQUIREMENTS.

STORAGE BUILDING XM32 - 1-2 CONTROLLER

	NUM.	REVISION	DATE:	BY:
CID: 00107802				
PID: 00116358				
PROJECT: C109951				
SALESPERSON: J Schatz				
DESIGNED BY: M Livsey	2	Re-Submittal	8/16/2023	MCL
CHECKED BY:	1	Submittal	4/21/2023	MCL

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518-785-1315

PROJECT: Vails Gate Fire District BAS

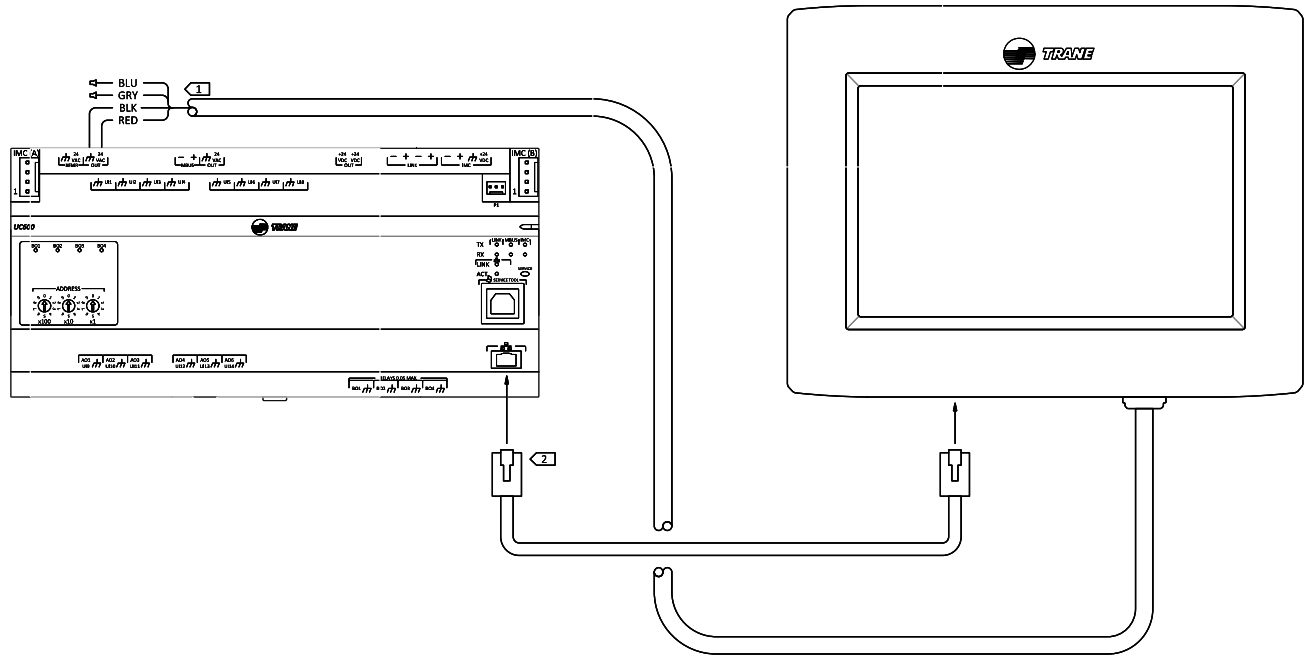
872 Blooming Grove Turnpike
New Windsor NY 10901

FILE: Vails Gate Fire Dept.vsdx

OD - 1
SYSTEM CONTROLLED:
STORAGE BLDG DISPLAY
LOCATION:

TYPICAL FOR 2
(STORAGE BLDG DISPLAY, APPARATUS BAY DISPLAY)

BILL OF MATERIAL				
TAG	QTY	VENDOR	PART NO	DESCRIPTION
OD - 2	2	TRANE	X05010511010	OPTIONAL VESA MOUNT
OD - 1	2	TRANE	X13651571010	UC600 TD7 COLOR DISPLAY



2 CONNECT ETHERNET CABLE FROM UC600'S ETHERNET PORT TO TD7'S ETHERNET PORT.

1 CAP OFF BLUE AND GRAY WIRES.

OD - 2

THESE DRAWINGS ARE SCHEMATIC ONLY AND ARE NOT INTENDED TO SHOW ALL MECHANICAL AND ELECTRICAL REQUIREMENTS. CONSULT THE CONTRACT MECHANICAL AND ELECTRICAL DRAWINGS AS WELL AS EQUIPMENT SUBMITTAL INFORMATION FOR COMPLETE MECHANICAL AND ELECTRICAL REQUIREMENTS.

GAS MONITOR SYSTEM DISPLAYS

CID: 00107802	NUM.	REVISION	DATE:	BY:
PID: 00116358				
PROJECT: C109951				
SALESPERSON: J Schatz				
DESIGNED BY: M Livsey	2	Re-Submittal	8/16/2023	MCL
CHECKED BY:	1	Submittal	4/21/2023	MCL

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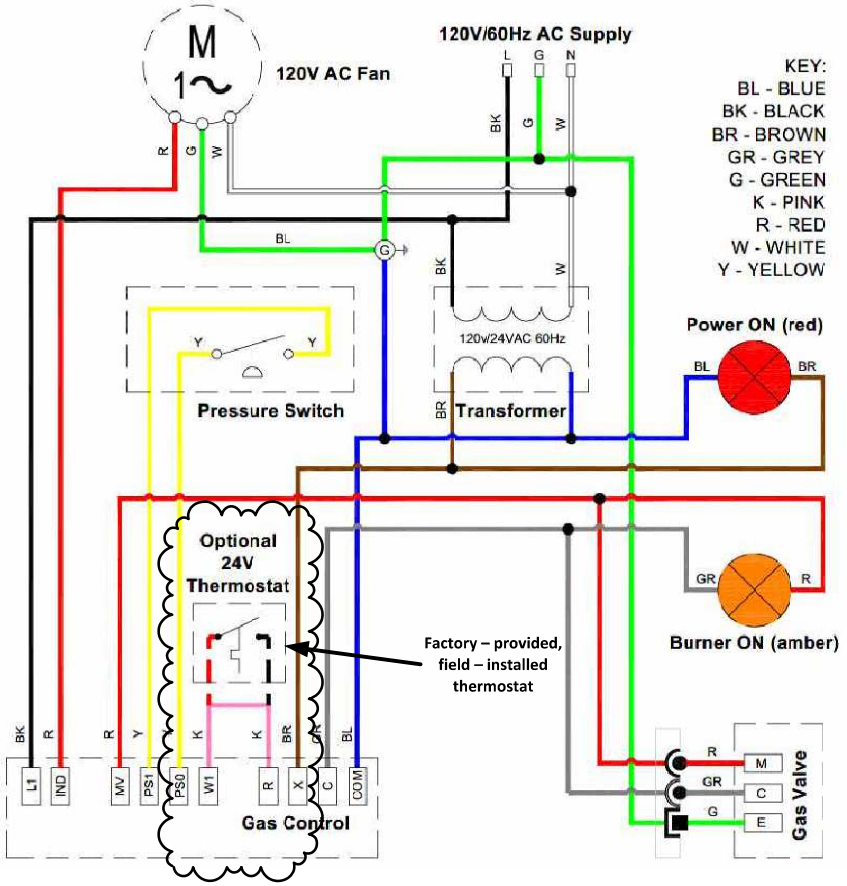
PROJECT: Vails Gate Fire District BAS

872 Blooming Grove Turnpike
New Windsor NY 10901

FILE: Vails Gate Fire Dept.vsdx

BILL OF MATERIAL				
TAG	QTY	VENDOR	PART NO	DESCRIPTION

Gas Fired Radiant Tube Heaters
Storage Building – Store Room 101



Installation Notes:

- Each of the (3X) ceiling – mounted radiant heaters will have a thermostat that will provide control.
- The thermostat and controls will be stand – alone and will not connect to the BAS.
- The thermostat will be Factory – Provided with the heaters.
- Coordinate final location of all sensors in the field with the architect and VGFD.
- Use 18 AWG wire for the thermostat connection per IOM.

Sequence of Operation:

The units shall operate under stand – alone controls (thermostat) to maintain a 70° F (adj.) Setpoint.

GAS FIRED RADIANT HEATERS - STORAGE BUILDING				
CID: 00107802	NUM.	REVISION	DATE:	BY:
PID: 00116358				
PROJECT: C109951				
SALESPERSON: J Schatz				
DESIGNED BY: M Livsey	2	Re-Submittal	8/16/2023	MCL
CHECKED BY:	1	Submittal	4/21/2023	MCL

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301 Old Niskayuna Road, Suite 1
LATHAM, NY 12110
518-785-1315

PROJECT: Vails Gate Fire District BAS

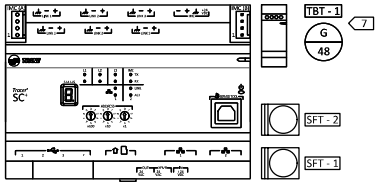
872 Blooming Grove Turnpike
New Windsor NY 10901

FILE: Vails Gate Fire Dept.vsdx

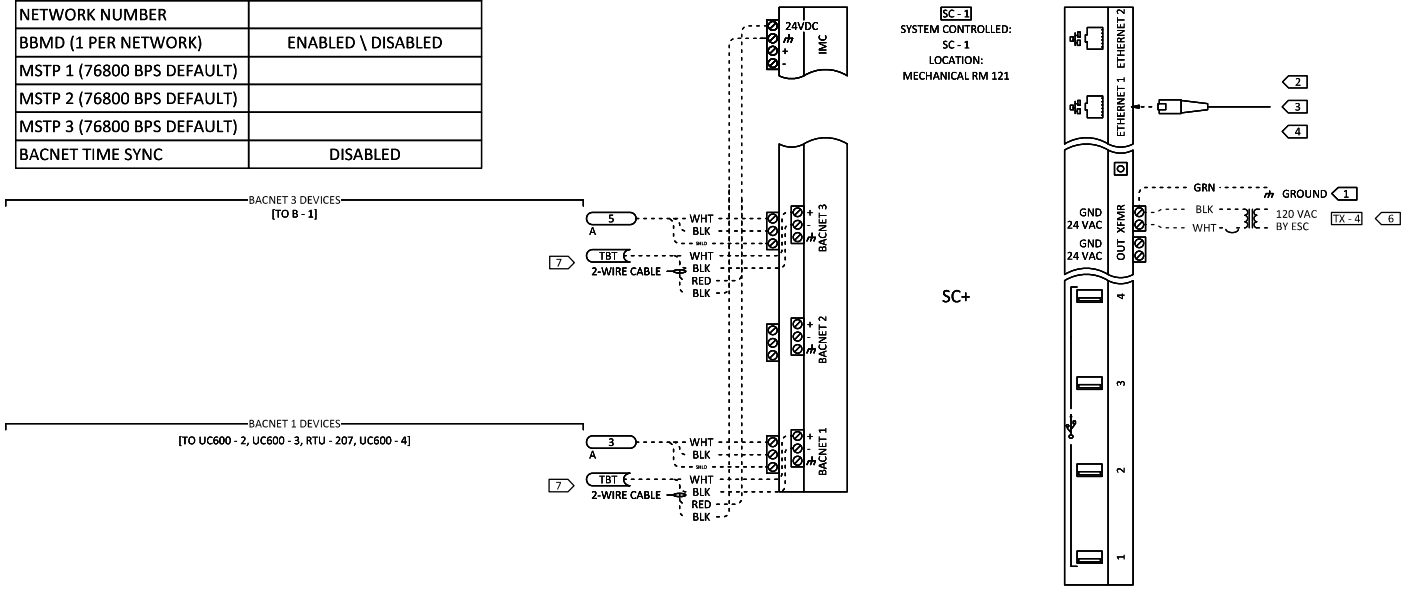
(SC - 1)

SC PORT CONFIGURATION <5>	
BACNET DEVICE NAME	SC - 1
ROTARY ADDRESS	001
IP PORT - 1	____ . ____ . ____ . ____
SUBNET MASK - 1	____ . ____ . ____ . ____
DEFAULT GATEWAY - 1	____ . ____ . ____ . ____
IP PORT - 2	____ . ____ . ____ . ____
SUBNET MASK - 2	____ . ____ . ____ . ____
DEFAULT GATEWAY - 2	____ . ____ . ____ . ____
PREFERRED DNS SERVER	____ . ____ . ____ . ____
ALTERNATE DNS SERVER	____ . ____ . ____ . ____
UDP PORT (47808 DEFAULT)	
NETWORK NUMBER	
BBMD (1 PER NETWORK)	ENABLED \ DISABLED
MSTP 1 (76800 BPS DEFAULT)	
MSTP 2 (76800 BPS DEFAULT)	
MSTP 3 (76800 BPS DEFAULT)	
BACNET TIME SYNC	DISABLED

BILL OF MATERIAL				
TAG	QTY	VENDOR	PART NO	DESCRIPTION
SFT - 2	1	TRANE	BMCF000AAA0BI00	TRANE/MITSUBISHI VRF LICENSE
SFT - 1	3	TRANE	BMCF000AAA0DB00	TRACER SC 15 LICENSE
TBT - 1	2	TRANE	X13651524-01	BACNET TERMINATOR (2 PACK)
SC - 1	1	TRANE	X13651695001	TRACER SC+ CONTROLLER
SW - 4	1	KELE	EIBA5-100T	5-PORT, UNMANAGED ETHERNET SWITCH, 24 VAC/DC, PANEL-MOUNT



SC - 1
SYSTEM CONTROLLED:
SC - 1
LOCATION:
MECHANICAL RM 121



Building Control Unit (Tracer SC)

User Interface:

The web-based Tracer SC system is the user interface used for this facility. The Tracer SC system building control unit is the centralized DDC control which communicates with the owner's interface (PC) and with all of the Trane HVAC controllers. Utilizing a web browser to access it, the controller allows the user to view custom floor plan graphics, individual unit graphics, control the units through schedules, monitor space conditions, create and monitor alarms and create trends to capture historical data.

The SC controller will send the controller Occupied, Unoccupied, Night Heat/ Cool, and Timed Override commands. The BAS may also send a Heat/Cool mode, space temperature and/or space temperature set point. If communication is lost with the BAS, the controller will operate using its local set points.

Time of Day Scheduling:

The time of day function in user interface is utilized to schedule the occupied and unoccupied time for the building's HVAC systems. Field to coordinate with customer the time periods for occupied and unoccupied modes of operation.

Area Control:

Area control is the function in the user interface which monitors the temperature in the building in unoccupied periods. The HVAC equipment will automatically start in a night heat/cool mode should the temperature in the space decrease below 60 deg. F or rise above 80 deg. F.

ETHERNET NETWORK SWITCH
SW - 4

<7> BACNET TERMINATOR TO BE AT BOTH THE START AND END OF THE BACNET LINK. DOCUMENT LOCATIONS IN THE AS-BUILT DRAWINGS.
<6> USE THE TRANSFORMER PROVIDED WITH THE ENCLOSURE TO POWER THE CONTROLLER.
<5> **TO BE COMPLETED DURING INSTALLATION AND INCLUDED IN RECORD DRAWINGS.**
<4> **REMOTE ACCESS REQUIRED FOR TIS IN WARRANTY SERVICE AGREEMENT.**
<3> **FOR THE CUSTOMER TO REMOTELY CONNECT TO THE SC, A SECURE NETWORK BEHIND A FIREWALL AND VPN ACCESS IS REQUIRED.**
<2> **CUSTOMER TO SUPPLY NETWORK COMM ACCESS POINT.**
<1> **DEVICE MUST BE GROUNDED WITH FACTORY PROVIDED GROUND WIRE AS DETAILED IN THE DEVICE INSTALLATION LITERATURE.**

SC - 1 CONTROLLER

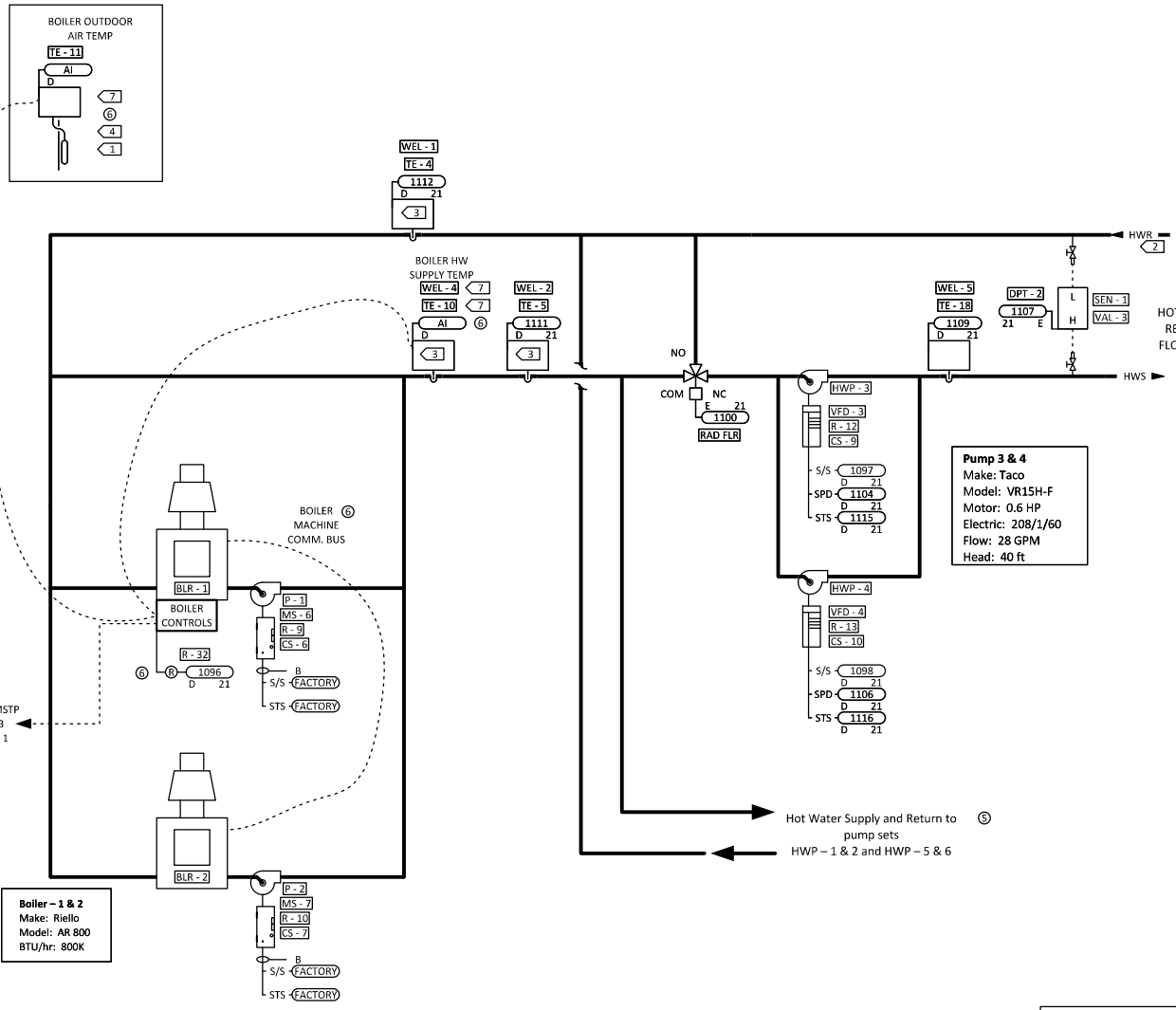
	NUM.	REVISION	DATE:	BY:
CID: 00107802				
PID: 00116358				
PROJECT: C109951				
SALESPERSON: J Schatz				
DESIGNED BY: M Livsey	2	Re-Submittal	8/16/2023	MCL
CHECKED BY:	1	Submittal	4/21/2023	MCL

Albany
301 Old Niskayuna Road, Suite 1
LATHAM, NY 12110
518-785-1315

PROJECT: Vails Gate Fire District BAS
872 Blooming Grove Turnpike
New Windsor NY 10901

FILE: Vails Gate Fire Dept.vsdx

(HW SYSTEM)



BILL OF MATERIAL				
TAG	QTY	VENDOR	PART NO	DESCRIPTION
TE - 18, TE - 4, TE - 5	3	ACI	A/CP-I-4"-GD	TEMP SENS, IMM, THERM, 4 IN
TC - 1	1	KELE	TCCC-111	THERMAL COMPOUND, 111 ML
WEL - 1, WEL - 2, WEL - 5	3	KELE	WEL-S	WELL,3.25 IN X 0.125 IN FPT X 0.5 IN MPT, SS
CS - 10, CS - 9	2	SENVA	C-2320L	CUR SW, PRE-SET, 0.45-50A, SPLIT, NO
TEH - 1	1	SENVA	HT1O-2EUD	HUMIDITY SENS, OA, 2%, DISPLAY
R - 12, R - 13, R - 32	3	SENVA	PRU1C	SPDT RELAY
DPT - 2	1	SENVA	PW30M-C	DIFF PRESS XMTR, METAL ENC, WTR, 0-5 VDC/0-10 VDC/4-20 MA, LCD
VAL - 3	2	SENVA	PWBV	OPTIONAL SERVICE VALVE
SEN - 1	2	SENVA	PWT100	SENSOR, 100 PSI
VALVES / ACT	*	*	*	*SEE WATER VALVE SCHEDULE

7 END DEVICE PROVIDED BY BOILER MANUFACTURER.

6 REFER TO PAGE 22 FOR MANAGERIAL BOILER B-1 CONTROLLER CONNECTIONS.

5 REFER TO PAGE 19 FOR CONTINUATION OF HYDRONIC FLOW TO PUMPS HWP - 1, 2, 5 & 6.

4 SEAL ANY CONDUIT CONNECTIONS FROM THE INSIDE OF THE BUILDING TO THE OUTSIDE OAT/RH SENSORS TO PREVENT CONDENSATION FROM ACCUMULATING IN THE OUTDOOR SENSOR ENCLOSURE.

3 GREASE TEMPERATURE SENSOR PROBE WITH THERMAL COMPOUND AND INSERT INTO THERMOWELL.

2 FLOW DIAGRAM IS FOR ILLUSTRATION PURPOSES ONLY. FOR DETAILED INFORMATION REFER TO MECHANICAL PRINTS.

1 MOUNT OUTDOOR AIR TEMP SENSOR ON NORTHERN EXPOSURE USING A NON-CONDENSATING CONDUIT CONNECTION. MOUNT AWAY FROM EXHAUST VENTS AND OTHER HEAT SOURCES. CONSULT WITH PROJECT MANAGER BEFORE MOUNTING.

HW SYSTEM UC600 - 3 FLOW

CID: 00107802	NUM.	REVISION	DATE:	BY:
PID: 00116358				
PROJECT: C109951				
SALESPERSON: J Schatz				
DESIGNED BY: M Livsey	2	Re-Submittal	8/16/2023	MCL
CHECKED BY:	1	Submittal	4/21/2023	MCL

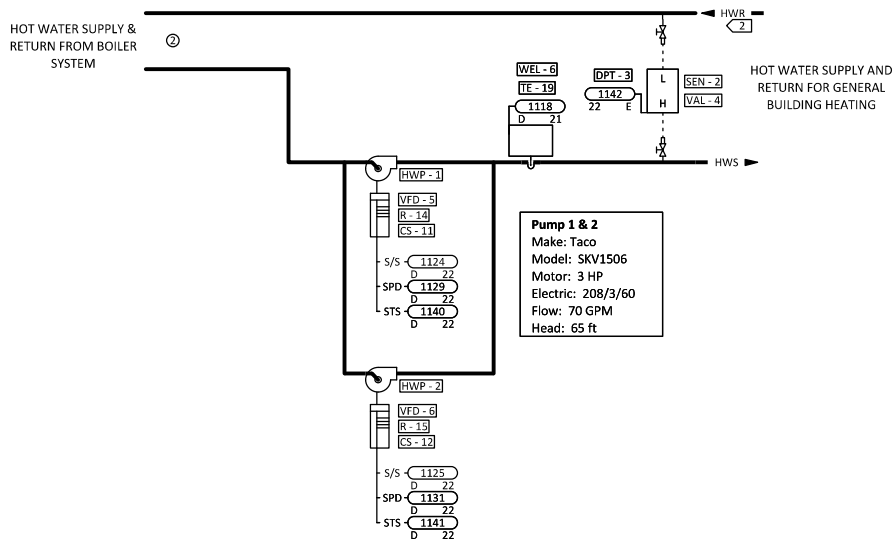
Albany
301 Old Niskayuna Road, Suite 1
LATHAM, NY 12110
518-785-1315

PROJECT: Vails Gate Fire District BAS

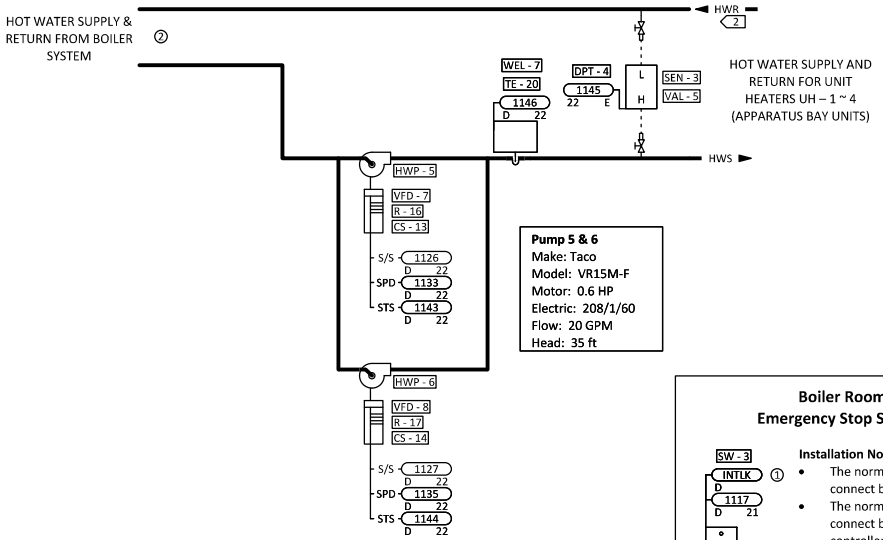
872 Blooming Grove Turnpike
New Windsor NY 10901

FILE: Vails Gate Fire Dept.vsdx

(HW SYSTEM)

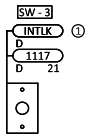


Pump 1 & 2
Make: Taco
Model: SKV1506
Motor: 3 HP
Electric: 208/3/60
Flow: 70 GPM
Head: 65 ft



Pump 5 & 6
Make: Taco
Model: VR15M-F
Motor: 0.6 HP
Electric: 208/1/60
Flow: 20 GPM
Head: 35 ft

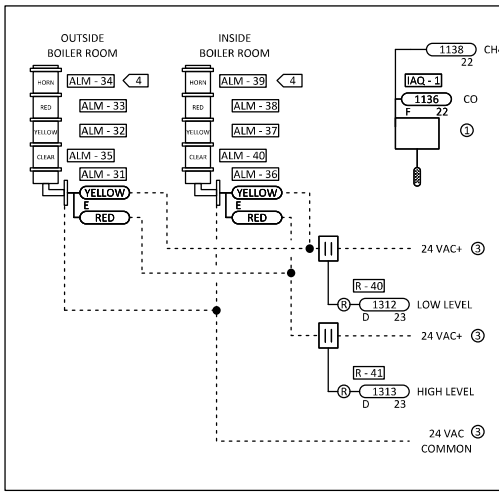
Boiler Room
Emergency Stop Station



Installation Notes:
- The normally-open contacts will connect back to the BAS.
- The normally-closed contacts will connect back to the boiler system controller in series with the BAS Start/ Stop command terminals.

BILL OF MATERIAL

TAG	QTY	VENDOR	PART NO	DESCRIPTION
TE - 19, TE - 20	2	ACI	A/CP-I-4"-GD	TEMP SENS, IMM, THERM, 4 IN
SW - 3	1	KELE	ESM-M1S-PP0-BS	EMERGENCY OPERATOR STATION, 1-NO, 1-NC CONTACTS, "BOILER SHUT-DOWN" LABEL, WALL-MOUNT, NEMA-1 METAL ENC
ALM - 34, ALM - 39	2	KELE	TWS-A-GN	HORN, TOWER, 24 VAC
ALM - 35, ALM - 40	2	KELE	TWS-BC	TOWER BOTTOM MODULE
ALM - 31, ALM - 36	2	KELE	TWS-BP1	TOWER, SINGLE WALL BASE MOUNT
ALM - 33, ALM - 38	2	KELE	TWS-LL3-G	TOWER, FLASHG LED, RED, 24 VAC
ALM - 32, ALM - 37	2	KELE	TWS-LL5-G	TOWER, FLASHG LED, YELLOW, 24 VAC
WEL - 6, WEL - 7	2	KELE	WEL-S	WELL,3.25 IN X 0.125 IN FPT X 0.5 IN MPT, SS
CS - 11, CS - 12, CS - 13, CS - 14	4	SENVA	C-2320L	CUR SW, PRE-SET, 0.45-50A, SPLIT, NO
R - 14, R - 15, R - 16, R - 17, R - 40, R - 41	6	SENVA	PRU1C	SPDT RELAY
DPT - 3, DPT - 4	2	SENVA	PW30M-C	DIFF PRESS XMTR, METAL ENC, WTR, 0-5 VDC/0-10 VDC/4-20 MA, LCD
VAL - 4, VAL - 5	4	SENVA	PWBV	OPTIONAL SERVICE VALVE
SEN - 2, SEN - 3	4	SENVA	PWT100	SENSOR, 100 PSI
IAQ - 1	1	SENVA	TGM-ACM-A	IAQ SENS, CO & CH4, WALL, LCD, METAL ENCLOSURE, NEMA-1



Boiler Room
Gas Monitoring System

Installation Notes:
- Wire the normally-closed contacts of the relay "AR1" and "AR2" in series with the boiler shutdown station, and the boiler emergency shut-down input ① to disable the boiler in the event of a gas alarm.
- The additional, remote, horn/strobe station will be installed outside the boiler room entrance door.
- Confirm horn/strobe location with Project Manager.

4 CONNECT THE HORN CONTACTS IN PARALLEL WITH THE HIGH LEVEL (RED LIGHT) CONTACT TO INTERLOCK THEIR OPERATION.

③ REFER TO PAGE 21 FOR THE CENTRAL, DEDICATED POWER TRANSFORMER FOR ALL ALARM STROBE/HORN STATIONS.

② REFER TO PAGE 18 FOR CONTINUATION OF THE HW SYSTEM TO BOILERS 1 & 2.

① REFER TO PAGE 24 FOR MANAGERIAL BOILER B-1 CONTROLLER CONNECTIONS.

HW SYSTEM PUMP SETS FLOW

CID: 00107802	NUM.	REVISION	DATE:	BY:
PID: 00116358				
PROJECT: C109951				
SALESPERSON: J Schatz				
DESIGNED BY: M Livsey	2	Re-Submittal	8/16/2023	MCL
CHECKED BY:	1	Submittal	4/21/2023	MCL

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LATHAM, NY 12110
518-785-1315

PROJECT: Vails Gate Fire District BAS
872 Blooming Grove Turnpike
New Windsor NY 10901

FILE: Vails Gate Fire Dept.vsdx

Vails Gate Fire District BAS, 872 Blooming Grove Turnpike, New Windsor, NY

HW SYSTEM UC600 - 3

Sequence of Operations

HW SYSTEM Flow

General Description:

The hot water system consists of multiple boilers and associated pumps. The Building Automation System (BAS) controller will provide stand-alone control or BAS workstation control of the supply heating water by controlling the boiler's enable/disable boiler signal and the hot water tempering valve for the radiant floors.

Heating System Enable/Disable:

The heating system will be enabled when the outside air temperature falls below 65° F (adj.). When enabled, the BAS controller will start the lead hot water distribution pump and enable the boiler system. The boiler factory control will operate the boiler to maintain its local supply setpoint.

Heating will be disabled when the outdoor air temperature is above 65° F (adj.) plus a 4° F (adj.) differential. When heating is disabled, the hot water pumps and boilers will be commanded to OFF.

Boiler Control:

The factory-installed boiler controls will provide control of the boiler system including lead/lag sequence, calculate setpoint, maintain the HW Supply setpoint and alarm-failure recovery.

Hot Water Distribution Pump Start/Stop (HWP – 1 ~ 6):

When the outdoor air temperature is below 54° F (adj.), the BAS shall enable all distribution pumps and run them continuously. When the outdoor air temperature rises above the enable setpoint plus a 4° F (adj.) differential, the BAS shall disable all distribution pumps.

The BAS controller will start a hot water pump through a contact closure of the pump's variable frequency drive (VFD) run-enable contacts.

Hot Water Distribution Pump Status (HWP – 1 ~ 6):

The BAS controller will detect hot water pump run status by a VFD current switch.

Hot Water Distribution Pump Lead/Lag (HWP – 1 ~ 6):

For each pair of distribution pumps, the hot water pump lead/lag sequence will be based on a weekly schedule. Additionally, for each pair of pumps, if the lead pump fails, the second pump will be enabled. See further sequence details below about pump staging. From the BAS workstation, an operator will be able to manually change the lead/lag sequence. If the lead pump speed falls below 40% (adj.) for five minutes (adj.) the lag pump will be disabled.

Hot Water Distribution Pump Failure (HWP – 1 ~ 6):

If the lead start/stop relay is enabled and the current switch status is off for more than 60 seconds (adj.), the BAS controller will annunciate a hot water pump failure alarm to the BAS workstation and starts the lag pump. When a pump failure exists, lead/lag automation will be disabled and the currently running pump becomes the lead pump. Once the problem has been corrected, the operator will be able to clear the alarm failure from the BAS workstation. This action will re-enable the lead/lag sequence.

Hot Water Distribution Pump Speed (HWP – 1 ~ 6):

For each pair of distribution pumps, the BAS controller will monitor the hot water system differential pressure sensor. When the pump VFD is enabled, the BAS controller will control the analog speed signal sent to the pump VFD to maintain a hot water differential pressure setpoint of 15 psig (adj.).

Radiant Floor HW Supply Mixing Valve:

The radiant floor system shall maintain a 70° F (adj.) space temperature for each area served by the system. The BAS shall modulate the mixing valve to maintain a hot ater supply temperature of 90° F (adj.) to the radiant floor system anytime the distribution pumps HWP – 3 or 4 are seen as enabled. The hot water supply temperature to the slab should not exceed 95° F to avoid damaging the floor.

Freeze Protection:

When the outdoor air temperature falls below 35° F (adj.), the hot water distribution pump will operate continuously to provide hot water circulation to all associated hot water coils. If the hot water supply temperature falls below 130° F (adj.) during unoccupied periods, the boiler sequence will be enabled to safeguard against low water temperature and boiler condensation.

CO and CH4 Gas Monitoring:

The BAS shall monitor the CO and CH4 levels in the boiler room.

If the CO levels exceed 25 PPM (adj.), or if CH4 levels exceed 10% LEL, the BAS shall generate a low-level gas alarm at the operator work station and activate the remote low level warning strobe (yellow) in the space.

If the CO levels exceed 100 PPM (adj.), or if CH4 levels exceed 20% LEL, the BAS shall generate a high-level gas alarm at the operator work station and activate the remote high level warning strobe (red) and horn in the space.

Emergency Shut Down Station:

The Operator Emergency Shut Down station shall be monitored by the BAS, when the switch is activated, the BAS shall generate an alarm at the operator work station. The BAS shall disable all distribution pumps as long as the switch is activated.

The normally-closed contacts of the Emergency Shut-Down Station shall be wired to the emergency stop terminals of the Factory-installed boiler controllers to disable the boiler system.

Alarms:

* High Distribution HW Supply Temperature; greater than 200° F (adj.) (all 3X zones)
* Low Distribution HW Supply Temperature; less than 100° F (adj.) (all 3X zones)
* High Primary HW Supply Temperature; greater than 200° F (adj.)
* Low Primary HW Supply Temperature; less than 100° F (adj.)
* Activation of the Emergency Stop Station
* CO gas low level alarm (yellow light)
* CO gas high level alarm (red light and horn)
* CH4 gas low level alarm (yellow light)
* CH4 gas high level alarm (red light and horn)
* Pump failure

TRANE

Albany
301 Old Niskayuna Road, Suite 1
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518-785-1315

HW SYSTEM UC600 - 3 SEQUENCE

CID: 00107802	NUM.	REVISION	DATE:	BY:
PID: 00116358				
PROJECT: C109951				
SALESPERSON: J Schatz				
DESIGNED BY: M Livsey	2	Re-Submittal	8/16/2023	MCL
CHECKED BY:	1	Submittal	4/21/2023	MCL

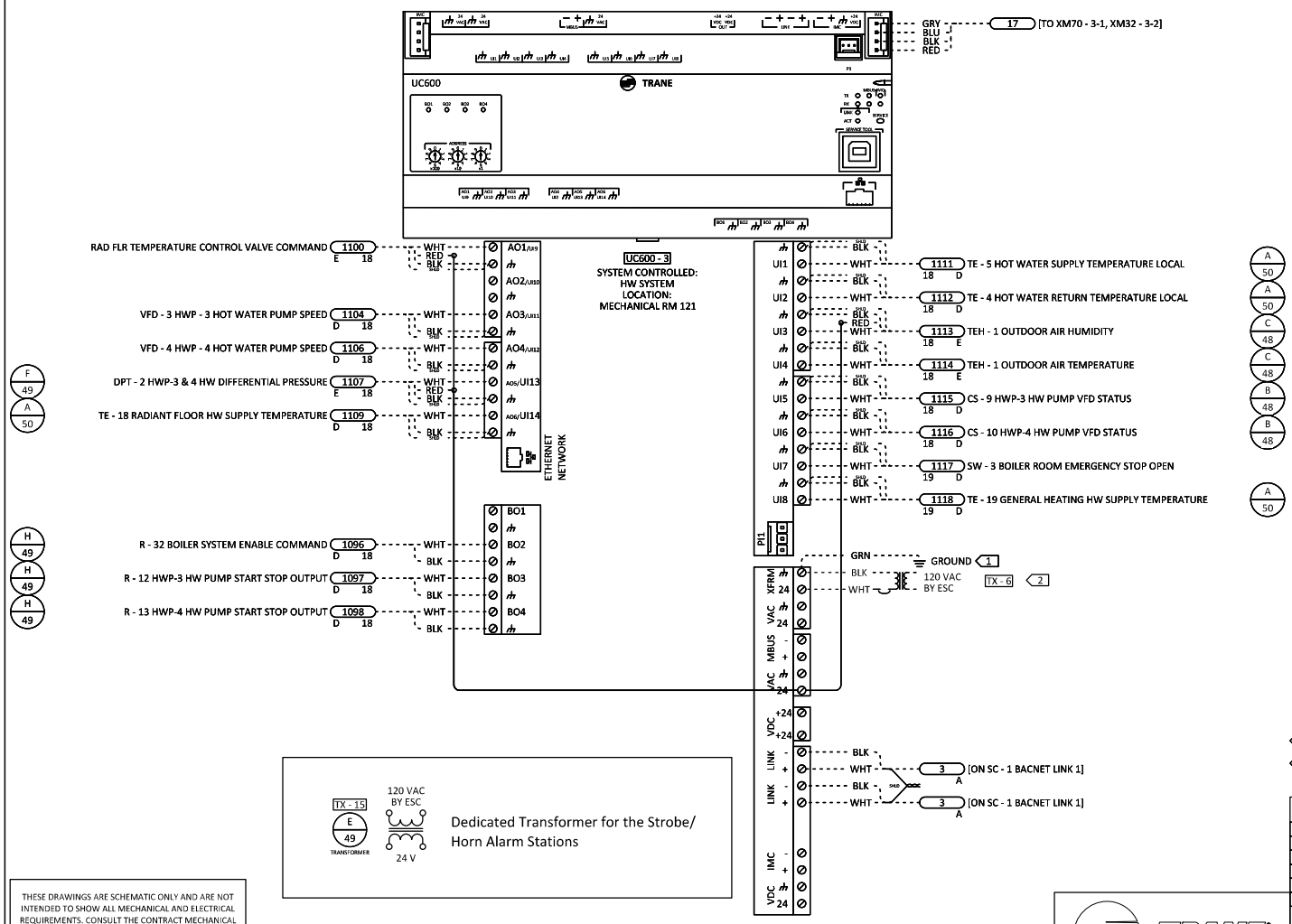
PROJECT: Vails Gate Fire District BAS

872 Blooming Grove Turnpike
New Windsor NY 10901

FILE: Vails Gate Fire Dept.vsdx

(HW SYSTEM)

BILL OF MATERIAL				
TAG	QTY	VENDOR	PART NO	DESCRIPTION
UC600 - 3	1	TRANE	BMUC600AAA0100011	UC600 CONTROLLER, DIN RAIL MOUNT
TX - 15	1	KELE	TR100VA002	XFMR, 120:24VAC, 100VA, CB



2 USE THE TRANSFORMER PROVIDED WITH THE ENCLOSURE TO POWER THE CONTROLLER.

1 DEVICE MUST BE GROUNDED WITH FACTORY PROVIDED GROUND WIRE AS DETAILED IN THE DEVICE INSTALLATION LITERATURE.

THESE DRAWINGS ARE SCHEMATIC ONLY AND ARE NOT INTENDED TO SHOW ALL MECHANICAL AND ELECTRICAL REQUIREMENTS. CONSULT THE CONTRACT MECHANICAL AND ELECTRICAL DRAWINGS AS WELL AS EQUIPMENT SUBMITTAL INFORMATION FOR COMPLETE MECHANICAL AND ELECTRICAL REQUIREMENTS.

HW SYSTEM UC600 - 3 CONTROLLER

CID: 00107802	NUM.	REVISION	DATE:	BY:
PID: 00116358				
PROJECT: C109951				
SALESPERSON: J Schatz				
DESIGNED BY: M Livsey	2	Re-Submittal	8/16/2023	MCL
CHECKED BY:	1	Submittal	4/21/2023	MCL

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LATHAM, NY 12110
518-785-1315

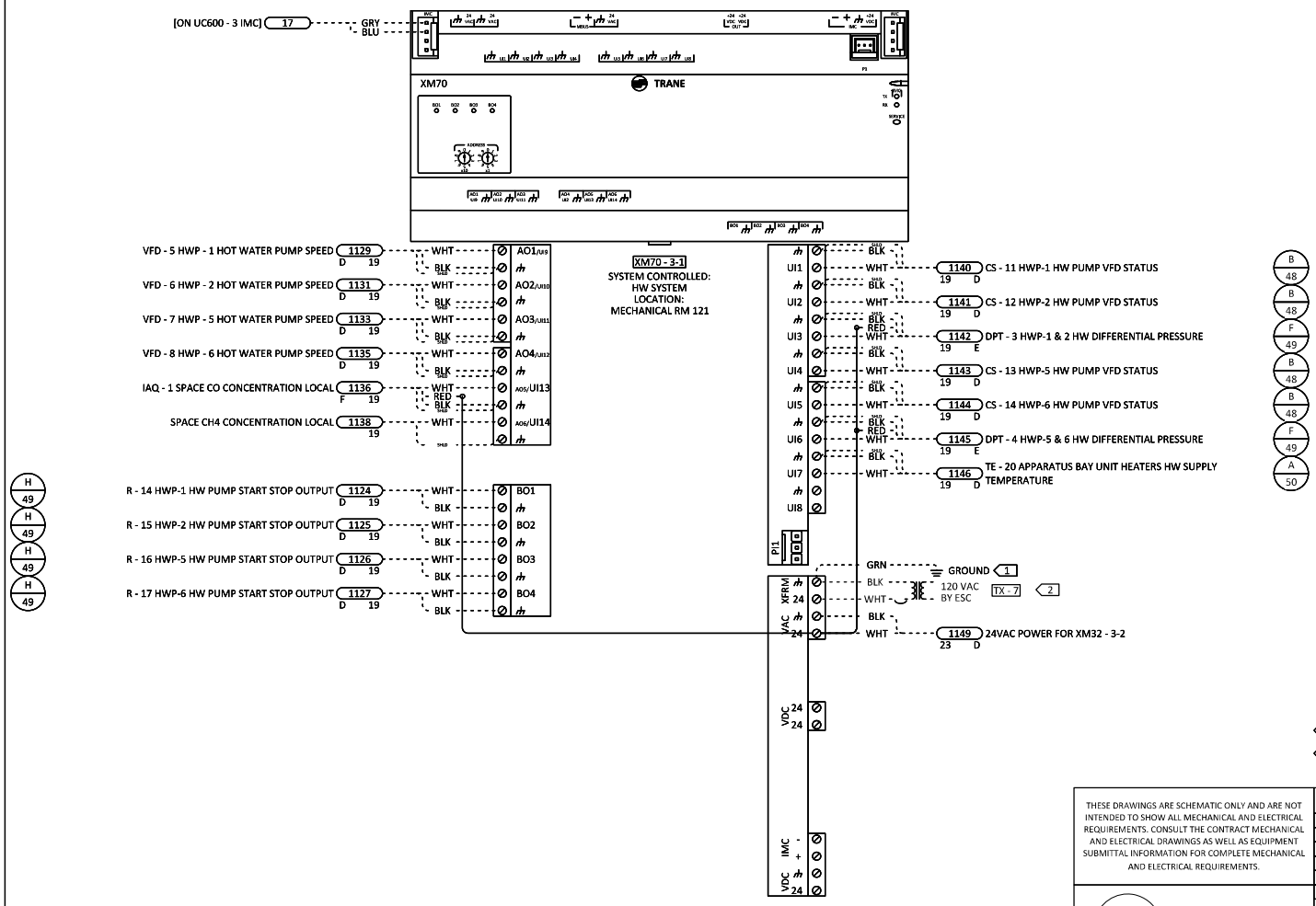
PROJECT: Vails Gate Fire District BAS

872 Blooming Grove Turnpike
New Windsor NY 10901

FILE: Vails Gate Fire Dept.vsdx

(HW SYSTEM)

BILL OF MATERIAL				
TAG	QTY	VENDOR	PART NO	DESCRIPTION
XM70 - 3-1	1	TRANE	X13651568010	XM70, 19 POINT EXPANSION MODULE



2 USE THE TRANSFORMER PROVIDED WITH THE ENCLOSURE TO POWER THE CONTROLLER.

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HW SYSTEM XM70 - 3-1 CONTROLLER

	NUM.	REVISION	DATE:	BY:
CID: 00107802				
PID: 00116358				
PROJECT: C109951				
SALESPERSON: J Schatz				
DESIGNED BY: M Livsey	2	Re-Submittal	8/16/2023	MCL
CHECKED BY:	1	Submittal	4/21/2023	MCL

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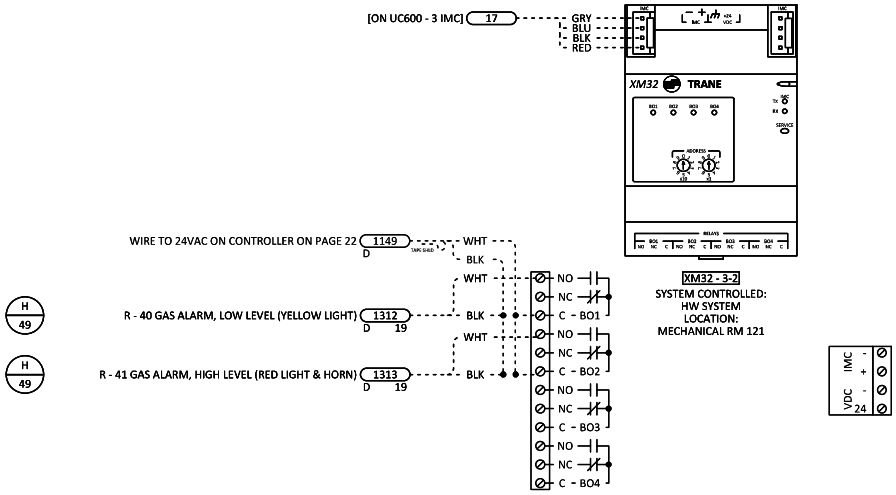
PROJECT: Vails Gate Fire District BAS

872 Blooming Grove Turnpike
New Windsor NY 10901

FILE: Vails Gate Fire Dept.vsdx

(HW SYSTEM)

BILL OF MATERIAL				
TAG	QTY	VENDOR	PART NO	DESCRIPTION
XM32 - 3-2	1	TRANE	X13651563010	XM32, 4 POINT BO EXPANSION MODULE



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HW SYSTEM XM32 - 3-2 CONTROLLER

	NUM.	REVISION	DATE:	BY:
CID: 00107802				
PID: 00116358				
PROJECT: C109951				
SALESPERSON: J Schatz				
DESIGNED BY: M Livsey	2	Re-Submittal	8/16/2023	MCL
CHECKED BY:	1	Submittal	4/21/2023	MCL

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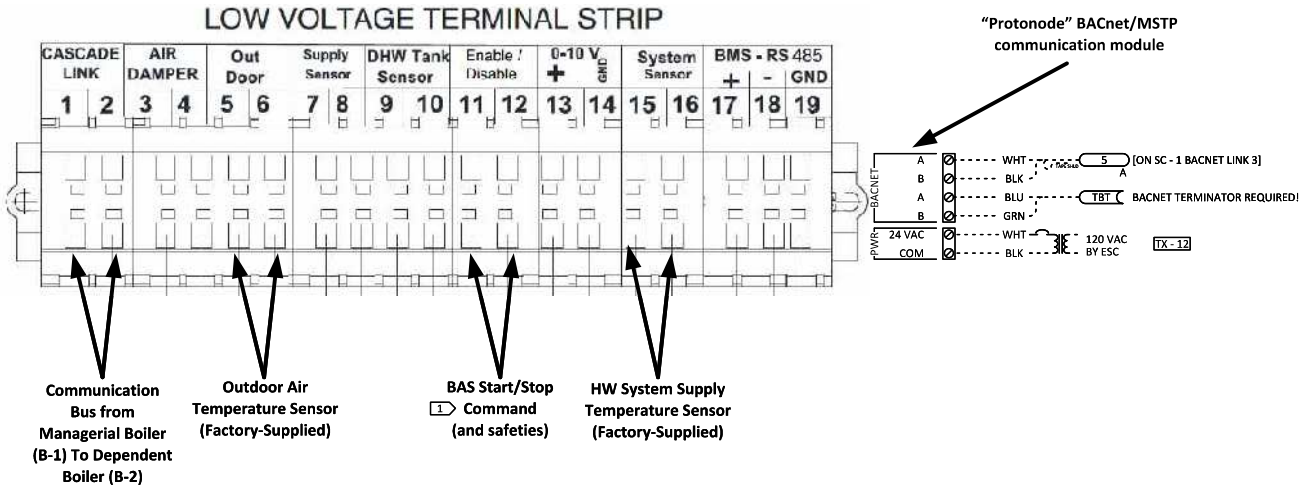
PROJECT: Vails Gate Fire District BAS

872 Blooming Grove Turnpike
New Windsor NY 10901

FILE: Vails Gate Fire Dept.vsdx

(BOILER 1)

BILL OF MATERIAL				
TAG	QTY	VENDOR	PART NO	DESCRIPTION



1 **Installation Note:**
Connect the normally – closed contacts of the emergency Start/Stop station and the alarm relay ("AR1" & "AR2") of the CO/CH4 gas sensor in series with the BAS Start/Stop command to disable the boiler system when the E-stop is pressed or there is a gas alarm.

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BOILER 1 CONTROLLER

	NUM.	REVISION	DATE:	BY:
CID: 00107802				
PID: 00116358				
PROJECT: C109951				
SALESPERSON: J Schatz				
DESIGNED BY: M Livsey	2	Re-Submittal	8/16/2023	MCL
CHECKED BY:	1	Submittal	4/21/2023	MCL

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PROJECT: Vails Gate Fire District BAS

872 Blooming Grove Turnpike
New Windsor NY 10901

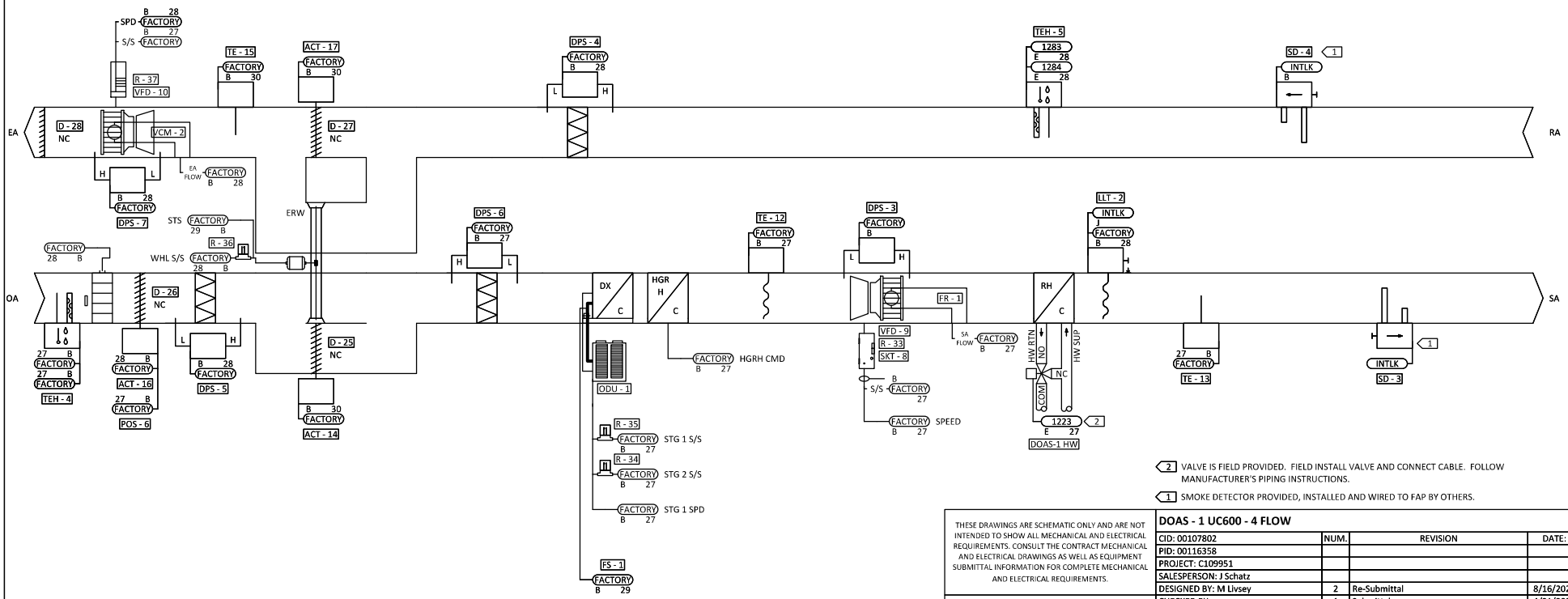
FILE: Vails Gate Fire Dept.vsdx

(DOAS - 1)

BILL OF MATERIAL				
TAG	QTY	VENDOR	PART NO	DESCRIPTION
TEH - 5	1	SENVA	HT1D-2EUD	HUMIDITY SENS, DUCT, 2%, TEMP, DISPLAY
VALVES / ACT	*	*	*	*SEE WATER VALVE SCHEDULE

DOAS – 1
MAKE: HORIZON
DEDICATED OUTDOOR AIR UNIT
MODEL: OADG015C1
208/60/3; 4,500 CFM
LOCATION: ROOF, AREA B
SERVES: OUTDOOR AIR TO VRF SPACES

DOAS - 1



2 VALVE IS FIELD PROVIDED. FIELD INSTALL VALVE AND CONNECT CABLE. FOLLOW MANUFACTURER'S PIPING INSTRUCTIONS.

1 SMOKE DETECTOR PROVIDED, INSTALLED AND WIRED TO FAP BY OTHERS.

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DOAS - 1 UC600 - 4 FLOW

	NUM.	REVISION	DATE:	BY:
CID: 00107802				
PID: 00116358				
PROJECT: C109951				
SALESPERSON: J Schatz				
DESIGNED BY: M Livsey	2	Re-Submittal	8/16/2023	MCL
CHECKED BY:	1	Submittal	4/21/2023	MCL

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LATHAM, NY 12110
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PROJECT: Vails Gate Fire District BAS
872 Blooming Grove Turnpike
New Windsor NY 10901

FILE: Vails Gate Fire Dept.vsdx

Vails Gate Fire District BAS, 872 Blooming Grove Turnpike, New Windsor, NY
DOAS - 1 UC600 - 4

Sequence of Operations

DOAS - 1 Flow

Building Automation System Interface:

The Building Automation System (BAS) will send the controller Occupied/Unoccupied and Heat/Cool modes. The BAS will also send temperatures, setpoints and other applicable information to the controller. If a BAS is not present, or communication is lost with the BAS, the controller will operate in the occupied mode using default modes and setpoints.

Occupancy shall be based on a time of day sequence.

Occupied Mode:

During occupied periods, the supply and exhaust fans will run continuously, and the outside air damper will open fully before the fans starts. The discharge air temperature setpoint will be dynamically reset based on the deviation of actual space temperature from the active space temperature setpoint.

The discharge air temperature shall be a constant neutral air of 75° F(adj.) and a RH of 50% (adj.).

The heat recovery wheel will run anytime the unit is occupied and not economizing.

Unoccupied:

During unoccupied periods the supply and exhaust fans will be disabled, the outside air damper will close, the DX cooling will be disabled and hot water valve will close.

Unoccupied heating or cooling of the space will be handled by the local RTUs or VRF cassettes.

Heat/Cool Mode:

The BAS shall enable and modulate the heating and cooling to maintain the discharge air temperature setpoint. The cooling stages will be based on factory-programming. If the discharge air temperature sensor fails an alarm will be annunciated at the BAS and the BAS shall control to the return air temperature.

The heating shall be disabled when the outdoor air temperature rises above 70° F (adj.). The maximum discharge air temperature will be 80° F (adj.).

Dehumidification Mode:

The unit shall use the Hot Gas Reheat Coil to dehumidify the supply air when necessary. The discharge air humidity setpoint shall be 50% (adj.).

If the return air relative humidity sensor fails, the dehumidification sequence will be terminated and an alarm will be annunciated at the BAS.

Supply Fan:

The fan will be off in the unoccupied mode and run continuously in the occupied mode once the outdoor air damper (2-position) is proven open. The exhaust fan status shall be monitored by a differential pressure sensor across the fan. If the fan is commanded ON and status is not seen for 2 minutes (adj.) the BAS shall generate an alarm and disable the unit.

Exhaust Fan:

The fan will be off in the unoccupied mode and run continuously in the occupied mode. The exhaust fan status shall be monitored by a differential pressure sensor across the fan. If the fan is commanded ON and status is not seen for 2 minutes (adj.) the BAS shall generate an alarm and disable the unit.

Economizer:

The unit shall bypass the energy wheel when outdoor air conditions permit free cooling of the air stream. The unit shall compare the outdoor air enthalpy to return air enthalpy and enable economizing when the outdoor air enthalpy is lower than return air by an adjustable differential.

Economizing shall be disabled when the outdoor air temperature is above 75° (adj.) or below 55° F (adj.), the unit is in dehumidification mode, or the unit is in heating mode.

Freeze Protection:

A hardwired, low limit temperature switch will be electrically interlocked with the motor starter. If the low limit temperature switch is tripped 38° F (adj.), the supply and exhaust fans will be disabled, the outside air damper will close, the hot water valve will open to 100%, all stages of DX cooling will be disabled and an alarm will be annunciated at the BAS.

Smoke Detector Shutdown:

The unit will shut down in response to a signal from the smoke detector indicating the presence of smoke. The smoke detector will be interlocked to the unit through the dry contacts of the smoke detector.

Filter Status:

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

Alarms:

* Fan failure; fan commanded ON, status not seen for 2 minutes (adj.)
* Dirty filter alarm
* Wheel rotation alarm; wheel commanded ON, status not seen for 2 minutes (adj.)
* Failed temperature sensor
* Failed humidity sensor

TRANE

DOAS - 1 UC600 - 4 SEQUENCE

	NUM.	REVISION	DATE:	BY:
CID: 00107802				
PID: 00116358				
PROJECT: C109951				
SALESPERSON: J Schatz				
DESIGNED BY: M Livsey	2	Re-Submittal	8/16/2023	MCL
CHECKED BY:	1	Submittal	4/21/2023	MCL

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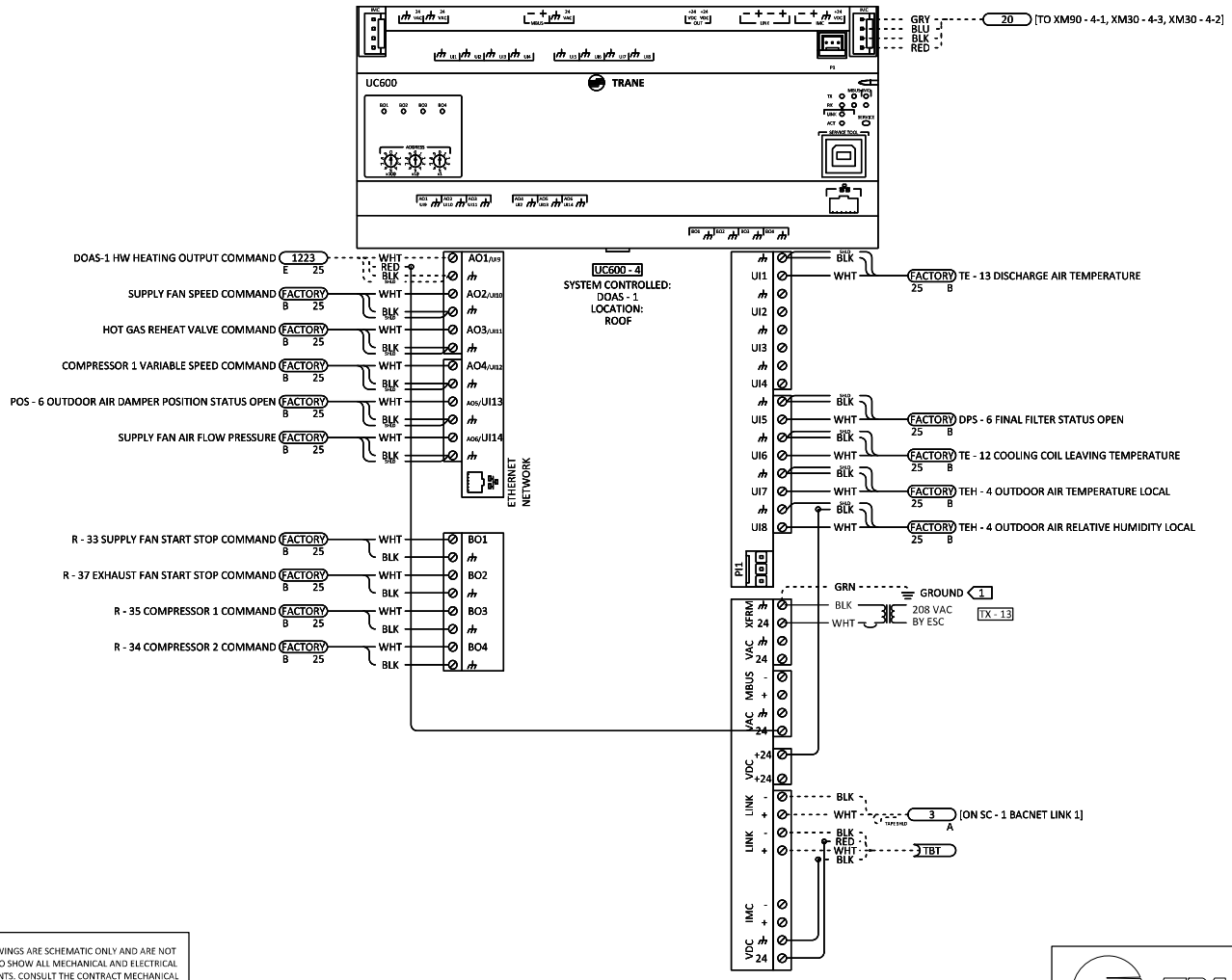
518-785-1315

PROJECT: Vails Gate Fire District BAS
872 Blooming Grove Turnpike
New Windsor NY 10901

FILE: Vails Gate Fire Dept.vsdx

(DOAS - 1)

BILL OF MATERIAL				
TAG	QTY	VENDOR	PART NO	DESCRIPTION



1 DEVICE MUST BE GROUNDED WITH FACTORY PROVIDED GROUND WIRE AS DETAILED IN THE DEVICE INSTALLATION LITERATURE.

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DOAS - 1 UC600 - 4 CONTROLLER

	NUM.	REVISION	DATE:	BY:
CID: 00107802				
PID: 00116358				
PROJECT: C109951				
SALESPERSON: J Schatz				
DESIGNED BY: M Livsey	2	Re-Submittal	8/16/2023	MCL
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PROJECT: Vails Gate Fire District BAS

872 Blooming Grove Turnpike
New Windsor NY 10901

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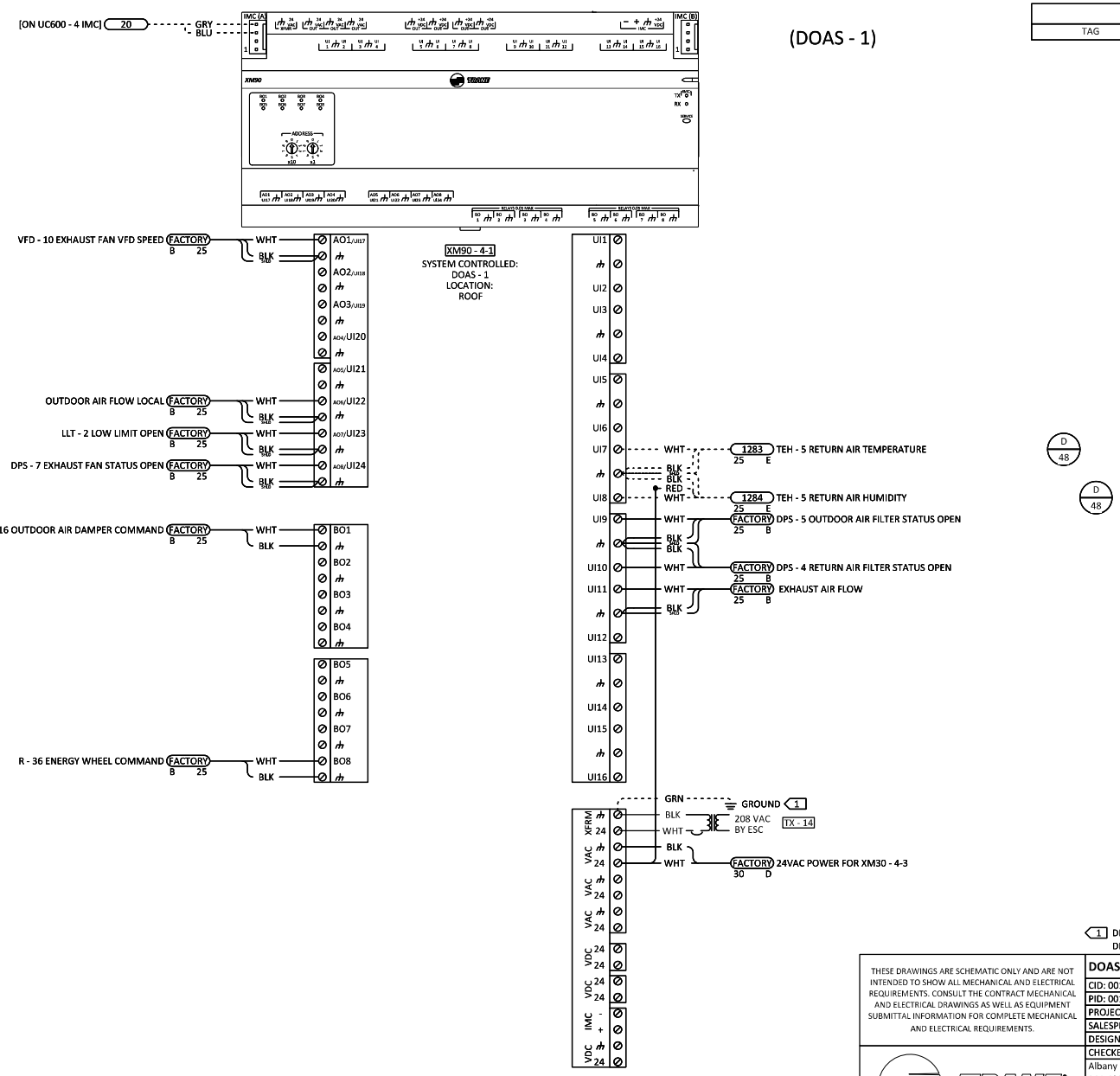

(DOAS - 1)

BILL OF MATERIAL				
TAG	QTY	VENDOR	PART NO	DESCRIPTION

XM90 - 4-1
SYSTEM CONTROLLED:
DOAS - 1
LOCATION:
ROOF

VFD - 10 EXHAUST FAN VFD SPEED (FACTORY) B 25 — WHT, BLK (SHLD) → AO1/UI17

OUTDOOR AIR FLOW LOCAL (FACTORY) B 25 — WHT, BLK (SHLD) → AO6/UI22

LLT - 2 LOW LIMIT OPEN (FACTORY) B 25 — WHT, BLK (SHLD) → AO7/UI23

DPS - 7 EXHAUST FAN STATUS OPEN (FACTORY) B 25 — WHT, BLK (SHLD) → AO8/UI24

ACT - 16 OUTDOOR AIR DAMPER COMMAND (FACTORY) B 25 — WHT, BLK → BO1

R - 36 ENERGY WHEEL COMMAND (FACTORY) B 25 — WHT, BLK → BO8

UI7 — WHT → 1283 25 E — TEH - 5 RETURN AIR TEMPERATURE
BLK (SHLD), BLK, RED

UI8 — WHT → 1284 25 E — TEH - 5 RETURN AIR HUMIDITY

UI9 — WHT → (FACTORY) 25 B — DPS - 5 OUTDOOR AIR FILTER STATUS OPEN
BLK (SHLD), BLK

UI10 — WHT → (FACTORY) 25 B — DPS - 4 RETURN AIR FILTER STATUS OPEN

UI11 — WHT → (FACTORY) 25 B — EXHAUST AIR FLOW
BLK (SHLD)

GRN → GROUND 1

XFRM 24: BLK, WHT → 208 VAC BY ESC (TX - 14)

VAC 24: BLK, WHT → (FACTORY) 30 D — 24VAC POWER FOR XM30 - 4-3

D 48

D 48

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DOAS - 1 XM90 - 4-1 CONTROLLER

CID: 00107802	NUM.	REVISION	DATE:	BY:
PID: 00116358				
PROJECT: C109951				
SALESPERSON: J Schatz				
DESIGNED BY: M Livsey	2	Re-Submittal	8/16/2023	MCL
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TRANE

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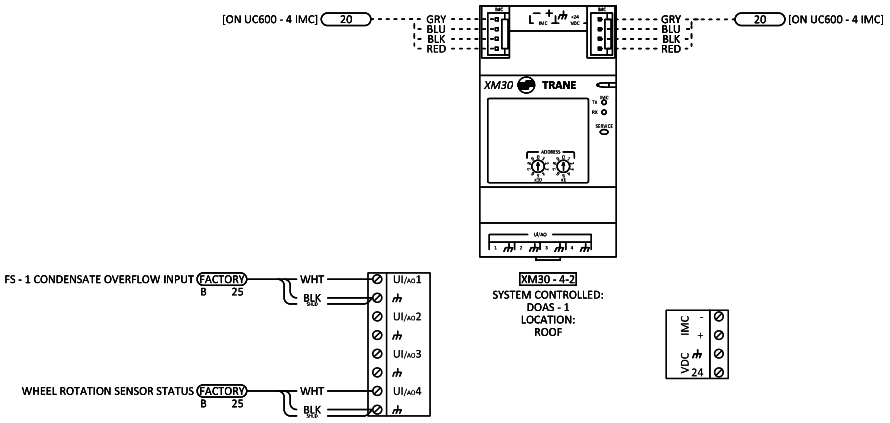
LATHAM, NY 12110
518-785-1315

PROJECT: Vails Gate Fire District BAS
872 Blooming Grove Turnpike
New Windsor NY 10901

FILE: Vails Gate Fire Dept.vsdx

(DOAS - 1)

BILL OF MATERIAL				
TAG	QTY	VENDOR	PART NO	DESCRIPTION



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DOAS - 1 XM30 - 4-2 CONTROLLER

	NUM.	REVISION	DATE:	BY:
CID: 00107802				
PID: 00116358				
PROJECT: C109951				
SALESPERSON: J Schatz				
DESIGNED BY: M Livsey	2	Re-Submittal	8/16/2023	MCL
CHECKED BY:	1	Submittal	4/21/2023	MCL

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518-785-1315

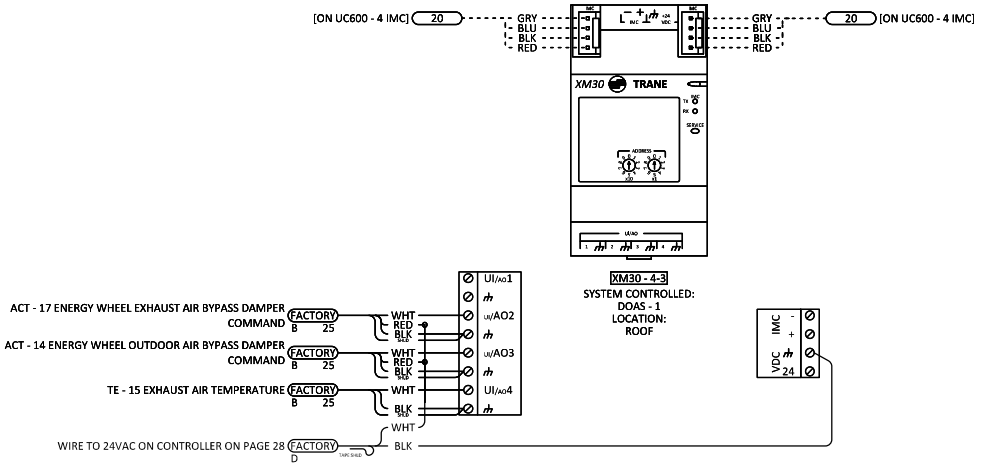
PROJECT: Vails Gate Fire District BAS

872 Blooming Grove Turnpike
New Windsor NY 10901

FILE: Vails Gate Fire Dept.vsdx

(DOAS - 1)

BILL OF MATERIAL				
TAG	QTY	VENDOR	PART NO	DESCRIPTION



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DOAS - 1 XM30 - 4-3 CONTROLLER

	NUM.	REVISION	DATE:	BY:
CID: 00107802				
PID: 00116358				
PROJECT: C109951				
SALESPERSON: J Schatz				
DESIGNED BY: M Livsey	2	Re-Submittal	8/16/2023	MCL
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518-785-1315

PROJECT: Vails Gate Fire District BAS

872 Blooming Grove Turnpike
New Windsor NY 10901

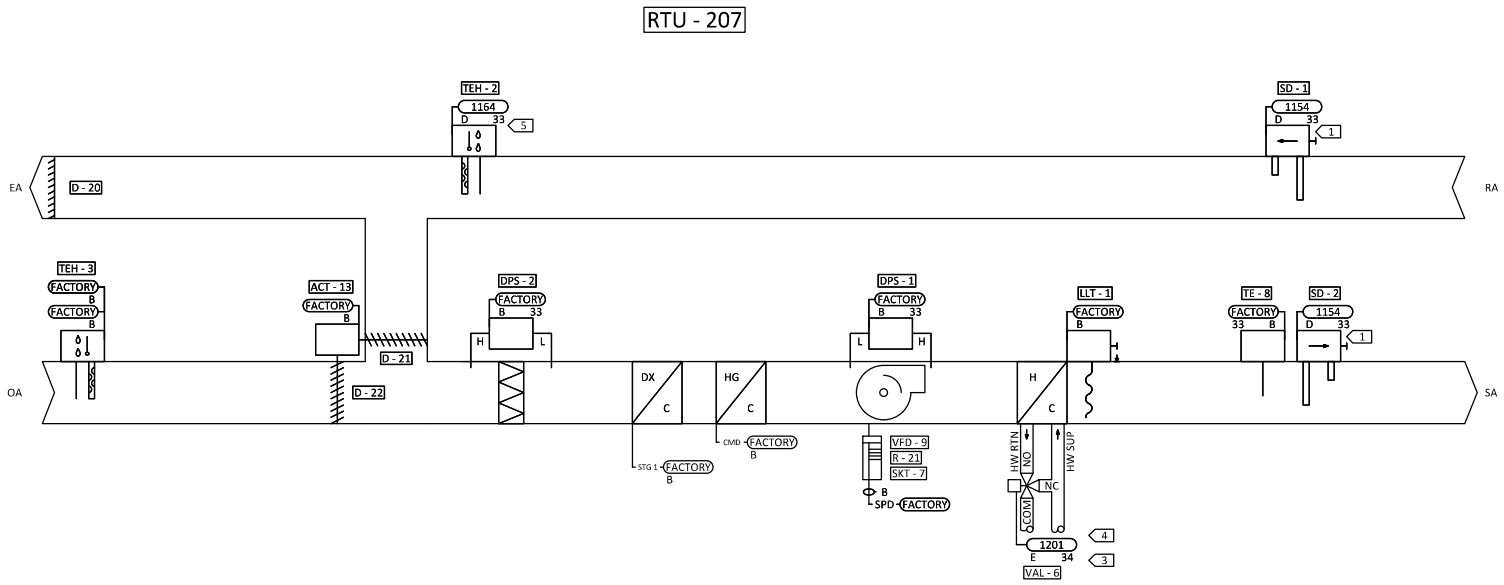
FILE: Vails Gate Fire Dept.vsdx

(RTU - 207)

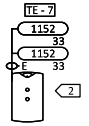
BILL OF MATERIAL				
TAG	QTY	VENDOR	PART NO	DESCRIPTION

RTU – 207
MAKE: TRANE
3 TON R-410A PACKAGED RTU
MODEL: TZC036E3R0A
208/60/3; 1,200 CFM
LOCATION: ROOF, AREA B
SERVES: EXERCISE RM 207

RTU - 207



SPACE TEMPERATURE SENSOR



5 DUCT HUMIDITY SENSOR IS FACTORY-PROVIDED, FIELD INSTALLED.

4 THE HOT WATER VALVE WILL BE WIRED TO AN ANALOG OUTPUT ON THE FACTORY-INSTALLED UC400 CONTROLLER INSIDE THE UNIT. CONFIRM OUTPUT NUMBER WITH WIRING DIAGRAM.

3 VALVE IS FACTORY-PROVIDED, SHIPPED LOOSE. INSTALL VALVE PER MANUFACTURER'S INSTRUCTIONS.

2 INSTALL SENSOR IN CONTROLLED SPACE PER MECHANICAL PRINT "M2 132B.00". CONFIRM LOCATION WITH PROJECT MANAGER.

1 SMOKE DETECTOR PROVIDED, INSTALLED AND WIRED TO FAP BY OTHERS.

RTU - 207 FLOW

	NUM.	REVISION	DATE:	BY:
CID: 00107802				
PID: 00116358				
PROJECT: C109951				
SALESPERSON: J Schatz				
DESIGNED BY: M Livsey	2	Re-Submittal	8/16/2023	MCL
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301 Old Niskayuna Road, Suite 1
LATHAM, NY 12110
518-785-1315

PROJECT: Vails Gate Fire District BAS

872 Blooming Grove Turnpike
New Windsor NY 10901

FILE: Vails Gate Fire Dept.vsdx

Vails Gate Fire District BAS, 872 Blooming Grove Turnpike, New Windsor, NY

RTU - 207

Sequence of Operations

RTU - 207 Flow

Building Automation System Interface:

The Building Automation System (BAS) will send the controller Occupied Bypass, Occupied / Unoccupied and Heat / Cool modes.

Occupancy shall be based on a Time of Day schedule

Occupied Mode:

During occupied periods, the supply fan will run continuously and the outside air damper will open to maintain minimum ventilation requirements. If economizing is enabled the outside air damper will modulate to maintain the occupied space temperature setpoint.

Default Setpoints:

Occupied Cooling:	75° F (adj.)
Occupied Heating:	70° F (adj.)

Unoccupied Mode:

On a call for heating or cooling, the fan(s) will be commanded on continuously until the heating or cooling need is satisfied.

Unoccupied Heating Mode:

When the space temperature is below the unoccupied heating setpoint of 55° F (adj.) the supply fan will start, the outside air damper will remain closed and the hot water heat will be enabled. When the space temperature rises above the unoccupied heating setpoint of 5° F (adj.) plus the unoccupied differential of 4° F (adj.) the supply fan will stop and the hot water heat will be disabled.

Unoccupied Cooling Mode:

When the space temperature is above the unoccupied cooling setpoint of 85° F (adj.) the supply fan will start, the outside air damper will open if economizing is enabled and remain closed if economizing is disabled and the DX cooling will be enabled. When the space temperature falls below the unoccupied cooling setpoint of 85° F minus the unoccupied differential of 4° F (adj.) the supply fan will stop, the DX cooling will be disabled and the outside air damper will close.

Cool Mode:

When the space temperature rises above the setpoint, the unit controller will modulate the economizer or stage the DX cooling as required to maintain the space temperature setpoint. Once all economizing requirements have been met, compressor operation will be enabled if the economizer alone cannot meet the demand. The supply fan will modulate above minimum speed to meet zone requirements. Once the space temperature falls below the setpoint the compressors will be deactivated and the fan will modulate to minimum speed. The economizer will continue modulating or return to minimum position as determined by cooling and minimum airflow requirements

Heat Mode:

When the space temperature drops below the setpoint, the unit controller will modulate the hot water valve as required to maintain the space temperature setpoint. The supply fan will modulate above minimum speed to meet zone requirements. The hot water will continue modulating as determined by heating requirements

Dehumidification:

Factory installed hot gas reheat will allow application of dehumidification. Dehumidification will be allowed only when the outside air temperature is above 40° F and below 100° F. The economizer outside air damper will drive to minimum position during dehumidification.

Single compressor units:

On a call for dehumidification, the hot gas reheat valve will energize and the compressor will enable. When the humidity control setpoint is satisfied, the hot gas reheat valve will be de-energized and the compressor will be disabled. If there is a call for cooling from the space temperature controller, while in reheat, the hot gas reheat valve will be de-energized and the compressor continues to run.

Economizer Control / Reference Dry Bulb:

When economizing is enabled and the unit is operating in the cooling mode, the economizer damper will modulate between its minimum position and 100% to maintain the space temperature setpoint. Minimum position will be calculated based on supply fan speed. If the supply air temperature starts to fall below supply air temperature setpoint, the outdoor damper will be at minimum position. Compressors will be delayed from operating until the economizer has opened to 100% for 5 minutes.

Comparative Enthalpy:

Outside air enthalpy is compared with return air enthalpy point. The economizer will be enabled when outdoor air enthalpy is less than return air enthalpy - 3.0 BTU/LB. The economizer will be disabled when outdoor air enthalpy is greater than return air enthalpy.

Supply Fan:

During a request for operation, the supply fan will run continuously in the occupied mode and cycled on during the unoccupied mode. Once enabled, the supply fan(s) will ramp up to minimum speed and hold minimum speed until the unit determines a request for increased cooling or heating exists. A differential pressure switch will monitor the differential pressure across the fan. A switch closure signals airflow has been established and the fan is controlled normally. If the supply fan fails the fan will be commanded off and an alarm will be annunciated at the BAS. The supply will vary its speed to meet current cooling and heating loads.

Building Pressure Control:

The barometric (gravity operated) relief dampers will open with increased building pressure. As the building pressure increases, the pressure in the unit return section also increases, opening the dampers and relieving air.

Smoke Detector Shutdown:

The unit will shut down in response to a signal from either smoke detector indicating the presence of smoke. A manual reset of the smoke detectors will be required to restart the unit.

Freeze Protection:

A low limit thermostat shall detect temperatures below 38° F (adj.). In a freeze-protection condition the fan shall be disabled, the outdoor damper closed, and the hot water valve shall open. The BAS shall generate an alarm.

Filter Status:

A differential pressure switch will monitor the differential pressure across the filter(s)when the fan is running. If the switch closes for 2 minutes after a request for fan operation a dirty filter alarm will be annunciated at the BAS.

Alarms:

* High Space Humidity; return air humidity greater than 70% (adj.)
* Low Space Humidity; return air humidity less than 35% (adj.)
* High Space Temperature; greater than setpoint by a user-definable amount
* Low Space Temperature; less than setpoint by a user-definable amount
* High Supply Air Temperature; greater than 120° F (adj.)
* Low Supply Air Temperature; less than 45° F (adj.)

TRANE

RTU - 207 SEQUENCE

CID: 00107802	NUM.	REVISION	DATE:	BY:
PID: 00116358				
PROJECT: C109951				
SALESPERSON: J Schatz				
DESIGNED BY: M Livsey	2	Re-Submittal	8/16/2023	MCL
CHECKED BY:	1	Submittal	4/21/2023	MCL

Albany
301 Old Niskayuna Road, Suite 1
LATHAM, NY 12110
518-785-1315

PROJECT: Vails Gate Fire District BAS

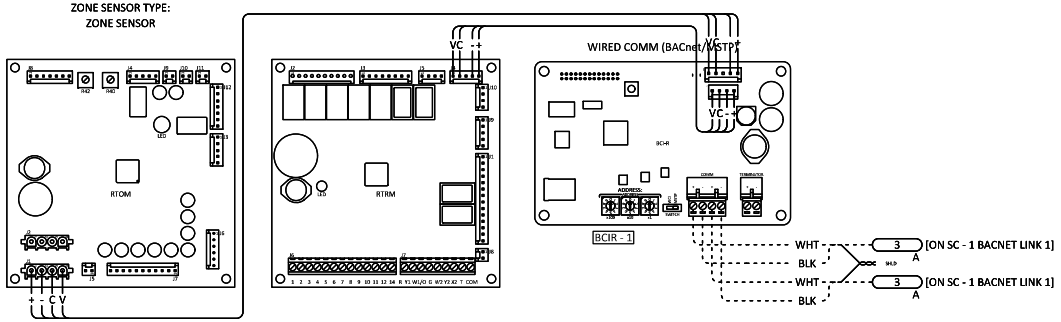
872 Blooming Grove Turnpike
New Windsor NY 10901

FILE: Vails Gate Fire Dept.vsdx

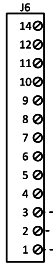
(RTU - 207)

BILL OF MATERIAL				
TAG	QTY	VENDOR	PART NO	DESCRIPTION

RTU - 207
SYSTEM CONTROLLED:
RTU - 207
LOCATION:
ROOF, AREA B
ZONE SENSOR TYPE:
ZONE SENSOR



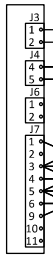
RTRM
J6



3 ------ RED
2 ------ BLK
1 ------ WHT — 1152 (31 E) — TE - 7 SPACE TEMPERATURE AND SETPOINT (TEMPERATURE, SETPOINT)

C / 50

RTOM - 1

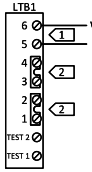


WHT — FACTORY (31 B) — TE - 8 DISCHARGE AIR TEMPERATURE
BLK

WHT — FACTORY (31 B) — DPS - 2 DIRTY FILTER ALARM OPEN
BLK

WHT — FACTORY (31 B) — DPS - 1 SUPPLY FAN STATUS OPEN
BLK

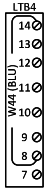
LTB1



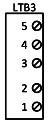
WHT — 1 — 1154 (31 D) — SD - 1 RETURN AIR SMOKE DETECTOR INPUT CLOSE, SD - 2 SUPPLY AIR SMOKE DETECTOR INPUT CLOSE
BLK

2
2

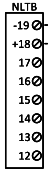
LTB4



LTB3



NLTB



WHT — 1164 (31 D) — TEH - 2 RETURN AIR HUMIDITY LOCAL
BLK

E / 48

2 TO DISABLE COMPRESSORS, REMOVE JUMPERS AND INSTALL FIELD SUPPLED DEVICE.
1 TO SHUT DOWN THE UNIT FOR EMERGENCY STOP, REMOVE JUMPER AND INSTALL FIELD SUPPLIED DEVICE.

RTU - 207 CONTROLLER

CID: 00107802	NUM.	REVISION	DATE:	BY:
PID: 00116358				
PROJECT: C109951				
SALESPERSON: J Schatz				
DESIGNED BY: M Livsey	2	Re-Submittal	8/16/2023	MCL
CHECKED BY:	1	Submittal	4/21/2023	MCL

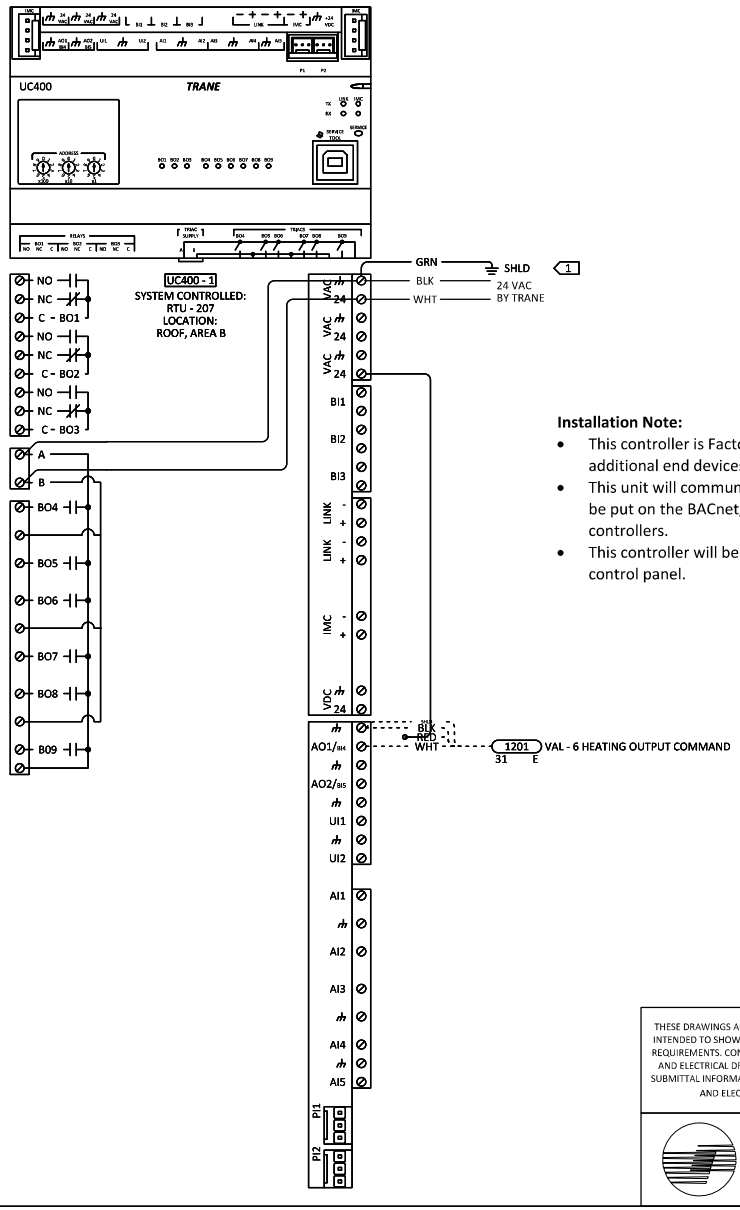
TRANE
Albany
301 Old Niskayuna Road, Suite 1
LATHAM, NY 12110
518-785-1315

PROJECT: Vails Gate Fire District BAS
872 Blooming Grove Turnpike
New Windsor NY 10901

FILE: Vails Gate Fire Dept.vsdx

(RTU - 207)

BILL OF MATERIAL				
TAG	QTY	VENDOR	PART NO	DESCRIPTION



Installation Note:

- This controller is Factory – Installed for control of additional end devices in the unit.
- This unit will communicate with the RTU, but will not be put on the BACnet/MSTP link with the other controllers.
- This controller will be mounted in a separate, external control panel.

1 DEVICE MUST BE GROUNDED WITH FACTORY PROVIDED GROUND WIRE AS DETAILED IN THE DEVICE INSTALLATION LITERATURE.

THESE DRAWINGS ARE SCHEMATIC ONLY AND ARE NOT INTENDED TO SHOW ALL MECHANICAL AND ELECTRICAL REQUIREMENTS. CONSULT THE CONTRACT MECHANICAL AND ELECTRICAL DRAWINGS AS WELL AS EQUIPMENT SUBMITTAL INFORMATION FOR COMPLETE MECHANICAL AND ELECTRICAL REQUIREMENTS.

RTU - 207 UC400 - 1 CONTROLLER

	NUM.	REVISION	DATE:	BY:
CID: 00107802				
PID: 00116358				
PROJECT: C109951				
SALESPERSON: J Schatz				
DESIGNED BY: M Livsey	2	Re-Submittal	8/16/2023	MCL
CHECKED BY:	1	Submittal	4/21/2023	MCL

Albany
301 Old Niskayuna Road, Suite 1
LATHAM, NY 12110
518-785-1315

PROJECT: Vails Gate Fire District BAS

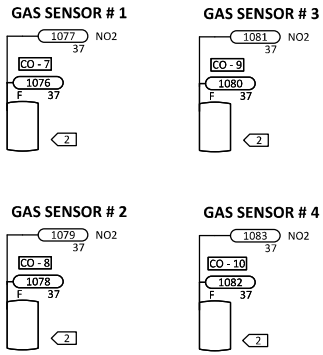
872 Blooming Grove Turnpike
New Windsor NY 10901

FILE: Vails Gate Fire Dept.vsdx

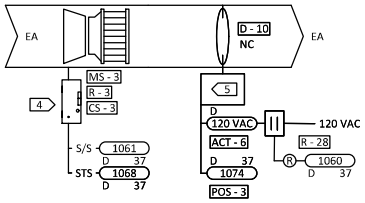
(APPARTATUS BAY 101 EQUIP)

BILL OF MATERIAL				
TAG	QTY	VENDOR	PART NO	DESCRIPTION
TE - 17	1	TRANE	X1351152701	TEMP SENS, ZONE THERM O/U SP
SW - 2	1	KELE	93502	MECHANICAL TIMER SWITCH, 30 MINUTE, WALL-MOUNT
CS - 3, CS - 5	2	SENVA	C-2320L	CUR SW, PRE-SET, 0.45-50A, SPLIT, NO
R - 5	1	SENVA	PR2401B	SPDT RELAY
R - 28, R - 29, R - 3, R - 30, R - 31	5	SENVA	PRU1C	SPDT RELAY
CO - 10, CO - 7, CO - 8, CO - 9	4	SENVA	TGM-ACN-A	IAQ SENS, CO & NO2, WALL, LCD, METAL ENCLOSURE, NEMA-1

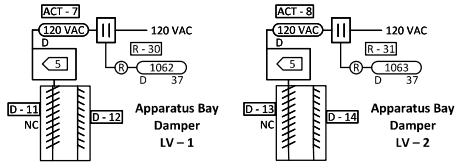
Apparatus Bay 101 ① Gas Monitoring System

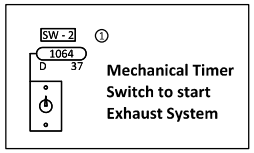


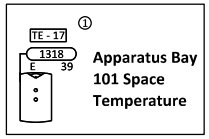
Exhaust Fan GX – 1 ①



Wall Ventilation Dampers ①







Apparatus Bay 101
Gas Monitoring & Exhaust System

Sequence of Operation:
The central controller will monitor and control all equipment associated with this system.

Gas Alarm: If the BAS senses CO above 25 PPM, or if NO2 rises above 0.7 PPM, the equipment bay dampers shall open, and the exhaust fan GX – 1, shall be enabled, and the low level (yellow) alarm light shall be enabled ON. If the BAS senses CO above 100 PPM, or if NO2 rises above 1.5 PPM, the high level (red) alarm light and horn shall be enabled ON.

The dampers shall remain open and the exhaust fan will run continuously while the system is in alarm, and for an additional 15 minutes after the gas levels have returned to normal. The BAS shall activate the remote horn/strobe alarm stations as long as the gas system is in alarm or until deactivated by an operator at the touch screen.

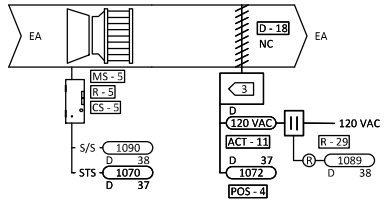
Temperature: If the BAS senses the space temperature of the Storage room above 85° F (adj.), all three equipment bay dampers shall open, and the exhaust fan GX – 1, shall be enabled. The dampers shall remain open and the fan will run continuously until the space temperature drops below the setpoint minus a 4° F (adj.) differential.

Manual Timer: The facility staff shall be able to enable the exhaust system via a mechanical timer (maximum time of 30 minutes). When the timer is activated all three equipment bay dampers shall open, and the exhaust fan GX – 1, shall be enabled. The dampers shall remain open and the fan will run continuously until the timer stops.

When none of the three sequences above are active, the equipment bay dampers shall remain closed, and exhaust fan GX – 1 shall be disabled.
When GX – 1 is enabled on, the damper will be commanded OPEN, once the damper is confirmed OPEN via the end-switch, the fan shall be enabled. If the end-switch is not seen within 2 minutes (adj.) the BAS shall generate an alarm and disable the fan.

Alarms:
* CO gas low-level alarm
* CO gas high-level alarm
* NO2 gas low-level alarm
* NO2 gas high-level alarm
* Exhaust fan failure; fan commanded ON, status not seen for 2 minutes (adj.)
* Exhaust damper failure; damper commanded OPEN, status not seen for 2 minutes (adj.)
* High space temperature (above the exhaust system temperature enable setpoint)

Exhaust Fan GX – 2 ①



Apparatus Bay 101
Exhaust Fan: "GX – 2"

Sequence of Operation:
The fan shall operate continuously 24/7.

Alarms:
* Exhaust fan failure; fan commanded ON, status not seen for 2 minutes (adj.)
* Exhaust damper failure; damper commanded OPEN, status not seen for 2 minutes (adj.)

4 EXHAUST FAN WILL BE FACTORY-PROVIDED WITH A VFD. BAS WILL ONLY START/STOP THE DRIVE, FAN SPEED TO BE SET LOCALLY AND DETERMINED BY TAB.

3 DAMPER & 120 VAC ACTUATOR PROVIDED BY OTHERS.

2 EACH GAS SENSOR HAS AN INTEGRAL HORN AND VISUAL STROBE LIGHT TO INDICATE AN ALARM.

1 REFER TO PAGE 7 FOR FLOOR PLAN OF GAS MONITORING SYSTEM END-DEVICE LOCATIONS.

APPARATUS BAY 101 MISC. EQUIPMENT FLOW PG 1

CID: 00107802	NUM.	REVISION	DATE:	BY:
PID: 00116358				
PROJECT: C109951				
SALESPERSON: J Schatz				
DESIGNED BY: M Livsey	2	Re-Submittal	8/16/2023	MCL
CHECKED BY:	1	Submittal	4/21/2023	MCL

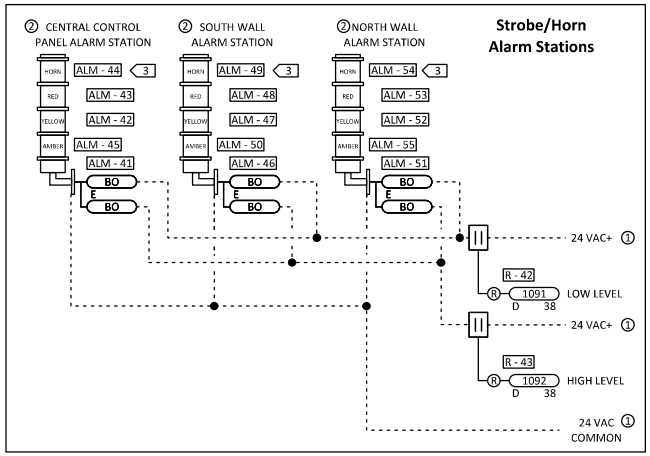
TRANE
Albany
301 Old Niskayuna Road, Suite 1
LATHAM, NY 12110
518-785-1315

PROJECT: Vails Gate Fire District BAS
872 Blooming Grove Turnpike
New Windsor NY 10901

FILE: Vails Gate Fire Dept.vsdx

(APPARTATUS BAY 101 EQUIP)

BILL OF MATERIAL				
TAG	QTY	VENDOR	PART NO	DESCRIPTION
ALM - 44, ALM - 49, ALM - 54	3	KELE	TWS-A-GN	HORN, TOWER, 24 VAC
ALM - 45, ALM - 50, ALM - 55	3	KELE	TWS-BC	TOWER BOTTOM MODULE
ALM - 41, ALM - 46, ALM - 51	3	KELE	TWS-BP1	TOWER, SINGLE WALL BASE MOUNT
ALM - 43, ALM - 48, ALM - 53	3	KELE	TWS-LL3-G	TOWER, FLASHG LED, RED, 24 VAC
ALM - 42, ALM - 47, ALM - 52	3	KELE	TWS-LL5-G	TOWER, FLASHG LED, YELLOW, 24 VAC
R - 42, R - 43	2	SENVA	PRU1C	SPDT RELAY



Apparatus Bay 101
Gas Monitoring & Exhaust System

Gas Alarm: If the BAS senses CO above 25 PPM, or if NO2 rises above 0.7 PPM, the equipment bay dampers shall open, and the exhaust fan GX – 1, shall be enabled, and the low level (yellow) alarm light shall be enabled ON. If the BAS senses CO above 100 PPM, or if NO2 rises above 1.5 PPM, the high level (red) alarm light and horn shall be enabled ON.

Alarms:
* CO gas low-level alarm
* CO gas high-level alarm
* NO2 gas low-level alarm
* NO2 gas high-level alarm

3 CONNECT THE HORN CONTACTS IN PARALLEL WITH THE HIGH LEVEL (RED LIGHT) CONTACT TO INTERLOCK THEIR OPERATION.

② REFER TO PAGE 7 FOR FLOORPLAN OF GAS MONITORING SYSTEM END-DEVICE LOCATIONS.

① REFER TO PAGE 37 FOR THE CENTRAL, DEDICATED POWER TRANSFORMER FOR ALL ALARM STROBE/HORN STATIONS.

APPARATUS BAY 101 MISC. EQUIPMENT FLOW PG 2

	NUM.	REVISION	DATE:	BY:
CID: 00107802				
PID: 00116358				
PROJECT: C109951				
SALESPERSON: J Schatz				
DESIGNED BY: M Livsey	2	Re-Submittal	8/16/2023	MCL
CHECKED BY:	1	Submittal	4/21/2023	MCL

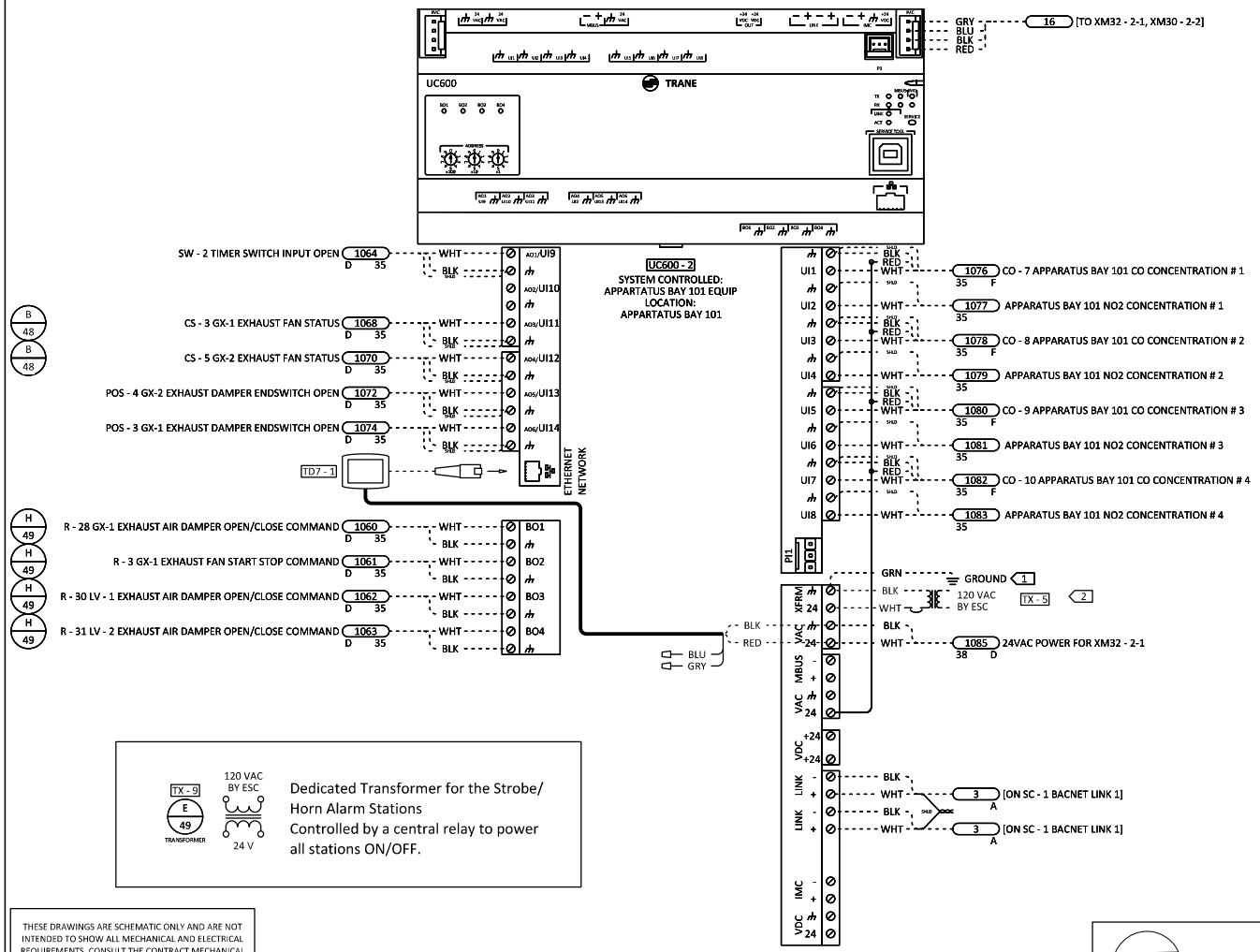
Albany
301 Old Niskayuna Road, Suite 1
LATHAM, NY 12110
518-785-1315

PROJECT: Vails Gate Fire District BAS
872 Blooming Grove Turnpike
New Windsor NY 10901

FILE: Vails Gate Fire Dept.vsdx

(APPARTATUS BAY 101 EQUIP)

BILL OF MATERIAL				
TAG	QTY	VENDOR	PART NO	DESCRIPTION
UC600 - 2	1	TRANE	BMUC600AAA0100011	UC600 CONTROLLER, DIN RAIL MOUNT
TX - 9	1	KELE	TR100VA002	XFMR, 120:24VAC, 100VA, CB



Dedicated Transformer for the Strobe/ Horn Alarm Stations
Controlled by a central relay to power all stations ON/OFF.

2 USE THE TRANSFORMER PROVIDED WITH THE ENCLOSURE TO POWER THE CONTROLLER.

1 DEVICE MUST BE GROUNDED WITH FACTORY PROVIDED GROUND WIRE AS DETAILED IN THE DEVICE INSTALLATION LITERATURE.

THESE DRAWINGS ARE SCHEMATIC ONLY AND ARE NOT INTENDED TO SHOW ALL MECHANICAL AND ELECTRICAL REQUIREMENTS. CONSULT THE CONTRACT MECHANICAL AND ELECTRICAL DRAWINGS AS WELL AS EQUIPMENT SUBMITTAL INFORMATION FOR COMPLETE MECHANICAL AND ELECTRICAL REQUIREMENTS.

APPARATUS BAY 101 UC600 - 2 CONTROLLER

CID: 00107802	NUM.	REVISION	DATE:	BY:
PID: 00116358				
PROJECT: C109951				
SALESPERSON: J Schatz				
DESIGNED BY: M Livsey	2	Re-Submittal	8/16/2023	MCL
CHECKED BY:	1	Submittal	4/21/2023	MCL

Albany
301 Old Niskayuna Road, Suite 1
LATHAM, NY 12110
518-785-1315

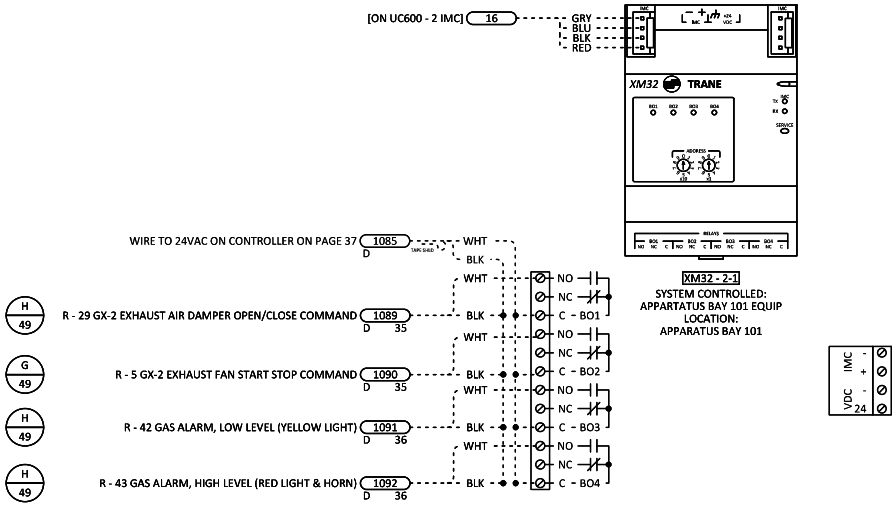
PROJECT: Vails Gate Fire District BAS

872 Blooming Grove Turnpike
New Windsor NY 10901

FILE: Vails Gate Fire Dept.vsdx

(APPARTATUS BAY 101 EQUIP)

BILL OF MATERIAL				
TAG	QTY	VENDOR	PART NO	DESCRIPTION
XM32 - 2-1	1	TRANE	X13651563010	XM32, 4 POINT BO EXPANSION MODULE



THESE DRAWINGS ARE SCHEMATIC ONLY AND ARE NOT INTENDED TO SHOW ALL MECHANICAL AND ELECTRICAL REQUIREMENTS. CONSULT THE CONTRACT MECHANICAL AND ELECTRICAL DRAWINGS AS WELL AS EQUIPMENT SUBMITTAL INFORMATION FOR COMPLETE MECHANICAL AND ELECTRICAL REQUIREMENTS.

APPARTATUS BAY 101 XM32 - 2-1 CONTROLLER

	NUM.	REVISION	DATE:	BY:
CID: 00107802				
PID: 00116358				
PROJECT: C109951				
SALESPERSON: J Schatz				
DESIGNED BY: M Livsey	2	Re-Submittal	8/16/2023	MCL
CHECKED BY:	1	Submittal	4/21/2023	MCL

Albany
301 Old Niskayuna Road, Suite 1
LATHAM, NY 12110
518-785-1315

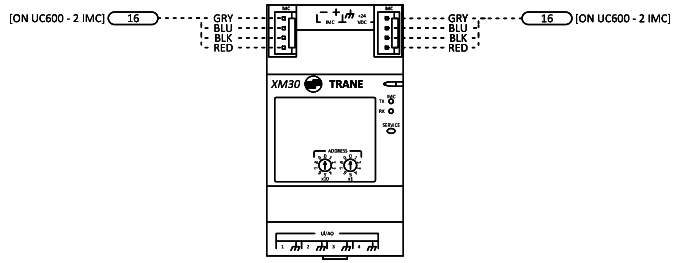
PROJECT: Vails Gate Fire District BAS

872 Blooming Grove Turnpike
New Windsor NY 10901

FILE: Vails Gate Fire Dept.vsdx

(APPARTATUS BAY 101 EQUIP)

BILL OF MATERIAL				
TAG	QTY	VENDOR	PART NO	DESCRIPTION
XM30 - 2-2	1	TRANE	X13651537010	XM30, 4 POINT UI/AO EXPANSION MODULE



B
50

TE - 17 SPACE TEMP LOCAL TEMPERATURE
1318
E 35
WHT
BLK
RED
UI/AO1
UI/AO2
UI/AO3
UI/AO4

XM30 - 2-2
SYSTEM CONTROLLED:
APPARTATUS BAY 101 EQUIP
LOCATION:
APPARTATUS BAY 101

IMC
VDC
24

THESE DRAWINGS ARE SCHEMATIC ONLY AND ARE NOT INTENDED TO SHOW ALL MECHANICAL AND ELECTRICAL REQUIREMENTS. CONSULT THE CONTRACT MECHANICAL AND ELECTRICAL DRAWINGS AS WELL AS EQUIPMENT SUBMITTAL INFORMATION FOR COMPLETE MECHANICAL AND ELECTRICAL REQUIREMENTS.

APPARTATUS BAY 101 EQUIP XM30 - 2-2 CONTROLLER

	NUM.	REVISION	DATE:	BY:
CID: 00107802				
PID: 00116358				
PROJECT: C109951				
SALESPERSON: J Schatz				
DESIGNED BY: M Livsey	2	Re-Submittal	8/16/2023	MCL
CHECKED BY:	1	Submittal	4/21/2023	MCL

Albany
301 Old Niskayuna Road, Suite 1
LATHAM, NY 12110
518-785-1315

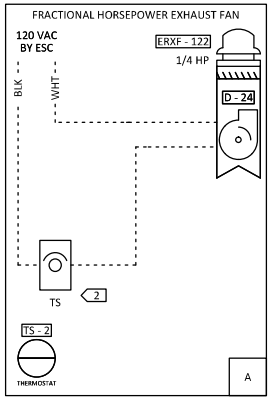
PROJECT: Vails Gate Fire District BAS

872 Blooming Grove Turnpike
New Windsor NY 10901

FILE: Vails Gate Fire Dept.vsdx

BILL OF MATERIAL				
TAG	QTY	VENDOR	PART NO	DESCRIPTION
VALVES / ACT	*	*	*	*SEE WATER VALVE SCHEDULE

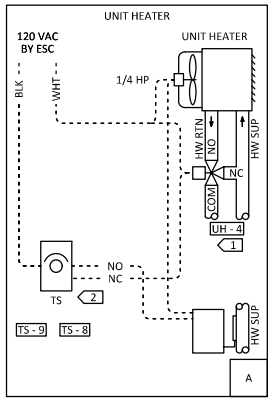
Exhaust Fan: ERXF – 122



Serves: Electrical Room 122
Sequence of Operation:
The units shall operate under stand–alone controls (thermostat) to maintain a space temperature below 80° F (adj.) Setpoint. When the space temperature rises above the setpoint, the fan shall be enabled and run continuously. When the space temperature drops below the setpoint the thermostat shall disable the exhaust fan.

Notes:
- This exhaust fan shall not be controlled or monitored by the BAS.
- Thermostat is a line voltage breaking power to the single phase fan.
- Unit is factory-supplied with a barometeric, 13" X 13", backdraft damper to be installed at the wall penetration. Damper will require a transition to the 6-inch round duct.

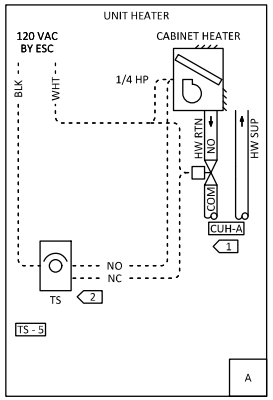
HW Unit Heater: UH – 4



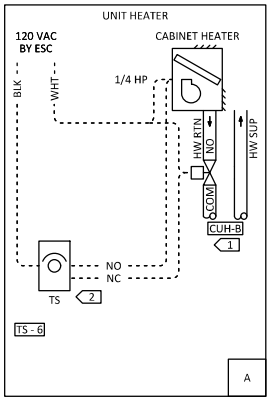
Serves: Apparatus Bay 101
Sequence of Operation:
The units shall operate under stand–alone controls (thermostat) to maintain a space temperature setpoint. When the space temperature drops below the setpoint, the fan shall be enabled and run continuously. When the space temperature rises above the setpoint the thermostat shall disable the fan.

Notes:
- These Unit Heaters shall not be controlled or monitored by the BAS.
- Thermostat is a factory-supplied, line voltage breaking power to the single phase fan.
- Unit is factory-supplied with an aquastat to lock out fan operation when the HW system is disabled.
- The valve is field-supplied with a 120 VAC NO/FO valve that will be controlled by the line voltage thermostat.
- Only UH – 4 shall have a 3 – way valve, other UHs will have 2-way valves.

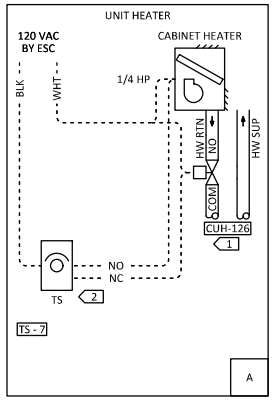
CUH – A
Serves: Stairwell "A"



CUH – B
Serves: Stairwell "B"



CUH – 126
Serves: Vestibule 126



Cabinet Unit Heaters (Typical)
Sequence of Operation:
The units shall operate under stand–alone controls (thermostat) to maintain a space temperature setpoint. When the space temperature drops below the setpoint, the fan shall be enabled and run continuously. When the space temperature rises above the setpoint the thermostat shall disable the fan.

Notes:
- These CUHs shall not be controlled or monitored by the BAS.
- Thermostat is line voltage.
- The valve is field-supplied with a 120 VAC NO/FO valve that will be controlled by the line voltage thermostat.

2 ALL THERMOSTATS TO BE INSTALLED AT 48" AFF PER NOTE # 13 ON MECHANICAL PRINT M7.01. CONFIRM LOCATION WITH THE PROJECT MANAGER.

1 VALVES ARE FIELD-PROVIDED, SEE VALVE SCHEDULE FOR DETAILS OF EACH VALVE. ALL OTHER END DEVICES ARE FACTORY SUPPLIED WITH THE EQUIPMENT.

ERXF-122, CUHS & UH - 4

	NUM.	REVISION	DATE:	BY:
CID: 00107802				
PID: 00116358				
PROJECT: C109951				
SALESPERSON: J Schatz				
DESIGNED BY: M Livsey	2	Re-Submittal	8/16/2023	MCL
CHECKED BY:	1	Submittal	4/21/2023	MCL

Albany
301 Old Niskayuna Road, Suite 1
LATHAM, NY 12110
518-785-1315

PROJECT: Vails Gate Fire District BAS

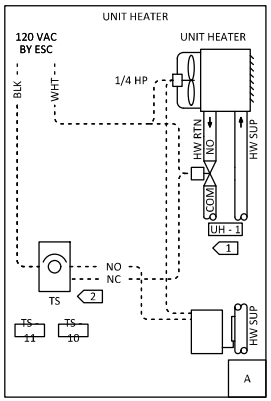
872 Blooming Grove Turnpike
New Windsor NY 10901

FILE: Vails Gate Fire Dept.vsdx

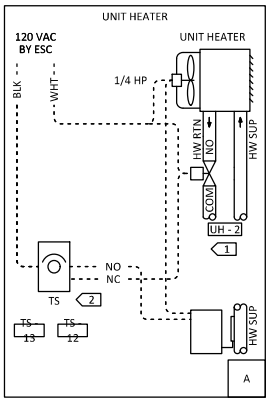
BILL OF MATERIAL				
TAG	QTY	VENDOR	PART NO	DESCRIPTION
VALVES / ACT	*	*	*	*SEE WATER VALVE SCHEDULE

APPARTATUS BAY
UNIT HEATERS

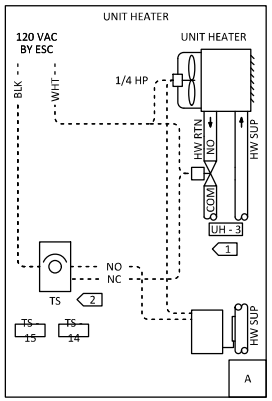
HW Unit Heater: UH – 1



HW Unit Heater: UH – 2



HW Unit Heater: UH – 3



Serves: Apparatus Bay 101

Sequence of Operation:

The units shall operate under stand–alone controls (thermostat) to maintain a space temperature setpoint. When the space temperature drops below the setpoint, the fan shall be enabled and run continuously. When the space temperature rises above the setpoint the thermostat shall disable the fan.

Notes:

- These Unit Heaters shall not be controlled or monitored by the BAS.
- Thermostat is a factory-supplied, line voltage, breaking power to the single phase fan.
- Unit is factory-supplied with an aquastat to lock out fan operation when the HW system is disabled.
- The valve is field-supplied with a 120 VAC NO/FO valve that will be controlled by the line voltage thermostat.
- Only UH – 4 shall have a 3 – way valve, other UHs will have 2-way valves.

2 ALL THERMOSTATS TO BE INSTALLED AT 48" AFF PER NOTE # 13 ON MECHANICAL PRINT M7.01. CONFIRM LOCATION WITH THE PROJECT MANAGER.

1 VALVES ARE FIELD-PROVIDED, SEE VALVE SCHEDULE FOR DETAILS OF EACH VALVE. ALL OTHER END DEVICES ARE FACTORY SUPPLIED WITH THE EQUIPMENT.

UNIT HEATERS UH - 1 , 2 & 3

	NUM.	REVISION	DATE:	BY:
CID: 00107802				
PID: 00116358				
PROJECT: C109951				
SALESPERSON: J Schatz				
DESIGNED BY: M Livsey	2	Re-Submittal	8/16/2023	MCL
CHECKED BY:	1	Submittal	4/21/2023	MCL

TRANE
Albany
301 Old Niskayuna Road, Suite 1
LATHAM, NY 12110
518-785-1315

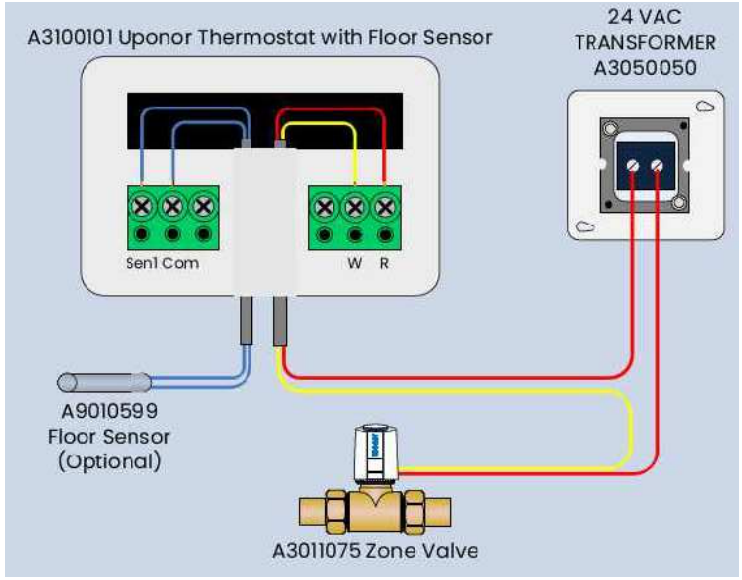
PROJECT: Vails Gate Fire District BAS

872 Blooming Grove Turnpike
New Windsor NY 10901

FILE: Vails Gate Fire Dept.vsdx

BILL OF MATERIAL				
TAG	QTY	VENDOR	PART NO	DESCRIPTION

RADIANT HEAT FLOOR ZONE CONTROLLERS



Serves: 1st Floor Radiant Heating Zones (Typical of 7X)

Sequence of Operation:

The units shall operate under stand–alone controls (thermostat) to maintain a space temperature setpoint and will not be connected to the BAS. The units shall run continuously whenever the HW system is enabled, to maintain a space temperature setpoint of 70° F (adj.). When the space temperature drops below the setpoint, the fan shall be enabled and run continuously. When the space temperature rises above the setpoint the thermostat shall disable the fan.

Notes:

- Each of the (7X) zones shall come with a control valve, thermostat, 24 VAC transformer and a floor (slab) sensor. All will be Factory–provided, field–installed. See wiring diagram on this page.
- These Zones shall not be controlled or monitored by the BAS.

TRANE

RADIANT FLOOR ZONE CONTROLLERS				
CID: 00107802	NUM.	REVISION	DATE:	BY:
PID: 00116358				
PROJECT: C109951				
SALESPERSON: J Schatz				
DESIGNED BY: M Livsey	2	Re-Submittal	8/16/2023	MCL
CHECKED BY:	1	Submittal	4/21/2023	MCL

Albany
301 Old Niskayuna Road, Suite 1
LATHAM, NY 12110
518-785-1315

PROJECT: Vails Gate Fire District BAS

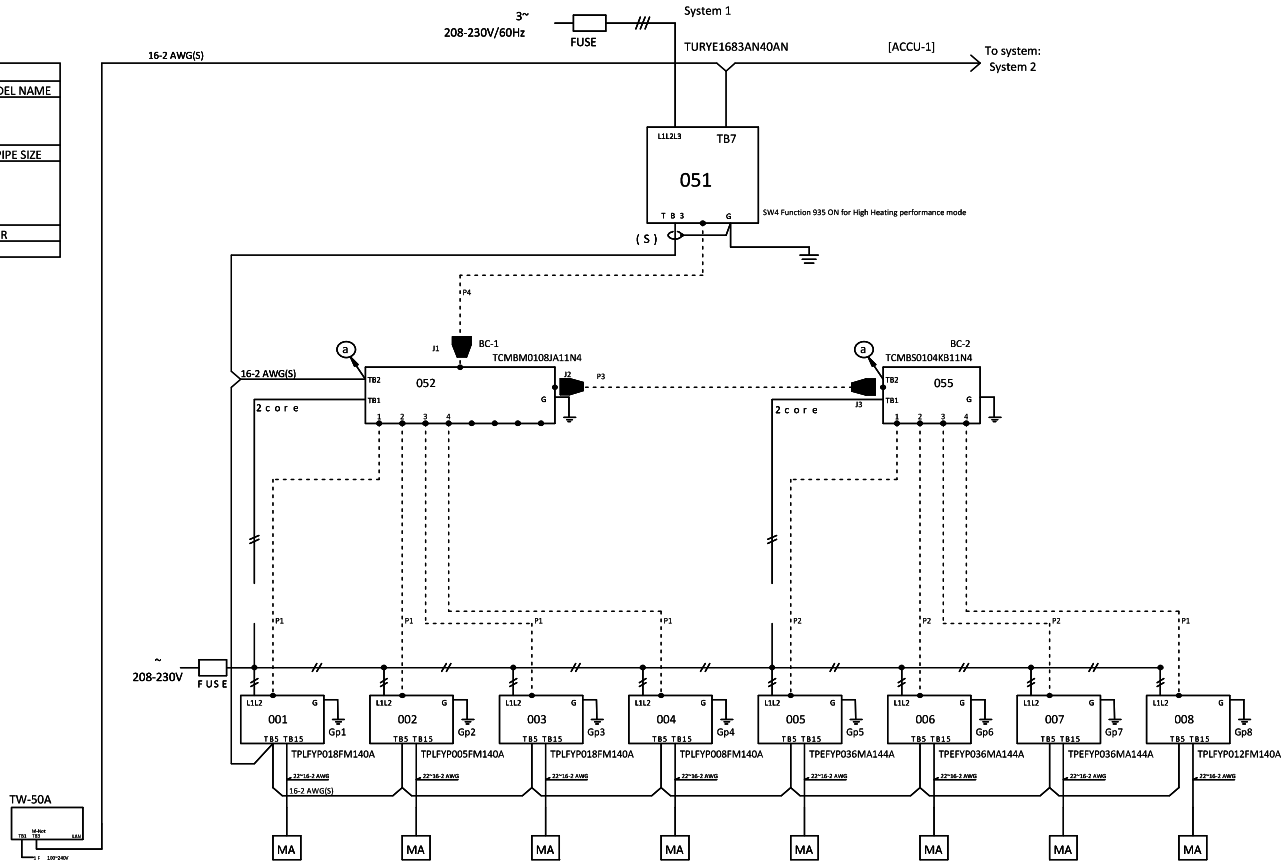
872 Blooming Grove Turnpike
New Windsor NY 10901

FILE: Vails Gate Fire Dept.vsdx

(VRF SYS 1)

BILL OF MATERIAL				
TAG	QTY	VENDOR	PART NO	DESCRIPTION

PIPING AND CONTROLS	
SYMBOL	BRANCH PIPE MODEL NAME
J1	CMY-R302S-G1
J2	CMY-R303S-G1
J3	CMY-R306S-G
SYMBOL	LIQUID PIPE/GAS PIPE SIZE
P1	1/4 / 1/2
P2	3/8 / 5/8
P3	1/2 / 3/4 / 1-1/8
P4	7/8 / 1-1/8
SYMBOL	MODEL NUMBER
MA	TAR-CT01MAU-SB



MITSUBISHI VRF

DIAGRAM SYMBOL LEGEND	
DISPLAY	DESCRIPTION
——//	POWER WIRE
———	CONTROL WIRE
- - - - -	REF. PIPE

EU-102 | EU-114 | EU-118 | EU-120 ① | 116-1 | 116-2 | 116-3 ① | EU-125A

REMARKS
Comments:

① REFER TO PAGE 46 FOR WIRING DETAILS OF THE 2ND STAGE FTR HEAT FOR THE UNIT.

Diamond System Builder
sw: 4.5.1.1
db: 4.5.0.15
4/14/2023
12:33 PM

VRF SYS 1 CONTROLLER

	NUM.	REVISION	DATE:	BY:
CID: 00107802				
PID: 00116358				
PROJECT: C109951				
SALESPERSON: J Schatz				
DESIGNED BY: M Livsey	2	Re-Submittal	8/16/2023	MCL
CHECKED BY:	1	Submittal	4/21/2023	MCL

Albany
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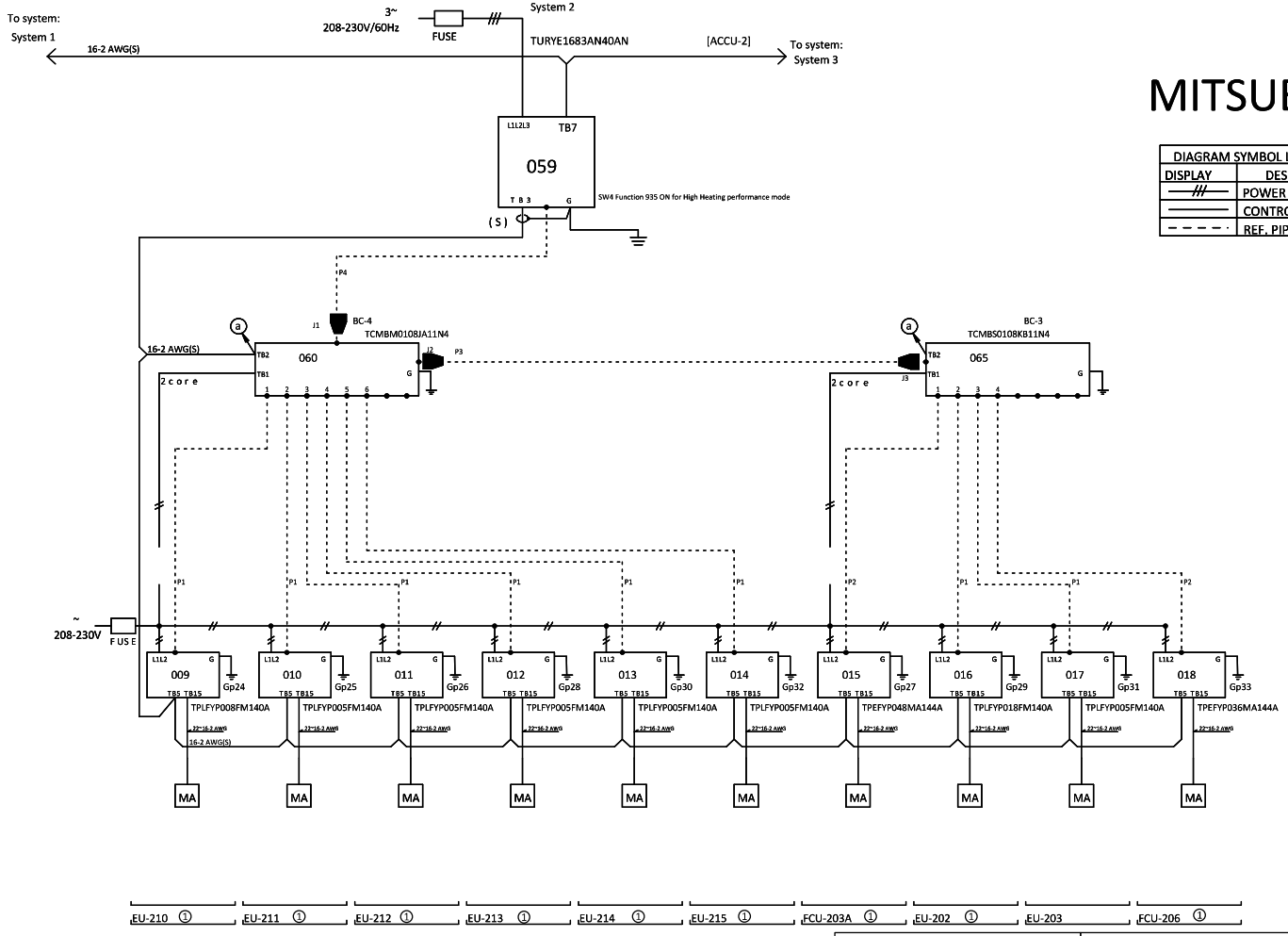
PROJECT: Vails Gate Fire District BAS
872 Blooming Grove Turnpike
New Windsor NY 10901

FILE: Vails Gate Fire Dept.vsdx

(VRF SYS 2)

BILL OF MATERIAL				
TAG	QTY	VENDOR	PART NO	DESCRIPTION

PIPING AND CONTROLS	
SYMBOL	BRANCH PIPE MODEL NAME
J1	CMY-R302S-G1
J2	CMY-R303S-G1
J3	CMY-R306S-G
SYMBOL	LIQUID PIPE/GAS PIPE SIZE
P1	1/4 / 1/2
P2	3/8 / 5/8
P3	3/8 / 3/4 / 7/8
P4	7/8 / 1-1/8
SYMBOL	MODEL NUMBER
MA	TAR-CT01MAU-SB



MITSUBISHI VRF

DIAGRAM SYMBOL LEGEND	
DISPLAY	DESCRIPTION
///	POWER WIRE
———	CONTROL WIRE
- - - -	REF. PIPE

EU-210 ① EU-211 ① EU-212 ① EU-213 ① EU-214 ① EU-215 ① FCU-203A ① EU-202 ① EU-203 FCU-206 ①

① REFER TO PAGE 46 FOR WIRING DETAILS OF THE 2ND STAGE FTR HEAT FOR THE UNIT.

Diamond System Builder
sw: 4.5.1.1
db: 4.5.0.15
4/14/2023
12:33 PM

TRANE

VRF SYS 2 CONTROLLER

CID: 00107802	NUM.	REVISION	DATE:	BY:
PID: 00116358				
PROJECT: C109951				
SALESPERSON: J Schatz				
DESIGNED BY: M Livsey	2	Re-Submittal	8/16/2023	MCL
CHECKED BY:	1	Submittal	4/21/2023	MCL

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PROJECT: Vails Gate Fire District BAS
872 Blooming Grove Turnpike
New Windsor NY 10901

FILE: Vails Gate Fire Dept.vsdx

(VRF SYS 3)

BILL OF MATERIAL				
TAG	QTY	VENDOR	PART NO	DESCRIPTION

MITSUBISHI VRF

PIPING AND CONTROLS
SYMBOL LIQUID PIPE/GAS PIPE SIZE
P1 1/4 / 1/2
SYMBOL MODEL NUMBER
MA TAR-CT01MAU-SB

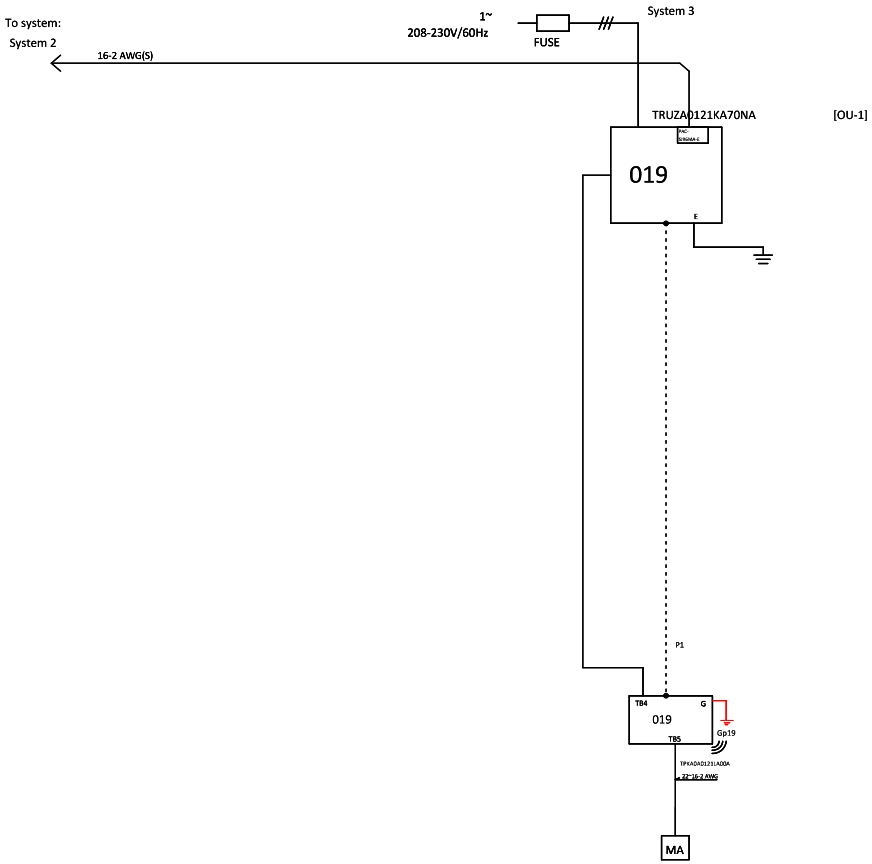

DIAGRAM SYMBOL LEGEND	
DISPLAY	DESCRIPTION
——//——	POWER WIRE
————	CONTROL WIRE
- - - - -	REF. PIPE

Diamond System Builder
sw: 4.5.1.1
db: 4.5.0.15
4/14/2023
12:33 PM

REMARKS
Comments:

THESE DRAWINGS ARE SCHEMATIC ONLY AND ARE NOT INTENDED TO SHOW ALL MECHANICAL AND ELECTRICAL REQUIREMENTS. CONSULT THE CONTRACT MECHANICAL AND ELECTRICAL DRAWINGS AS WELL AS EQUIPMENT SUBMITTAL INFORMATION FOR COMPLETE MECHANICAL AND ELECTRICAL REQUIREMENTS.

TRANE

VRF SYS 3 VRF - 3 CONTROLLER

CID: 00107802	NUM.	REVISION	DATE:	BY:
PID: 00116358				
PROJECT: C109951				
SALESPERSON: J Schatz				
DESIGNED BY: M Livsey	2	Re-Submittal	8/16/2023	MCL
CHECKED BY:	1	Submittal	4/21/2023	MCL

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518-785-1315

PROJECT: Vails Gate Fire District BAS
872 Blooming Grove Turnpike
New Windsor NY 10901

FILE: Vails Gate Fire Dept.vsdx

BILL OF MATERIAL				
TAG	QTY	VENDOR	PART NO	DESCRIPTION
TX - 11	11	KELE	TR50VA009	XFMR, 120/208/240:24VAC, 50VA, CB
R - 22	11	SENVA	PRU1C	SPDT RELAY
VALVES / ACT	*	*	*	*SEE WATER VALVE SCHEDULE

Fin Tube Radiation Control Valve Wiring

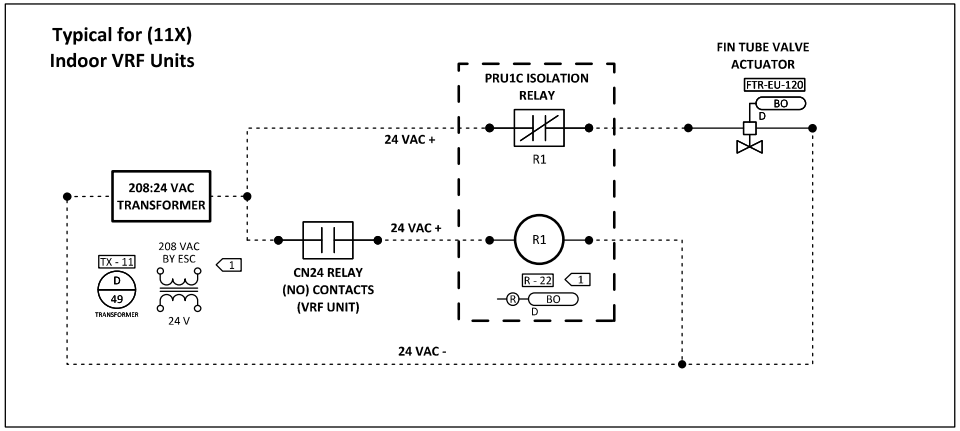
The following indoor VRF units will have hot water heat as a second stage of heating. This will be a 2-position valve controlled by the indoor VRF unit via the auxiliary "CN24 Relay Kit". This kit provides a single dry contact, which will control 24 VAC power to the FTR valve actuator which is NO/FO.

Ceiling Cassette Style:

- EU – 120
- EU – 202
- EU – 210
- EU – 211
- EU – 212
- EU – 213
- EU – 214
- EU – 215

Ducted FCU Style:

- FCU – 116 – 3
- FCU – 203A
- FCU – 206



1 INSTALL TRANSFORMER AND CONTROL RELAY NEAR THE INDOOR VRF UNIT.

THESE DRAWINGS ARE SCHEMATIC ONLY AND ARE NOT INTENDED TO SHOW ALL MECHANICAL AND ELECTRICAL REQUIREMENTS. CONSULT THE CONTRACT MECHANICAL AND ELECTRICAL DRAWINGS AS WELL AS EQUIPMENT SUBMITTAL INFORMATION FOR COMPLETE MECHANICAL AND ELECTRICAL REQUIREMENTS.

VRF HW FIN TUBE 2ND STG HEAT

	NUM.	REVISION	DATE:	BY:
CID: 00107802				
PID: 00116358				
PROJECT: C109951				
SALESPERSON: J Schatz				
DESIGNED BY: M Livsey	2	Re-Submittal	8/16/2023	MCL
CHECKED BY:	1	Submittal	4/21/2023	MCL

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301 Old Niskayuna Road, Suite 1
LATHAM, NY 12110
518-785-1315

PROJECT: Vails Gate Fire District BAS

872 Blooming Grove Turnpike
New Windsor NY 10901

FILE: Vails Gate Fire Dept.vsdx

WATER VALVE SCHEDULE

ITEM	TAG	SYSTEM	SERVICE	LINE SIZE (IN)	FLOW RATE (GPM)	DESIGN ΔP (PSI)	TARGET Cv	NOMINAL VALVE Cv	ACTUAL ΔP (PSI)	VALVE SIZE (IN)	TOTAL P PRESS (PSI)	MAX. VAL. CLS-OFF (PSI)	FAIL CONFIG	CONTROL SIGNAL	VALVE TYPE	CONNECT	FLOW PATTERN	SUPPLY POWER	VENDOR	BODY + ACTUATOR PART NUMBER	NOTES
1	DOAS-1 HW	DOAS - 1	DOAS HEAT	2	18.10	4	9	10	3.3	1.25		200	NO FO A TO AB	PROP	CCV/BALL	NPT	3-WAY	24 VAC/VDC	BELIMO	B329 + AFRB24-SR	
2	CUH-126	ERXF-122 EX FAN-1	CABINET UNIT HEATER	0.75	1.50	4	0.8	1.2	1.6	0.50		75	NO	ON/OFF	QCV ZONE	NPT	2-WAY	100-240 VAC	BELIMO	Z2050Q-J + CQKBUP-LL	SET ACTUATOR END STOP TO POSITION "3".
3	CUH-A	ERXF-122 EX FAN-1	CABINET UNIT HEATER	0.75	1.50	4	0.8	1.2	1.6	0.50		75	NO	ON/OFF	QCV ZONE	NPT	2-WAY	100-240 VAC	BELIMO	Z2050Q-J + CQKBUP-LL	SET ACTUATOR END STOP TO POSITION "3".
4	CUH-B	ERXF-122 EX FAN-1	CABINET UNIT HEATER	0.75	1.50	4	0.8	1.2	1.6	0.50		75	NO	ON/OFF	QCV ZONE	NPT	2-WAY	100-240 VAC	BELIMO	Z2050Q-J + CQKBUP-LL	SET ACTUATOR END STOP TO POSITION "3".
5	UH - 4	ERXF-122 EX FAN-1	UNIT HEATER-4	1	4.80	4	2.4	4.7	1	0.75		200	NO FO A TO AB	ON/OFF	CCV/BALL	NPT	3-WAY	100-240 VAC	BELIMO	B317B + TFRB120	
6	RAD FLR	HW SYSTEM	RADIANT FLOOR MIXING VALVE	2	70	4	35	37	3.6	2		200	NO B TO AB	PROP	CCV/BALL	NPT	3-WAY	24 VAC/VDC	BELIMO	B348 + AFRB24-SR	VALVE WILL FAIL TO THE BYPASS POSITION.
7	UH - 1	UNIT HEATERS UH - 1 , 2 & 3-1	UNIT HEATER	1	4.80	4	2.4	4.7	1	0.75		200	NO	ON/OFF	CCV/BALL	NPT	2-WAY	100-240 VAC	BELIMO	B217B + TFRB120	
8	UH - 2	UNIT HEATERS UH - 1 , 2 & 3-1	UNIT HEATER	1	4.80	4	2.4	4.7	1	0.75		200	NO	ON/OFF	CCV/BALL	NPT	2-WAY	100-240 VAC	BELIMO	B217B + TFRB120	
9	UH - 3	UNIT HEATERS UH - 1 , 2 & 3-1	UNIT HEATER	1	4.80	4	2.4	4.7	1	0.75		200	NO	ON/OFF	CCV/BALL	NPT	2-WAY	100-240 VAC	BELIMO	B217B + TFRB120	
10	FTR-EU-120	VRF HW FIN TUBE 2ND STG HEAT-1	VRF FTR HEAT	0.75	2.50	4	1.2	5.9	0.2	0.50		75	NO	ON/OFF	QCV ZONE	NPT	2-WAY	24 VAC/VDC	BELIMO	Z2050Q-J + CQKB24-LL	SET ACTUATOR END STOP TO POSITION "3".
11	FTR-EU-202	VRF HW FIN TUBE 2ND STG HEAT-1	VRF FTR HEAT	0.75	2.50	4	1.2	5.9	0.2	0.50		75	NO	ON/OFF	QCV ZONE	NPT	2-WAY	24 VAC/VDC	BELIMO	Z2050Q-J + CQKB24-LL	SET ACTUATOR END STOP TO POSITION "3".
12	FTR-EU-210	VRF HW FIN TUBE 2ND STG HEAT-1	VRF FTR HEAT	0.75	2.50	4	1.2	5.9	0.2	0.50		75	NO	ON/OFF	QCV ZONE	NPT	2-WAY	24 VAC/VDC	BELIMO	Z2050Q-J + CQKB24-LL	SET ACTUATOR END STOP TO POSITION "3".
13	FTR-EU-211	VRF HW FIN TUBE 2ND STG HEAT-1	VRF FTR HEAT	0.75	2.50	4	1.2	5.9	0.2	0.50		75	NO	ON/OFF	QCV ZONE	NPT	2-WAY	24 VAC/VDC	BELIMO	Z2050Q-J + CQKB24-LL	SET ACTUATOR END STOP TO POSITION "3".
14	FTR-EU-212	VRF HW FIN TUBE 2ND STG HEAT-1	VRF FTR HEAT	0.75	2.50	4	1.2	5.9	0.2	0.50		75	NO	ON/OFF	QCV ZONE	NPT	2-WAY	24 VAC/VDC	BELIMO	Z2050Q-J + CQKB24-LL	SET ACTUATOR END STOP TO POSITION "3".
15	FTR-EU-213	VRF HW FIN TUBE 2ND STG HEAT-1	VRF FTR HEAT	0.75	2.50	4	1.2	5.9	0.2	0.50		75	NO	ON/OFF	QCV ZONE	NPT	2-WAY	24 VAC/VDC	BELIMO	Z2050Q-J + CQKB24-LL	SET ACTUATOR END STOP TO POSITION "3".
16	FTR-EU-214	VRF HW FIN TUBE 2ND STG HEAT-1	VRF FTR HEAT	0.75	2.50	4	1.2	5.9	0.2	0.50		75	NO	ON/OFF	QCV ZONE	NPT	2-WAY	24 VAC/VDC	BELIMO	Z2050Q-J + CQKB24-LL	SET ACTUATOR END STOP TO POSITION "3".
17	FTR-EU-215	VRF HW FIN TUBE 2ND STG HEAT-1	VRF FTR HEAT	0.75	2.50	4	1.2	5.9	0.2	0.50		75	NO	ON/OFF	QCV ZONE	NPT	2-WAY	24 VAC/VDC	BELIMO	Z2050Q-J + CQKB24-LL	SET ACTUATOR END STOP TO POSITION "3".
18	FTR-FCU-116-3	VRF HW FIN TUBE 2ND STG HEAT-1	VRF FTR HEAT	0.75	2.50	4	1.2	5.9	0.2	0.50		75	NO	ON/OFF	QCV ZONE	NPT	2-WAY	24 VAC/VDC	BELIMO	Z2050Q-J + CQKB24-LL	SET ACTUATOR END STOP TO POSITION "3".
19	FTR-FCU-203A	VRF HW FIN TUBE 2ND STG HEAT-1	VRF FTR HEAT	0.75	2.50	4	1.2	5.9	0.2	0.50		75	NO	ON/OFF	QCV ZONE	NPT	2-WAY	24 VAC/VDC	BELIMO	Z2050Q-J + CQKB24-LL	SET ACTUATOR END STOP TO POSITION "3".
20	FTR-FCU-206	VRF HW FIN TUBE 2ND STG HEAT-1	VRF FTR HEAT	0.75	2.50	4	1.2	5.9	0.2	0.50		75	NO	ON/OFF	QCV ZONE	NPT	2-WAY	24 VAC/VDC	BELIMO	Z2050Q-J + CQKB24-LL	SET ACTUATOR END STOP TO POSITION "3".

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TRANE

WATER VALVE SCHEDULE

CID: 00107802	NUM.	REVISION	DATE:	BY:
PID: 00116358				
PROJECT:				
SALESPERSON: J Schatz				
DESIGNED BY: M Livsey				
CHECKED BY:	1	Submittal		MCL

Albany
301 Old Niskayuna Road, Suite 1
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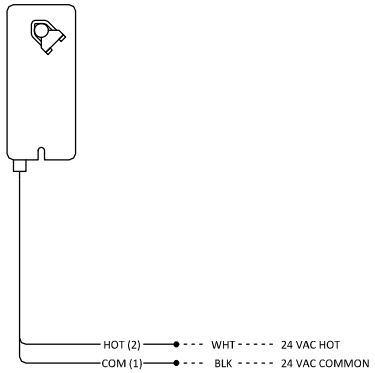
FILE: Vails Gate Fire Dept.vsdx

ACT, ON/OFF, 24 VAC, EFS, NO/FO

BELIMO

CQKB24-LL

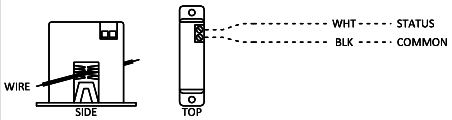


A

CUR SW, 0.45-50A, SPLIT, NO, PRE-SET

SENVA

C-2320L

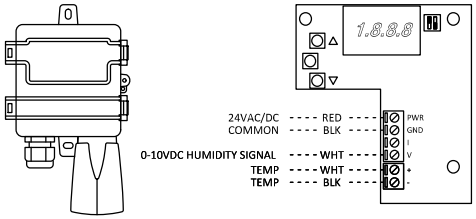


B

2% OSA RH, THERMISTOR, DISPLAY

SENVA

HT1O-2EUD

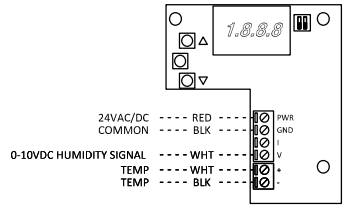


C

HUMIDITY SENS, DUCT, 2%, TEMP, DISPLAY

SENVA

HT1D-2EUD

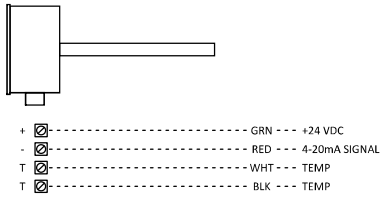


D

SENSOR DUCT RH +/- 3% AND TEMP

TRANE

4190-7020

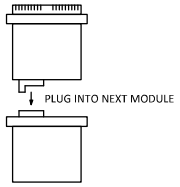


E

HORN, TOWER, 24 VAC/DC

KELE

TWS-A-GN

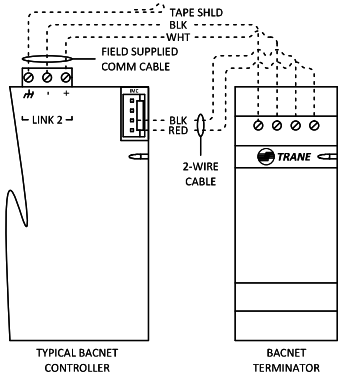


F

TRACER BACNET TERMINATOR (2/PKG)

TRANE

X13651524-01

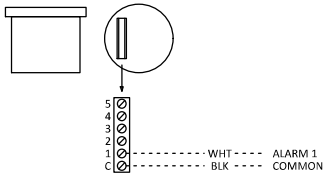


G

TOWER BOTTOM MODULE

KELE

TWS-BC



H

THESE DRAWINGS ARE SCHEMATIC ONLY AND ARE NOT INTENDED TO SHOW ALL MECHANICAL AND ELECTRICAL REQUIREMENTS. CONSULT THE CONTRACT MECHANICAL AND ELECTRICAL DRAWINGS AS WELL AS EQUIPMENT SUBMITTAL INFORMATION FOR COMPLETE MECHANICAL AND ELECTRICAL REQUIREMENTS.

TRANE

DETAIL SHEET

CID: 00107802	NUM.	REVISION	DATE:	BY:
PID: 00116358				
PROJECT: C109951				
SALESPERSON: J Schatz				
DESIGNED BY: M Livsey	2	Re-Submittal	8/16/2023	MCL
CHECKED BY:	1	Submittal	4/21/2023	MCL

Albany
301 Old Niskayuna Road, Suite 1
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518-785-1315

PROJECT: Vails Gate Fire District BAS

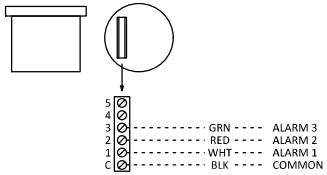
872 Blooming Grove Turnpike
New Windsor NY 10901

FILE: Vails Gate Fire Dept.vsdx

TOWER BOTTOM MODULE

KELE

TWS-BC

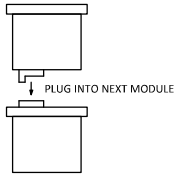


A

TOWER, FLASHG LED, RED, 24 VAC

KELE

TWS-LL3-G

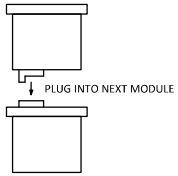


B

TOWER, FLASHG LED, YELLOW, 24 VAC

KELE

TWS-LL5-G

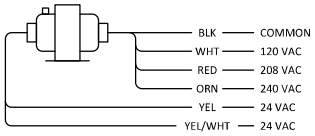


C

TRANSFORMER, 120/208/240:24, 50VA, CKT BRK

KELE

TR50VA009

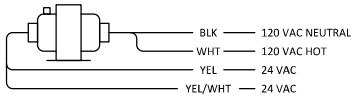


D

TRANSFORMER, 120:24, 96VA, CKT BKR

KELE

TR100VA002

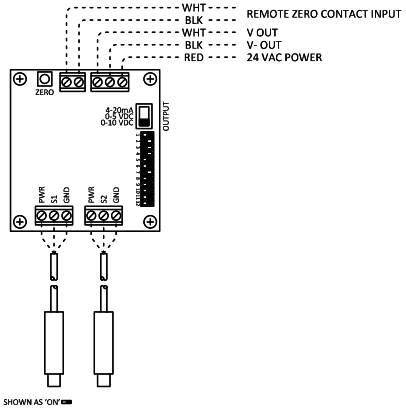


E

CONFIG DIFF PRES SENSOR

SENVA

PW30M-C

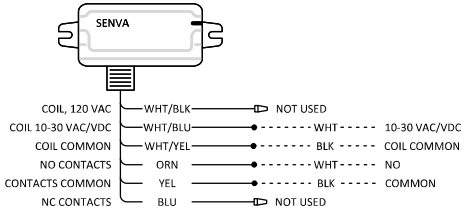


F

SPDT RELAY

SENVA

PR2401B

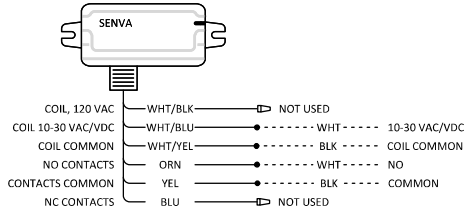


G

SPDT RELAY

SENVA

PRU1C



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TRANE

DETAIL SHEET 2

CID: 00107802	NUM.	REVISION	DATE:	BY:
PID: 00116358				
PROJECT: C109951				
SALESPERSON: J Schatz				
DESIGNED BY: M Livsey	2	Re-Submittal	8/16/2023	MCL
CHECKED BY:	1	Submittal	4/21/2023	MCL

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518-785-1315

PROJECT: Vails Gate Fire District BAS

872 Blooming Grove Turnpike
New Windsor NY 10901

FILE: Vails Gate Fire Dept.vsdx

SENSOR TEMP 4" IMMERSION 10K OHM THERM

ACI

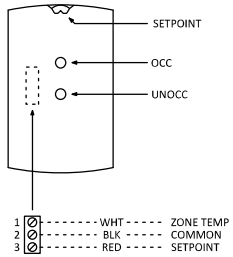
A/CP-I-4"-GD

A

ZONE SENSOR THERM + SETPOINT + OCC/UNOC

TRANE

X1351152701

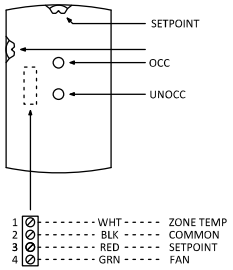


B

ZONE SENSOR THERM + SETPOINT + OCC/UNOC + 5 POS. FAN

TRANE

X1379084801



C

DETAIL SHEET 3

CID: 00107802	NUM.	REVISION	DATE:	BY:
PID: 00116358				
PROJECT: C109951				
SALESPERSON: J Schatz				
DESIGNED BY: M Livsey	2	Re-Submittal	8/16/2023	MCL
CHECKED BY:	1	Submittal	4/21/2023	MCL

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518-785-1315

PROJECT: Vails Gate Fire District BAS

872 Blooming Grove Turnpike
New Windsor NY 10901

FILE: Vails Gate Fire Dept.vsdx

BILL OF MATERIAL (1 of 2)				
TAG PREFIX	QTY	VENDOR	PART NO	DESCRIPTION
SFT	1	TRANE	BMCF000AAA0BI00	TRANE/MITSUBISHI VRF LICENSE
SFT	3	TRANE	BMCF000AAA0DB00	TRACER SC 15 LICENSE
UC600	3	TRANE	BMUC600AAA0100011	UC600 CONTROLLER, DIN RAIL MOUNT
OD	2	TRANE	X05010511010	OPTIONAL VESA MOUNT
TE	2	TRANE	X1351152701	TEMP SENS, ZONE THERM O/U SP
TBT	2	TRANE	X13651524-01	BACNET TERMINATOR (2 PACK)
XM30	1	TRANE	X13651537010	XM30, 4 POINT UI/AO EXPANSION MODULE
XM32	3	TRANE	X13651563010	XM32, 4 POINT BO EXPANSION MODULE
XM70	2	TRANE	X13651568010	XM70, 19 POINT EXPANSION MODULE
OD	2	TRANE	X13651571010	UC600 TD7 COLOR DISPLAY
SC	1	TRANE	X13651695001	TRACER SC+ CONTROLLER
TE	5	ACI	A/CP-I-4"-GD	TEMP SENS, IMM, THERM, 4 IN
SW	2	KELE	93502	MECHANICAL TIMER SWITCH, 30 MINUTE, WALL-MOUNT
HDW	5	KELE	BAM-1000	DIN RAIL, AL , 39.4 IN
SW	1	KELE	EIBA5-100T	5-PORT, UNMANAGED ETHERNET SWITCH, 24 VAC/DC, PANEL-MOUNT
SW	1	KELE	ESM-M1S-PP0-BS	EMERGENCY OPERATOR STATION, 1-NO, 1-NC CONTACTS, "BOILER SHUT-DOWN" LABEL, WALL-MOUNT, NEMA-1 METAL ENC
ENC	1	KELE	NSTA2018VA100-GY	KELE INSTA-PANEL SMALL ENCLOSURE, NEMA 1, 20" X 18", GRAY
ENC	1	KELE	NSTA2620VA200-GY	KELE INSTA-PANEL MEDIUM ENCLOSURE, NEMA 1, 26" X 20", GRAY
ENC	1	KELE	NSTA3626VA300-GY	KELE INSTA-PANEL LARGE ENCLOSURE, NEMA 1, 36" X 26", GRAY
TC	1	KELE	TCCC-111	THERMAL COMPOUND, 111 ML
TX	3	KELE	TR100VA002	XFMR, 120:24VAC, 100VA, CB
TX	11	KELE	TR50VA009	XFMR, 120/208/240:24VAC, 50VA, CB
ALM	8	KELE	TWS-A-GN	HORN, TOWER, 24 VAC
ALM	8	KELE	TWS-BC	TOWER BOTTOM MODULE
ALM	8	KELE	TWS-BP1	TOWER, SINGLE WALL BASE MOUNT
ALM	8	KELE	TWS-LL3-G	TOWER, FLASHG LED, RED, 24 VAC
ALM	8	KELE	TWS-LL5-G	TOWER, FLASHG LED, YELLOW, 24 VAC
HDW	1	KELE	VD1-3W	WIRE DUCT, 1"W X 3"H, 6.5'L, WHITE W/COVER
WEL	5	KELE	WEL-S	WELL,3.25 IN X 0.125 IN FPT X 0.5 IN MPT, SS
CS	10	SENVA	C-2320L	CUR SW, PRE-SET, 0.45-50A, SPLIT, NO
TEH	1	SENVA	HT1D-2EUD	HUMIDITY SENS, DUCT, 2%, TEMP, DISPLAY
TEH	1	SENVA	HT1O-2EUD	HUMIDITY SENS, OA, 2%, DISPLAY
R	3	SENVA	PR2401B	SPDT RELAY
R	34	SENVA	PRU1C	SPDT RELAY
DPT	3	SENVA	PW30M-C	DIFF PRESS XMTR, METAL ENC, WTR, 0-5 VDC/0-10 VDC/ 4-20 MA, LCD
VAL	6	SENVA	PWBV	OPTIONAL SERVICE VALVE
SEN	6	SENVA	PWT100	SENSOR, 100 PSI
IAQ	1	SENVA	TGM-ACM-A	IAQ SENS, CO & CH4, WALL, LCD, METAL ENCLOSURE, NEMA-1

BILL OF MATERIAL (2 of 2)				
TAG PREFIX	QTY	VENDOR	PART NO	DESCRIPTION
CO	8	SENVA	TGM-ACN-A	IAQ SENS, CO & NO2, WALL, LCD, METAL ENCLOSURE, NEMA-1
VALVES / ACT	*	*	*	*SEE WATER VALVE SCHEDULE

BILL OF MATERIALS

CID: 00107802	NUM.	REVISION	DATE:	BY:
PID: 00116358				
PROJECT: C109951				
SALESPERSON: J Schatz				
DESIGNED BY: M Livsey	2	Re-Submittal	8/16/2023	MCL
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Albany
301 Old Niskayuna Road, Suite 1
LATHAM, NY 12110
518-785-1315

PROJECT: Vails Gate Fire District BAS

872 Blooming Grove Turnpike
New Windsor NY 10901

FILE: Vails Gate Fire Dept.vsdx

Datasheet Index

The following is a list of datasheets included in this submittal in the order that they appear.

Installation Instructions

Tracer® BACnet® Terminator

Ordering Number: X13651524-01

Packaged Contents:

- Two (2) Tracer BACnet terminators
- Two (2) wire cables with power connectors
- One (1) copy of the installation instructions

⚠ SAFETY WARNING

Only qualified personnel should install and service the equipment. The installation, starting up, and servicing of heating, ventilating, and air-conditioning equipment can be hazardous and requires specific knowledge and training. Improperly installed, adjusted or altered equipment by an unqualified person could result in death or serious injury. When working on the equipment, observe all precautions in the literature and on the tags, stickers, and labels that are attached to the equipment.

September 2020 **BAS-SVN214E-EN**

1

Warnings, Cautions, and Notices

Read this manual thoroughly before operating or servicing this unit. Safety advisories appear throughout this manual as required. Your personal safety and the proper operation of this machine depend upon the strict observance of these precautions.

The three types of advisories are defined as follows:

⚠ WARNING	Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.
⚠ CAUTION	Indicates a potentially hazardous situation which, if not avoided, could result in minor or moderate injury. It could also be used to alert against unsafe practices.
NOTICE	Indicates a situation that could result in equipment or property-damage only accidents.

BACnet Wiring Guidelines

- Use 18 AWG, 24 pF/ft, communication wire (Trane purple wire).
- BACnet wiring must use daisy-chain configuration.
- Maximum length is 4,000 ft (1219 m).
- Maintain polarity across the BACnet communication link.
- Limit each link to 60 controllers or 120 total controllers per Tracer SC.
- All Tracer SC BACnet links must be properly terminated; use a BACnet terminator at each end of the link.

Note: *Trane devices operate on BACnet MS/TP (Master Slave/Token Passing) communication links. MS/TP is a type of local area network. It is wired using shielded twisted pair wire.*

BACnet Link Configuration and Power Wiring

The Tracer BACnet terminator is a powered device that must be connected to either 24 Vac or 24 Vdc power.

Figure 1 llustrates valid daisy-chain configurations and Tracer BACnet terminator locations. Figure 2 illustrates the most common application, which is connecting to the IMC bus to power the module. Wire cables are supplied for this application.

Note: *Refer to the label on the Tracer BACnet terminator for power requirements when connecting the Tracer BACnet terminator to non-Trane devices.*

2

Communication Wiring

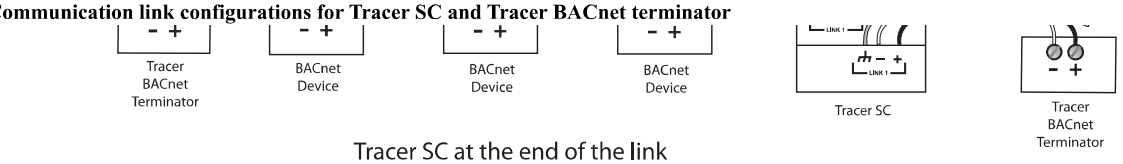
Follow these guidelines when installing communication wiring:

- The communication wire shield must be connected to the ground terminal of the link termination block at the Tracer SC. The Tracer SC provides the ground for the BACnet link.
- It is best practice to tape back the shield conductor at the terminator and each end of the link as illustrated in Figure 1.

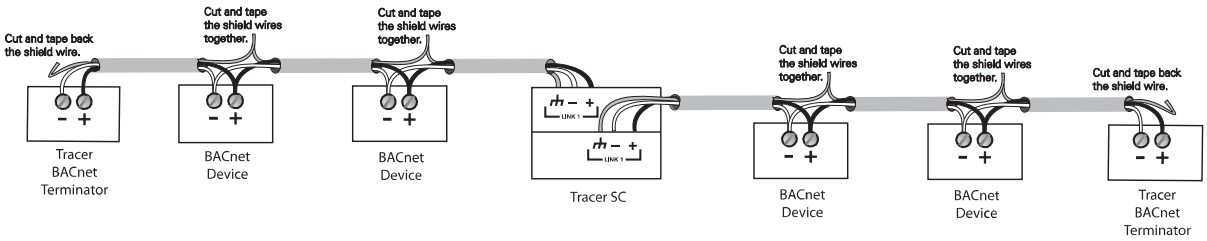
Important: *Never connect the shield conductor to ground at the Tracer BACnet terminator.*

- Tie shield conductors together and tape back at each BACnet device between the Tracer SC and the BACnet terminator.
- BACnet communication wiring can be terminated on LINK 1 or LINK 2 on the Tracer SC.

Figure 1. Communication link configurations for Tracer SC and Tracer BACnet terminator



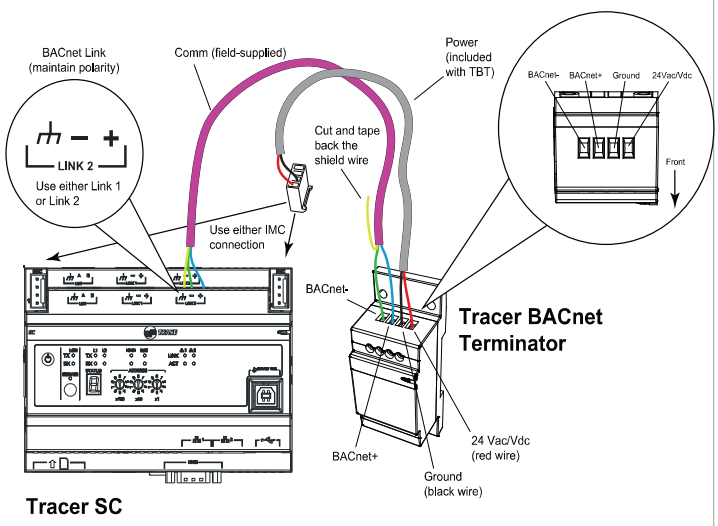
Tracer SC at the end of the link



Tracer SC in the middle of the link

4

Figure 2. Tracer BACnet terminator connected to a Tracer SC



Note: *If an IMC terminal is not available when connecting to a BACnet device, it may be necessary to install a 24 Vac power supply or run power from another 24 Vac or 24 Vdc source.*

5

Installation Options

The Tracer BACnet terminator can be installed onto a DIN rail or directly inside of an enclosure.

Option 1: Install the Tracer BACnet terminator onto a DIN rail

NOTICE
Avoid Equipment Damage! Do not use excessive force to install the Tracer BACnet terminator onto a DIN rail. Excessive force could result in damage to the plastic enclosure.

To install the device:

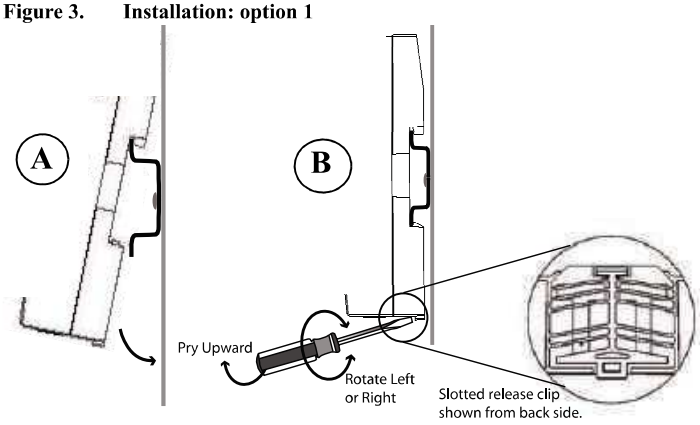
1. Hook device over top of a DIN rail (see Figure 3A).
2. Gently push on lower half of device in the direction of the arrow until the release clip snaps into place.

To remove or reposition the device:

1. Disconnect all connectors before removing or repositioning.
2. Insert screwdriver into slotted release clip and gently pry upward on the clip with the screwdriver (see Figure 3B).
3. While holding tension on the clip, lift device upward to remove or reposition.
4. If repositioned, push on the device until the release clip snaps back into place to secure the device to the DIN rail.

6

Figure 3. Installation: option 1



Option 2: Install the Tracer BACnet terminator inside an enclosure

Note: *Two #8 pan-head sheet metal or two wood screws (3/4 to 1 in.) are required for installation.*

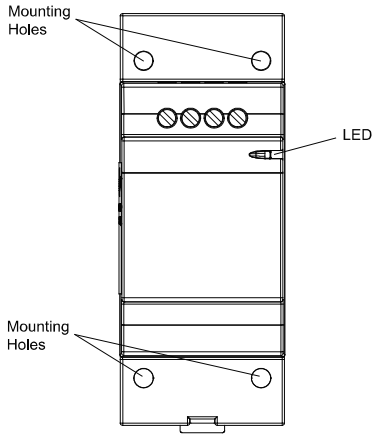
To install the device:

1. If necessary, mark and drill holes in the enclosure.
2. Drill holes suitable for #8 pan-head sheet metal or wood screws (3/4 to 1 in.).
3. Mount the device, matching the mounting holes with the predrilled holes in the enclosure.
4. Secure with screws.

   The Tracer BACnet terminator has four mounting holes. Only two screws are required for proper installation.

7

Figure 4. Installation: option 2



Important: *The LED on the front of the Tracer BACnet terminator indicates that the unit is powered. If the LED is not illuminated solid green, the device may not have been wired correctly.*

Trane - by Trane Technologies (NYSE: TT), a global climate innovator - creates comfortable, energy efficient indoor environments for commercial and residential applications. For more information, please visit trane.com or tranetechnologies.com.

Trane has a policy of continuous product and product data improvement and reserves the right to change design and specifications without notice. We are committed to using environmentally conscious print practices.

BAS-SVN214E-EN 31 Sep 2020
Supersedes X39641151-01D (Jul 2011)

Product Data

Tracer® SC+ System Controller

Ordering number: X13651695001

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August 2021 **BAS-PRD038J-EN**

TRANE TECHNOLOGIES

The Tracer SC+ building automation system, along with the Tracer Synchrony user interface, is a complete building control solution that delivers high performance and efficiency with the reliability you would expect from Trane. Tracer SC+ coordinates equipment from your building's HVAC, lighting, and other systems and offers control with a simplified, web-enabled user interface so you get easy and convenient access to your systems from virtually anywhere.

Feature	Benefit
Occupant comfort and energy savings	• Tracer SC+ includes several factory engineered HVAC applications that have been developed by HVAC system experts and tested on tens of thousands of facilities to ensure that your facility operates at its peak performance. These applications provide consistent comfort and improved indoor air quality, while reducing energy requirements. • For any building owner concerned with energy, indoor air quality, and the environment, Trane EarthWise™ Systems represent a design philosophy whose time has come. EarthWise Systems provide documented sustainability of high efficiency and low emissions over the entire lifetime of the building.
Access your facility from anywhere	• The Tracer Synchrony user interface is accessible from virtually any device with a web browser. Most popular device types, operating systems, and browsers are supported. • The Tracer BAS Operator Suite is a mobile app that allows you to monitor and manage buildings from virtually anywhere, giving you greater freedom and constant peace of mind. • Trane Connect Remote Access provides an easy, secure option to connect remotely to a Tracer SC+.
Support for open, standard protocols	• Open, standard protocols are the key to enabling communication among Trane and non-Trane HVAC equipment, as well as other complementary facility systems. These protocols enable communication across systems and vendors to ensure that your building operates at its best on day one and beyond. • Tracer SC+ natively communicates with BACnet®, Modbus, and LonTalk controllers and is listed as a BACnet Building Controller (B-BC) by BACnet Test Labs (BTL).
Support for Trane® VRF XML/IP communications	• Enables communication with Trane®/Mitsubishi Electric VRF devices.
Support for Trane® Air-Fi™ wireless	• Trane Air-Fi Wireless brings maximum flexibility to a building automation system. Trane technology helps prepare your facilities for the future of building information. Trane Air-Fi Wireless runs BACnet protocol over ZigBee building automation standards. **Note:** ZigBee is a registered trademark of the ZigBee Alliance.
Easy to use	• The Tracer Synchrony user interface provides an easy way for building operators to set up, operate, and modify a building automation system.

Hardware Features

- Four USB ports for LON integration, Wi-Fi, Cellular Module, and USB memory sticks
- Optional Wi-Fi module that can serve as an access point or a client
- Support for XM30 and XM32 (8 terminations maximum)
- Three EIA-485 ports configurable for BACnet MS/TP or Modbus RTU
- BACnet IP support on all Ethernet ports (including Wi-Fi client)
- MicroSD card support for backups
- Up to 2 Tracer USB LonTalk modules to support up to 240 LonTalk devices
- Optional battery (BR2032) to preserve regional settings
- Power options: Supply power using a 24 Vac terminal block, Tracer® Plugin power supply, or a PM014 power supply
- Mounts easily onto a standard DIN rail

Tracer SC+ Device Capability

A Tracer® SC+ facility is defined as one Application Tracer SC+ and one or more associated Base Tracer SC+. A single building or site can contain more than one facility. See the *Tracer SC+ IOM*, BAS-SVX077, for more details.

Communication Type	Single SC+	Multi SC+
Air-Fi™ Wireless	Up to 120 devices	Up to 240 devices
BACnet MS/TP	Up to 180 devices	Up to 240 devices
BACnet IP	Up to 240 devices	Up to 240 devices
COMM 3/4*	Up to 240 devices	Up to 240 devices
LonTalk	Up to 240 devices (when using two Tracer USB LonTalk modules)	Up to 240 devices (when using two Tracer USB LonTalk modules)**
Trane VRF (XML/IP)	Up to 240 devices	Up to 240 devices**
Modbus TCP	Up to 240 devices	Up to 240 devices**
Modbus RTU	Up to 90 devices	Up to 90 devices**
* A BMTB is required for communication to COMM 3/4 ** Must be installed on the Application SC+		

Note: LonTalk, Modbus TCP, and Modbus RTU devices must all be installed in the Application Tracer SC+.

Controller Specifications

Client Software Requirements	
Web Browsers	The most recent version of web browsers are tested with each new firmware release and will provide the best user experience. Utilization of other operating systems and browsers may work given our adherence to web standards, but this is not recommended/supported. Microsoft® Windows 10: • Google Chrome • Mozilla Firefox • Microsoft Edge (chromium) Apple® Mac OS (most recent version) • Google Chrome • Mozilla Firefox

Mobile Devices	Apple® iOS/iPadOS (most recent version) • Google Chrome • Mozilla Firefox • Safari Android (most recent version) • Google Chrome • Mozilla Firefox
Tracer SC+ System Controller	
Concurrent Users	• Five
Supported Languages	Up to four languages are supported per Tracer SC+ • English • Chinese (Simplified/Traditional) • French • French Canadian • Portuguese (Brazil) • German • Indonesian • Japanese • Korean • Spanish (Latin America) • Thai • Polish • Arabic
Power requirements	24 Vac @ 30 VA Class 2 transformer- Output:600mA at 24 Vdc@ 50C, Tracer® Plugin power supply w/single barrel connector - Output: 0.75A max at 24 Vdc @50C. Polarity: outer ground, inner 24 Vdc, PM014power supply module through inter-module-communication bus (IMC) - Output: 1.4A max @ 24 Vdc @ 70C
Operating environment	• Temperature: From –40°F to 158°F (–40°C to 70°C) when 24 Vdc and 1.4 A max. USB current. 40°C to 50°C (-40°F to 122°F) for all other configurations. • Relative humidity: From 10% to 90%, non-condensing
Storage environment	• Temperature: From –40°F to 158°F (–40°C to 70°C) • Relative humidity: From 5% to 95%, non-condensing
Agency Listings	UL: • UL-864/UUKL listed (when installed and programmed in accordance with the Engineered Smoke Control System Application Guide, BAS-APG019-EN) • UL-916-PAZX – energy management • CUL-C22.2-signal devices – Canada FCC: • FCC part 15, Class A CE CE: • Emissions EN61326:1998 Class B • Immunity EN61326:1998 • Commercial Safety EN61010-1:2001 ISO: • 9001:2008
Processor	Arm A9 Cortex Dual Core
Memory	• FLASH 4 GB eMMC • SDRAM 1 GB DDR3
Battery	• Optional BR2032 battery that preserves regional settings (including date/time) for up to 30 days.
BACnet	Tracer building automation systems communicates with BACnet devices that support: • Communications based on the BACnet ASHRAE/ANSI 2012 standard • ENV-1805-1/ENV-13321-1 • 10BASE-T/100BASE-TX dedicated Ethernet (ISO/IEC 8802-3) or Transmission Control Protocol/ Internet Protocol (TCP/IP) compatible network Tracer SC+ is listed by BACnet Test Labs (BTL) as a BACnet Building Controller (B-BC). Listing information can be found at: http://www.bacnetinternational.net
LonTalk	Tracer building automation systems communicates with LonTalk devices that support: • Communications based on the EIA-709.1 (LonTalk) standard • LonTalk standard network variable types (SNVTs) - *Note: this requires an external Echelon U60 module (part# X13651698001)*. • FTT-10A or FT-X1 transceivers • Twisted-pair physical media (Level 4 wiring)
Modbus	• Communications based on Modbus RTU defacto standard over EIA/TIA 485 (2-wire) • Communications based on Modbus TCP defacto standard over 10BASE-T/100BASE-TX Transmission Control Protocol/Internet Protocol (TCP/IP) compatible network

Medium Enclosure (optional)	
NEMA Type	NEMA-1
Weight	14 lb. (6.5 kg)
Mounting	Wall-mounted with #10 (5 mm) screws and #10 wall anchors. Mounting surface must be able to support 60 lb. (28 kg)
Large Enclosure (optional)	
NEMA Type	NEMA-1
Weight	50 lb (23.0 kg)
Mounting	Wall-mounted with #10 (5 mm) screws and #10 wall anchors. Mounting surface must be able to support 120 lb (56 kg)
Protocol Communication	
Device Limits	Tracer SC+ facility (Combination of all protocols) • Up to 240 devices **(Per link/Per facility)** BACnet • Tracer UC200/400/600/800/BCI Series — 60/240 • Non-Trane BACnet - 32/240 • Trane Communicating Thermostats — 60/240 • Air-Fi® BACnet Zigbee) — 30/240 • Symbio 800 — 60/240 LonTalk • AH/CH/VV/ZN Series — 120/240 • MP503 — 120/240 • MP580 — 20/40 • Trane Communicating Thermostats - 120/240 • Symbio 800 — 120/240 Modbus • TCP — 240/240 • RTU — 30/90 • Non-Trane LON — 120/240 Trane VRF • XML/IP — 240/240

NOTES

NOTES

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BAS-PRD038J-EN 05 Aug 2021
Supersedes BAS-PRD038H-EN (May 2020)

DESCRIPTION

The Plug-and-Play (PnP) **Contemporary Controls EIBA switches** provide the needed functionality, mounting convenience, and ruggedness to fit most BAS applications. The popular **EIBA5-100T** which is designed for panel mounting is complemented by its DIN-rail cousin, the **EIBA5-100T/R**.

Utilizing switching technology, the compact and low-cost **EIBA** switches provide five 10/100 Mbps shielded RJ-45 ports. Each port is Auto-MDIX compliant and can operate as an uplink port, eliminating the need for crossover cables. All ports automatically negotiate data rate, duplex, and flow control.

EIBA5-100T

EIBA5-100T/R

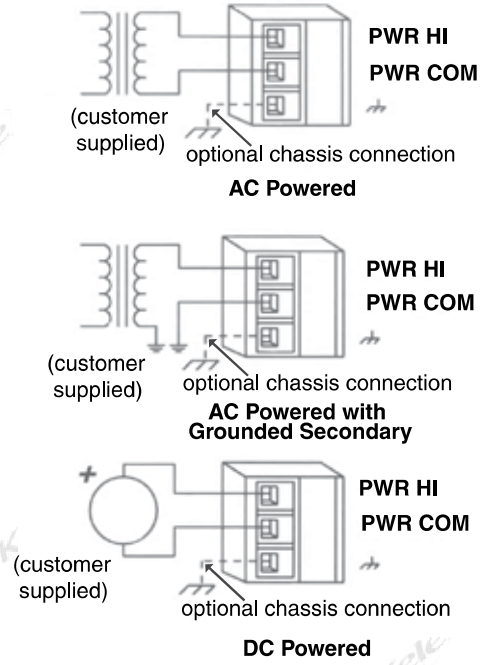
FEATURES

- ***Compact size***
- ***10BASE-T/100BASE-TX compliant***
- ***Auto-MDIX ports***
- ***Auto-negotiated data rate, duplex and flow control***
- ***Panel and DIN-rail mountable versions***
- ***Powered from an unregulated DC source (10-36 V) or an AC source (8-24 V, 47-63 Hz) via a quick-disconnect terminal strip***

SPECIFICATIONS

Supply Voltage	24 VAC ±10% @ 4 VA, 24 VDC @ 167 mA
Communication	Ethernet communications IEEE 802.3 10/100 Mbps data rate 10 BASE-T, 100 BASE-TX physical layer 100 m (max) CAT 5 cable length
LED Indication	Ethernet Green = 100 Mbps Yellow = 10 Mbps Flash = activity
Operating Temperature	32° to 140°F (0° to 60°C)
Operating Humidity	10 to 95% non-condensing
Dimensions	4.13"H x 3.5"W x 1.25"D (10.5 x 8.9 x 3.2 cm)
Weight	0.6 lbs (0.27 Kg)
Approvals	CE, UL File #E225652, RoHs
Warranty	5 years

WIRING



ORDERING INFORMATION

MODEL	DESCRIPTION
EIBA5-100T	Five-port 10BASE-T/100BASE-TX, panel mount
EIBA5-100T/R	Five-port 10BASE-T/100BASE-TX, DIN-rail mount

Product Data Sheet

Tracer™ UC600 Programmable Controller

Ordering number: BMUC600AAA0100011

⚠SAFETY WARNING

Only qualified personnel should install and service the equipment. The installation, starting up, and servicing of heating, ventilating, and air-conditioning equipment can be hazardous and requires specific knowledge and training. Improperly installed, adjusted or altered equipment by an unqualified person could result in death or serious injury. When working on the equipment, observe all precautions in the literature and on the tags, stickers, and labels that are attached to the equipment.

May 2020 **BAS-PRD016C-EN**

The Tracer UC600 unit controller is a multi-purpose, programmable, field-installed device that is designed to control the following types of equipment:

- Air-handling units (AHUs)
- Rooftop units
- Chillers
- Central heating and cooling plants
- Cooling towers
- Generic input/output (I/O) control

Features and Benefits

Feature	Benefit
BACnet MS/TP, BACnet IP	An open standard building automation communications protocol which enables connections to other BAS systems and controllers
Scheduling—supports up to 3 weekly schedules	Easy to set up and access (3 schedule types supported: Analog, Binary, Multistate)
Graphics—support for up to 10 custom graphics with optional TD7 Display.	Perform overrides, link directly to alarms, reports, or other graphics directly from a graphic.
Custom data graphs	Create and view graphically formatted data logs. Up to 8 custom data graphs can be created with a maximum of 4 data logs per graph.
Configurable and fully programmable	• Factory programs available through quick configuration for lowest setup time • Programmable for flexibility to meet unique sequence or hardware needs
Total of 19 built-in I/O hardware terminations	Meets most applied product needs with built-in I/O or with additional custom programming on the controller
Expandable up to 120 hardware terminations (with the use of optional expansion modules)	Flexibility to meet additional equipment needs
Data logging—25,000 samples	Easier investigation of equipment, zone, or building problems
Removable connectors, DIN rail mounting, multiple service tool connections	Ease of installation and service

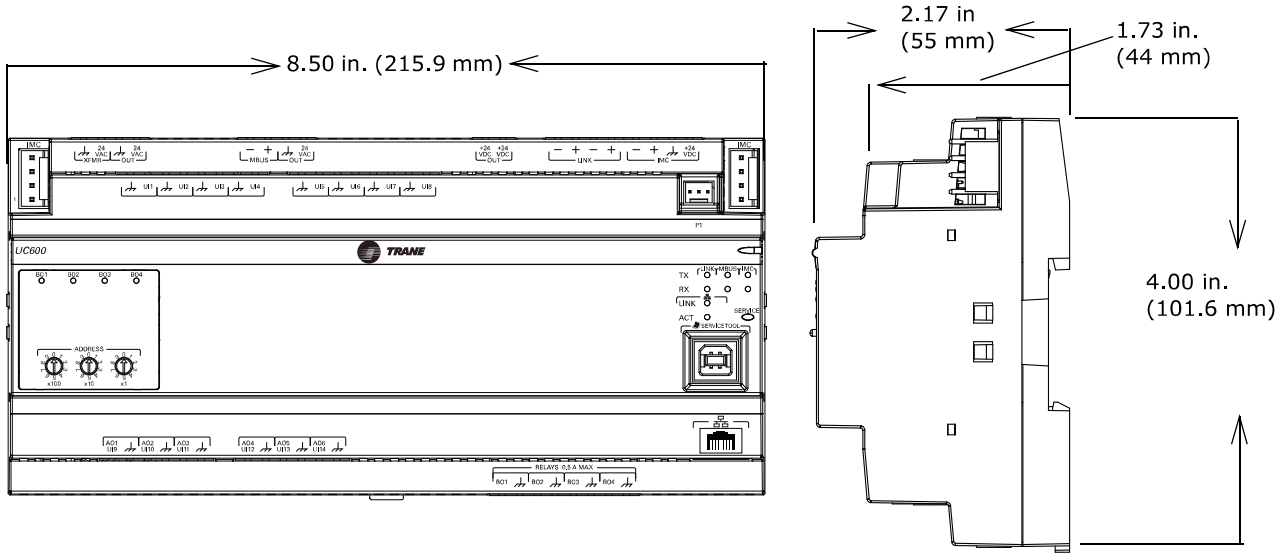
Controller Specifications and Agency Compliance

Storage	
Temperature:	-67°F to 203°F (-55°C to 95°C)
Relative humidity:	Between 5% to 95% (non-condensing)
Operating	
Temperature:	-40°F to 158°F (-40°C to 70°C)
Humidity:	Between 5% to 95% (non-condensing)
Power:	Input: 20.4–27.6 Vac (24 Vac ±15% nominal), 50 or 60 Hz, 26 VA Output: 26 VA plus a maximum of 12 VA for each binary output 24 Vdc ±10%, device max load 600 mA
Time Clock:	On-board real time clock with 7 day backup
Mounting weight of controller:	Mounting surface must support 1.3 lb. (0.6 kg)
Environmental rating (enclosure):	NEMA 1
Installation:	UL 840: Category 3
Pollution	UL 840: Degree 2
Wiring/Transformer/Communications Protocol	
18 AWG is recommended for the circuit between the transformer and the controller. Data link protocol supported: BACnet MS/TP, BACnet IP 10/100 BaseT	
• UL listed, Class 2 power transformer, 24 Vac ±10%, device max load 26 VA. • The transformer must be sized to provide adequate power to the UC600 controller (26 VA) and external device outputs. • UC600 requires 26 VA for UC600+ IO + two expansion modules (XM30 or XM32).	
Agency Compliance	
• UL916 PAZX, Open Energy Management Equipment • UL94-5V Flammability • UL864/UUKL Smoke Control (when installed and programmed in accordance with the Engineered Smoke Control System Applications Guide, BAS-APG019-EN) • CE Marked • FCC Part 15, Subpart B, Class B Limit • BTL Listed—Advanced Application Profile (B-AAC)	

Input and Output Specifications

Input/Output type	Quantity	Types	Range	Notes
Universal Input	8	Thermistor	10 kΩ Type II, 10 kΩ Type III, 2252 Ω Type II, 20 kΩ Type IV, 100 kΩ	The UC600 provides 600 mA of DC power for 0–20 mA inputs and/or outputs and to power expansion modules. See the power budget table in the *Tracer UC600 Installation, Operation, and Maintenance guide* (*BAS-SVX045).*
		Resistive (setpoint)	100 Ω – 1 MΩ	
		RTD	Balco™ (Ni-Fe), 1 kΩ, 375 (Pt), 385 (Pt), 1 kΩ	
		Current	0–20 mA (linear)	
		Voltage	0–20 Vdc (linear)	
		Binary	Dry contact	
		Pulse Accumulator	Minimum: 20 ms, closed (on) 20 ms, open (off)	
Universal Input/ Analog Output	Configure using any combination of analog or binary inputs/analog outputs			
Inputs	6	Thermistor	10 kΩ Type II, 10 kΩ Type III, 2252 Ω Type II, 20 kΩ Type IV, 100 kΩ	
		Resistive (setpoint)	100 Ω –1 MΩ	
		RTD	Balco™ (Ni-Fe), 1 kΩ, 375 (Pt), 385 (Pt), 1 kΩ	
		Current	0–20 mA (linear)	
		Voltage	0–20 Vdc (linear)	
		Binary	Dry contact	
		Pulse accumulator	Minimum: 20 ms, closed (on) 20 ms, open (off)	
Outputs		Current	0–20 mA @16 V	
		Voltage	0–10 Vdc @20 mA	
		Pulse	12.5 ms to 1 s (12.5 ms resolution), 1–60 s (0.5 s resolution)	
Binary Output	4	Relay (form A) wet	24 Vac, 0.5A maximum	Ranges are given per contact.
Pressure Input	1	3-wire	0–5 in H_2O	Pressure input supplied with 5 Vdc. Designed for Kavlico™ pressure transducers.
Point total	**19**			

Dimensions



Additional Ordering Options

- UC600 Controller (Made in the U.S.A. Version) *(order number: BMUC600USA0100011)*
- Tracer TD7 Operator Display *(order number: X13651571010)*
- TD7 Sealed Ethernet cable (for wet environments) *(order number: X19070632020)*
- TD7 Display Portable Carry Case *(order number: X18210613010)*
- TD7 Mounting Bracket (flat surface, fixed position) *(order number: X05010511010)*
- Tracer XM30 Expansion Module (*order number: X13651537010)*
- Tracer XM32 Expansion Module (*order number: X13651563010*)
- Tracer XM70 Expansion Module (*order number: X13651568010)*
- Tracer XM70 Expansion Module, manufactured in USA (*order number: X13651597010)*
- Tracer BACnet Term (2 pack) *(order number X1365152401)*
- Tracer Large enclosure 120 VAC with display capable door (*order number: X13651552010)*
- Tracer Large enclosure 230 VAC with display capable door (*order number: X13651554010)*
- Tracer Medium enclosure 120 VAC (*order number: X13651559010*)
- Tracer Medium enclosure 230 VAC *(order number: X13651560010)*
- Tracer Small 10" DIN Rail enclosure *(order number: X19091354010)*
- Power Supply 24VAC to 1.4A 24 VDC for XM modules exceeding UC600 power budget *(order number: X1365153801)*
- IMC Harness *(order number: S3090059462)*

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BAS-PRD016C-EN 20 May 2020
Supersedes BAS-PRD016B-EN (Feb 2015)

Product Data Sheet

Tracer™ XM30 Expansion Module

Ordering Number: X13651537010

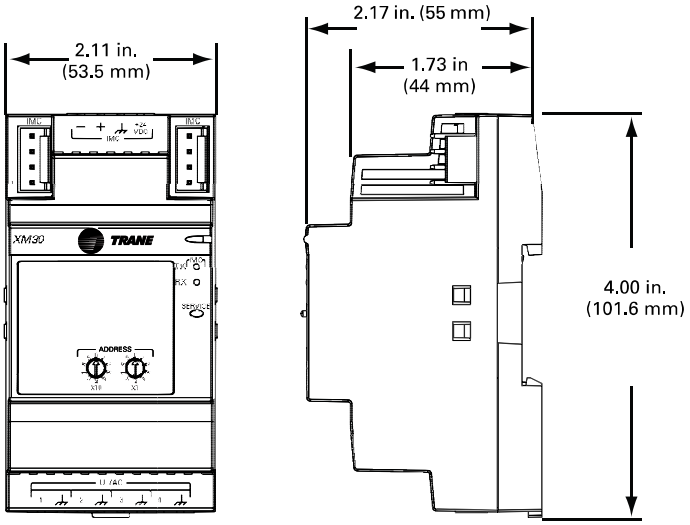
The Tracer XM30 Expansion Module provides additional points when needed for Tracer UC600, Tracer UC400, and Tracer UC210 applications. Each expansion module has a total of 4 points that can be configured using any combination of inputs/outputs (refer to the table below). A maximum of eight (8) expansion modules can be added to a Tracer UC400. Use of a PM014 DC power supply is required for applications requiring more than two XM30 modules.

Configurable Connections

Connection	Quantity	Types	Range
Inputs	**Can be configured using any combination of analog or binary inputs/analog outputs**	Thermistor	2252 Ω, 10k, 20k, 100kΩ
		Resistive (Setpoint)	100 Ω to 1 MΩ
		RTD	1 kΩ; platinum, Balco™ or nickel
		Current	0–20 mA (linear)
		Voltage	0–20 Vdc (linear)
		Binary	Dry Contact
		Pulse Accumulator	Minimum 20 milliseconds open or closed
Outputs		Current	0–20 mA @ 16V
		Voltage	0–16 Vdc @ 20mA
Point Total	4		

Specifications, Agency Compliance, and Dimensions

Storage	
Temperature:	-67°F to 203°F (-55°C to 95°C)
Relative humidity:	5% to 95% (non-condensing)
Operating	
Temperature:	-40°F to 158°F (-40°C to 70°C)
Humidity:	5% to 95% (non-condensing)
Power:	24 Vdc ±10%, 120 mA
• Mounting weight of controller: • Mounting weight of controller with terminal connectors:	• Mounting surface must support 0.27 lb. (0.122 kg) • Mounting surface must support 0.31 lb. (0.142 kg)
Environmental rating (enclosure):	NEMA 1
Installation:	UL 840: Category 3
Pollution:	UL 840: Degree 2
Agency Compliance	
• UL916 PAZX- Open Energy Management Equipment • UL94-5V, Flammability • UL864/UUKL Smoke Control (when installed and programmed in accordance with the Engineered Smoke Control System Applications Guide, BAS-APG019-EN) • CE Marked • FCC Part 15, Subpart B, Class B Limit	



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BAS-PRC035D-EN 30 Mar 2020
Supersedes BAS-PRC035C-EN (May 2013)

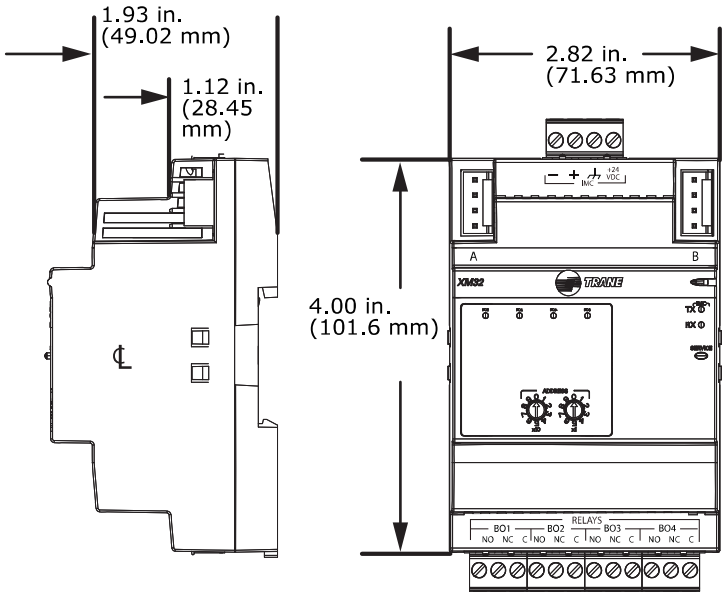
Product Data Sheet

Tracer™ XM32 Expansion Module

The Tracer XM32 Expansion Module provides additional points when needed for Tracer UC600, Tracer UC400, and Tracer UC210 applications. Each expansion module has a total of four (4) relay outputs. A PM014 24Vac/ 24Vdc power supply module (*Order Number X136515380*) is required for applications that require more than two expansion modules.Configurable Connections

Connection	Quantity	Types	Range	Notes
Binary output (BO1 to BO4)	4	General purpose	General Purpose (Resistive) 10 A max up to 277 Vac 10 A max up to 30 Vdc Motor Duty (Inductive) 1/3 hp at 125 Vac (7.5 A max) 1/2 hp at 277 Vac (7.5 A max)	POWER MUST BE WIRED TO THE BINARY OUTPUT. ALL OUTPUTS ARE ISOLATED FROM EACH OTHER AND FROM GROUND OR POWER. ***RANGES ARE GIVEN PER CONTACT***
		Motor		
		Pilot duty (inductive load)		
		Resistive load		

Dimensions



Specifications and Agency Compliance

Storage	
Temperature:	-67°F to 203°F (-55°C to 95°C)
Relative humidity:	5% to 95% (non-condensing)
Operating	
Temperature:	-40°F to 158°F (-40°C to 70°C)
Humidity:	5% to 95% (non-condensing)
Power:	24 Vdc ±10%, 100 mA
• Mounting weight of controller: • Mounting weight of controller with terminal connectors:	• Mounting surface must support 0.43 lb. (0.195 kg) • Mounting surface must support 0.47 lb. (0.213 kg)
Environmental rating (enclosure):	NEMA 1
Installation:	UL 840: Category 3
Pollution:	UL 840: Degree 2
Agency Compliance	
• UL916 PAZX- Open Energy Management Equipment • UL94-5V Flammability • UL864/UUKL Smoke Control (when installed and programmed in accordance with the Engineered Smoke Control System Applications Guide, BAS-APG019-EN) • CE Marked • FCC Part 15, Subpart B, Class B Limit	

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BAS-PRC052E-EN 30 Mar 2020
Supersedes BAS-PRC052D-EN (May 2013)

Product Data Sheet

Tracer® TD7 Display

for the Tracer UC600 Programmable Controller

⚠ SAFETY WARNING

Only qualified personnel should install and service the equipment. The installation, starting up, and servicing of heating, ventilating, and air-conditioning equipment can be hazardous and requires specific knowledge and training. Improperly installed, adjusted or altered equipment by an unqualified person could result in death or serious injury. When working on the equipment, observe all precautions in the literature and on the tags, stickers, and labels that are attached to the equipment.

August 2020 **BAS-PRD030B-EN**

Introduction

The Tracer TD7 Display features a touch-sensitive color screen that provides for ease of viewing and editing of Tracer UC600 data. Building operators can easily monitor space temperature and relative humidity, change setpoints, and enter point overrides with time-limits with a just a few touches of the screen.

Scheduling capability and access to custom graphics are available with Tracer UC600 Version 3.0 or higher.

The TD7 Display communicates exclusively with the Tracer UC600 Programmable controller (one Tracer UC600 per TD7), and is ideal for use with the following types of applications:

- Air-handling units (AHUs)
- Rooftop units
- Chillers
- Central heating and cooling plants
- Cooling towers
- Generic input/output (I/O) control

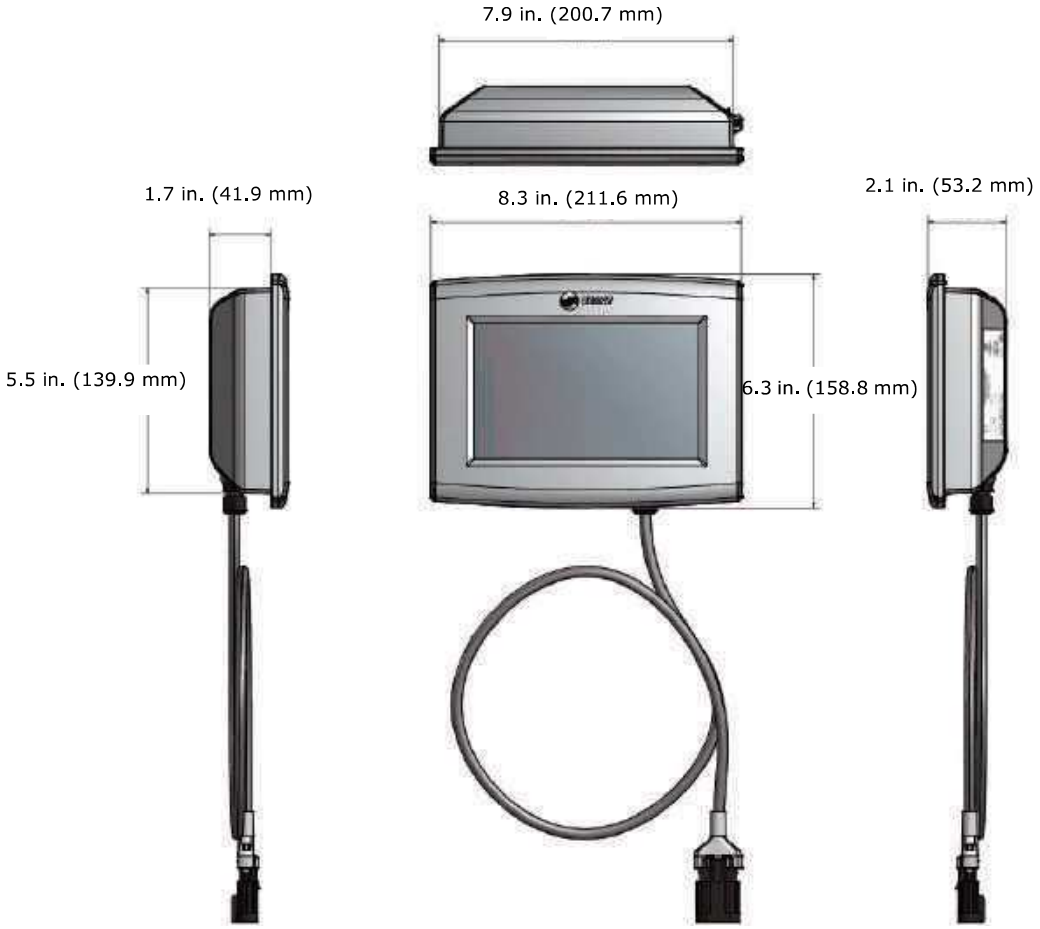
Features and Benefits

Feature	Benefit
7-inch WVGA touch-sensitive color screen	Allows for easy navigation for viewing data and making operational changes.
Display preferences	Choose how to view dates, times, units (SI, IP), screen brightness, data format, and backlight timeout.
Scheduling—supports up to 3 weekly schedules	Easy to set up and access (3 schedule types supported: Analog, Binary, Multistate)
Custom data graphs	Create and view graphically formatted data logs. Up to 8 custom data graphs can be created with a maximum of 4 data logs per graph.
Custom graphics	TD7 supports up to 10 graphics. Perform overrides, link to alarms, reports, or other graphics directly from a graphic.
Icon-labeled alarm categories	Easily and quickly identify alarm severities with distinctive, colorful icons.
Three Customizable Reports	Select up to 36 pieces of data per report (maximum of 3 custom reports).
Built-in All Points Report	View all points that have been configured in a single report.
Point overrides with timeout feature	Set up point overrides to expire at designated times.
Optional user security	Set up security for overriding/releasing points, release all overrides, custom report editing, Date and Time edit
Multiple mounting options	Can be mounted to meet customer preferences and needs. See "Mounting Options," p. 4. Can also be remotely mounted up to 100 meters.
Language options	25 built-in languages are supported and selectable for all TD7 screens.

Specifications and Agency Compliance

Specification	
Input power:	24 Vac +/- 15%, 21 VA, 50, or 60 Hz
Storage temperature:	-67°F to 203°F (-55°C to 95°C) Humidity: Between 5% to 100% (Condensing)
Operating temperature:	Temperature: -40°F to 158°F (-40°C to 70°C) Humidity: Between 5% to 100% (Condensing)
Mounting weight:	Mounting surface must support 1.625 lb (0.737 kg) Mounting Type: VESA (75 mm x 75 mm)
Environmental rating (enclosure):	IP56 (dust and strong water jet protected) with optional sealed Ethernet cable (PN: X19070632020)
Agency Compliance	
• UL916 PAZX, Open Energy Management Equipment • UL94-5V, Flammability • FCC CFR Title 47, Part 15.109: Class A Limit, (30 MHz—4 GHz) • CE EMC Directive 2004/108/EC • CE EMC Directive 2004/108/EC	

Dimensions



Supported Languages

English (United States)	Greek
German	Czech
Dutch	Romanian
Italian	Russian
Spanish (Spain)	Arabic (Gulf Regions)
Spanish (Mexico)	Hebrew
Portuguese (Portugal)	Thai
Portuguese (Brazil)	Chinese Simplified (China)
Swedish	Chinese Simplified (Taiwan)
Norwegian	Japanese
French	Korean
Polish	Indonesian
Hungarian	

Mounting Options

The TD7 Display can be mounted using either of the following:

- Large Enclosure with display-capable door 120 VAC (order number: X13651553-01)
- Large Enclosure with display-capable door 230 VAC (order number: X13651555-01)
- TD7 Display Low Profile Mounting Bracket VESA 75 mm (order number: X05010511010)
- TD7 Display Portable Carry Case (order number: 31800912B)
- Any user-supplied VESA 75 mm mounting bracket

Agency Listing and Compliance

The European Union (EU) Declaration of Conformity is available from your local Trane® office.

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BAS-PRD030B-EN 18 Aug 2020
Supersedes BAS-PRD030A-EN (Mar 2016)

Product Data Sheet

Zone Sensors

Trane™ offers a full line of wireless and wired temperature sensors. Wireless temperature sensors are an ideal and cost-effective alternative to wired sensors that provide easy and flexible installation. Conventional wired sensors are best suited where wireless sensors are not allowed or when a wired connection to a service tool is required.

Features, Benefits, and Part Numbers:

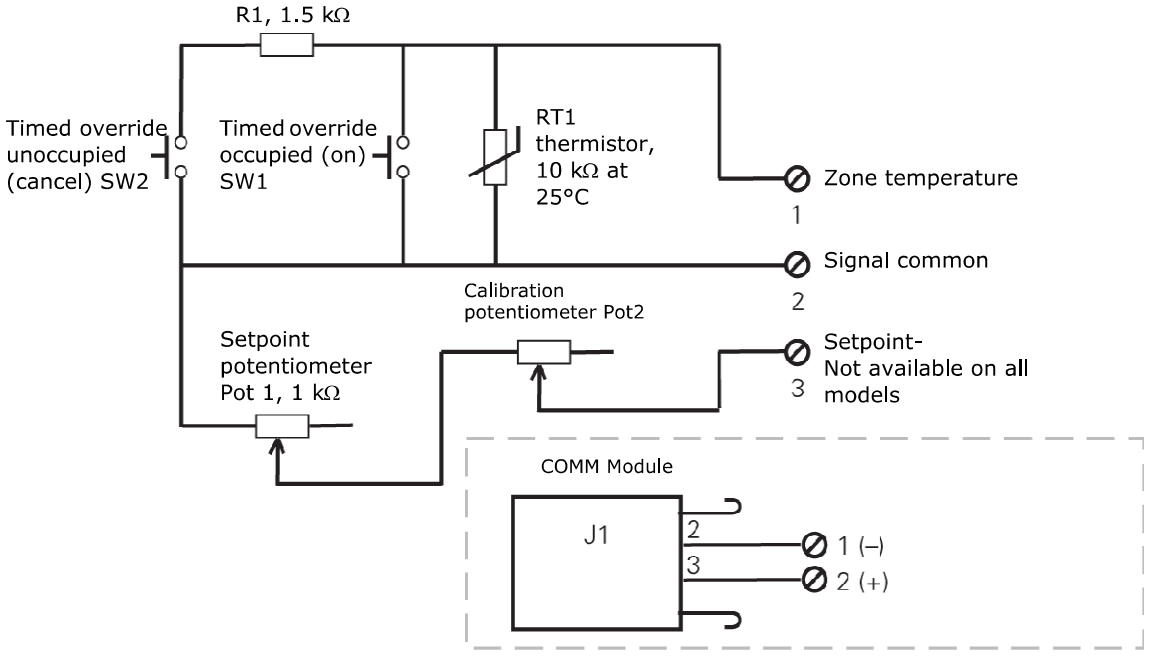
Features	Benefits
Temperature-only sensors	Simplifies tenant interaction by moving the temperature setpoint to a centralized source.
Temperature setpoint control	Allows the tenant to choose a temperature setpoint that satisfies their personal preference.
Occupancy override	Allows the tenant to request temporary timed override system operation that permits the building conditions to remain in occupied comfort conditions.
COMM module (optional)	Compatible with all Trane-wired temperature sensors. This optional accessory provides local RJ22 connection to Trane service tools for easy, low cost maintenance.
Hot/cold thumbwheel (optional)	Allows the tenant to choose a temperature setpoint relative to their zone of comfort as opposed to exact numbers.

Part Numbers				
Description		Part Number	BAYSENS	Global Parts
Setpoint	Occupancy			
Single	Yes	X1351152701	BAYSENS074A	SEN01447
NA	No	X1351152801	BAYSENS077A	SEN01448
Single	No	X1351152901	BAYSENS075A	SEN01449
NA	Yes	X1351153001	BAYSENS073A	SEN01450
COMM Module (Box of 12)		X1365146702	BAYCOMM005A	CON01313
Thumbwheel; Hot/Cold (Box of 12)		X1316105702	NA	KNB00182

Specifications

Description	
Sensor operating temperature	From 32°F to 122°F (0°C to 50°C)
Storage temperature	From -40°F to 185°F (-40°C to 85°C)
Storage/operating humidity range	5% to 95% relative humidity (RH), noncondensing
Thermistor accuracy	0.2°C at 25°C, 1%
Setpoint functional range	45°F to 90°F (7.2°C to 32.2°C)
Setpoint thumbwheel markings	50°F to 85°F (in 5°F increments) with */** icons on thumbwheel 11°C to 29°C (in 3°C increments) with */** icons on thumbwheel
Housing material	Polycarbonate/ABS (suitable for plenum mounting), UV protection, UL 94: 5 VA flammability rating
Mounting	Fits a standard 2 in. by 4 in. junction box (vertical mount only). Mounting holes are spaced 3.2 in. (83 mm) apart on vertical center line. Includes mounting screws for junction box or wall anchors for sheet-rock walls. Overall dimensions: 2.9 in (74 mm) by 4.7 in. (119 mm)

Schematic (Typical)



Literature Order Number	BAS-PRC027-EN
Date	November 2007
Supersedes	New

www.trane.com

For more information, contact your local Trane office or e-mail us at comfort@trane.com

Featured Thermistor Product

Duct

Duct w/o Box

Immersion, Two Piece Well

Immersion, Machined Well

Immersion w/o Well

Copper Averaging

Flexible Averaging

Strap

Outdoor Air

Raw Potted Sensor

Raw, 6′ Leads

Bullet Probe

Bullet Probe, 20′ Z

Rigid Averaging

Probe Only

THERMISTORS

General Mounting

ACI offers a comprehensive selection of general mounting configurations for Thermistors (see list above). These sensors provide a predictable and accurate output over the specified temperature range. Each sensor configuration is designed and manufactured for long-term quality and performance. ACI incorporates standard features such as double encapsulation and etched Teflon leads where applicable.

The ACI Thermistor Series is covered by ACI's Five (5) year limited warranty, which is located in the front of ACI's Sensors & Transmitters catalog or can be found on ACI's web site, which is www.workaci.com.

SPECIFICATIONS

Accuracy (0-70ºC)	Single Point: +/-0.2ºC (+/-0.36ºF)
Stability	+/-0.13ºC (+/-0.23ºF)
Interchangeability	+/-0.2ºC (+/-0.36ºF)
Operating Temperature Range	-40 to 302ºF (-40 to 150ºC)
Sensor Output [A/AN]	10KΩ @ 77°F (Type III)
Sensor Output [A/CP]	10KΩ @ 77°F (Type II)
Sensor Output [A/3K]	3KΩ @77°F (25°C)
Sensor Output [A/1.8K]	1.8KΩ @77°F (25°C)
Sensor Output [A/20K]	20KΩ @77°F (25°C)
Sensor Output [A/100KS]	100KΩ @77°F (25°C)
Sensor Output [A/10KS]	10KΩ @77°F (25°C)
Sensor Output [A/2252]	2252Ω @77°F (25°C)
Sensor Output [A/CSI]	10KΩ @77°F (25°C)
Sensor Output [A/AN-BC]	10KΩ with 11K Shunt
Sensor Output [A/10K-E]	10KΩ @77°F (25°C)
Sensor Output [A/10K-E1]	10KΩ @77°F (25°C)
Power Dissipation Constant	3 mW/ºC
Operating Humidity	10 to 95% RH non-condensing
Product Dimensions	Please reference pages 5, 6, 7 & 8

ORDERING

Select one Series (A), one Configuration (B), one Length (C), one Enclosure (D) & one Lead Wire (E) (optional). **NOTE:** See Thermowell data sheet for proper well selection for all Immersion related sensors. Enclosure options (D) include Plastic Box (PB), Galvanized Box (GD), NEMA 3R (BB), NEMA 4X (4X), & Euro Housing (EH). The Plastic Box (PB) is rated from 0 to 203ºF. Stay within the same row throughout the selection process for all General Mounting pages. ▸

A Sensor Series

◯ A/AN	◯ A/3K	◯ A/20K	◯ A/10KS	◯ A/CSI	◯ A/10K-E
◯ A/CP	◯ A/1.8K	◯ A/100KS	◯ A/2252	◯ A/AN-BC	◯ A/10K-E1

B Configuration	C Length	D Enclosure	E Lead Wire
◯ **D** (Duct) ▸	◯ 4″ ◯ 6″ ◯ 8″ ◯ 12″ ◯ 18″ ▸	◯ PB ◯ GD ◯ BB ◯ 4X ◯ EH ▸	◯ ---- (N/A)
◯ **DO** (Duct w/o Box) ▸	◯ 4″ ◯ 6″ ◯ 8″ ◯ 12″ ◯ 18″ ▸	◯ ---- (No Enclosure) ▸	◯ ---- (N/A)
◯ **PO** (Probe Only) ▸	◯ 4″ ◯ 6″ ◯ 8″ ◯ 12″ ◯ 18″ ▸	◯ ---- (No Enclosure) ▸	◯ 6'CL2P ◯ 10'CL2P ◯ 20'CL2P
◯ **I** (Immersion, Two Piece Well) ▸	◯ 2.5″ ◯ 4″ ◯ 6″ ▸	◯ PB ◯ GD ◯ BB ◯ 4X ◯ EH ▸	◯ ---- (N/A)
◯ **IM** (Immersion, Machined Well) ▸	◯ 1″ ◯ 2.5″ ◯ 4″ ◯ 6″ ◯ 12″ ▸	◯ PB ◯ GD ◯ BB ◯ 4X ◯ EH ▸	◯ ---- (N/A)
◯ **INW** (Immersion w/o Well) ▸	◯ 2.5″ ◯ 4″ ◯ 6″ ◯ 12″ ▸	◯ PB ◯ GD ◯ BB ◯ 4X ◯ EH ▸	◯ ---- (N/A)
◯ **A** (Copper Averaging) ▸	◯ 8′ ◯ 12′ ◯ 24′ ◯ 50′ ▸	◯ PB ◯ GD ◯ BB ◯ 4X ◯ EH ▸	◯ ---- (N/A)
◯ **FA** (Flexible Cable Averaging) ▸	◯ 8′ ◯ 12′ ◯ 24′ ◯ 50′ ▸	◯ PB ◯ GD ◯ BB ◯ 4X ◯ EH ▸	◯ ---- (N/A)
◯ **RA** (Rigid Averaging) ▸	◯ 18″ ◯ 24″ ◯ 36″ ▸	◯ PB ◯ GD ◯ BB ◯ 4X ◯ EH ▸	◯ ---- (N/A)
◯ **S** (Strap) ▸	◯ ---- (No Length) ▸	◯ PB ◯ GD ◯ ---- ◯ 4X ◯ EH ▸	◯ ---- (N/A)
◯ **O** (Outdoor Air) ▸	◯ ---- (No Length) ▸	◯ ---- ◯ ---- ◯ BB ◯ 4X ◯ EH ▸	◯ ---- (N/A)
◯ **W** (Raw Potted Sensor) ▸	◯ ---- (No Length) ▸	◯ ---- (No Enclosure) ▸	◯ ---- (N/A)
◯ **W-6′** (Raw w/6′ Leads) ▸	◯ ---- (No Length) ▸	◯ ---- (No Enclosure) ▸	◯ ---- (N/A)
◯ **BP** (Bullet Probe, Plenum Cable) ▸	◯ ---- (No Length) ▸	◯ ---- (No Enclosure) ▸	◯ 6'CL2P ◯ 10'CL2P ◯ 20'CL2P
◯ **BP** (Bullet Probe, Teflon leads) ▸	◯ ---- (No Length) ▸	◯ ---- (No Enclosure) ▸	◯ ---- (N/A)
◯ **BP-20'Z** (BP, 20′ Zip Wire)	◯ ---- (No Length) ▸	◯ ---- (No Enclosure) ▸	◯ ---- (N/A)

BUILD PART NUMBER

After completing (A), (B), (C), (D) & (E) from the above table, fill in the "Part Number Table" below. An example part number is offered.

—	—	—	—	
A	B	C	D	E

EXAMPLE: A/CP - D - 4″ - PB

The Plastic Box has a UL94-HB rating. The NEMA 4X enclosure has a UL94-V2 flammability rating. The Euro Housing enclosure has a UL94-V0 flammability rating. CE exception: Averaging units and any other configuration with leads longer than 3 meters.

BELIMO

Technical data sheet B217B

Chrome Plated Brass Ball and Nickel Plated Brass Stem

5-year warranty

Technical data

Functional data	Valve Size	0.75" [20]
	Fluid	chilled or hot water, up to 60% glycol
	Fluid Temp Range (water)	0...250°F [-18...120°C]
	Body Pressure Rating	600 psi
	Close-off pressure Δps	200 psi
	Flow characteristic	equal percentage
	Servicing	maintenance-free
	Flow Pattern	2-way
	Leakage rate	0% for A – AB
	Controllable flow range	75°
	Cv	4.7
	Body pressure rating note	600 psi
	Cv Flow Rating	A-port: as stated in chart B-port: 70% of A – AB Cv
Materials	Valve body	Nickel-plated brass body
	Stem seal	EPDM (lubricated)
	Seat	PTFE
	Pipe connection	NPT female ends
	O-ring	EPDM (lubricated)
	Ball	chrome plated brass
Suitable actuators	Non-Spring	TR LRB(X)

Safety notes

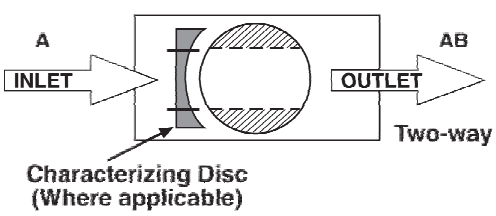
- WARNING: This product can expose you to lead which is known to the State of California to cause cancer and reproductive harm. For more information go to www.p65warnings.ca.gov

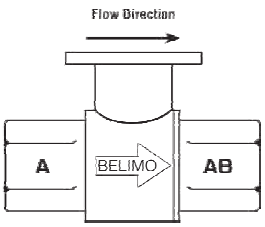
Product features

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 flow.

Flow/Mounting details

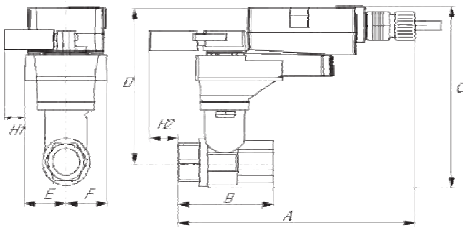




Dimensions

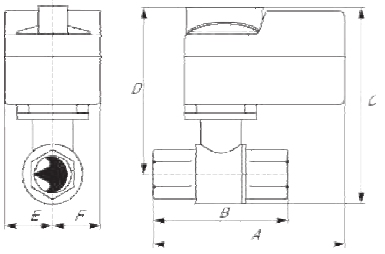
Dimensional drawings

LRB, LRX



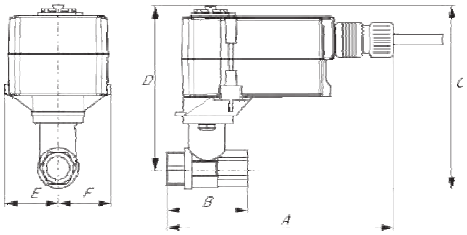
A	B	C	D	E	F	H1	H2
9.4" [239]	2.7" [69]	5.8" [147]	5.1" [129]	1.3" [33]	1.3" [33]	1.2" [30]	1" [25]

TR



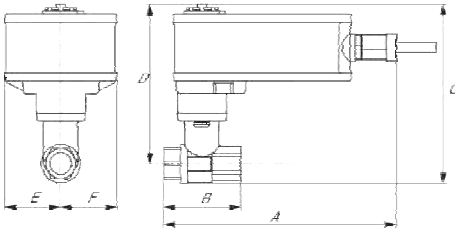
A	B	C	D	E	F
4.0" [102]	2.7" [69]	5.4" [137]	4.7" [120]	1.3" [33]	1.3" [33]

TFRB, TFRX



A	B	C	D	E	F
7.0" [178]	2.7" [69]	5.5" [139]	4.8" [122]	1.5" [39]	1.5" [39]

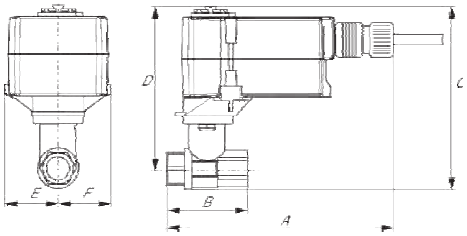
LF



A	B	C	D	E	F
8.6" [218]	2.7" [69]	6.3" [159]	5.6" [142]	1.8" [46]	1.8" [46]

A	B	C	D	E	F
8.6" [218]	2.7" [69]	6.3" [159]	5.6" [142]	1.8" [46]	1.8" [46]

TFRB, TFRX



A	B	C	D	E	F
7.0" [178]	2.7" [69]	5.5" [139]	4.8" [122]	1.5" [39]	1.5" [39]

BELIMO

On/Off, Spring Return, AC 100...240 V

Technical data sheet TFRB120

5-year warranty

Technical data

Electrical data	Nominal voltage	AC 100...240 V
	Nominal voltage frequency	50/60 Hz
	Power consumption in operation	2.5 W
	Power consumption in rest position	1.3 W
	Transformer sizing	5 VA (class 2 power source)
	Electrical Connection	18 GA appliance cable, 3 ft [1 m], with 1/2" conduit connector
	Overload Protection	electronic throughout 0...95° rotation
Functional data	Position feedback U note	No Feedback
	Direction of motion motor	selectable by ccw/cw mounting
	Direction of motion fail-safe	reversible with cw/ccw mounting
	Angle of rotation	Max. 95°, 90°
	Angle of rotation note	90°
	Running Time (Motor)	75 s
	Running time fail-safe	<75 s
	Noise level, motor	50 dB(A)
	Noise level, fail-safe	50 dB(A)
	Position indication	Mechanical
Safety data	Degree of protection IEC/EN	IP42
	Degree of protection NEMA/UL	NEMA 2 UL Enclosure Type 2
	Agency Listing	cULus acc. to UL60730-1A/-2-14, CAN/CSA E60730-1:02, CE acc. to 2014/30/EU
	Quality Standard	ISO 9001
	Ambient temperature	-22...122°F [-30...50°C]
	Storage temperature	-40...176°F [-40...80°C]
	Ambient humidity	max. 95% r.H., non-condensing
	Servicing	maintenance-free
Weight	Weight	1.6 lb [0.80 kg]
Materials	Housing material	UL94-5VA

Electrical installation

INSTALLATION NOTES

A Actuators with appliance cables are numbered.

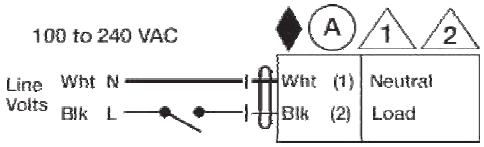
1 Provide overload protection and disconnect as required.

2 Actuators may be connected in parallel. Power consumption and input impedance must be observed.

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

! **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.



On/Off

Chrome Plated Brass Ball and Nickel Plated Brass Stem

5-year warranty

Technical data

Functional data	Valve Size	0.75" [20]
	Fluid	chilled or hot water, up to 60% glycol
	Fluid Temp Range (water)	0...250°F [-18...120°C]
	Body Pressure Rating	600 psi
	Close-off pressure Δps	200 psi
	Flow characteristic	A-port Equal percentage; B-port modified linear for constant flow
	Servicing	maintenance-free
	Flow Pattern	3-way Mixing/Diverting
	Leakage rate	0% for A – AB, <2.0% for B – AB
	Controllable flow range	75°
	Cv	4.7
	Body pressure rating note	600 psi
	Cv Flow Rating	A-port: as stated in chart B-port: 70% of A – AB Cv
Materials	Valve body	Nickel-plated brass body
	Stem seal	EPDM (lubricated)
	Seat	PTFE
	Pipe connection	NPT female ends
	O-ring	EPDM (lubricated)
	Ball	chrome plated brass
Suitable actuators	Non-Spring	TR LRB(X)

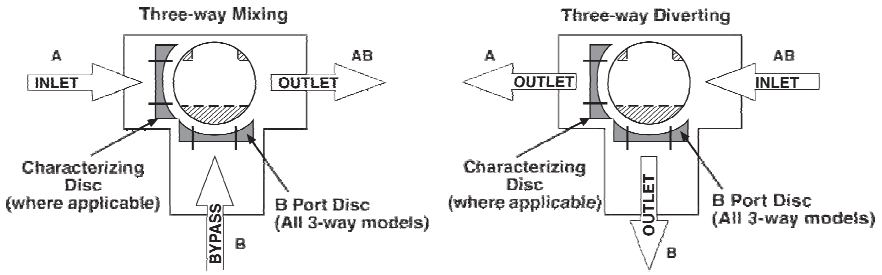
Safety notes

- WARNING: This product can expose you to lead which is known to the State of California to cause cancer and reproductive harm. For more information go to www.p65warnings.ca.gov

Product features

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.

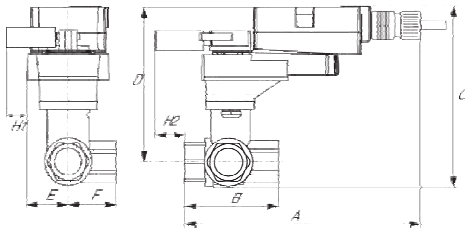
Flow/Mounting details



Dimensions

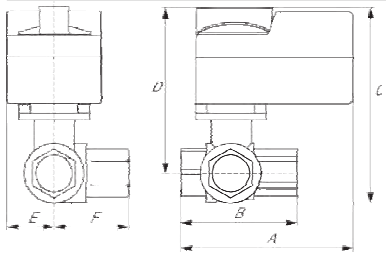
Dimensional drawings

LRB, LRX



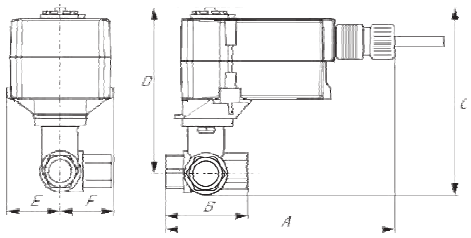
A	B	C	D	E	F	H1	H2
8.5" [216]	2.7" [69]	5.8" [147]	5.1" [129]	1.3" [33]	1.5" [39]	1.2" [30]	1" [25]

TR



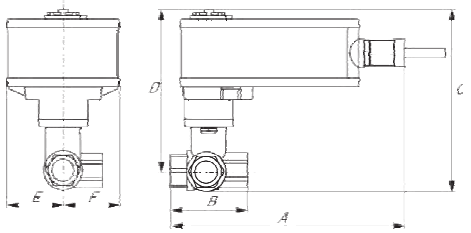
A	B	C	D	E	F
4.0" [102]	2.7" [69]	5.4" [137]	4.7" [120]	1.3" [33]	1.5" [39]

TFRB, TFRX



A	B	C	D	E	F
7.0" [178]	2.7" [69]	5.5" [139]	4.8" [122]	1.5" [39]	1.5" [39]

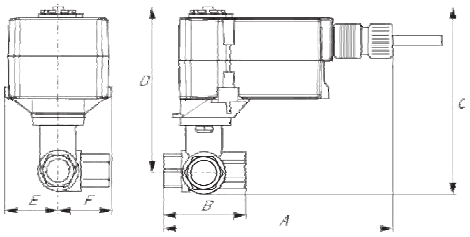
LF



A	B	C	D	E	F
8.6" [218]	2.7" [69]	6.3" [159]	5.6" [142]	1.8" [46]	1.9" [48]

A	B	C	D	E	F
8.6" [218]	2.7" [69]	6.3" [159]	5.6" [142]	1.8" [46]	1.9" [48]

TFRB, TFRX



A	B	C	D	E	F
7.0" [178]	2.7" [69]	5.5" [139]	4.8" [122]	1.5" [39]	1.5" [39]

BELIMO

On/Off, Spring Return, AC 100...240 V

Technical data sheet TFRB120

5-year warranty

Technical data

Electrical data	Nominal voltage	AC 100...240 V
	Nominal voltage frequency	50/60 Hz
	Power consumption in operation	2.5 W
	Power consumption in rest position	1.3 W
	Transformer sizing	5 VA (class 2 power source)
	Electrical Connection	18 GA appliance cable, 3 ft [1 m], with 1/2" conduit connector
	Overload Protection	electronic throughout 0...95° rotation
Functional data	Position feedback U note	No Feedback
	Direction of motion motor	selectable by ccw/cw mounting
	Direction of motion fail-safe	reversible with cw/ccw mounting
	Angle of rotation	Max. 95°, 90°
	Angle of rotation note	90°
	Running Time (Motor)	75 s
	Running time fail-safe	<75 s
	Noise level, motor	50 dB(A)
	Noise level, fail-safe	50 dB(A)
	Position indication	Mechanical
Safety data	Degree of protection IEC/EN	IP42
	Degree of protection NEMA/UL	NEMA 2 UL Enclosure Type 2
	Agency Listing	cULus acc. to UL60730-1A/-2-14, CAN/CSA E60730-1:02, CE acc. to 2014/30/EU Listed to UL 2043 - suitable for use in air plenums per Section 300.22(c) of the NEC and Section 602.2 of the IMC
	Quality Standard	ISO 9001
	Ambient temperature	-22...122°F [-30...50°C]
	Storage temperature	-40...176°F [-40...80°C]
	Ambient humidity	max. 95% r.H., non-condensing
	Servicing	maintenance-free
Weight	Weight	1.6 lb [0.80 kg]
Materials	Housing material	UL94-5VA

Electrical installation

INSTALLATION NOTES

A Actuators with appliance cables are numbered.

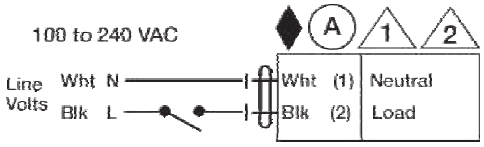
1 Provide overload protection and disconnect as required.

2 Actuators may be connected in parallel. Power consumption and input impedance must be observed.

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

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.



On/Off

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

Application

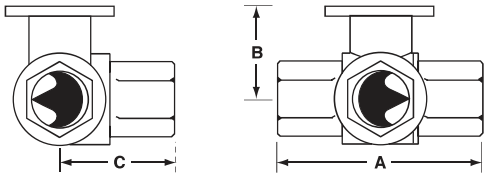
This valve is typically used in air handling units on heating or cooling coils, and fan coil unit heating or cooling coils. Some other common applications include Unit Ventilators, VAV box re-heat coils and bypass loops. This valve is suitable for use in a hydronic system with variable or constant flow.

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



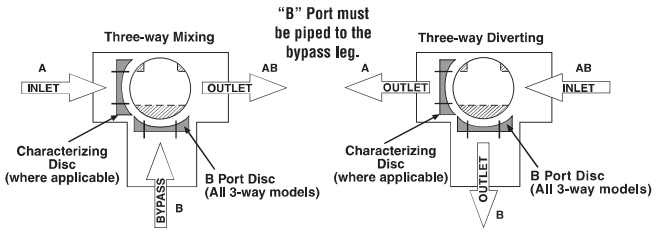
3WayValve-B307-B320

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]

	Valve Nominal Size		Type	Suitable Actuators	
C_V	Inches	DN [mm]	3-Way NPT	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



AFRB24-SR, AFRX24-SR

Proportional, Spring Return, 24 V, for 2 to 10 VDC or 4 to 20 mA Control Signal

5 YEAR WARRANTY

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

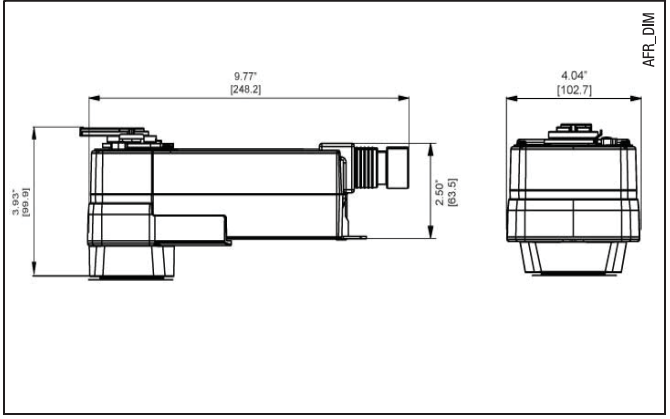
BRUSHLESS dc motor

Technical Data

Power supply		24 VAC ±20%, 50/60 Hz 24 VDC +20% / -10%
Power consumption	running	5.5 W
	holding	3 W
Transformer sizing		8.5 VA (class 2 power source)
Electrical connection		
AFRB...		3 ft, 18 GA appliance cable, 1/2" conduit connector **-S models:** two 3 ft, 18 gauge appliance cables with 1/2" conduit connectors
AFX...		3 ft [1m], 10 ft [3m] or 16 ft [5m] 18 GA appliance or plenum cables, with or without 1/2" conduit connector **-S models:** Two 3 ft [1m], 10 ft [3m] or 16 ft [5m] appliance cables, with or without 1/2" conduit connectors
Overload protection		electronic throughout 0 to 95° rotation
Operating range Y		2 to 10 VDC, 4 to 20mA
Input impedance		100 kΩ for 2 to 10 VDC (0.1 mA) 500 Ω for 4 to 20 mA
Feedback output U		2 to 10 VDC (max. 0.5 mA)
Direction of rotation	spring	reversible with CW/CCW mounting
	motor	reversible with built-in switch
Mechanical angle of rotation		95° (adjustable with mechanical end stop, 35° to 95°)
Running time	spring	< 20 seconds @ -4°F to 122°F [-20°C to 50°C]; < 60 seconds @ -22°F [-30°C]
	motor	95 seconds
Position indication		visual indicator, 0° to 95° (0° is full spring return position)
Manual override		5 mm hex crank (3/16" Allen), supplied
Humidity		max. 95% RH non-condensing
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, Enclosure Type2
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 & 2006/95/EC
Noise level		≤40dB(A) motor @ 95 seconds ≤62dB(A) spring return
Servicing		maintenance free
Quality standard		ISO 9001
Weight		4.6 lbs (2.1 kg); 4.9 lbs (2.25 kg) with switches

† Rated Impulse Voltage 800V, Type of action 1.AA (1.AA.B for -S version), Control Pollution Degree 3.

Dimensions (Inches [mm])



Accessories	
AV 8-25	Shaft extension
IND-AFB	Damper position indicator
KH-AFB	Crank arm
K7-2	Universal clamp for up to 1.05" dia jackshafts
TF-CC US	Conduit fitting
Tool-06	8mm and 10 mm wrench
ZG-100	Universal mounting bracket
ZG-101	Universal mounting bracket
ZG-118	Mounting bracket for Barber Colman® MA 3../4.., Honeywell® Mod III or IV or Johnson® Series 100 replacement or new crank arm type installations
ZG-AFB	Crank arm adaptor kit
ZG-AFB118	Crank arm adaptor kit
ZS-100	Weather shield (metal)
ZS-150	Weather shield (polycarbonate)
ZS-260	Explosion-proof housing
ZS-300	NEMA 4X housing

NOTE: When using AFRB24-SR, AFRB24-SR-S, AFRX24-SR and AFRX24-SR-S actuators, only use accessories listed on this page.
For actuator wiring information and diagrams, refer to Belimo Wiring Guide.

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 proportional 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 counterclockwise 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 shall be cULus Approved 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

INSTALLATION NOTES

1 Provide overload protection and disconnect as required.

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

2 Up to 4 actuators may be connected in parallel if not mechanically mounted to the same shaft. With 4 actuators wired to one 500 Ω resistor.
Power consumption must be observed.

3 Actuator may also be powered by 24 VDC.

4 For end position indication, interlock control, fan startup, etc., AFB24-SR-S and AFX24-SR-S incorporates two built-in auxiliary switches: 2 x SPDT, 3A (0.5A) @250 VAC, UL Approved, one switch is fixed at +10°, one is adjustable 10° to 90°.

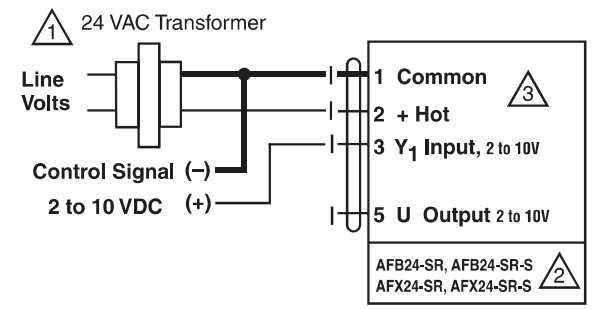
5 Only connect common to neg. (–) leg of control circuits

APPLICATION NOTES

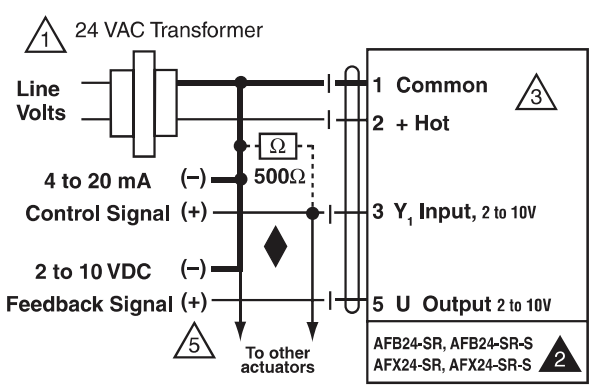
♦ The ZG-R01 500 Ω resistor converts the 4 to 20 mA control signal to 2 to 10 VDC.

ATTENTION: AFRB24-SR(-S) and AFRX24-SR(-S) **cannot** be tandem mounted on the same damper or valve shaft. Only On/Off and MFT AF models can be used for tandem mount applications.

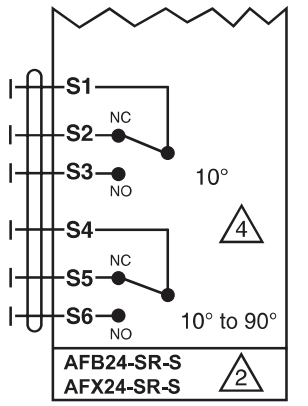
***WARNING** Live Electrical Components!*
During installation, testing, servicing and troubleshooting of this product, it may be necessary to work with live electrical components. Have a qualified licensed electrician or other individual who has been properly trained in handling live electrical components 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 of AFRB24-SR and AFRX24-SR



4 to 20 mA control of AFRB24-SR and AFRX24-SR with 2 to 10 VDC feedback output



Auxiliary switches for AFRB24-SR-S, AFX24-SR-S

Z2050Q-J, 1/2", ZoneTight Valve

Application

The QCV zone valves are suited for large commercial buildings where higher close-off and the ability to change flow is desired. Common applications include unit ventilators, fan coil units, VAV reheat coils, fin tube casing, radiant panels and duct coils. The valve fits in space restricted areas and can be assembled without the use of tools.

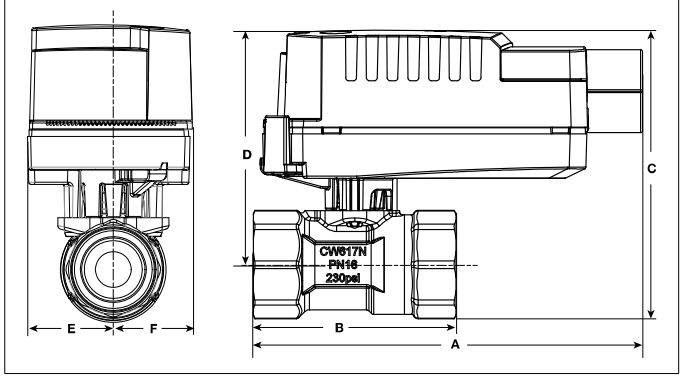
Suitable Actuators

	Non-Spring	Electronic Fail-Safe
Z2050Q-J	CQ	CQK

Technical Data	
Service	chilled , hot water, up to 60% glycol
Flow characteristic	Equal Percentage
Controllable Flow Range	75°
Size [mm]	0.5" [15]
End Fitting	NPT female ends
Body	forged brass
Ball	chrome plated brass
Stem	brass
Seat	Teflon® PTFE
Seat O-ring	EPDM (lubricated)
Diaphragm	EPDM
Body Pressure Rating [psi]	230
Media Temperature Range (Water)	36°F to 212°F [2°C to +100°C]
Maximum Allowable Operating Temperature	212°F [100°C] *
Media Temperature Limit	250°F [121°C] *
Max Differential Pressure (Water)	40 psi
Close-Off Pressure	75 psi
Leakage	0%
Cv	5.9

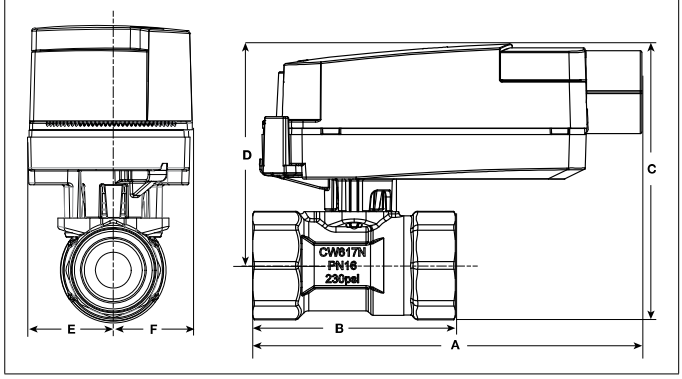
* If temperature exceeds 212°F operating range due to a boiler control failure the valve will safely contain the hot water but manufacturers product warranty becomes invalid. Valve and actuator replacement is at the expense of others.

Dimensions (Inches [mm])



A	B	C	D	E	F
4.5" [114]	2.05" [52]	3.27" [83]	2.71" [69]	1.02" [26]	

Dimensions (Inches [mm])



A	B	C	D	E	F
4.5" [114]	2.05" [52]	3.14" [80]	2.56" [65]	1.02" [26]	

CQKB24-LL
On/Off, Electronic-Fail-safe,24V

Application
Electronic Fail-Safe On/Off ZoneTight actuator.

Valve selection should be done in accordance with the flow parameters and system specifications. The actuator is mounted directly to the valve without the need for tools or additional linkage.

The actuator operates in response to 24VAC/DC.

Angle of rotation is adjustable with the integrated mechanical stop.

Technical Data	
Power Supply	24 VAC ± 20%, 50/60 Hz, 24 VDC ± 10%
Power Consumption Running	2.5 W
Power Consumption Holding	0.5 W
Transformer Sizing	5 VA (class 2 power source)
Electrical Connection	3 ft., 18 GA plenum cable with 1/2" conduit connector
Overload Protection	electronic throughout full stroke
Operating Range Y	on/off
Angle of Rotation	90°, adjustable with mechanical stop
Position Indication	pointer
Running Time (Motor)	75 seconds
Running Time (Fail-Safe)	60 seconds
Humidity	5 to 95% RH non-condensing
Ambient Temperature Range	+35°F to +104°F [+1.7°C to +40°C]
Storage Temperature Range	-40°F to +176°F [-40°C TO +80°C]
Housing	NEMA 2
Housing Material	UL94-5VA
Agency Listings†	cULus acc. to UL60730-1A/-2-14, CAN/CSA E60730-1:02, CE acc. to 2004/108/EC and 2006/95/EC
Noise Level (Motor)	<35 dB (A)
Servicing	maintenance free
Quality Standard	ISO 9001
Weight	3.6 lbs

Use flexible metal conduit. Push the Listed conduit fitting device over the actuator's cable to butt against the enclosure. Screw in conduit connector. Jacket the actuators input wiring with Listed flexible conduit. Properly terminate the conduit in a suitable junction box. Rated impulse Voltage 800V. Type of action 1. Control Pollution Degree 3.

Wiring Diagrams

INSTALLATION NOTES

△2 Actuators may be connected in parallel. Power consumption and input impedance must be observed.

△3 Actuators may also be powered by 24 VDC.

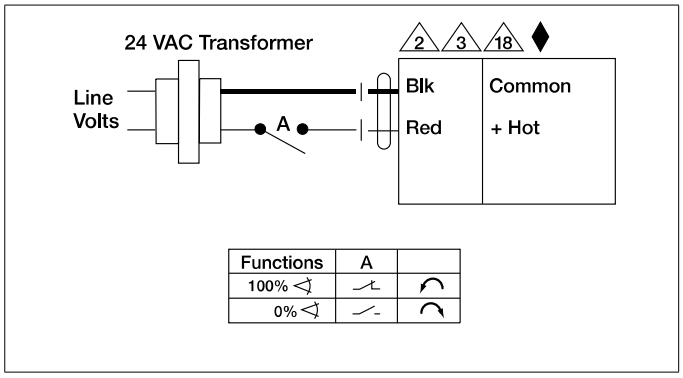
△18 Actuators with plenum cable do not have numbers; use color codes instead.

APPLICATION NOTES

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

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.



5-year warranty

Type overview

Type	DN
Z2050Q-J	15

Technical data

Functional data	Valve Size	0.5" [15]
	Noise level, Motor	dB(A)
	Fluid	chilled or hot water, up to 60% glycol
	Fluid Temp Range (water)	36...212°F [2...100°C]
	Body Pressure Rating	360 psi
	Close-off pressure Δps	75 psi
	Flow characteristic	equal percentage
	Servicing	maintenance-free
	Flow Pattern	2-way
	Leakage rate	0%
	Controllable flow range	75°
	Cv	5.9
Materials	Valve body	forged brass
	Spindle	brass
	Seat	PTFE
	Pipe connection	NPT female ends
	O-ring	EPDM (lubricated)
	Ball	chrome plated brass
Suitable actuators	Non-Spring	CQB
	Electrical fail-safe	CQKB(X)

Safety notes

- WARNING: This product can expose you to lead which is known to the State of California to cause cancer and reproductive harm. For more information go to www.p65warnings.ca.gov
- If temperature exceeds 212°F operating range due to a boiler control failure the valve will safely contain the hot water but manufacturers product warranty becomes invalid. Valve and actuator replacement is at the expense of others.

Product features

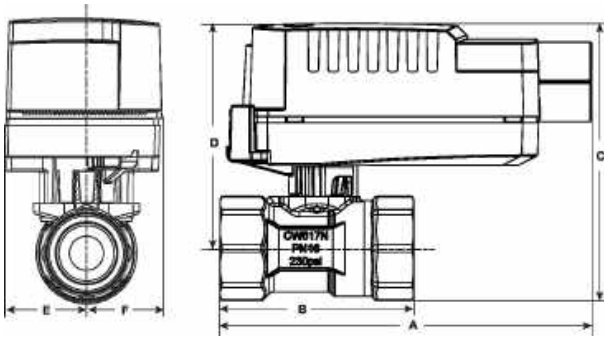
Application

The QCV zone valves are suited for large commercial buildings where higher close-off and the ability to change flow is desired. Common applications include unit ventilators, fan coil units, VAV reheat coils, fin tube casing, radiant panels and duct coils. The valve fits in space restricted areas and can be assembled without the use of tools.

Dimensions

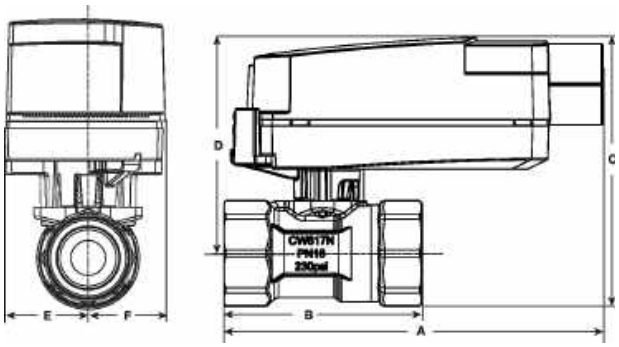
Type	DN
Z2050Q-J	15

CQK



A	B	C	D	E	F
4.5" [114]	2.0" [52]	3.3" [83]	2.7" [69]	0.9" [24]	0.9" [24]

CQ



A	B	C	D	E	F
4.5" [114]	2.0" [52]	3.1" [80]	2.6" [65]	1.0" [25]	1.0" [26]

BELIMO

On/Off, Electrical Fail-Safe, AC 100...240 V

- Nominal voltage AC 100...240 V
- Control On/Off
- Position feedback

Technical data sheet CQKBUP-LL

5-year warranty

Technical data

Electrical data	Nominal voltage	AC 100...240 V
	Nominal voltage frequency	50/60 Hz
	Power consumption in operation	2.5 W
	Power consumption in rest position	0.5 W
	Power consumption for wire sizing	5 VA
	Transformer sizing	7 VA (class 2 power source)
	Electrical Connection	18 GA appliance cable, 3 ft [1 m], with 1/2" conduit connector
	Overload Protection	electronic thoughout 0...90° rotation
Functional data	Bridging time (PF)	2 s
	Pre-charging time	5...20 s
	Angle of rotation	90°
	Angle of rotation note	adjustable with mechanical stop
	Running Time (Motor)	75 s / 90°
	Running time fail-safe	<60 s
	Noise level, motor	35 dB(A)
	Noise level, fail-safe	35 dB(A)
	Position indication	pointer
Safety data	Degree of protection IEC/EN	IP40
	Degree of protection NEMA/UL	NEMA 2
	Enclosure	UL Enclosure Type 2
	Agency Listing	cULus acc. to UL60730-1A/-2-14, CAN/CSA E60730-1:02, CE acc. to 2014/30/EU and 2014/35/EU; Listed to UL 2043 - suitable for use in air plenums per Section 300.22(c) of the NEC and Section 602.2 of the IMC
	Quality Standard	ISO 9001
	Ambient temperature	1.7...40°C
	Storage temperature	-40...176°F [-40...80°C]
	Ambient humidity	Max. 95% RH, non-condensing
	Servicing	maintenance-free
Materials	Housing material	UL94-5VA

Product features

Application

Electrical fail-safe On/Off ZoneTight actuator.

Valve selection should be done in accordance with the flow parameters and system specifications.

The actuator is mounted directly to the valve without the need for tools or additional linkage.

The actuator operates in response to AC 100...240 V. Angle of rotation is adjustable with the integrated mechanical stop.

Electrical installation

INSTALLATION NOTES

A Actuators with appliance cables are numbered.

1 Provide overload protection and disconnect as required.

2 Actuators may be connected in parallel. Power consumption and input impedance must be observed.

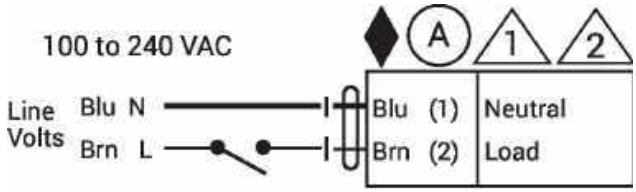
Meets cULus requirements without the need of an electrical ground connection.

1 **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.

Wiring diagrams

On/Off



Functions	A	
0%		
100%		
Fail Position	100%	Open

Dimensions

Décora Series In-Wall Timers

935 Series

 # 93502 - 30 Minute Timer Shown

RATINGS

INPUT: 125-277 VAC, 60 Hz

7A - 125 VAC	Tungsten
20A - 125VAC	Resistive
10A - 250VAC	Resistive
1 Hp - 250 VAC	Motor

ORDERING INFORMATION

Part #	*Description*
93501	15 Minute
93502	30 Minute
93503	60 Minute
93504	2 Hour
93507	4 Hour
93505	6 Hour
93506	12 Hour
93513	60 Minute with hold
93516	12 Hour with hold

White & Ivory Decorator Dial & Knob Included

WARRANTY

1 Year Limited Warranty

c UL us LISTED

OVERVIEW

The MarkTime® 935 Décora Series In-Wall Timers are interchangeable with any standard single or multi-gang wall switch. These energy saving timers use no electricity to operate and automatically limit the "ON" time of energy consuming loads.

APPLICATIONS

The Décora Series in-Wall Timer switch is an easy upgrade from any single pole wall switch. The 935 Series can be used in a variety of residential and light commercial applications providing convenient timed control of lighting, fans, heaters, motors and other energy consuming loads.

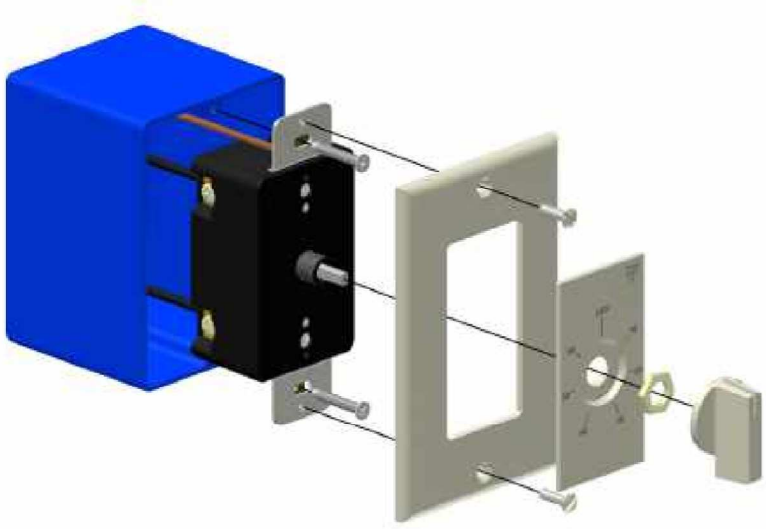
FEATURES & BENEFITS

- Versatile time limits allow for quick, simple operation while providing the most effective energy management.
- Select models have a convenient hold feature to override automatic shutoff.
- Combined N.O. and N.C. switching configurations give the convenience and versatility of either typical operation; turning a load on during time delay or reverse operation of turning the load off during time delay.
- Switching Convenience - SPST switching with the option to be wired for SPDT.
- No neutral required – great for retrofits, saves time and money.
- White & ivory decorator dials & knobs included so you carry 1 SKU VS. 2; saving counter space & inventory cost.
- Supplied decorator dials can be installed with either standard or decorator wall plates.
- Fits single or multi-gang wall box to replace a single-pole wall switch for fast easy installation.

Caution: Not to be used in precision timing applications where inaccurate timing could have dangerous consequences. (i.e. sun lamp, tanning beds etc.) Do not use with fluorescent lamp ballasts.

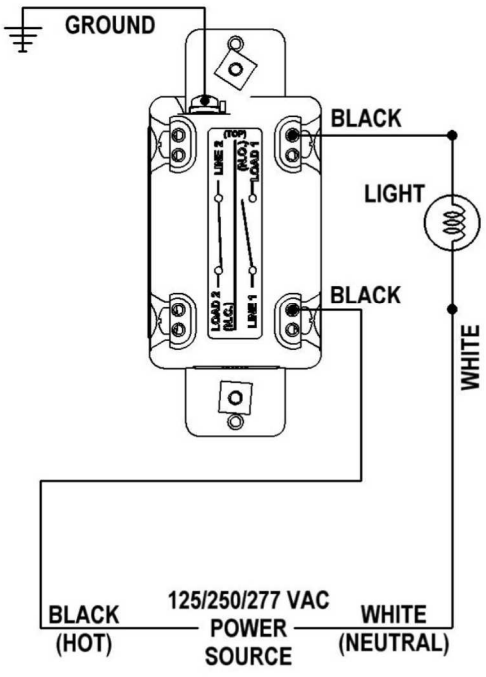
935 Series Décora Series In-Wall Timers

INSTALLATION

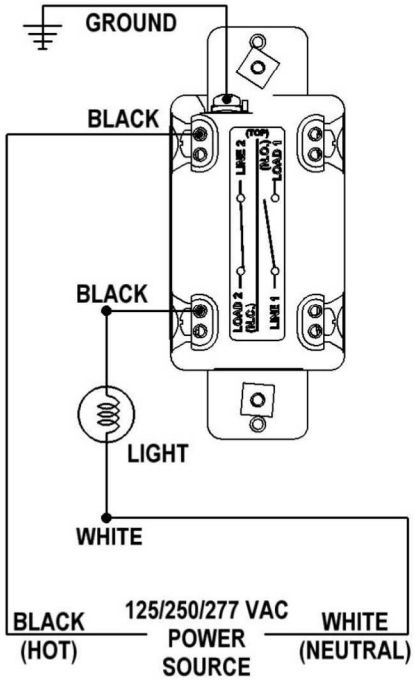


WIRING DIAGRAMS

TYPICAL WIRING



REVERSE OPERATION



IBOCO

DESCRIPTION

The **Iboco P Series Spiralite** universal spiral wrapping is great for fast and economical grouping of wire bundles.

FEATURES

- ***Polyethylene construction***
- ***Provides flexible connection between panel and door***
- ***Strong, yet simple to install and remove***

P Series

ORDERING INFORMATION

MODEL	FOR WIRE BUNDLES in (cm)	FT (m) (per carton*)
P2	1/4 to 1 (0.64 to 2.54)	80 (24)
P3	3/8 to 2 (0.95 to 5.08)	80 (24)
P4	1/2 to 3 (1.27 to 7.62)	65 (20)
* Available in carton quantities only – order quantity 1 = 1 carton		

IBOCO

DESCRIPTION

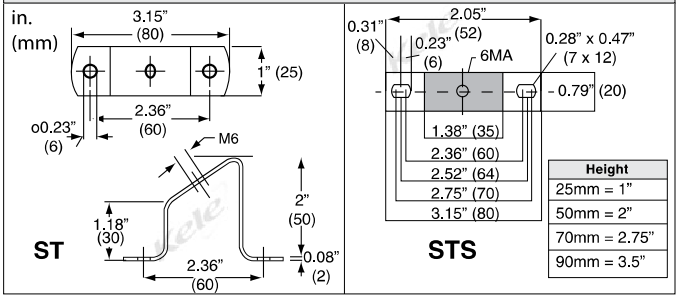
The **Iboco ST, STS support brackets** give you options in mounting your DIN rail. These are made of cold-rolled steel treated with galvanic zinc plating and passivation.

FEATURES

- ***Includes 6mm screws***

STS Series ST Series

DIMENSIONS



ORDERING INFORMATION

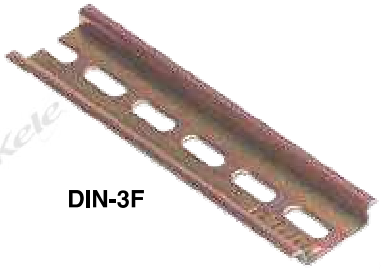
MODEL	DESCRIPTION
ST	DIN Rail support bracket
STS-25	1" din rail support bracket
STS-50	2" din rail support bracket
STS-70	2.75" din rail support bracket
STS-90	3.5" din rail support bracket

DESCRIPTION

DIN rail is the standard method for mounting relays and terminal blocks. Kele offers five models with different features.

FEATURES

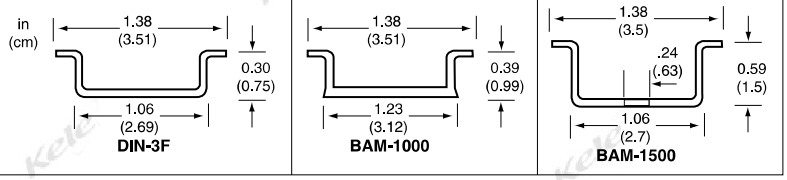
- ***One meter length (39.4")***
- ***Steel or aluminum***
- ***Perforated***



DIN-3F

RoHS

DIMENSIONS



ORDERING INFORMATION

MODEL	DESCRIPTION
BAM-1000	35 mm aluminum DIN mounting rail 39.4" (1m)
BAM-1500	35 mm aluminum DIN mounting rail 39.4" (1m) 15mm height
DIN-3F	35 mm DIN rail, steel, 39.4" (1m), RoHS compliant
DINRALU	DIN rail, aluminum, 39.4" (1m)
DINRSTL	DIN rail, steel, 39.4" (1m)

RELATED PRODUCTS

DINCLIC-FM4	Mounting clips, 4 mm screw size

ALARMS & INDICATION

EMERGENCY OPERATOR STATIONS
ESM SERIES

DESCRIPTION

The **E-Stop ESM Series emergency operator stations** offer a highly visible method to shut down equipment, initiate alarms, or give a controller input during emergency conditions. Operation is with the push of a red 40mm mushroom-head push-button. The button may be reset with a pull or twist of the mushroom head, depending on the button style.

FEATURES

- ***Highly visible yellow/black backGround***
- ***UL listed for Category NISD Emergency Stop Devices, File #E348889***
- ***Various NEMA rated enclosures***
- ***40mm Red Mushroom Operators***
- ***1 N.O. and 1 N.C. contact included***

ESM-M1S-PP0-BS

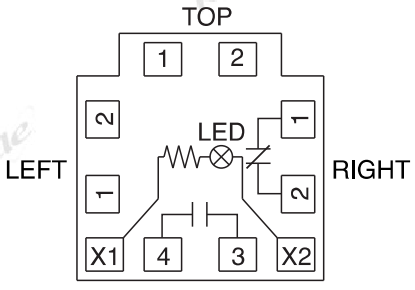
ESM-NXS-PP0-VT

SPECIFICATIONS

Contact Rating	
ES-NO	10A, 600 VAC
ES-NC	2.5A, 600 VDC
Contact Configuration	4 Maintained or 6 Momentary maximum
Mechanical Life	Contact 10 million operations
Contact Type	Self-cleaning silver contacts
Contact Resistance	<25 milli-ohms, closed
Operating Temperature	-13° to 158°F (-25° to 70°C)
Enclosure Rating	NEMA 1, 3R, 4, 4X, 12, 13 availiable
Dimensions	
M1S, M2S	4"H x 4"DW x 3"D (10.2 x 10.2 x 7.6 cm)
NXS	4.45"H x 2.87" W x 3.11"D (10.2 x 7.6 x 7.9 cm)
SXS	3.5"H x 3.25"W x 2.75"D (8.9 x 8.3 x 7.1 cm)
M3S	4"H x 4" W x 4"D (10.2 x 10.2 x 10.2 cm)
M1F	5.5"H x 5.5"W x 3"D (14 x 14 x 7.6 cm)
Weight	
M1S	1.84 lb (0.84 Kg)
NXS	1.93 lb (0.88 Kg)
M2S	2.30 lb (1.04 Kg)
SXS	1.90 lb (0.86 Kg)
M3S	2.95 lb (1.34 Kg)
M1F	2.39 lb (1.03 Kg)
Approvals	UL Listed NISD File# E348889, CSA, NEMA
Warranty	1 year

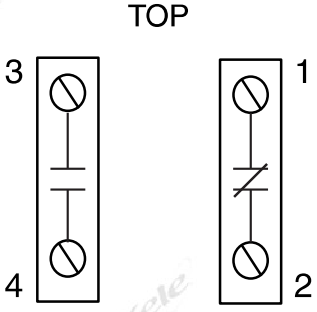
WIRING

PTL24



1 NO-1 NC
Note: Standard contact arrangement

PP0, PT0, PK



1 NO-1 NC
Note: Standard contact arrangement
(4 momentary or 6 maintained total maximum)

ORDERING INFORMATION

Model	Description		
ESM	**Maintained Emergency Operator Station (UL NISD) (1-N.O. & 1-N.C. contact included)**		
	Enclosure		
	M1S	NEMA 1 Metal enclosure, surface mount	
	NXS	NEMA 4X,12 Non-metal enclosure, surface mount	
	M2S	NEMA 12,13 Metal enclosure, surface mount	
	SXS	NEMA 4X Stainless steel enclosure, surface mount	
	M3S	NEMA 3R Metal enclosure, surface mount	
	M1F	NEMA 1 Metal enclosure, flush mount	
		Button Style	
		PP0	Red maintained 40mm mushroom (push-pull)
		PT0	Red maintained 40mm mushroom (push-twist)
		PTL24*	Illuminated 24V red maintained 40mm mushroom (push-twist, lamp included)
		PK0	Red maintained 40mm mushroom (push- key release)
			Legend
			BS Emergency - Boiler Shut-down
			CS Emergency - Chiller Stop
			FN Emergency - Exhaust Fan
			HS Emergency- HVAC Shut-down
			PO Emergency - Power Off
			RP Emergency - Refrigerant Purge
			SD Emergency - Shut Down
			SO Emergency - Shut Off
			ST Emergency - Stop
			VP Emergency - Ventilation Stop
			VT Emergency - Ventilation Start

*Can only be used with M1S or M1F enclosure

**18 character max, no color changes, no font changes, no company logos.

ESM - **M1S** - **PP0** - **CS**

Example: **ESM-M1S-PP0-CS** Maintained Emergency Operator Station, NEMA1 metal enclosure, surface mount, Red maintained 40mm push-pull mushroom, labeled as "Chiller Stop"

ACCESSORIES

ES-KEY	Replacement Key for PK0 option, ESM and ESP series
ES-NC	Normally Closed Contact Block for Non-illuminated ESM, ESB, and ESP Emergency Operator Stations
ES-NO	Normally Open Contact Block for Non-illuminated ESM, ESB, and ESP Emergency Operator Stations

INSTA-PANEL™ SERIES
MODEL NSTA2018VA100

DESCRIPTION

Frequently jobs are done on a fast track basis in our industry. **Insta-Panels** were created for a fast turnaround on a control panel job, saving time and labor. **Insta-Panels** are built at Kele in three sizes: small, medium, and large. Each panel is set up with transformer(s), terminal blocks, wire duct, convenience outlet, additional DIN rail and a perforated back panel for easy mounting of customer parts. Pick your size panel based on the interior space needed for mounting components.

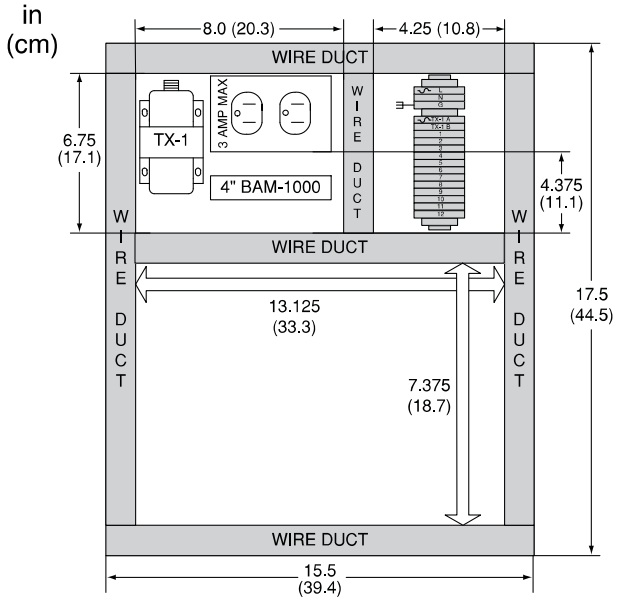
FEATURES

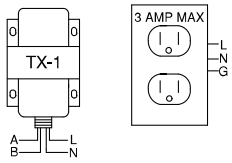
- ***NEMA 1 enclosure***
- ***Convenience outlet***
- ***An extra piece of DIN rail is provided***
- ***Fused primary (incoming 120 volt 10 Amp)***
- ***Fused secondary (24 volts 4 amps)***
- ***White wire duct 3" high x 1" wide***
- ***Separation of high and low voltage wiring***
- ***Prewired power terminals, primary and secondary***
- ***Blown fuse indication on incoming 120 VAC***
- ***Perforated back panel***

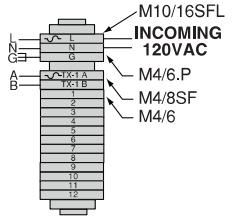
SPECIFICATIONS

Power	(1) 120/24 Volt transformer 100 VA
Weight	31 lb (14 kg)
Panel size	20"H x 18"W x 7"D (50.8 x 45.7 x 17.8 cm)
Panel Color	Dark brown body and light tan door
Interior panel mounting dimensions	See detail

DIMENSIONS / WIRING







Bill of Materials

1 - RET2018ULP Enclosure and Perf Panel
1 - 691-K1 Transformer
1 - PRK Duplex Receptacle
1 - BAM-1000 Aluminum DIN Rail
1 - M10/16SFL Primary Fuse Holder
1 - M4/6.P Grounding Terminal Block
14 - M4/6 Terminal Block
1 - M4/8SF 8mm Fuseholder
1 - FEM8S Fuse Holder End Section
2 - FEM6 End Section
3 - BAM2 End Stop
1 - RC610/1-50 Marker Tags
1 - RC610/B Blank Marker Tag
2 - T1-1030W White Wiring Duct
1 - GF-10 Primary Fuse
1 - K235-4 Secondary Fuse
1 - LEN indication lamp for blown fuse

ORDERING INFORMATION

MODEL	DESCRIPTION
NSTA2018VA100	**20" x 18" Insta-Panel, (1) 100 VA transformer, outlet, 12 available terminal blocks**

KELE INSTA-PANEL ENCLOSURES

NSTA SERIES

DESCRIPTION

The **Kele NSTA Series Insta-Panel Enclosures** were created for a fast turnaround on a control panel job, saving time and labor. **Instapanels** are built at Kele in three sizes: small, medium, and large. Each panel is set up with transformer(s), terminal blocks, wire duct, convenience outlet, additional DIN rail and a perforated back panel for easy mounting of customer parts. Pick the size panel based on the interior space necessary for mounting components. Choose from NEMA 1 or NEMA 4/12 enclosures.

FEATURES

- ***Three popular sizes of NEMA 1 enclosures (Gray, Dark Blue, Light Blue and Tan/Brown)***
- ***Convenience outlet***
- ***Three popular sizes of NEMA 4/12 enclosures (Gray color only)***

NSTA2018VA100

NSTA2620VA200

NSTA3826VA300

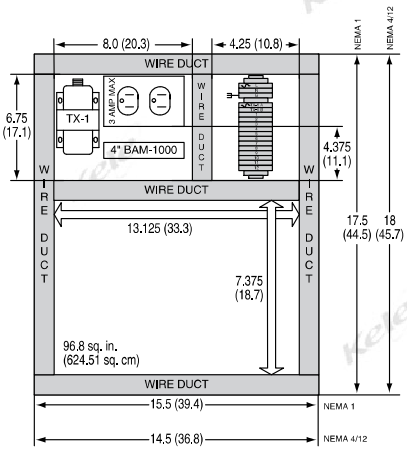
NSTA2016412-GY

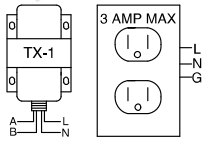
SPECIFICATIONS

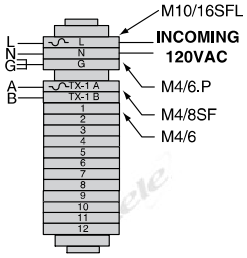
Supply Voltage	
NSTA2018VA100, NSTA2016412-GY	(1) 120/24 VAC transformer, 100 VA
NSTA2620VA200, NSTA2420412-GY	(2) 120/24 VAC transformers, 100 VA (200 VA total)
NSTA3826VA300, NSTA3624412-GY	(3) 120/24 VAC transformers, 100 VA (300 VA total)
Convenience Outlet	120 VAC, 3 A maximum
Enclosure Size	
NSTA2018VA100	20"H x 18"W x 7"D (50.8 x 45.7 x 17.8 cm)
NSTA2016412-GY	20"H x 16"W x 8"D (51.0 x 30.0 x 20.0 cm)
NSTA2620VA200	26"H x 20"W x 7"D (66 x 50.8 x 17.8 cm)
NSTA2420412-GY	24"H x 20"W x 8"D (61.0 x 51.0 x 20.0 cm)
NSTA3826VA300	38"H x 26"W x 7"D (96.5 x 66 x 17.8 cm)
NSTA3624412-GY	36"H x 24"W x 8"D (91.0 x 61.0 x 20.0 cm)

Interior Panel Mounting Dimensions	
NSTA2018VA100	7.375"H x 13.125"W (18.7 x 33.3 cm)
NSTA2016412-GY	7.375"H x 13.125"W (18.7 x 33.3 cm)
NSTA2620VA200	13.0" H x 15.375" W (33.0 x 39.0 cm)
NSTA2420412-GY	13.0" H x 15.375" W (33.0 x 39.0 cm)
NSTA3825VA300	24.0" H x 20" W (61.0 x 50.8 cm)
NSTA3624412-GY	24.0" H x 20" W (61.0 x 50.8 cm)
Panel Color	Dark brown body and light tan door, Dark blue body and door, Gray body and door (NEMA 4/12 only) Dark blue body and powder blue door
Weight	
NSTA2018VA100	31 lb (14 Kg)
NSTA2016412-GY	36.2 lb (16.4 Kg)
NSTA2620VA200	45 lb (20.4 Kg)
NSTA2420412-GY	53.3 lb (24.2 Kg)
NSTA3826VA300	71 lb (32.2 Kg)
NSTA3624412-GY	88.6 lb (40.2 Kg)
Warranty	1 year

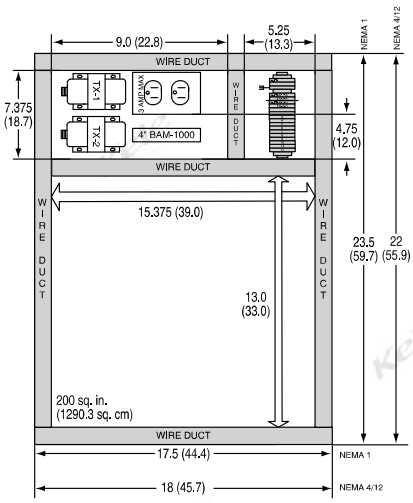
DIMENSIONS

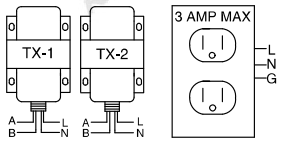


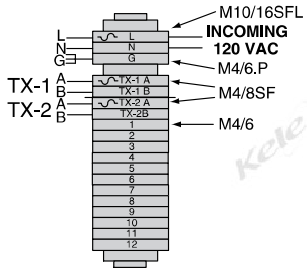




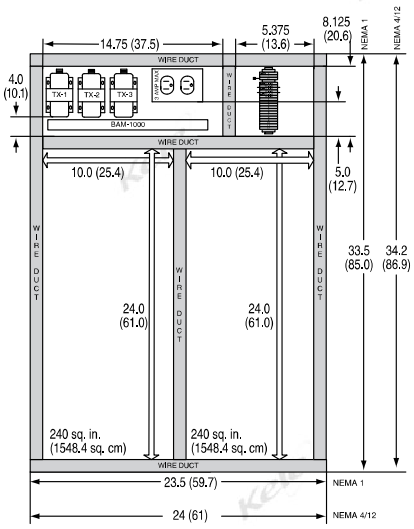
One Transformer Panel

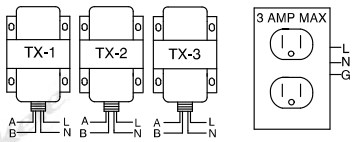


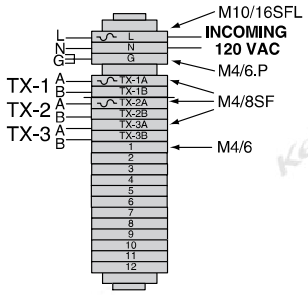




Two Transformer Panel







Three Transformer Panel

ORDERING INFORMATION

MODEL	DESCRIPTION
NSTA2018VA100	20" x 18" Insta-Panel, (1) 100 VA transformer, outlet, 12 available terminal blocks, NEMA 1, Tan and Brown
NSTA2018VA100-DB	20" x 18" Insta-Panel, (1) 100 VA transformer, outlet, 12 available terminal blocks, NEMA 1, Dark Blue
NSTA2018VA100-GY	20" x 18" Insta-Panel, (1) 100 VA transformer, outlet, 12 available terminal blocks, NMEA 1, Gray
NSTA2018VA100-PB	20" x 18" Insta-Panel, (1) 100 VA transformer, outlet, 12 available terminal blocks, NEMA 1, Light Blue
NSTA2620VA200	26" x 20" Insta-Panel, (2) 100VA transformers, outlet, 12 available terminal blocks, NEMA 1,Tan and Brown
NSTA2620VA200-DB	26" x 20" Insta-Panel, (2) 100VA transformers, outlet, 12 available terminal blocks, NEMA 1, Dark Blue
NSTA2620VA200-GY	26" x 20" Insta-Panel, (2) 100VA transformers, outlet, 12 available terminal blocks, NEMA 1, Gray
NSTA2620VA200-PB	26" x 20" Insta-Panel, (2) 100VA transformers, outlet, 12 available terminal blocks, NEMA 1, Light Blue
NSTA3826VA300	38" x 26" Insta-Panel, (3) 100VA transformers, outlet, 12 available terminal blocks, NEMA 1, Tan and Brown
NSTA3826VA300-DB	38" x 26" Insta-Panel, (3) 100VA transformers, outlet, 12 available terminal blocks, NEMA 1, Dark Blue
NSTA3826VA300-GY	38" x 26" Insta-Panel, (3) 100VA transformers, outlet, 12 available terminal blocks, NEMA 1, Gray
NSTA3826VA300-PB	38" x 26" Insta-Panel, (3) 100VA transformers, outlet, 12 available terminal blocks, NEMA 1, Light Blue
NSTA3624412-GY	36" x 24" Insta-Panel, (3) 100VA transformers, outlet, 12 available terminal blocks, NEMA 4/12, Gray
NSTA2420412-GY	24" x 20" Insta-Panel, (2) 100VA transformers, outlet, 12 available terminal blocks, NEMA 4/12, Gray
NSTA2016412-GY	20" x 16" Insta-Panel, (1) 100 VA transformer, outlet, 12 available terminal blocks, NEMA 4/12, Gray

***No suffix:** brown/tan, DB: dark blue, GY: gray, PB: dark blue/light blue

SENSOR THERMOWELLS AND WELL ADAPTERS

F2B-D, F2N-B, F2S-D, WEL-B, WEL-S

DESCRIPTION

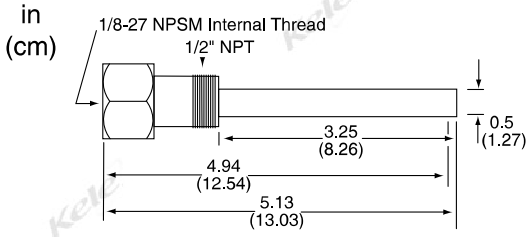
The **Kele WEL-B** and **WEL-S Sensor Wells** are used with standard length Kele and Precon branded immersion thermistor and RTD sensors. These wells may be used with 5" (12.7 cm) Minco immersion sensors by using the "H" option adapter. The well is designed to be installed into a standard 1/2" saddle or Thredolet.®

The **WEL-B Brass Thermowell** is the standard thermowell for inserting into noncorrosive liquid lines. It will withstand a maximum temperature of 400°F (204°C) and a maximum static pressure of 1000 psig (6.9 MPa).The **WEL-S 304 Stainless Steel Thermowell** is inserted into corrosive liquid pipe lines. It will withstand a maximum temperature of 1000°F (538°C) and a maximum static pressure of 4500 psig (31 MPa).

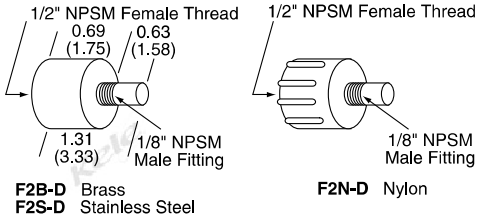
The **F2S-D Stainless Steel, F2N-D Nylon**, or the **F2B-D Brass Well Adapter** allows a 1/4" (0.64 cm) diameter sensor probe with a 1/2" NTSM fitting to be used with a standard **WEL-B** or **WEL-S Thermowell**.

WARRANTY 1 year

DIMENSIONS



WEL-B Brass Well or WEL-S Stainless Steel Well



(insertion length add 0.31" (0.97))

Well Adapters

ORDERING INFORMATION

MODEL	DESCRIPTION	
WEL	Bulb wells	
	B	Brass bulb well
	S	304 Stainless steel bulb well
	OPTIONAL ADAPTER	
	H	F2B-D* brass adapter for use with WEL-B F2S-D* stainless steel adapter for use with WEL-S

WEL – B – H

Example: **WEL-B** brass bulb well with F2B-D brass adapter

* For use with Minco sensor probe length LLL=5.5"

RELATED PRODUCTS

F2B-D	Brass adapter 1/2" NPT to 1/8" NPS adapter
F2N-D	Nylon adapter 1/8" NPSM x 1/2" NPSM
F2S-D	Stainless steel adapter 1/8" NPS x 1/2" NPSM
TCC-111	Thermal conductive compound 111 ml tub
TCC-12	Thermal conductive compound tube, 12 ml

FUNCTIONAL DEVICES CONTROL TRANSFORMERS

RIB TR SERIES

DESCRIPTION

The **Functional Devices RIB TR Series** offers a complete line of control transformers for use in building automation and temperature control systems. The series includes transformer VA ratings from 20 VA up through 375 VA and primary voltages of 120, 208, 240, 277, and 480 VAC. Isolation transformers for 24 VAC circuits are also included. All **RIB TR Series** transformers are UL listed and feature split-bobbin construction. Some also have a secondary circuit breaker.

FEATURES

- ***Complete line of control transformers from 20 VA to 375 VA***
- ***Foot and hub mounting on most models***
- ***All models UL listed, many are Class 2 rated***
- ***Ambient temp -30° to 140°F (0° to 60°C)***
- ***Color-coded wire leads***
- ***One year warranty***

RIB TR Series

SPECIFICATIONS

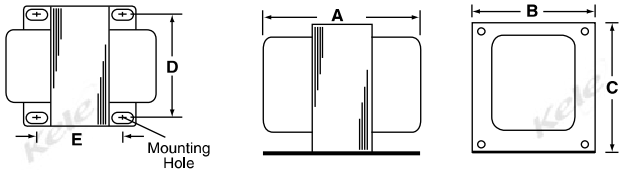
ORDER NUMBER	VA RATING	PRIMARY:SECONDARY VOLTAGE (VAC)	FREQ (HZ)	CIRCUIT BREAKER	MOUNTING H=HUB	AGENCY APPROVALS
TR20VA001	20	120:24	50/60	No	1H + Foot	Class 2 UL5085-3 listed,C-UL,CE,RoHS E197146
TR20VA002	20	208:24	50/60	No	2H + Foot	Class 2 UL5085-3 listed,C-UL,CE,RoHS E197146
TR20VA003	20	24:24 (isolation)	50/60	No	1H + Foot	Class 2 UL508-2 listed General Purpose,C-UL,CE,RoHS E197147
TR20VA004	20	120:24	50/60	No	2H + Foot	Class 2 UL5085-3 listed,C-UL,CE,RoHS E197146
TR20VA007	20	277:24	50/60	No	1H + Foot	Class 2 UL5085-3 listed,C-UL,CE,RoHS E197146
TR40VA001	40	120:24	50/60	No	1H + Foot	Class 2 UL5085-3 listed,C-UL,CE,RoHS E197146
TR40VA002	40	120:24	50/60	No	2H + Foot	Class 2 UL5085-3 listed,C-UL,CE,RoHS E197146
TR40VA003	40	24:24	50/60	No	1H + Foot	Class 2 UL508-2 listed General Purpose,C-UL,CE,RoHS E197147
TR40VA004	40	277/240/208/120:24	50/60	No	2H + Foot	Class 2 UL5085-3 listed,C-UL,CE,RoHS E197146
TR40VA013	40	480/277/240/208:120	50/60	No	1H + Foot	Class 2 UL508-2 listed General Purpose,C-UL,CE,RoHS E197147
TR40VA015	40	240/208/120:24	50/60	No	1H + Foot	Class 2 UL5085-3 listed,C-UL,CE,RoHS E197146
TR40VA022	40	120:24	50/60	No	2H + Foot	Class 2 UL5085-3 listed,C-UL,CE,RoHS E197146
TR40VA040	40	240/208/120:24	50/60	No	2H + Foot	Class 2 UL5085-3 listed,C-UL,CE,RoHS E197146
TR50VA001	50	120:24	50/60	No	2H + Foot	Class 2 UL5085-3 listed,C-UL,CE,RoHS E197146
TR50VA002	50	120:24	50/60	No	2H + Foot	Class 2 UL5085-3 listed,C-UL,CE,RoHS E197146
TR50VA003	50	208:24	50/60	No	2H + Foot	Class 2 UL5085-3 listed,C-UL,CE,RoHS E197146
TR50VA004	50	480/277/240/120:24	50/60	Yes	2H + Foot	Class 2 UL5085-3 listed,C-UL,CE,RoHS E197146
TR50VA005	50	120:24	50/60	Yes	1H + Foot	Class 2 UL5085-3 listed,C-UL,CE,RoHS E197146
TR50VA006	50	277:24	50/60	No	1H + Foot	Class 2 UL5085-3 listed,C-UL,CE,RoHS E197146
TR50VA007	50	277:24	50/60	No	2H + Foot	Class 2 UL5085-3 listed,C-UL,CE,RoHS E197146
TR50VA009	50	240/208/120:24	50/60	Yes	2H + Foot	Class 2 UL5085-3 listed,C-UL,CE,RoHS E197146
TR50VA014	50	277:24	50/60	Yes	1H + Foot	Class 2 UL5085-3 listed,C-UL,CE,RoHS E197146
TR50VA015	50	480/277/240/208/120:24	50/60	Yes	1H + Foot	Class 2 UL5085-3 listed,C-UL,CE,RoHS E197146
TR50VA016	50	240/208/120:24	50/60	Yes	1H + Foot	Class 2 UL5085-3 listed,C-UL,CE,RoHS E197146
TR50VA017	50	480/277/208:24	50/60	Yes	1H + Foot	Class 2 UL5085-3 listed,C-UL,CE,RoHS E197146
TR50VA018	50	480/277/240/208:24	50/60	No	Plate	Class 2 UL508-2 listed General Purpose,C-UL,CE,RoHS E197147
TR50VA019	50	277/120:24	50/60	No	Foot	Class 2 UL5085-3 Component Recognized,C-UL,CE,RoHS E197146
TR75VA001	75	120:24	50/60	Yes	1H + Foot	Class 2 UL5085-3 listed,C-UL,CE,RoHS E197146
TR75VA002	75	120:24	50/60	Yes	2H + Foot	Class 2 UL5085-3 listed,C-UL,CE,RoHS E197146
TR75VA003	75	277:24	50/60	Yes	1H + Foot	Class 2 UL5085-3 listed,C-UL,CE,RoHS E197146
TR75VA004	75	480/240/208/120:24	50/60	Yes	1H + Foot	Class 2 UL5085-3 listed,C-UL,CE,RoHS E197146
TR75VA005	75	480/240/208/120:24	50/60	Yes	1H + Foot	Class 2 UL5085-3 listed,C-UL,CE,RoHS E197146
TR75VA007	75	480/240/208/120:24	50/60	Yes	2H + Foot	Class 2 UL5085-3 listed,C-UL,CE,RoHS E197146
TR100VA001	100	120:24	50/60	Yes	1H + Foot	Class 2 UL5085-3 listed,C-UL,CE,RoHS E197146
TR100VA002	100	120:24	50/60	Yes	1H + Foot	Class 2 UL5085-3 listed,C-UL,CE,RoHS E197146
TR100VA004	100	480/277/240/120:24	50/60	Yes	2H + Foot	Class 2 UL5085-3 listed,C-UL,CE,RoHS E197146
TR100VA005	100	480/277/240/120:24	50/60	Yes	1H + Foot	Class 2 UL5085-3 listed,C-UL,CE,RoHS E197146
TR100VA008	100	480/277/240/120:24	50/60	Yes	2H + Foot	UL508-2 listed General Purpose,C-UL,CE,RoHS E197147
TR100VA015	100	480/277/240/120:24	50/60	Yes	1H + Foot	Class 2 UL5085-3 listed,C-UL,CE,RoHS E197146
TR150VA001	150	120:24	50/60	Yes	1H + Foot	UL5085-3 Component Recognized,C-UL,CE,RoHS E197147
TR150VA002	150	120:24	50/60	Yes	2H + Foot	UL508-2 listed General Purpose,C-UL,CE,RoHS E197147
TR150VA008	150	480/277/240/208:24	50/60	Yes	2H + Foot	UL508-2 listed General Purpose,C-UL,CE,RoHS E197147
TR175VA001	175	240/208	50/60	No	Foot	UL508-2 listed General Purpose,C-UL,CE,RoHS E197147
TR175VA002	175	120:24	50/60	No	2H + Foot	UL508-2 listed General Purpose,C-UL,CE,RoHS E197147
TR175VA003	175	120:24	50/60	No	1H + Foot	UL508-2 listed General Purpose,C-UL,CE,RoHS E197147
TR240VA001	240	120:24	50/60	No	1H	UL508-2 listed General Purpose,C-UL,CE,RoHS E197147
TR300VA002	300	480/240/208/120:24	50/60	Yes	Foot	UL508-2 listed General Purpose,C-UL,CE,RoHS E197147
TR375VA001	375	120:24	50/60	No	Foot	UL508-2 listed General Purpose,C-UL,CE,RoHS E197147

FUNCTIONAL DEVICES CONTROL TRANSFORMERS

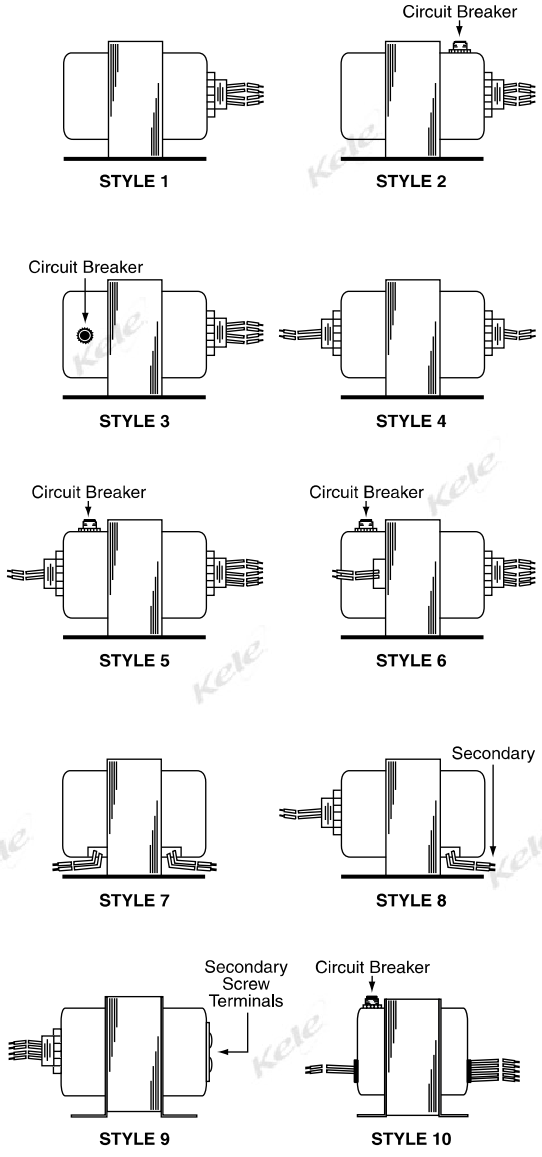
RIB TR SERIES

DIMENSIONS

in
(cm)



MODEL	OUTER DIMENSIONS			MOUNTING DIMENSIONS		WIRES In. (cm)	WEIGHT lb (Kg)	STYLE
	A	B	C	D	E			
TR20VA001	2.226	1.877	2.595	1.619	1.612	8.0 (20.32)	1.20 (0.54)	1
TR20VA002	2.296	1.922	2.616	1.665	1.604	8.0 (20.32)	1.40 (0.64)	4
TR20VA003	2.272	1.900	2.628	1.686	1.635	8.0 (20.32)	1.40 (0.64)	1
TR20VA004	2.310	1.890	5.625	1.625	1.540	8.0 (20.32)	1.40 (0.64)	1
TR20VA007	2.302	1.895	2.607	1.685	1.608	8.0 (20.32)	1.20 (0.54)	1
TR40VA001	2.607	2.169	2.906	1.786	2.020	8.0 (20.32)	2.00 (0.91)	1
TR40VA002	2.634	2.177	2.886	1.775	2.007	8.0 (20.32)	2.00 (0.91)	4
TR40VA003	2.653	2.171	2.882	1.779	2.033	8.0 (20.32)	2.00 (0.91)	1
TR40VA004	2.631	2.177	2.882	1.774	1.998	8.0 (20.32)	2.20 (1.0)	4
TR40VA013	3.325	2.505	3.000	1.986	1.699	8.0 (20.32)	2.65 (1.2)	2
TR40VA015	2.628	2.175	2.907	1.780	2.040	8.0 (20.32)	2.20 (1.0)	1
TR40VA022	2.660	2.172	2.891	1.786	1.980	8.0 (20.32)	2.00 (0.91)	4
TR40VA040	2.728	2.171	2.890	1.792	1.995	8.0 (20.32)	2.20 (1.0)	9
TR50VA001	2.677	2.178	2.879	1.793	2.109	8.0 (20.32)	2.00 (0.91)	1
TR50VA002	2.696	2.181	2.908	1.788	2.053	8.0 (20.32)	2.00 (0.91)	4
TR50VA003	2.695	2.181	2.899	1.778	2.082	8.0 (20.32)	2.00 (0.91)	4
TR50VA004	3.475	2.513	3.014	1.970	1.856	9.5 (24.13)	3.00 (1.36)	5
TR50VA005	3.489	2.515	3.008	1.971	1.870	9.0 (22.86)	2.40 (1.09)	2
TR50VA006	2.763	2.182	2.898	1.790	2.135	8.0 (20.32)	2.00 (0.91)	1
TR50VA007	2.715	2.173	2.886	1.784	2.148	8.0 (20.32)	2.00 (0.91)	4
TR50VA009	3.142	2.504	3.014	1.961	1.864	9.5 (24.13)	2.80 (1.27)	5
TR50VA014	3.479	2.509	3.009	1.965	1.873	9.30 (23.62)	2.60 (1.18)	2
TR50VA015	3.405	2.517	3.013	1.985	1.875	9.5 (24.13)	2.80 (1.27)	2
TR50VA016	3.345	2.510	3.028	1.978	1.842	9.5 (24.13)	2.80 (1.27)	2
TR50VA017	3.470	2.520	3.031	1.872	1.880	9.5 (24.13)	2.86 (1.3)	2
TR50VA018	4.450	4.100	4.100	3.000	Plate Mount	12.0 (30.48)	3.00 (1.36)	–
TR50VA019	2.470	2.170	2.896	1.740	1.850	28.0 (71.12)	1.99 (0.9)	4
TR75VA001	3.743	2.506	3.016	1.974	2.256	9.5 (24.13)	3.40 (1.54)	2
TR75VA002	3.789	2.508	3.013	1.952	2.290	9.5 (24.13)	3.60 (1.63)	5
TR75VA003	3.875	2.507	3.037	1.978	2.269	9.5 (24.13)	3.60 (1.63)	2
TR75VA004	3.802	2.515	3.050	1.990	2.244	9.5 (24.13)	3.60 (1.63)	6
TR75VA005	3.880	2.515	3.030	1.975	2.270	9.5 (24.13)	3.60 (1.63)	5
TR75VA007	2.287	5.504	3.034	1.981	1.708	8.0 (20.32)	3.97 (1.8)	6
TR100VA001	4.085	2.515	3.030	1.975	2.486	8.0 (20.32)	3.80 (1.72)	2
TR100VA002	4.077	2.504	3.023	1.975	2.470	8.0 (20.32)	4.00 (1.81)	5
TR100VA004	4.173	2.523	3.041	1.976	2.647	8.0 (20.32)	4.40 (2.0)	5
TR100VA005	4.258	2.510	3.030	1.968	2.670	8.0 (20.32)	4.40 (2.0)	3
TR100VA008	4.220	5.525	3.022	1.970	2.690	8.0 (20.32)	4.40 (2.0)	6
TR100VA015	4.270	2.500	3.060	2.030	2.699	8.0 (20.32)	4.74 (2.15)	2
TR150VA001	3.650	3.800	3.183	3.150	2.560	9.5 (24.13)	5.00 (2.27)	3
TR150VA002	3.620	3.785	3.160	3.147	2.568	8.0 (20.32)	5.00 (2.27)	4
TR150VA008	4.283	3.786	3.161	3.260	3.211	8.0 (20.32)	7.20 (3.27)	4
TR175VA001	3.801	3.790	3.163	3.141	3.264	9.5 (24.13)	7.00 (3.18)	7
TR175VA002	4.180	3.790	3.189	3.150	3.220	9.5 (24.13)	7.10 (3.22)	4
TR175VA003	4.030	3.786	3.161	3.155	3.189	8.0 (20.32)	7.44 (3.37)	1
TR240VA001	4.025	3.750	4.530	3.180	3.350	9.5 (24.13)	8.60 (3.9)	8
TR300VA002	4.526	3.750	4.500	3.187	3.859	8.5 (21.59)	11.60 (5.26)	10
TR375VA001	4.592	3.747	4.504	3.181	3.933	7.00 (17.78)	11.20 (5.08)	7



TRANSFORMER STYLES

WIRING

Primary Pigtail Wires

120 VAC	White
208 VAC	Red
240 VAC	Orange
277 VAC	Brown
480 VAC	Gray

Secondary Pigtail Wires

24 VAC	Yellow
24 VAC	Yellow/White
Supply Frequency	50/60HzA
Approvals	UL File #E197146, RoHS, CE
Warranty	1 Year

ORDERING INFORMATION

Order by transformer model as listed under Specifications on the previous page.

ALARMS & INDICATION

75 MM TOWER LIGHTS
TWS SERIES

DESCRIPTION

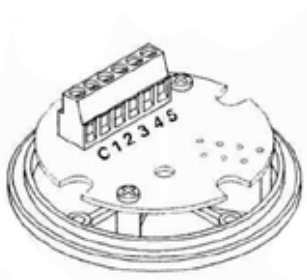
The **EEC TWS Series tower lights** enable stacking of up to five signaling devices. Each device has its own set of contacts. Starting with a bottom module, up to five devices can be added in any combination of continuous and flashing incandescent lights, continuous and flashing LED lights, and Xenon strobes. Each stack can be capped with a horn. Each light comes in a variety of colors, and all lamps are replaceable. Several wall- and pedestal-mounting configurations are available.

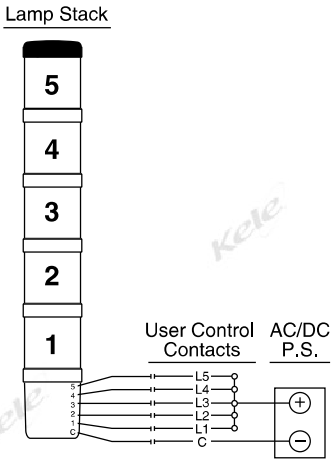
FEATURES

- ***Up to 6 colors available***
- ***Horn module available***
- ***Each lamp individually initiated***
- ***24 AC/DC or 110VAC voltages***
- ***IP65 (IP20 for Horn)***
- ***4 mounting styles***
- ***5 modules per stack (10 with Double Stack)***

Stack with TWS-BS | Stack with TWS-BP1 | Two stacks with TWS-BP2 | Stack with TWS-KIT

WIRING





SPECIFICATIONS

Supply Voltage	24 VAC/VDC, 110 VAC
Power	
Light module	5W 24-120 VAC/VDC
Horn module	24V-6 mA, 110V-4 mA
Color	Blue, Amber, Red, Green, Yellow, Clear
Flash Rate	Flashes per minute (FPM)
Incandescent LED	110 FPM ±20 FPM
Strobe	65 FPM ±10 FPM(24 VAC/DC) 90 FPM ±20 FPM (110/240 VAC)
Horn Loudness	Medium, 76-86 dB @ 1 meter
Mounting	2.13" (5.4 cm) centers
Wall	Two holes
Surface	Four holes

Operating Temperature	-22° to 140°F (-30° to 60°C)
Strobe	14° to 122°F (-10° to 50°C)
Enclosure Rating	NEMA 4, IP65, Horn derates to IP20
Horn	NEMA 1, IP20 upward mount NEMA 1, IP24 downward mount
Dimensions	
Base	2.68"H x 2.95" dia (6.8 x 7.5 cm)
Light	2.72"H x 2.95" dia (6.9 x 7.5 cm)
Horn	3.11"H x 2.95" dia (7.9 x 7.5 cm)
Approvals	CE, UL File #E194312
Warranty	1 year

ORDERING INFORMATION

Steps	Direction	Part Number	Description					
1	*Select Module and Cap (1 required)*	TWS-BC	Bottom wiring module and cap (May need two for double stack)					
2	*Select Mounting Base (1 required only)*	TWS-BS	Base with gasket					
		TWS-BP1	Single stack wall-mount base					
		TWS-BP2	Double stack wall-mount base					
		TWS-KIT	Base and stem extension					
3	*Select Lighting Modules (5 maximum) (1 required)* *Note: All must be the same voltage*	Module Voltage Range	Color	Continuous Incandescent	Flashing Incandescent	Continuous LED	Flashing LED	Strobe
				Part Number				
		24 VAC	BLUE	TWS-F1G	TWS-L1G	TWS-FL1G	TWS-LL1G	TWS-X1G
		24 VDC	BLUE	TWS-F1N	TWS-L1N	TWS-FL1N	TWS-LL1N	TWS-X1N
		110 VAC	BLUE	TWS-F1A	TWS-L1A	TWS-FL1A	TWS-LL1A	TWS-X1A
		24 VAC	AMBER	TWS-F2G	TWS-L2G	TWS-FL2G	TWS-LL2G	TWS-X2G
		24 VDC	AMBER	TWS-F2N	TWS-L2N	TWS-FL2N	TWS-LL2N	TWS-X2N
		110 VAC	AMBER	TWS-F2A	TWS-L2A	TWS-FL2A	TWS-LL2A	TWS-X2A
		24 VAC	RED	TWS-F3G	TWS-L3G	TWS-FL3G	TWS-LL3G	TWS-X3G
		24 VDC	RED	TWS-F3N	TWS-L3N	TWS-FL3N	TWS-LL3N	TWS-X3N
		110 VAC	RED	TWS-F3A	TWS-L3A	TWS-FL3A	TWS-LL3A	TWS-X3A
		24 VAC	GREEN	TWS-F4G	TWS-L4G	TWS-FL4G	TWS-LL4G	TWS-X4G
		24 VDC	GREEN	TWS-F4N	TWS-L4N	TWS-FL4N	TWS-LL4N	TWS-X4N
		110 VAC	GREEN	TWS-F4A	TWS-L4A	TWS-FL4A	TWS-LL4A	TWS-X4A
		24 VAC	YELLOW	TWS-F5G	TWS-L5G	TWS-FL5G	TWS-LL5G	TWS-X5G
		24 VDC	YELLOW	TWS-F5N	TWS-L5N	TWS-FL5N	TWS-LL5N	TWS-X5N
		110 VAC	YELLOW	TWS-F5A	TWS-L5A	TWS-FL5A	TWS-LL5A	TWS-X5A
		24 VAC	CLEAR	TWS-F6G	TWS-L6G	-	-	TWS-X6G
		24 VDC	CLEAR	TWS-F6N	TWS-L6N	-	-	TWS-X6N
		110 VAC	CLEAR	TWS-F6A	TWS-L6A	-	-	TWS-X6A
4	*Select Horn (1 maximum per stack) (Not required)*	24 VAC	TWS-AG					
		24 VDC	TWS-AN					
		110 VAC	TWS-AA					

Note: A complete assembly has parts from steps – 1, 2, 3 and sometimes 4

ACCESSORIES

691-K0A	Control transformer, 120:24 VAC, 40 VA, Class 2
DCP-1.5-W	Power supply, 24 VAC IN to 24 VDC OUT
DCPA-1.2	Power supply, 120 VAC In to 24 VAC/24 VDC Out
TWS-BA15D-G	24 VAC Replacement IC Lamp
TWS-BA15D-N	24 VDC Replacement IC Lamp
TWS-BA15D-A	110VAC Replacement IC Lamp
TWS-LED1-G	24 VAC Blue replacement LED
TWS-LED1-N	24 VDC Blue replacement LED
TWS-LED1-A	110 VAC Blue replacement LED
TWS-LED2-G	24 VAC Amber replacement LED
TWS-LED2-N	24 VDC Amber replacement LED
TWS-LED2-A	110 VAC Amber replacement LED
TWS-LED3-G	24 VAC Red replacement LED
TWS-LED3-N	24 VDC Red replacement LED
TWS-LED3-A	110 VAC Red replacement LED
TWS-LED4-G	24 VAC Green replacement LED
TWS-LED4-N	24 VDC Green replacement LED
TWS-LED4-A	110 VAC Green replacement LED
TWS-LED5-G	24 VAC Yellow replacement LED
TWS-LED5-N	24 VDC Yellow replacement LED
TWS-LED5-A	110 VAC Yellow replacement LED
TWS-LRX2J	Universal Xenon replacement- requires solder connection

PANEL FABRICATION

WIRING DUCT
VD SERIES

DESCRIPTION

The **Kele VD Series wiring duct** allows the simplification and acceleration of panel-building operations such as wire retention, identification of equipment and circuits, and wire separation.

FEATURES

- ***High impact PVC, self extinguishing***
- ***UL recognized, file E97527***
- ***One year warranty***
- ***Gray or white***

VD Series

ORDERING INFORMATION

MODEL	DESCRIPTION
VD1-15G	1.5"H x 1"W x 6.5'L (3.81 cm x 2.54 cm x 2m), includes cover (**56)
VD1-15W	1.5"H x 1"W x 6.5'L (3.81 cm x 2.54 cm x 2m), includes cover (**56)
VD1-3G	3"H x 1"W x 6.5'L (7.62 cm x 2.54 cm x 2m), includes cover (**28)
VD1-3W	3"H x 1"W x 6.5'L (7.62 cm x 2.54 cm x 2m), includes cover (**28)
VD15-15G	1.5"H x 1.5"W x 6.5'L (3.81 cm x 3.81 cm x 2m), includes cover (**38)
VD15-15W	1.5"H x 1.5"W x 6.5'L (3.81 cm x 3.81 cm x 2m), includes cover (**38)
VD15-3G	3"H x 1.5"W x 6.5'L (7.62 cm x 3.81 cm x 2m), includes cover (**28)
VD15-3W	3"H x 1.5"W x 6.5'L (7.62 cm x 3.81 cm x 2m), includes cover (**28)
VD22-22G	2.25"H x 2.25"W x 6.5'L (5.72 cm x 5.72 cm x 2m), includes cover (**18)
VD22-22W	2.25"H x 2.25"W x 6.5'L (5.72 cm x 5.72 cm x 2m), includes cover (**18)
VD22-3G	3"H x 2.25"W x 6.5'L (7.62 cm x 5.72 cm x 2m), includes cover (**20)
VD22-3W	3"H x 2.25"W x 6.5'L (7.62 cm x 5.72 cm x 2m), includes cover (**20)
VD3-3G	3"H x 3"W x 6.5'L (7.62 cm x 7.62 cm x 2m), includes cover (**16)
VD3-3W	3"H x 3"W x 6.5'L (7.62 cm x 7.62 cm x 2m), includes cover (**16)

** Carton quantity, order per piece

SENSOR THERMOWELLS AND WELL ADAPTERS

F2B-D, F2N-B, F2S-D, WEL-B, WEL-S

DESCRIPTION

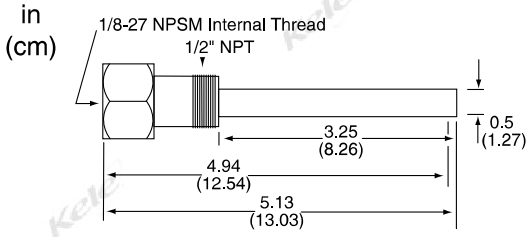
The **Kele WEL-B** and **WEL-S Sensor Wells** are used with standard length Kele and Precon branded immersion thermistor and RTD sensors. These wells may be used with 5" (12.7 cm) Minco immersion sensors by using the "H" option adapter. The well is designed to be installed into a standard 1/2" saddle or Thredolet.®

The **WEL-B Brass Thermowell** is the standard thermowell for inserting into noncorrosive liquid lines. It will withstand a maximum temperature of 400°F (204°C) and a maximum static pressure of 1000 psig (6.9 MPa).The **WEL-S 304 Stainless Steel Thermowell** is inserted into corrosive liquid pipe lines. It will withstand a maximum temperature of 1000°F (538°C) and a maximum static pressure of 4500 psig (31 MPa).

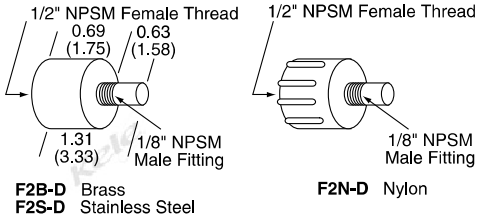
The **F2S-D Stainless Steel, F2N-D Nylon**, or the **F2B-D Brass Well Adapter** allows a 1/4" (0.64 cm) diameter sensor probe with a 1/2" NTSM fitting to be used with a standard **WEL-B** or **WEL-S Thermowell**.

WARRANTY 1 year

DIMENSIONS



WEL-B Brass Well or WEL-S Stainless Steel Well



(insertion length add 0.31" (0.97))

Well Adapters

ORDERING INFORMATION

MODEL	DESCRIPTION	
WEL	Bulb wells	
	B	Brass bulb well
	S	304 Stainless steel bulb well
	OPTIONAL ADAPTER	
	H	F2B-D* brass adapter for use with WEL-B F2S-D* stainless steel adapter for use with WEL-S

WEL – B – H

Example: **WEL-B** brass bulb well with F2B-D brass adapter

* For use with Minco sensor probe length LLL=5.5"

RELATED PRODUCTS

F2B-D	Brass adapter 1/2" NPT to 1/8" NPS adapter
F2N-D	Nylon adapter 1/8" NPSM x 1/2" NPSM
F2S-D	Stainless steel adapter 1/8" NPS x 1/2" NPSM
TCC-111	Thermal conductive compound 111 ml tub
TCC-12	Thermal conductive compound tube, 12 ml

"The safest, most cost-effective proof of flow for fans and pumps is with Senva Sensors."

Reduce the risk of arc flash with Senva.

No guesswork. Multi-turn adjustments are a thing of the past.

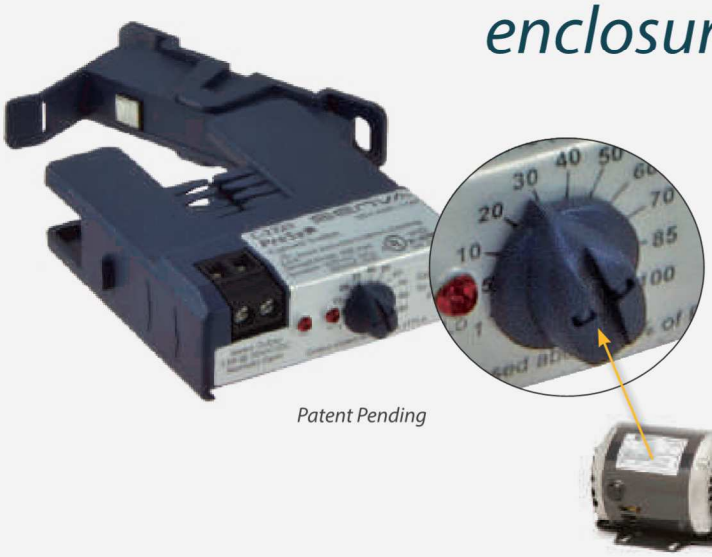
Save over 1/2 hour per sensor install.

OSHA requires protection when working in energized enclosures; just use Senva never calibrate live again!

If you're calibrating current sensors in energized enclosures, you're wasting time and money.

Worse, you should be suiting up for arc flash protection (yes, it's OSHA code). If you're not, you're exposed to injury and liability. Senva makes it safe, simple, and profitable.

Thanks to PRESET™ you'll never calibrate in live enclosures again!



Patent Pending

PreSet™ sensors let you set the dial to the motor amperage. You can install the sensor and never return back to calibrate. Installers tell us they save over ½ hour per sensor. Plus, they're safe. You do the math.

Never calibrate live again!

Split Core Mini now available!

PreSet™

Set the sensor to motor full load amps—never return to calibrate!

PreSet™
Adjustable Current Switch

Scaled calibration for proof of flow set-point
Split and solid core models to 150A
N.O. 30VAC/DC or 120VAC output
Optional command relay

Patent Pending

c UL us

DESCRIPTION

PreSet™ allows for matching sensor set-point to the motor nameplate, eliminating the need to calibrate in energized enclosures and reducing installation time. Sensor will detect motor undercurrent conditions such as belt loss, coupling shear, and mechanical failure on fans and pumps.

APPLICATIONS

- Detecting belt loss, coupling shear, and mechanical failure on fans and pumps
- Monitoring status of industrial processes
- Monitoring status of critical motors

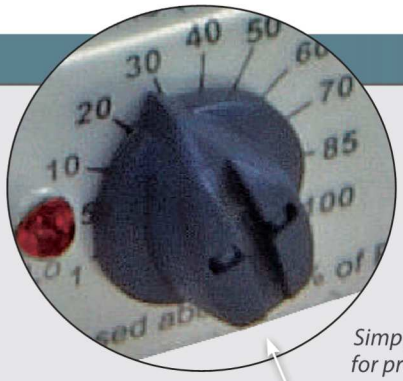
FEATURES

Save time and money while eliminating calibration inside energized enclosures

- Preset™ scaled calibration enables set-point adjustment for proof of flow by simply matching dial to motor full load amps (FLA) nameplate
- Safer: Eliminates calibration in energized enclosures, reduces arc flash hazard
- No need to return to calibrate—saves time and money
- Super low turn-on

Maintenance-free—no call backs

- Superior to traditional adjustable CTs and pressure switches
- Industry leading 7 year warranty

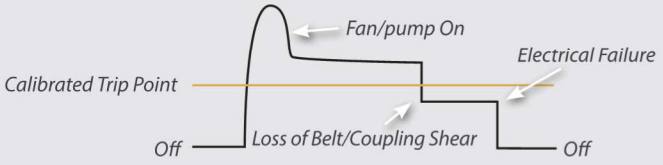


Simply set to motor FLA for proof of flow set-point

Patent Pending

SET-POINT OPERATION

Detects Belt Loss/Coupling Shear!



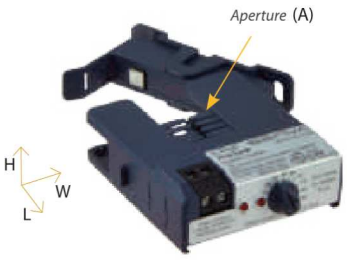
Now you can easily detect when drive belts slip, break, or pump coupling shear. In fact, a typical HVAC motor that loses its load has a reduction of current draw of up to 50%. That's why our sensors are the industry standard for status.

No hazardous guesswork. Multi-turn adjustments are a thing of the past.

Reduce the risk of arc flash because sensor is calibrated to motor FLA nameplate

Save over 1/2 hour per sensor install—based on field productivity tests.

SPLIT CORE
C-2320



L: 2.5" H: 0.57" W: 2.23"
A: 0.75"x 0.75"

- Mount sensor without removing conductor for installation savings
- Clamp on conductor with iris, or use detach-able base to screw or DIN mount
- Larger 0.75" aperture accomodates oversize conductors

OPTIONAL RELAY
for additional labor savings

L: .84" H: .72" W: 2.06"

- Add to 2320 series to get start/stop/status in a single device
- Reduces the number of installed components... saves time and space
- Removable relay facilitates service

SPLIT CORE - MINI
C-2220

L: 2.00" H: .75" W: 1.75"
A: .40"x 0.32"

- Mount sensor without removing conductor for installation savings
- Fits in small enclosures
- Clamp on conductor with iris, or screw mount detachable base

SOLID CORE
C-1320

L: 2.40" H: 1.04" W: 1.6"
A: 0.52" diameter

- Compact design
- Aperture accomodates spade terminals

SOLID CORE - MINI
C-1220

L: 1.91" H: .88" W: 1.31"
A: 0.30" diameter

- Super small—fits anywhere
- Low cost

ORDERING INFORMATION

SPLIT CORE	Min (on)	Max A	N.O. Output*	Trip LED	Power LED
C-2320-L	0.45A	50A	1.0A@30VAC/DC	•	•
C-2320	0.50A	100A	1.0A@30VAC/DC	•	•
C-2320-H *NEW LOWER TURN-ON!*	0.50A	150A	1.0A@30VAC/DC	•	•
C-2320HV	0.50A	100A	0.2A@120VAC	•	•
C-2320HV-L	0.45A	50A	0.2A@120VAC	•	•
SPLIT CORE - MINI					
C-2220	1.00A	50A	1.0A@30VAC/DC	•	
SOLID CORE					
C-1320	0.75A	50A	1.0A@30VAC/DC	•	
SOLID CORE - MINI					
C-1220-L	0.75A	5A	1.0A@30VAC/DC	•	
C-1220	0.75A	50A	1.0A@30VAC/DC	•	
C-1220HV-L	0.75A	5A	0.2A@120VAC	•	
C-1220HV	0.75A	50A	0.2A@120VAC	•	

COMMAND RELAY	Contact rating	Coil
CR3-24	N.O. 10A @ 125VAC	24VAC/DC 15mA nom.
CR4-24	N.C. 10A @ 125VAC	24VAC/DC 15mA nom.
CR3-12	N.O. 10A @ 125VAC	9-12VDC 30mA nom.
CR4-12	N.C. 10A @ 125VAC	9-12VDC 30mA nom.

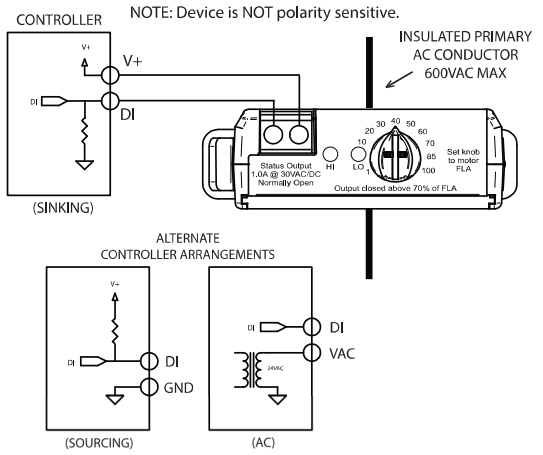
Other coil voltages available—consult factory

Ordering tip: *For best resolution, choose the sensor lowest maximum amperage which accomodates your motor (e.g. 0-50A us -L, 50-100A use standard, 100 to 150A use -H*

SPECIFICATIONS

Standard Output Rating	1.0A@30VAC/DC
Line Voltage Output Rating	0.2A@120VAC (-HV ONLY)
Output Type	NO, solid-state FET
Temperature Rating	-15-60 ° C
Insulation Class	600V RMS. For use on insulated conductors only! Use minimum 75 ° C insulated conductor
Sensor Power	Induced
Frequency Range	50/60Hz

TYPICAL WIRING



Warning: *Refer to installation instructions that accompany product and heed all safety instructions. Do not rely on current status LED to indicate presence of power.*

Designed and Assembled In the U.S.A

7 year limited warranty

HT1D Series

Duct Humidity/Temperature

2% or 3% accuracy (NIST certification options)
0-5V/10V and 4-20mA RH/Temp (thermistors optional)
LCD display with field calibration menu
Field replaceable element

DESCRIPTION

The HD Series is designed with both the engineer and field technician in mind. The HD Series combines excellent stability with reliable operation in 2% or 3% RH accuracy options. Optional temperature transmitters, RTDs and thermistors add further flexibilty when ordering. The standard LCD and field replaceable elements make the intitial installation and future service a breeze.

APPLICATIONS

- HVAC room humidity and temperature measurement and control
- Replaceable element is ideal for difficult environments such as swimming pools

FEATURES

Versatile

- 2% or 3% RH versions with field replaceable sensor
- Switch selectable 5V/10V and 4-20mA RH/T transmitter outputs
- Thermistor outputs for temperature optional

Easy to maintain

- Field calibration. LCD and push-button menu allows easy adjustment of calibrated RH value as needed to maintain certification.
- Field replaceable sensor—without disturbing conduit

Superior RH sensing

- On-board temperature compensation for RH. Eliminates temperature coefficient errors and achieves an excellent measurement accuracy as well as high repeatability and offset stability.
- State of the art testing facilities. 8-point calibration certificate available (NIST traceability—consult factory)

Quality

- Industry leading 7-year warranty/ 2-year replaceable element warranty

Field replaceable element

- Ideal for harsh environments
- Accurate dual RH/Temp IC sensing

LCD with menu

- Easier commissioning
- Re-scale to field metrics if required
- LCD cover provided

NIST traceable

- 8-point calibration certification options. Consult factory.

ORDERING

HT1D - [ ] [ ] U [ ]

Accuracy
2 = 2%
3 = 3%
N = 2% NIST

Temperature
A = None
B = Transmitter
C = 100Pt (385)
D = 1000Pt (385)
E = 10k type 2
F= 10k type 3
G = 10k type 3 w/11k shunt
H = 3k
I = 2k2
J = 1k8
K = 20k
L = 100k

Output Type
U = Universal (2-wire and 3-wire 4-20mA, 0-5V, 0-10V)

Display (LCD)
D = Display
X= None

PROUDLY MADE IN USA

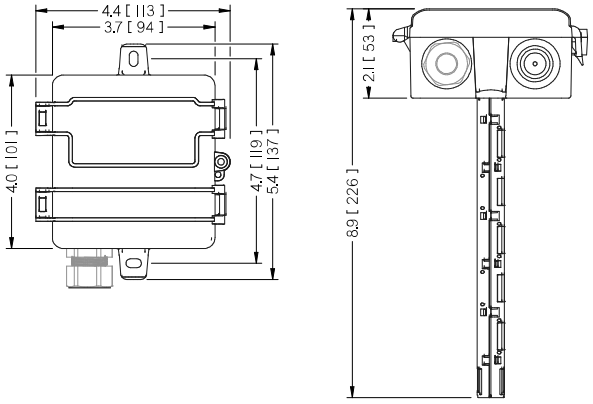
7 year limited warranty

SPECIFICATIONS

Power Supply	3-wire voltage mode (0-5/10V)	12-30VDC/24VAC (1), 15mA max.
	2-wire current mode (4-20mA)	12-30VDC, 30mA max.
Outputs	RH and Temperature (option)	3-wire 0-5/10V (4) or 3-wire or 2-wire 4-20mA (Selectable)
Output scaling	RH	0-100% RH
	Temperature	32-122° F (0-50°C) or -40-140° F (-40-60°C) (Selectable)
Thermistor/RTD	Optional	See ordering table
Media filter		PBT with water-vapor permeable membrane
Relative Humidity	Accuracy	2% models, ±2% over 0 to 100% RH Range; ±1.5% typ 3% models, ±3% over 0 to 100% RH Range; ±2% typ
	Resolution	0.01%RH
	Hysteresis	±0.8%RH
	Non-Linearity	factory linearized <1%RH
	Temperature coefficient	fully compensated by on-board sensor
	Response time (2)	8s
	Output update rate	0.5s
	Operating range	0 to 100%RH (non-condensing)
	Long term drift	<0.25%RH per year
	Element Normal Operating conditions (3)	41 to 140"F (5°C to 60°C) @ 20% to 80% RH
Temperature	Accuracy	2% models, <±0.25°C; 0.5°C typ @ 25°C 3% models, <±0.3°C; 0.25°C typ @ 25°C
	Resolution	0.01 °C
	Repeatability	0.04 °C
	Response time (2)	2s
	Output update rate	0.5s
	Element Operating range	-40 to 140°F (-40° C to 60° C)
Enclosure	Materials	ABS/Polycarbonate
	Unit Temp Rating	-40 to 158°F (-40 to 70°F)
	Dimensions	4.0"h x 4.4"w x 2.1"d (+6.8" probe)

(1) One side of transformer, secondary is connected to signal common. Dedicated transformer is recommended.
(2) Time for reaching 63% of reading at 25° C and 1 m/s airflow.
(3) Long term exposures to conditions outside normal range at high humidity may temporarily offset the RH reading (+3%RH after 60 hours.)
(4) 15-30VDC/24VAC power supply voltage required for 10 volt output.

DIMENSIONS



HT1O Series

Outdoor Humidity/Temperature

2% or 3% accuracy (NIST certification options)
0-5V/10V and 4-20mA RH/Temp (thermistors optional)
LCD display with field calibration menu
Field replaceable element

DESCRIPTION

The HO Series is designed to be mounted on the building exterior to provide outside air RH measurement. The HO Series combines excellent stability with reliable operation in 2% or 3% RH accuracy options. Optional temperature transmitters, RTDs and thermistors add further flexibilty when ordering. The standard LCD, gasketed lid and field replaceable elements make the intitial installation and future service a breeze.

APPLICATIONS

- Outdoor humidity and temperature measurement for building control

FEATURES

Versatile

- 2% or 3% Rh versions with field replaceable sensor
- Switch selectable 5V/10V and 4-20mA RH/T transmitter outputs
- Thermistor/RTD output for temperature optional

Easy to maintain

- Field calibration. LCD and push-button menu allows easy adjustment of calibrated RH value as needed to maintain certification
- Replace a sensor without disturbing conduit

Superior RH sensing

- On-board temperature compensation for RH. Eliminates temperature coefficient errors and achieves an excellent measurement accuracy as well as high repeatability and offset stability
- State of the art testing facilities. 8-point calibration certificate available (NIST traceability—consult factory)

Quality

- Industry leading 7-year warranty/ 2-year replaceable element warranty

PROUDLY MADE IN USA

7 year limited warranty

Field replaceable element

- Ideal for harsh environments
- Accurate dual RH/Temp IC sensing

LCD with menu

- Easier commissioning
- Re-scale to field metrics if required

NIST traceable

- 8-point calibration certification options. Consult factory.

ORDERING

HT10 - [ ] [ ] U [ ]

Accuracy

2 = 2%
3 = 3%
N = 2% NIST

Temperature

A = None
B = Transmitter
C = 100Pt (385)
D = 1000Pt (385)
E = 10k type 2
F= 10k type 3
G = 10k type 3 w/11k shunt
H = 3k
I = 2k2
J = 1k8
K = 20k

Output Type

U = Universal (2-wire and 3-wire 4-20mA, 0-5V, 0-10V)

Display (LCD)

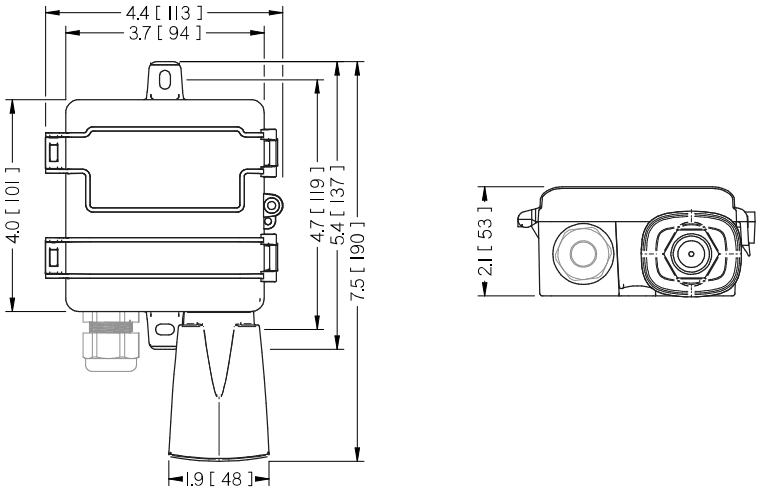
D = Display
X= None

SPECIFICATIONS

Power Supply	3-wire voltage mode (0-5/10V)	12-30VDC/24VAC[1], 15mA max
	2-wire current mode (4-20mA)	12-30VDC, 30mA max.
Outputs	RH and Temperature (option)	3-wire 0-5/10V[4] or 3-wire or 2-wire 4-20mA
Output scaling	RH	0-100% RH
	Temperature	32-122°F (0-50°C) or -40-140°F (-40-60°C)
Thermistor/RTD	Optional	See ordering table
Media filter		Sintered stainless steel
Relative Humidity	Accuracy	2% models, ±2% over 0 to 100% RH Range; ±1.5% typ 3% models, ±3% over 0 to 100% RH Range; ±2% typ
	Resolution	0.01%RH
	Hysteresis	±0.8%RH
	Non-Linearity	Factory linearized <1%RH
	Temperature coefficient	Fully compensated by on-board sensor
	Response time[2]	8s
	Output update rate	0.5s
	Operating range	0 to 100%RH (non-condensing)
	Long term drift	<0.25%RH per year
	Normal Operating conditions [3]	41 to 140"F (5°C to 60°C) @ 20% to 80% RH
Temperature	Accuracy	2% models, <±0.25° C; 0.1° C typ @ 25° C 3% models, <±0.3° C; 0.25° C typ @ 25° C
	Resolution	0.01° C
	Repeatability	0.08° C
	Response time[2]	2s
	Output update rate	0.5s
	Operating range	-40 to 140°F (-40° to 60° C)
Enclosure	Materials	ABS/Polycarbonate
	Unit Temp Rating	-40 to 158°F (-40 to 70°F)
	Enclosure Rating	Nema 1; Add drain holes to enclosure bottom to achieve Nema 3R rating
	Dimensions	4.0"h x 4.4"w x 2.1"d (+2.8" solar shield)

(1) One side of transformer,, secondary is connected to signal common. Dedicated transformer is recommended.
(2) Time for reaching 63% of reading at 25° C and 1 m/s airflow.
(3) Long term exposures to conditions outside normal range at high humidity may temporarily offset the RH reading (+3%RH after 60 hours.)
(4) 15-30VDC/24VAC power supply voltage required for 10 volt ouput.

DIMENSIONS



PR24 Series
Power Relays

20A range resistive rating
Hand Off Auto switch option
Current run-status confirmation option

c UL us

NEW!

DESCRIPTION

The PR Series pilot relays are ideal multi-voltage input pilot duty relays that mount to existing panels to control loads. External enclosures are not required making them ideal for interfacing loads with building automation control systems.

APPLICATIONS

- Command contactors
- Control motors
- Isolation
- Device interlocking
- Relay logic
- Lighting load levels

FEATURES

Convenient and cost-effective control

- Current sensor run status option
- LED indicator
- Multi-voltage coil input
- Hand-Off-Auto switch option

Compact enclosure mounts externally for easy installation

- Nipple mount to any electrical enclosure
- Flexible tinned stranded wire… fits easily in tight spaces and provides secure connections to wire nuts

Concealed HOA switch with screw secured cover prevents tampering

- Versions with Hand Off Auto (HOA) switch feature with secure screw cover door to prevent tampering
- Eliminates costly system override related service calls

Run status confirmation

- True current sensing provides proof of load feedback that pilot device relay coil is powered

Hinged HOA cover with screw retention minimizes tampering

MODEL	CONTACT	COIL INPUT	CONTACT	HOA	CURRENT RUN STATUS	ENCLOSURE	LED
PR2401B	SPDT	24-30VDC, 24VAC, 120VAC	20A			Small	●
PR24BM	SPDT	24-30VDC, 24VAC	20A		N.O. 1A @ 30VAC/DC, 0.3A TRIP	Small	●
PR2401SB	SPST N.O.	24-30VDC, 24VAC, 120VAC	20A	●		Medium	●
PR2401SBM	SPST N.O.	24-30VDC, 24VAC, 120VAC	20A	●	N.O. 1A @ 30VAC/DC, 0.3A TRIP	Medium	●

SPECIFICATIONS

General	Environmental Operating	-30 to 60°C (-22 to 140°F), 10-95% RH non-condensing
	Expected Relay Life	100,000 cycles electrical; 10,000,000 mechanical
	LED	ON when energized
	Device Wiring	16" minimum lead length; coil: 18AWG; contacts: 12AWG; HOA monitor wires: 12 AWG; status: 18AWG
	Field Wiring	Coil: 16AWG to 18AWG, Contacts: 12AWG to 14AWG
	Certifications	UL1015, Plenum Rated (UL2043), California State Fire Marshal
Dimensions	Small Enclosure	1.75"x3.0"x1.75" with 0.5" NPT nipple
	Medium Enclosure	2.5"x4.0"x1.78" with 0.5" NPT nipple

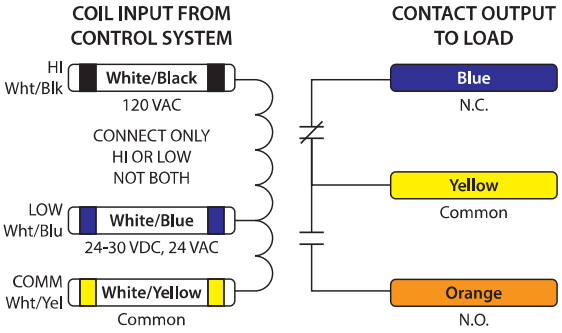
CONTACT RATINGS(PR2401B/PR24BM)
20 Amp Resistive @ 277 VAC/30VDC NO/NC
1HP @ 120VAC NO/NC
2HP @ 277VAC NO/NC
20A @ 120/277VAC STANDARD BALLAST NO
1100VA Pilot Duty @ 277VAC
Not rated for electronic ballast
10A @ 120VAC TUNGSTEN NO

CONTACT RATINGS(PR2401SB/PR2401SBM)
20 Amp Resistive @ 277 VAC NO
1HP @ 120VAC NO
2HP @ 277VAC NO
20A @ 120/277VAC STANDARD BALLAST NO
1100VA Pilot Duty @ 277VAC
Not rated for electronic ballast
10A @ 120VAC TUNGSTEN NO

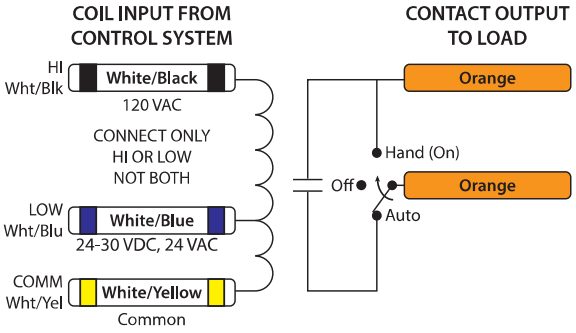
COIL CURRENT/PERFORMANCE		
Voltage	**AC**	**DC**
24 V	59mA	32mA
26 V		35mA
28 V		37mA
30 V		40mA
120 V	43mA	
Pull-In Voltage		
	AC	DC
10 to 30V	8V	9V
120V	85V	
Dropout Voltage		
10 to 30V	3V	3V

TYPICAL WIRING

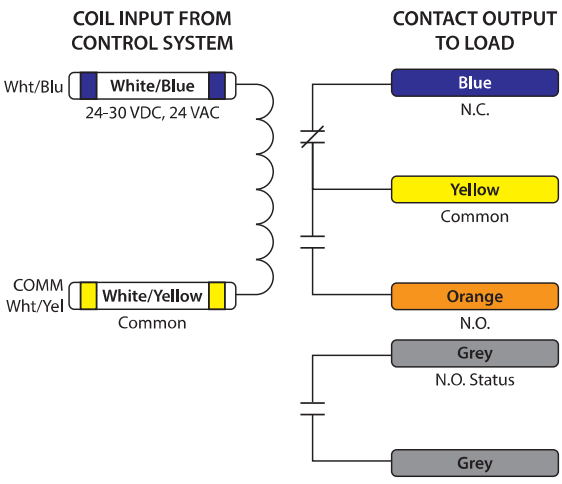
PR2401B



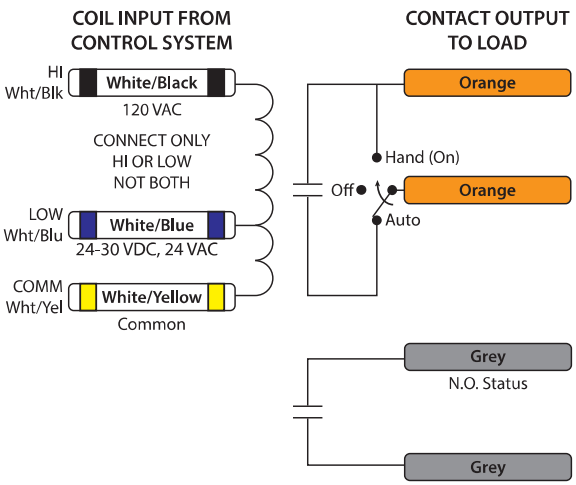
PR2401SB



PR24BM



PR2401SBM



PRU1 Series
Pilot Relays

10A range resistive rating
Hand Off Auto switch option
Current run-status confirmation option

c UL us

NEW!

DESCRIPTION

The PR Series pilot relays are ideal multi-voltage input pilot duty relays that mount to existing panels to control loads. External enclosures are not required making them ideal for interfacing loads with building automation control systems.

APPLICATIONS

- Command contactors
- Control motors
- Isolation
- Device interlocking
- Relay logic
- Lighting load levels

FEATURES

Convenient and cost-effective control

- Current sensor run status option
- LED indicator
- Multi-voltage coil input
- Hand-Off-Auto switch option

Compact enclosure mounts externally for easy installation

- Nipple mount to any electrical enclosure
- Flexible tinned stranded wire… fits easily in tight spaces and provides secure connections to wire nuts

Concealed HOA switch with screw secured cover prevents tampering

- Versions with Hand Off Auto (HOA) switch feature with secure screw cover door to prevent tampering
- Eliminates costly system override related service calls

Run status confirmation

- True current sensing provides proof of load feedback that pilot device relay coil is powered

Hinged HOA cover with screw retention minimizes tampering

MODEL	CONTACT	COIL INPUT	CONTACT	HOA	CURRENT RUN STATUS	ENCLOSURE	LED
PRU1C	SPDT	10-30VAC/DC, 120VAC	10A			Small	●
PRU1CM	SPDT	10-30VAC/DC, 120VAC	10A		N.O. 1A @ 30VAC/DC, 0.3A TRIP	Small	●
PRU1S	SPST N.O.	10-30VAC/DC, 120VAC	10A	●		Medium	●
PRU1SM	SPST N.O.	10-30VAC/DC, 120VAC	10A	●	N.O. 1A @ 30VAC/DC, 0.3A TRIP	Medium	●

SPECIFICATIONS

General	Environmental Operating	-30 to 60°C (-22 to 140°F), 10-95% RH non-condensing
	Expected Relay Life	100,000 cycles electrical; 10,000,000 mechanical
	LED	ON when energized
	Device Wiring	16" minimum lead length; coil: 18AWG; contacts: 14AWG; HOA monitor wires: 14 AWG; status: 18AWG
	Field Wiring	Coil: 16AWG to 18AWG, Contacts: 14AWG to 16AWG
	Certifications	UL1015 , Plenum Rated (UL2043), California State Fire Marshal
Dimensions	Small Enclosure	1.75"x3.0"x1.75" with 0.5" NPT nipple
	Medium Enclosure	2.5"x4.0"x1.78" with 0.5" NPT nipple

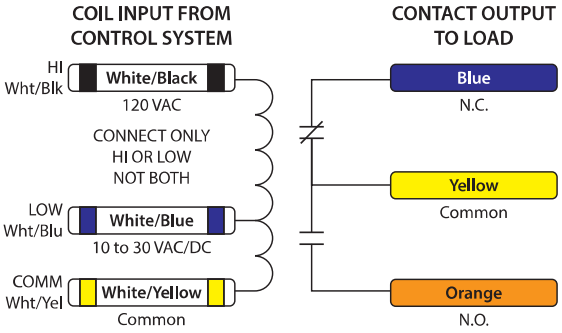
CONTACT RATINGS(PRU1C)
10 Amp Resistive @ 277 VAC
10 Amp Resistive @ 28 VDC
480 VA Pilot Duty @ 240-277 VAC
480 VA Ballast @ 277 VAC
Not rated for electronic ballast
600 Watt Tungsten @ 120 VAC (N.O.)
240 Watt Tungsten @ 120 VAC (N.C.)
1/3 HP @ 120 VAC (N.O.)
1/6 HP @ 120 VAC (N.C.)
1/4 HP @ 277 VAC (N.O.)
1/8 HP @ 277 VAC (N.C.)

CONTACT RATINGS(PRU1S)
10 Amp Resistive @ 277 VAC
10 Amp Resistive @ 14 VDC
480 VA Pilot Duty @ 240-277 VAC
480 VA Ballast @ 277 VAC
Not rated for electronic ballast
600 Watt Tungsten @ 120 VAC (N.O.)
1/3 HP @ 120/240 VAC (N.O.)
1/4 HP @ 277 VAC (N.O.)

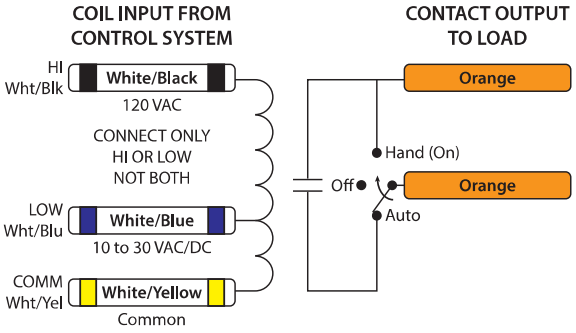
COIL CURRENT/PERFORMANCE		
Voltage	**AC**	**DC**
10 V	30mA	16mA
15 V	34mA	20mA
20 V	38mA	21mA
25 V	42mA	22mA
30 V	45mA	23mA
120 V	23mA	
Pull-In Voltage		
	AC	DC
10 to 30V	8V	9V
120V	85V	
Dropout Voltage		
10 to 30V	3V	3V

TYPICAL WIRING

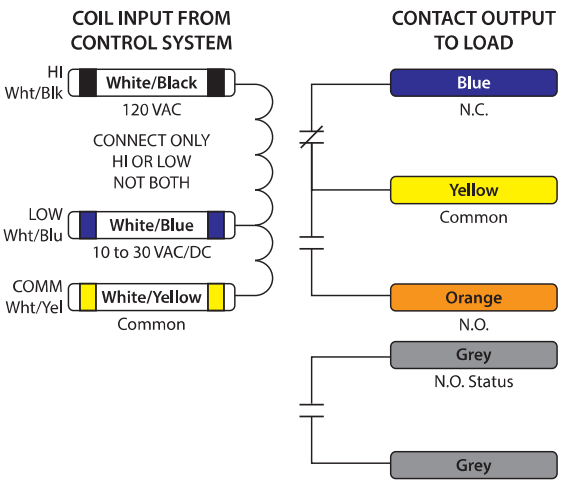
PRU1C



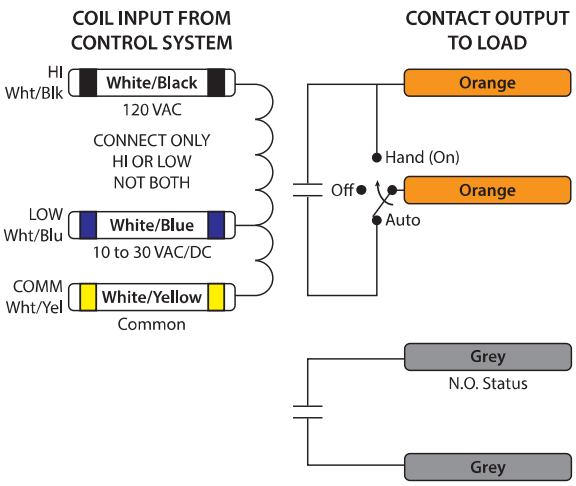
PRU1S



PRU1CM



PRU1SM



PW30 Series

Remote Wet-to-Wet Differential Pressure Sensor

Revolutionary design eliminates plumbing/bypass assemblies
16 selectable differential ranges in one device
LCD display for verification of high, low, and differential pressures

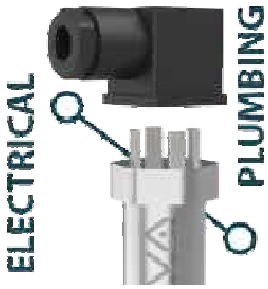
DESCRIPTION

The PW30 Series uses remote sensors to eliminate the need for costly bypass assemblies, enabling fast, cost effective installation. The remote sensors mount directly to pipe to eliminate bleeding and additional plumbing. Sensors come with both conduit and wire connection options. Optional factory pre-wired harnesses also available in wire and armored cable versions. Standard LCD screen and dip switches make configuration a breeze. Measure 16 differential pressure ranges from 1-500 PSID with a single device without sacrificing accuracy. Selectable output 0-5V, 0-10V, or 2 Wire 4-20mA.

APPLICATIONS

- Demand measurement in HVAC systems for pump speed control and local indication
- Process control systems
- Flow measurement of gases, vapors, and liquids compatible with 316L SS
- Filter status monitoring
- System leak detection

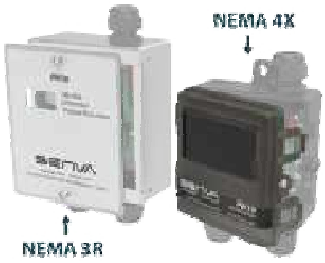
Remote sensors eliminate need for bypasses



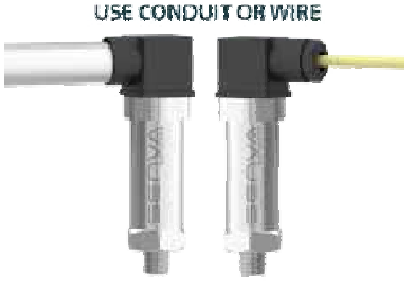
Independent installation for mechanical & electrical trades

Available with prewired armored cable or exposed cable

Dip switch terminal and field selectable outputs for easy installation



Metal or Plastic tamper resistant enclosures provided added layer of security



Accepts rigid conduit and field wiring

FEATURES

- Drastically reduce plumbing needs and save installation time
- Order with pre-fabricated wire to save additional time
- Single device for 1-500 PSID makes ordering easy
- LCD and dip switches make configuration fast and simple
- Display kPa or PSID units
- Remote sensors come standard with DIN43650 connection for easy plug-and-play, no wire twisting
- MEMS sensor technology
- Integrated surge snubber protects sensor from water hammer for reliable long term performance
- Manual and remote zero for maintained accuracy
- Port swap corrects plumbing errors
- Fast/slow switch for desired response time
- Uni/bi directional
- Test mode - forces full scale output
- Conduit and wire connection compatible

ORDERING

Transmitter

PW30 ☐

Enclosure
W = Rugged Plastic
M = Metal

Cable

☐ – ☐ –

Cable Termination
C = Conduit and wire gland connections (for field wiring)

Optional Factory Wire (Pre-wired)
003 = 3 feet (36in)
006 = 6 feet (72in)
009 = 9 feet (108in)
015 = 15 feet (180in)
020 = 20 feet (240in)
025 = 25 feet (300in)
030 = 30 feet (360in)
035 = 35 feet (420in)
040 = 40 feet (480in)
045 = 45 feet (540in)
050 = 50 feet (600in)
075 = 75 feet (900in)
100 = 100 feet (1200in)

Cable Type
Blank = Standard
A = Armored

Remote Sensor

PWT ☐

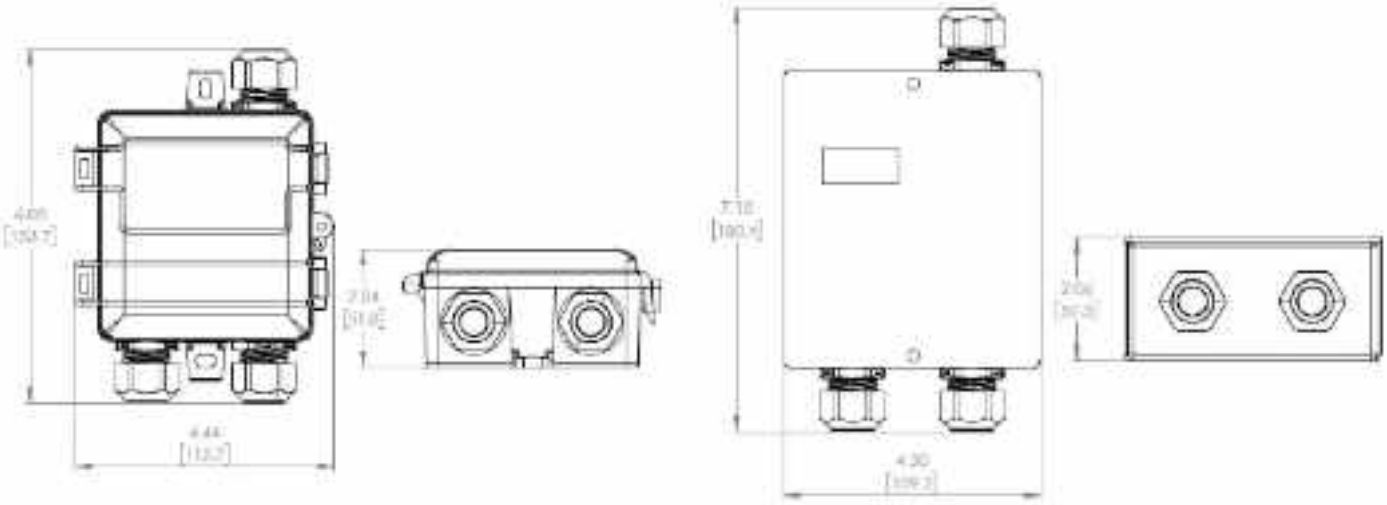
Range
050 = 0-50 PSIG
100 = 0-100 PSIG
250 = 0-250 PSIG
500 = 0-500 PSIG

Optional Service Valve

PWBV

Optional service valve PWBV
for live sensor swap

DIMENSIONS



SPECIFICATIONS			
Power supply	Voltage output mode (0-5v)		12-30VDC/24VAC (1), 20mA max.
	Voltage output mode (0-10v)		13-30VDC/24VAC required for 10V FS output
	Current (4-20mA) output mode		15-30VDC (0 Ohm)/16-30VDC (250 Ohm)/ 18-30VDC (500 Ohm) , 20mA max.
Outputs	Switch selectable		2-wire 4-20mA, 3-wire 0-5V/10V
Operating Temperature	Transmitter		-22 to 158°F (-30 to 70°C)
Media Compatibility	Type		Water, other 316 SS compatible media (316L diaphragm)
	Temperature		32 to 250°F (0-125°C)
Zero adjustment	Automatic		Pushbutton, terminal block switch input
			Press button for 5 seconds to re-zero
			Hold for 10 seconds to restore factory settings
Sensor Type			Micro-machined silicon strain gauge
PW Transmitter Accuracy	*Sensor PSIG*	*2% Accuracy Ranges*	*1% Accuracy Ranges*
	25 PSIG	0-1 / 0-2 PSID	0-5 / 0-10 / 0-15 / 0-20 / 0-25 PSID
	50 PSIG	0-10 / 0-15 PSID	0-20 / 0-25 / 0-30 / 0-40 / 0-50 PSID
	100 PSIG	0-15 / 0-20 / 0-25 / 0-30 PSID	0-40/ 0-50 / 0-75 / 0-100 PSID
	250 PSIG	0-30 / 0-40 / 0-50 PSID	0-75 / 0-100 / 0-125 / 0-150 / 0-250 PSID
	500 PSIG	0-75 / 0-100 / 0-125 PSID	0-150 / 0-250 / 0-500 PSID
Sensor Performance	Accuracy		< ±0.25% BFSL
	Stability (1 year)		±0.25% FS, typ
	Over-range protection		200% rated pressure
	Pressure Cycles		> 100 Million
	Compensated Range		14 to 158°F (-10-70°C)
	Temperature Compensation %FS/C		Zero, <±0.03(<100kPa), <±0.02(>100kPa)
			Span, <±0.03(<100kPa), <±0.02(>100kPa)
	Vibration		10G peak, 20 to 2000 Hz
Enclosure	Construction		PC/ABS (Plastic), Powder coated steel (metal)
	Sealing		Nema 4X (plastic), Nema 3R (Metal)
Enclosure, PWC[xxx] Sensor	Construction		Stainless Steel, 304, 1/4" MNPT, 1/2" Conduit Fitting

(1) FS is defined as the full scale of the selected range. Accuracy includes non-linearity, hysteresis, and repeatability.

(2) Because of lower accuracy, it is not factory recommended to use an output range less than 10% of the total sensor PSIG.

** Product improvement is a continual process as Senva and product features and specification may change without prior notice. Refer to instructions that accompany the product for installation and wiring.*

NEW!

TG UL Series Wall & Duct
Dual Combustible Gas Sensor/Controller

Analog and BACnet/Modbus protocol options
Field replaceable calibrated sensing elements
Detect combustibles and CO in one unit
Integrated LED indicators and audible alarm

BACnet

DESCRIPTION

Senva TG Series sensors can be ordered as individual sensors or as any dual combination of CO/NO_2/Propane/Methane/H_2S sensor in a shared enclosure. Detect Methane/Propane leaks and monitor for elevated CO levels, all in one unit.

The analog output model features 2 outputs that support daisy chain wiring - multiple sensors may be used in a parallel sequence (0-10V) for cost effective coverage of large areas. The unit can also act as a stand alone controller, utilizing the relay for exhaust fan operation or the output for direct control of a VFD.

The BACnet/Modbus model supports BACnet MS/TP & Modbus network communication in one unit. Standard features include network auto-configuration, programmable fan and alarm relays, LED indicators,

APPLICATIONS

- Boiler rooms
- Commercial kitchens
- Battery Rooms
- Compressed Gas storage
- Residential and commercial heating and water heating
- Vehicle bays and garages for natural gas (LNG) or petroleum gas (LPG) vehicles
- Waste facilities
- Monitor multiple combustible gases with one mounted unit
- Alert occupants of elevated gas levels
- Directly control exhaust fans

FEATURES

Cost-effective dual gas sensing and control

- Integrated display, LED indicators, audible alarm
- Order as individual CO, NO_2, Propane, Methane, Hydrogen, Oxygen, or Hydrogen Sulfide sensor, or specify any two sensing elements in one enclosure

Flexibility of analog output model

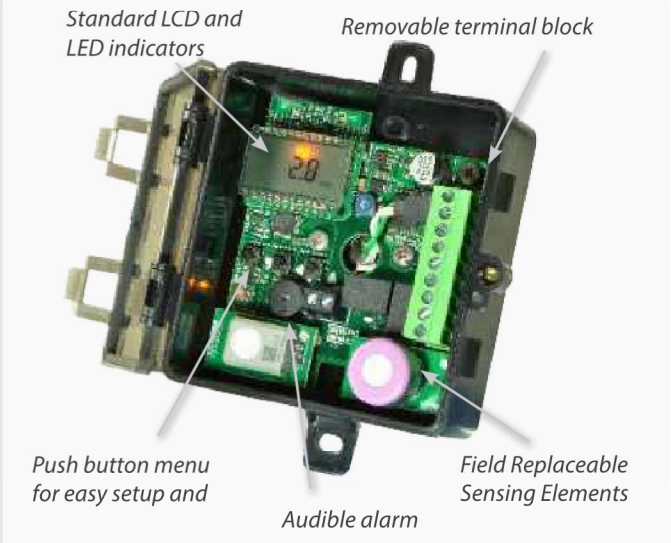
- Menu selectable 0-5/10V, 1-5V and 4-20mA outputs (0-10V default)
- Dual outputs support daisy chain wiring to cost-effectively sense and control large areas

Versatility with BACnet/Modbus model

- Supports BACnet MS/TP and Modbus RTU networks
- Auto-configuration detects network baud rate, serial format, protocol type and self-addresses

High reliability reduces call backs

- Temperature compensated elements for maximum accuracy
- UL2034 recognized electrochemical CO sensing element
- Warning indicators alert occupants when element's lifecycle is near end for replacement
- 7-year limited warranty on electronics; 2-year on elements



Easy to install

- Through the back wiring
- Test mode speeds up field commissioning for verifying warning indicators and relay functions
- Push buttons and LCD to navigate

PROUDLY MADE IN USA

7 year limited warranty

ORDERING

TG [Pkg] - [Out] [Gas1] [Gas2] [Temp] [Lid]

Package
W = Wall Mount
M = Metal
D = Duct Mount

Output Type
A = Analog
B = BACnet/Modbus

Gas Type 1
C = Carbon Monoxide (CO)
N = Nitrogen Dioxide (NO_2)
M = Methane (CH_4)
P = Propane (C_3H_8)
H = Hydrogen (H_2)
O = Oxygen (O_2)
S = Hydrogen Sulfide H_2S
D = Carboon Dioxide (CO_2)
E = Dual Channel CO_2

Gas Type 2
N = Nitrogen Dioxide (NO_2)
M = Methane (CH_4)
P = Propane (C_3H_8)
H = Hydrogen (H_2)
O = Oxygen (O_2)
S = Hydrogen Sulfide (H_2S)
D = Carboon Dioxide (CO_2)
E = Dual Channel CO_2
X = No second gas

Temperature Output
A = None
C = 100Pt RTD
D = 1000Pt RTD
E = 10K Type 2
F = 10K Type 3
G = 10k w/11k
H = 3k
I = 2k2
J = 1k8
K = 20k

Enclosure Lid
Blank = Clear/Tinted
S = Solid/Opaque
W=All White Solid

Replacement Elements

TGS-CO-UL = Carbon Monoxide
TGS-NO2-UL = Nitrogen Dioxide
TGS-CH4-UL = Methane
TGS-C3H8-UL = Propane
TGS-O2-UL = Oxygen
TGS-H2-UL = Hydrogen
TGS-S-UL = Hydrogen Sulfide

(1) One side of transformer secondary is connected to signal common. Dedicated transformer is recommended. No mains circuit connection allowed. In addition, it is required to use an isolated power supply that is certified by a national or international standard (i.e. UL). Use of a Class 2 LPS power supply or greater is required.
(2) Carbon Monoxide full scale is 1000ppm.
(3) Nitrogen Dioxide full scale is 30ppm.
(4) Accuracy of CO_2 reading may be reduced at temperatures below 14 F (-10°C).

SPECIFICATIONS

Power Supply		15-30 VDC/24VAC(1), 4 W max, 160 mA max.
Analog Outputs	2 programmable outputs	0-10 V (default), 0-5V, 1-5 V and 4-20 mA (menu selectable)
	Output scaling	Menu selectable; see installation manual for ranges
BACnet /Modbus	Protocol RS-485	BACnet MS/TP, Modbus RTU, Modbus ASCII
	Baud Rates	9600, 19200, 38400, 57600, 76800, 115200
Fan Relay	Fan relay characteristics	N.C. 1A@24/30 VDC (50/60 Hz) (no mains connection)
Alarm Relay	Alarm relay characteristics	N.C. 1A@24/30 VDC (50/60 Hz) (no mains conenction)
Display	3-1/2 digit LCD	Indicates ppm or % LEL or % Vol (menu selectable)
LEDs	Green, Yellow, Red	Green = Normal, Yellow = Relay, Red = Alarm
Audible Alarm Exposure	85dB Piezo transducer	30 minutes above alarm setpoint per UL2034 (menu selectable)
CO Sensor Performance	Type	Electrochemical
	Accuracy	±5% of default range(2) ±5%of reading above 200 ppm
	Resolution	1 ppm
	Certifications	UL2034 Listed Component
	Life expectancy	>7 years
	Coverage Area	5000-7500 square feet
NO_2 Sensor Performance	Type	Electrochemical
	Accuracy	±5% of default range(3) ±5%of reading above 20 ppm
	Resolution	0.1 ppm
	Life expectancy	>7 years
	Coverage Area	5000-7500 square feet
Methane/Propane/ Hydrogen Sensors Performance	Type	Catalytic
	Detection Range	0-50% LEL (Lower Explosive Limit)
	Accuracy	5% of range
	Resolution	1%LEL
	Life expectancy	>5 years
	Coverage Area	Methane/Hydrogen 5000-7500 sq ft; Propane 5000 sq ft
Oxygen Sensor Performance	Type	Electrochemical
	Detection Range	0-25% Volume
	Accuracy	±5% of range
	Resolution	0.1 %
	Life expectancy	5 years
	Coverage Area	5000-7500 square feet
H2S Sensor Performance	Type	Electrochemical
	Detection Range	0-100 ppm
	Accuracy	±5% of range
	Resolution	1 ppm
	Life expectancy	5 years
	Coverage Area	5000-7500 square feet
Carbon Dioxide (CO_2)	Type	Non-Dispersive Infrared (NDIR)
	Accuracy(4)	±(30ppm +3% of reading) (400-2000ppm), @-10-50°C ±(50ppm +5% of reading) Standard (2000-5000ppm), ±(50ppm+3% of reading) Dual Channel (2000-5000ppm), ±(100ppm+10% of reading) (5000-10000ppm)
	Resolution	1 ppm
	Life expectancy	15 years
	Coverage Area	5000-7500 square feet
Operating Environment	Temperature, continuous	-20 to 50°C
	Humidity	15-95% continuous, 0-95% intermittent
	Max Elevation	2000m
Enclosure (Wall & Duct)	Material	ABS/Polycarbonate
	Dimensions	4.0"h x 4.4"w x 2.1"d
	Conduit Opening	Tapped 1/2" NPT
	Rating	IP20
Enclosure (Metal)	Material & Enclosure Rating	Powder coated steel/acrylic, NEMA 3R
	Dimensions	5.0"h x 4.3"w x 2.25"d
	Opening	Dual air vents on bottom of enclosure
	Mounting	Pre-drilled for 2x4" electrical box
	Rating	IP20
Agency	Compliance	UL61010-1 Listed UL, cUL, CE

TG UL Series Wall & Duct
Dual Toxic Gas CO/NO2 Sensor/Controller

Analog and BACnet/Modbus protocol options
Field replaceable calibrated sensing elements
Standard LCD with intuitive set up menu
Integrated LED indicators and audible alarm

DESCRIPTION

Senva TG Series sensors can be ordered as individual CO or NO2 sensors or as any dual combination of CO/NO2 sensor in a shared enclosure.

The analog output model features 2 outputs that support daisy chain wiring - multiple sensors may be used in a parallel sequence (0-10V) for cost effective coverage of large areas. The unit can also act as a stand alone controller, utilizing the relay for exhaust fan operation or the output for direct control of a VFD.

The BACnet/Modbus model supports BACnet MS/TP & Modbus network communication in one unit. Standard features include network auto-configuration, programmable fan and alarm relays, LED indicators, integrated display and audible alarm.

APPLICATIONS

- Control exhaust in parking garages accoding to International Mechanical Code
- Ensure adequate air flow in occupied spaces
- Monitor multiple toxic gases with one mounted unit
- Alert occupants of elevated gas levels
- Directly control exhaust fans

FEATURES

Cost-effective dual gas sensing and control

- Integrated display, LED indicators, audible alarm
- Order as individual CO or NO2 sensor, or specify any two sensing elements in one enclosure

Flexibility of analog output model

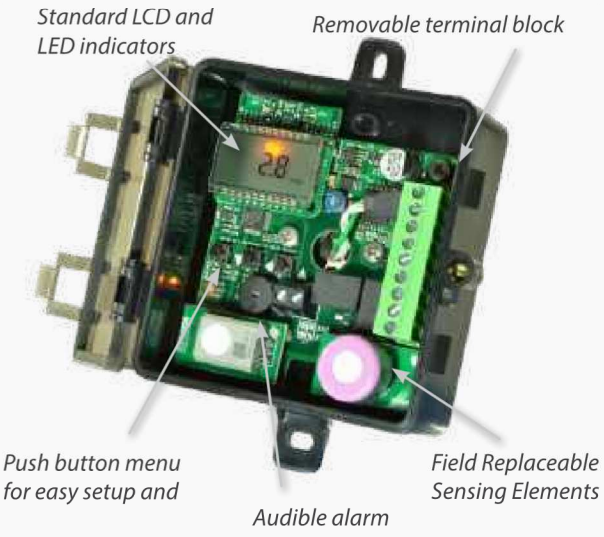
- Menu selectable 0-5/10V, 1-5V and 4-20mA outputs (0-10V default)
- Dual outputs support daisy chain wiring to cost-effectively sense and control large areas

Versatility with BACnet/Modbus model

- Supports BACnet MS/TP and Modbus RTU networks
- Auto-configuration detects network baud rate, serial format, protocol type and self-addresses

High reliability reduces call backs

- Temperature compensated elements for maximum accuracy
- UL2034 recognized electrochemical CO sensing element
- 7 year life expectancy on CO and NO2 elements
- Warning indicators alert occupants when element's lifecycle is near end for replacement
- 7-year limited warranty on electronics; 2-year on elements



Easy to install

- Through the back wiring
- Test mode speeds up field commissioning for verifying warning indicators and relay functions
- Push buttons and LCD to navigate setting parameters

PROUDLY MADE IN USA

7 year limited warranty

ORDERING

TG - [Pkg] [Out] [Gas1] [Gas2] - [Temp] [Lid]

Package
W = Wall Mount
M = Metal
D = Duct Mount

Output Type
A = Analog
B = BACnet/Modbus

Gas Type 1
C = Carbon Monoxide (CO)
N = Nitrogen Dioxide (NO_2)
D = Carboon Dioxide (CO_2)
E = Dual Channel CO_2

Gas Type 2
N = Nitrogen Dioxide (NO_2)
D = Carboon Dioxide (CO_2)
E = Dual Channel CO_2
X = No second gas

Temperature Output
A = None
C = 100Pt RTD
D = 1000Pt RTD
E = 10K Type 2
F = 10K Type 3
G = 10k w/11k
H = 3k
I = 2k2
J = 1k8

Enclosure Lid
Blank = Clear/Tinted
S = Solid/Opaque
W=All White Solid

Replacement Elements

TGS-CO-UL = Carbon Monoxide
TGS-NO2-UL = Nitrogen Dioxide

Pair it with a fan relay

See Senva pilot and power relays for ordering information.

Duct Applications

See Senva's Duct Mount Gas sensing application note to learn about the use of duct-mounted sensors to provice redundancy and peace of mind.

Warning: *Refer to installation instructions that accompany product and heed all safety instructions.*

SPECIFICATIONS

Power Supply		15-30VDC/24VAC(1), 4W max, 160mA max.
Analog Outputs	2 programmable outputs	0-10V (default), 0-5V, 1-5V and 4-20mA (menu selectable)
	CO output scaling	0-200ppm (default), 0-1000ppm (menu selectable)
	NO2 output scaling	0-10ppm (default), 0-30ppm (menu selectable)
	Temperature output scaling	-20 to 85°C
BACnet /Modbus	Protocol RS-485	BACnet MS/TP, Modbus RTU, Modbus ASCII
	Baud Rates	9600, 19200, 38400, 57600, 76800, 115200
Fan Relay	Fan relay characteristics	N.C. 1A@24/30VDC (50/60Hz) (no mains connection)
	CO fan relay setpoint	25ppm (default), 0-1000 ppm (menu selectable)
	NO2 fan relay setpoint	1ppm (default), 0-30ppm (menu selectable)
Alarm Relay	Alarm relay characteristics	N.C. 1A@24/30VDC (50/60Hz) (no mains conenction)
	CO alarm relay setpoint	100ppm (default), 0-1000 ppm (menu selectable)
	NO2 alarm relay setpoint	3ppm (default), 0-30ppm (menu selectable)
Display	3-1/2 digit LCD	Indicates CO ppm, NO2 ppm (menu selectable)
LEDs	Green, Yellow, Red	Green = Normal, Yellow = Relay, Red = Alarm
Audible Alarm Exposure	85dB Piezo transducer	30 minutes above alarm setpoint per UL2034 (menu selectable)
CO Sensor Performance	Type	Electrochemical
	Accuracy	±5% of default range(2) ±5%of reading above 200ppm
	Resolution	1ppm
	Certifications	UL2034 Listed Component
	Life expectancy	>7 years
	Coverage Area	5000-7500 square feet
NO_2 Sensor Performance	Type	Electrochemical
	Accuracy	±5% of default range(3) ±5%of reading above 20ppm
	Resolution	0.1ppm
	Life expectancy	>7 years
	Coverage Area	5000-7500 square feet
Carbon Dioxide (CO_2)	Type	Non-Dispersive Infrared (NDIR)
	Accuracy(4)	±(30ppm +3% of reading) (400-2000ppm), @-10-50°C ±(50ppm +5% of reading) Standard (2000-5000ppm), ±(50ppm+3% of reading) Dual Channel (2000-5000ppm), ±(100ppm+10% of reading) (5000-10000ppm)
	Resolution	1 ppm
	Life expectancy	15 years
	Coverage Area	5000-7500 square feet
Operating Environment	Temperature, continuous	-20 to 50°C
	Humidity	15-95% continuous, 0-95% intermittent
	Max Elevation	2000m
Enclosure (Wall & Duct)	Material	ABS/Polycarbonate
	Dimensions	4.0"h x 4.4"w x 2.1"d (+6.8" probe for duct version)
	Conduit Opening	Tapped 1/2" NPT
	Rating	IP20
Enclosure (Metal)	Material & Enclosure Rating	Powder coated steel/acrylic, NEMA 3R
	Dimensions	5.0"h x 4.3"w x 2.25"d
	Opening	Dual air vents on bottom of enclosure
	Mounting	Pre-drilled for 2x4" electrical box
	Rating	IP20
Agency	Compliance	UL61010-1 Listed UL, cUL, CE

(1) One side of transformer secondary is connected to signal common. Dedicated transformer is recommended. No mains circuit connection allowed. In addition, it is required to use an isolated power supply that is certified by a national or international standard (i.e. UL). Use of a Class 2 LPS power supply or greater is required.
(2) Carbon Monoxide full scale is 1000ppm.
(3) Nitrogen Dioxide full scale is 30ppm
(4) Accuracy of CO_2 reading may be reduced at temperatures below 14 F (-10°C).