Carrier

TruVU™ MPC for 39MN, MW Indoor and Weathertight Outdoor Air Handlers

Installation Instructions

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SAFETY CONSIDERATIONS

IMPORTANT: This equipment generates, uses, and can radiate radio frequency energy and if not installed and used in accordance with these instructions may cause radio interference. The equipment has been tested and complies with the limits of a Class A computing device as defined by FCC (Federal Communications Commission) regulations, Subpart J of Part 14, which are designed to provide reasonable protections against such interference when operated in a commercial environment.

Installation and start-up of air-handling equipment can be hazardous due to system pressure, rotating parts, and electrical components. Only trained and qualified service personnel should install, start-up or service air-conditioning equipment.

When working on air-conditioning equipment, observe precautions in the literature, tags and labels attached to the unit, and other safety precautions that may apply.

Follow all safety codes, including ANSI (American National Standards Institute) Z223.1 or latest version. Wear a hard hat, safety glasses, and work gloves.

⚠ WARNING

Disconnect all power to the unit, then lock out and safety tag all disconnects before performing maintenance or service. Unit may automatically start if power is not disconnected. Electrical shock and personal injury could result.

⚠ WARNING

DO NOT USE TORCH to remove any component. System contains oil and refrigerant under pressure.

To remove a component, wear protective gloves and goggles and proceed as follows:

Shut off electrical power to unit.

Recover refrigerant to relieve all pressure from system using both high-pressure and low pressure ports.

Traces of vapor should be displaced with nitrogen and the work area should be well ventilated. Refrigerant in contact with an open flame produces toxic gases.

Cut component connection tubing with tubing cutter and remove component from unit. Use a pan to catch any oil that may come out of the lines and as a gauge for how much oil to add to the system.

Carefully unsweat remaining tubing stubs when necessary. Oil can ignite when exposed to torch flame.

Failure to follow these procedures may result in personal injury or death.

⚠ CAUTION

DO NOT re-use compressor oil or any oil that has been exposed to the atmosphere. Dispose of oil per local codes and regulations. DO NOT leave refrigerant system open to air any longer than the actual time required to service the equipment. Seal circuits being serviced and charge with dry nitrogen to prevent oil contamination when timely repairs cannot be completed. Failure to follow these procedures may result in damage to equipment.

⚠ CAUTION

Do not store or use gasoline or other flammable vapors and liquids in the vicinity of this or any other appliance.

INTRODUCTION

General

Carrier's TruVu™ MPC central station air handler controls provide heating, cooling, and ventilation control for constant volume (CV) and variable air volume (VAV) applications.

The control box provides centralized management of the air handler operation. A control module is supplied in the control box which can store hundreds of configuration settings and set points. It also performs self diagnostic tests at unit start-up, monitors the operation of the unit, and provides alarms.

The controls can operate either stand-alone or can be interfaced with BACnet[1] network. If a controller is installed as part of a network, the controller is connected to the BACnet communication bus with a field-installed cable.

When ordered along with a 39M unit, the TruVu MPC controller is installed inside a control box in its own control plenum or externally mounted on the supply fan section. See Fig. 1 and Fig. 2. All factory-installed sensors will be wired to one of 2 locations based on the controls option selected in *AHU*Builder® program as outlined below:

NO PRODUCT INTEGRATED CONTROLS

No sensors are installed nor wired in the AHU (air-handling unit).

FACTORY WIRED – NO CONTROLLER

All factory- installed sensors are wired to a terminal strip normally located in either a control plenum or the supply fan section.

FACTORY WIRED – UNPROGRAMMED CONTROLLER IN CONTROL PLENUM

All factory-installed sensors are wired to a terminal strip inside the control plenum. The TruVu MPC controller is then wired to the terminal strip and mounted inside the control plenum.

If shipping splits exist, wiring will be terminated at each split with a Molex[1] type quick connect at each end of the wiring.

The control box includes the control module, circuit breaker, transformers, and terminal blocks. An ON/OFF switch is provided to shut off the control box power.

The control box environmental limitations are as follows:

- Shipping Temperature: –40°F to 158°F (–40°C to 70°C)
- Shipping Humidity: 10 to 95%
- Operating Temperature: –40°F to 158°F (–40°C to 70°C)
- Operating Humidity: 10 to 95%

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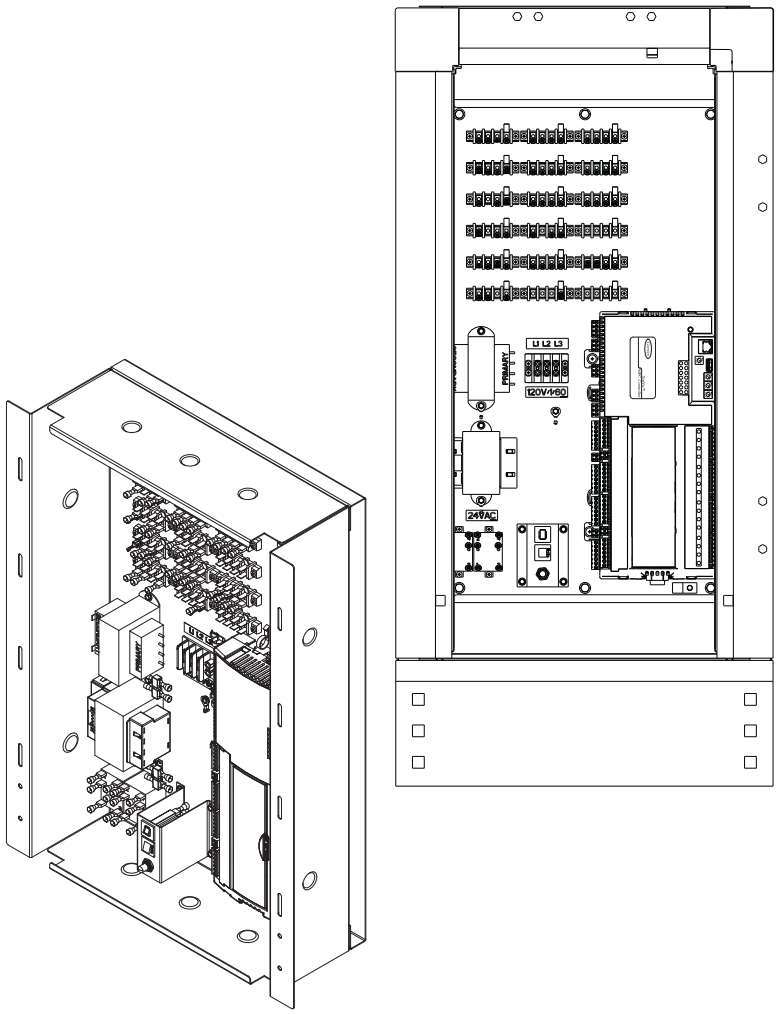


Fig. 1 — Typical Control Box Installation on 39M Supply Fan Section

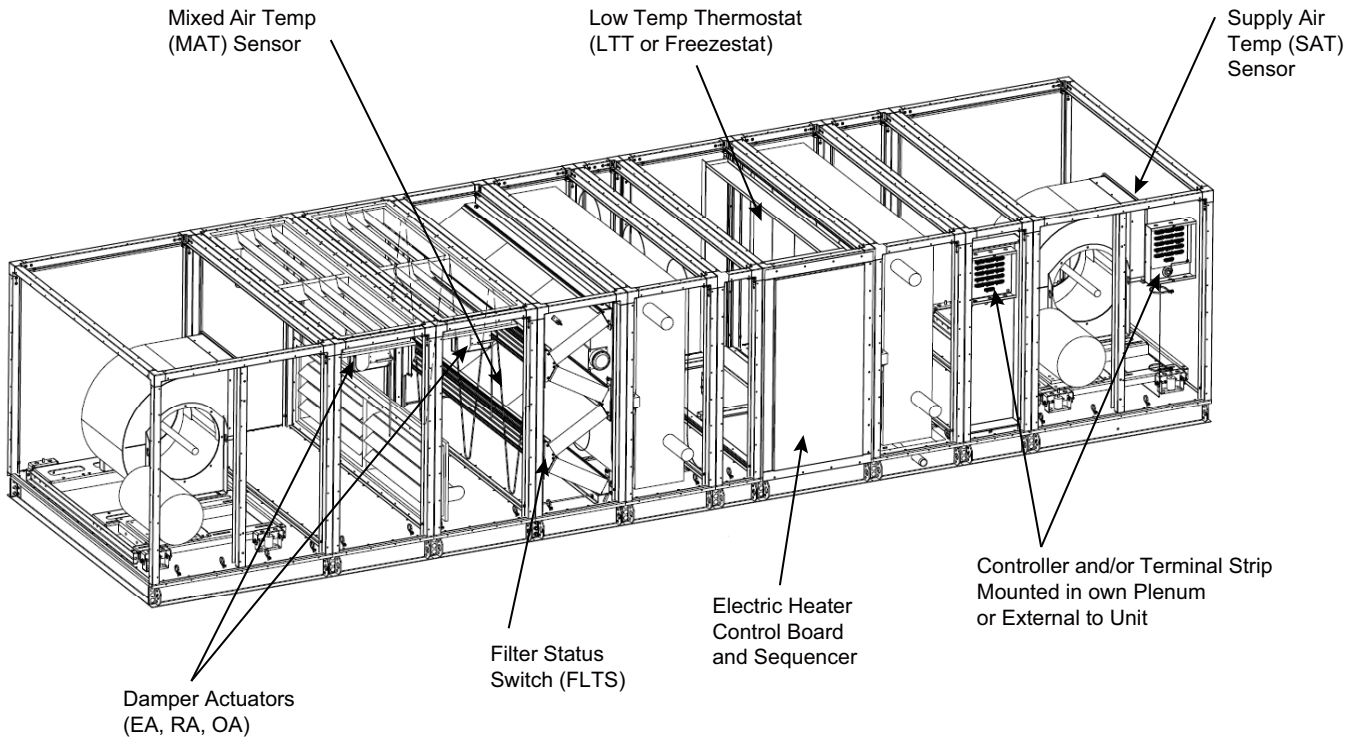


Fig. 2 — 39M Typical Sensor, Actuator, and Controller Installation Locations

Service Area Requirements

Article 110-16 of the NEC (National Electrical Code) describes electrical installation. All TruVu MPC control installations must comply with the minimum clearances required for electrical installation as listed in Table 110-16(a) of the code. Make sure to provide the necessary clearance from the TruVu MPC controls and unit to any adjoining wall. Refer to the base unit installation instructions for detailed dimensions for each unit section.

Electrical Requirements

The control system will run off of the AHU system's power through 2 transformers to adjust the incoming voltage to 24 vac ± 10%. The incoming power supply may be 50 or 60 Hz and capable of providing a minimum of 4.2 amps (but not greater than 20 amps) to the control board. Do not run Class I power wiring in the same conduit as Class II sensor wiring, control wiring of field-installed devices, or the Class motor starter wiring.

IMPORTANT: To ease installation and servicing, all field-installed sensor wiring should be located on the service side of the unit. All factory wiring run between sections, which are equipped with separation joints, has factory-supplied connections. The wiring must be disconnected if the unit is separated for service.

Refer to Fig. 3 and 4 for control box components. Various wiring details are shown in Fig. 5 and 6. Factory-supplied and wired controller input and output points are listed in Tables 1 and 2 and corresponding terminal numbers in the control are shown in Fig. 7.

⚠ CAUTION

Power is present in the control box from the motor starter circuit even when the dedicated power to the control box is off.

The supply and return fan starter circuits are independent from each other. Either circuit can be 24 vac, 120 vac, or 240 vac powered.

All factory-supplied and installed accessories are powered by factory-installed transformers. Each transformer is UL (Underwriters Laboratories) listed as a Class II device. An accessory transformer is required on the CO_2 sensor.

All electrical components are UL (Underwriters Laboratories) listed. The electronic control module is approved under UL HVAC (Heating, Ventilation and Air Conditioning) Equipment Standard 916 for energy management equipment. Complete air-handling unit with factory-installed controls are listed and labeled by UL to comply with UL Standard 60335-2-40 for heating and cooling equipment, and comply with NFPA (National Fire Protection Association) Standard 90A.

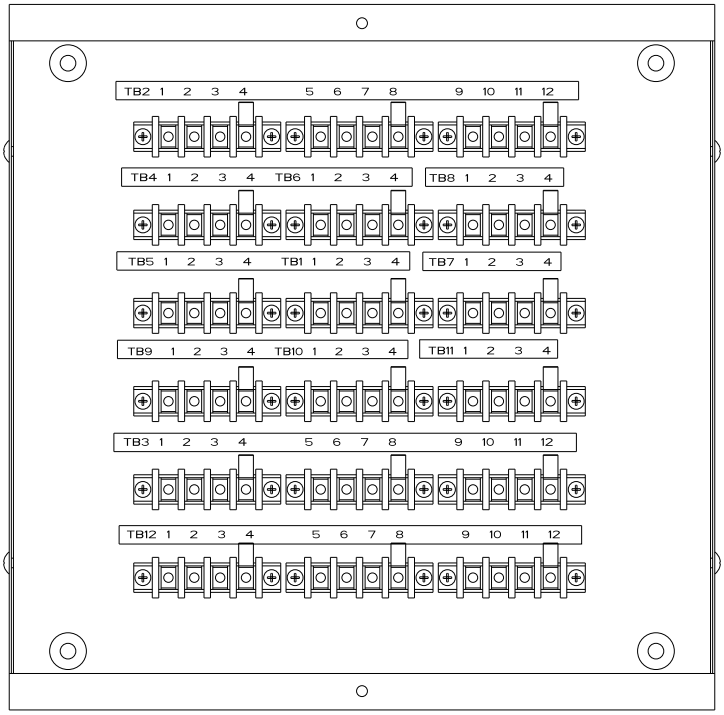


Fig. 3 — Sensor Only Terminal Box

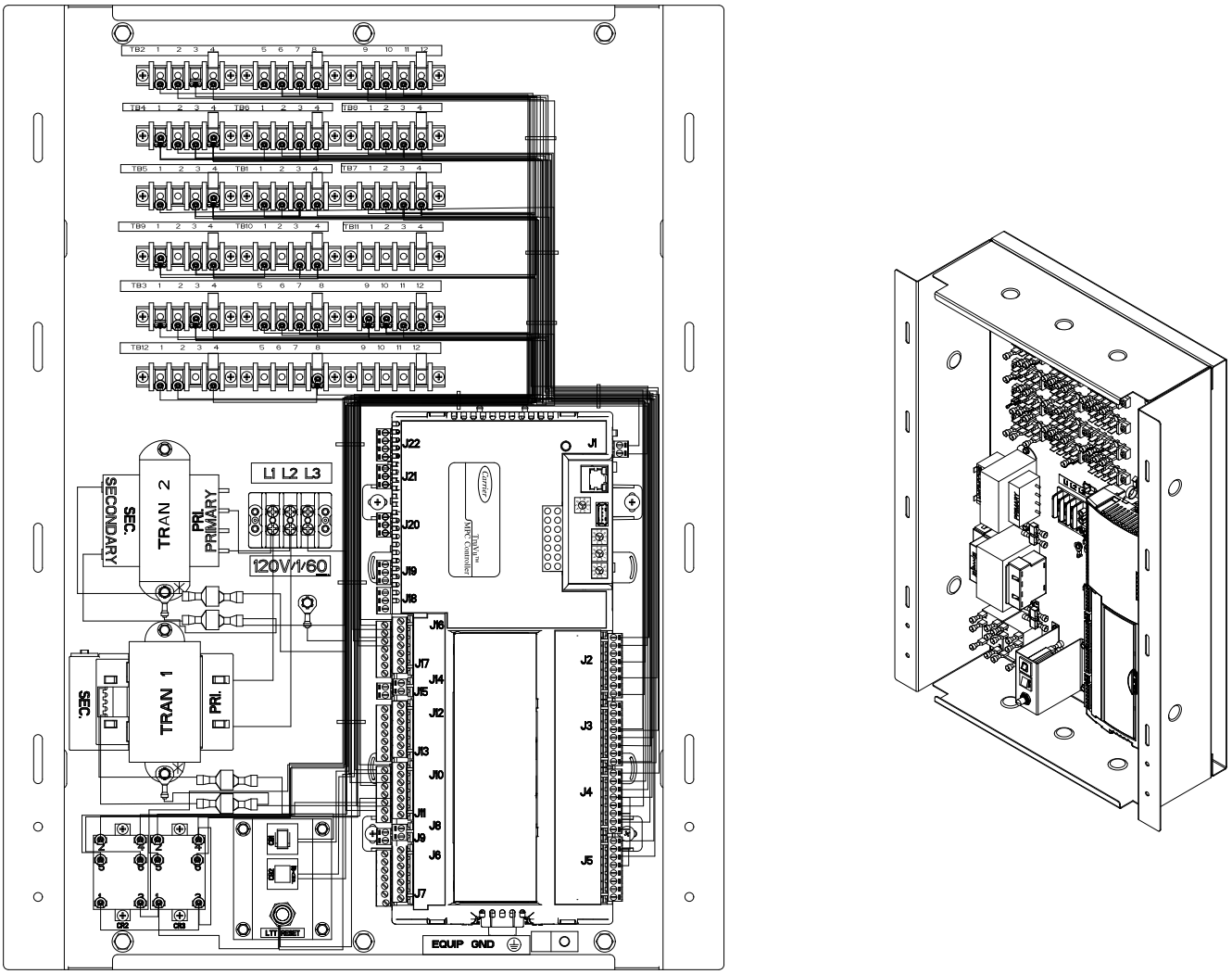


Fig. 4 — TruVu MPC Control Box Components

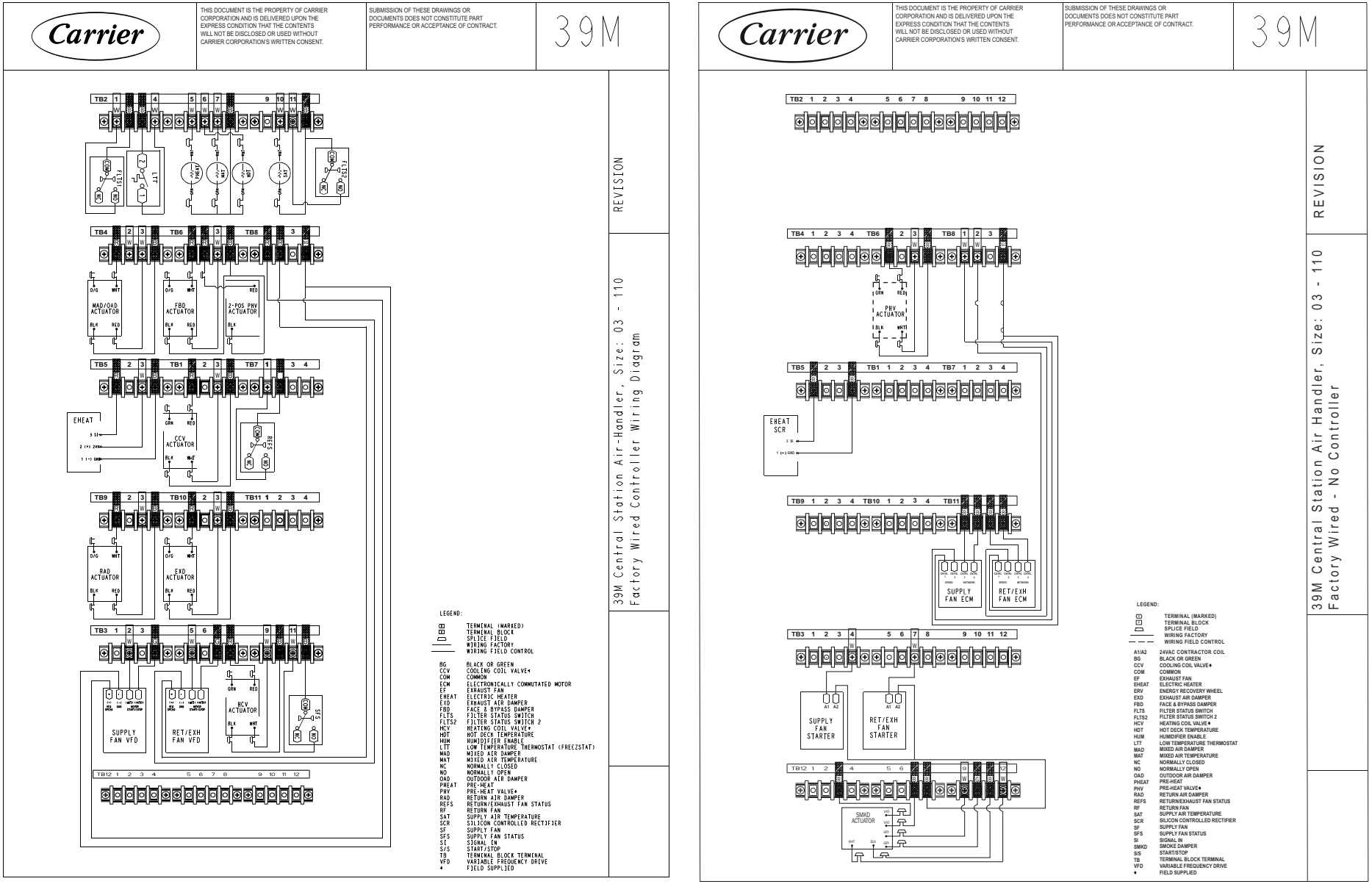


Fig. 5 — TruVu MPC Wiring Schematic

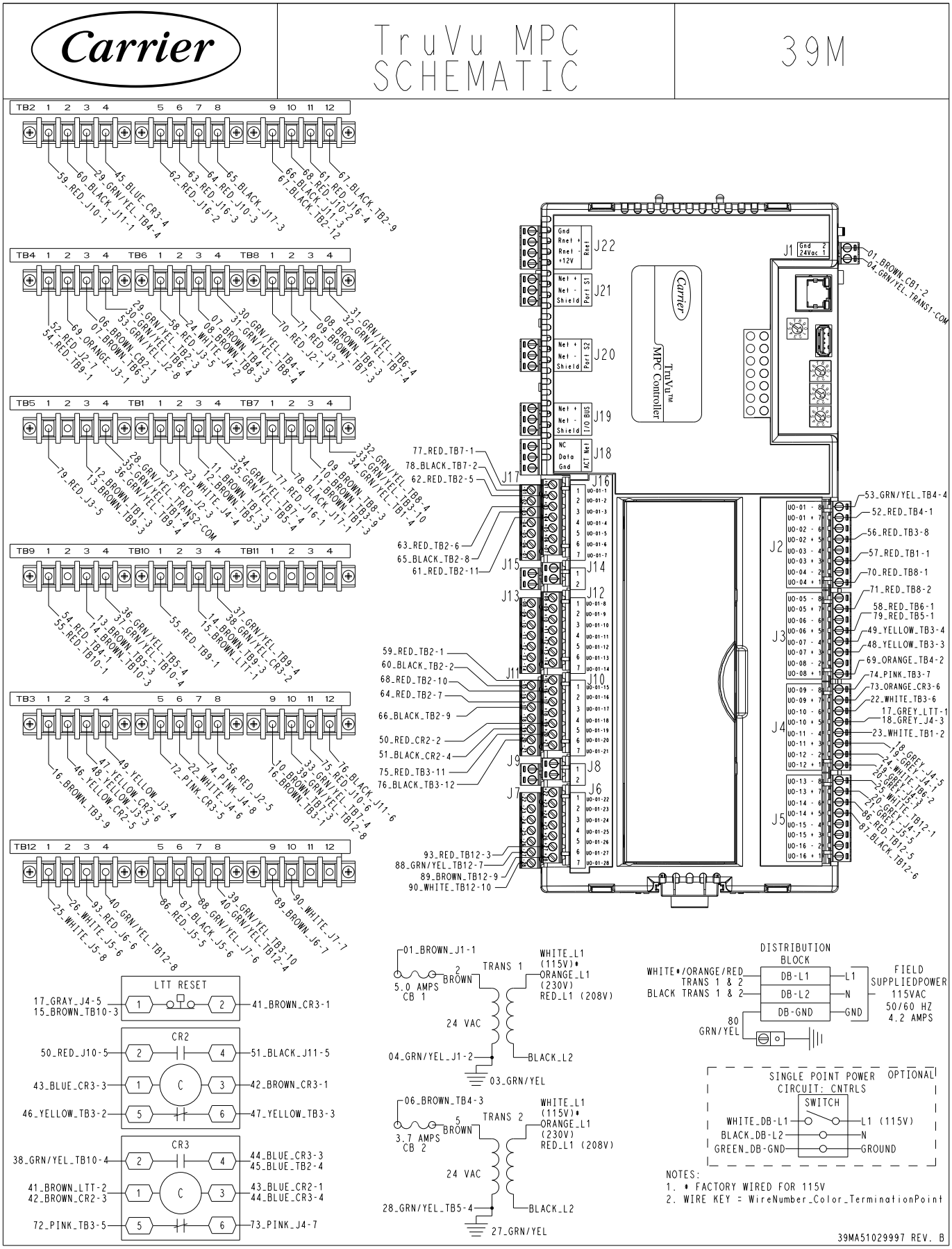


Fig. 6 — Controller Wiring Schematic

Table 1 — Sensor Only Wire Designations

CONNECTION DEVICE	WIRE NO.	WIRE PART NO.	"A" END WIRE LABEL	"A" END TERMINATION	WIRE COLOR	WIRE LENGTH (in.)	"B" END WIRE LABEL	"B" END TERMINATION
T1 24vac Power	1	39MA51027701	CB1-2	J	BROWN	23	J1-1(PWR+)	E
	2	39MA51027702	TRANS1-HOT	C	BROWN	4	CB1-1	C
T1 GND	3	39MA51027703	TRANS1-GND	H	GREEN/YEL	5	TRANS1-COM	J
		39MA51027704	J1-2(PWR-)	E	GREEN/YEL	21	TRANS1-COM	J
	4	39MA51027705	J1-2(PWR-)	E	GREEN	5	J1-2 (Gnd)	E
T2 24vac Power	5	39MA51027706	TRANS2-HOT	C	BROWN	11	CB2-1	C
	6	39MA51027707	CB2-2	C	BROWN	33	TB4-3	J
		39MA51027708	TB6-3	J	BROWN	6	TB4-3	J
		39MA51027709	TB6-3	J	BROWN	6	TB8-3	J
		39MA51027710	TB7-3	J	BROWN	10	TB8-3	J
		39MA51027711	TB7-3	J	BROWN	13	TB3-9	J
		39MA51027712	TB7-3	J	BROWN	6	TB1-3	J
		39MA51027713	TB5-3	J	BROWN	6	TB1-3	J
		39MA51027714	TB5-3	J	BROWN	21	TB9-3	J
		39MA51027715	TB10-3	J	BROWN	6	TB9-3	J
		39MA51027716	TB10-3	J	BROWN	28	LTT-1	D
		39MA51027717	TB3-9	D	BROWN	9	TB3-1	D
	7	39MA51027718	LTT-1	C	GREY	33	J4-5 (UO-10)	E
	8	39MA51027719	J4-5 (UO-10)	E	GREY	2	J4-3 (UO-11)	E
	9	39MA51027720	J4-3 (UO-11)	E	GREY	2	J4-1 (UO-12)	E
T2 GND	10	39MA51027721	TRANS2-GND	H	GREEN/YEL	9	TRANS2-COM	J
		39MA51027722	TB5-4	D	GREEN/YEL	25	TRANS2-COM	J
	11	39MA51027723	TB2-3	D	GREEN/YEL	20	TB4-4	J
		39MA51027724	TB6-4	J	GREEN/YEL	6	TB4-4	J
		39MA51027725	TB6-4	J	GREEN/YEL	6	TB8-4	J
		39MA51027726	TB7-4	J	GREEN/YEL	9	TB8-4	J
		39MA51027727	TB7-4	J	GREEN/YEL	11	TB3-10	J
		39MA51027728	TB7-4	J	GREEN/YEL	6	TB1-4	J
		39MA51027729	TB5-4	J	GREEN/YEL	6	TB1-4	J
		39MA51027730	TB5-4	J	GREEN/YEL	20	TB9-4	J
		39MA51027731	TB10-4	J	GREEN/YEL	6	TB9-4	J
		39MA51027732	TB10-4	J	GREEN/YEL	30	CR3-2	C
		39MA51027733	TB3-10	D	GREEN/YEL	13	TB12-8	J
		39MA51027734	TB12-8	D	GREEN/YEL	6	TB12-4	J
LTT	12	39MA51027735	LTT-2	C	BROWN	10	CR3-1	J
		39MA51027736	CR2-3	C	BROWN	2	CR3-1	J
	13	39MA51027737	CR2-1	C	BLUE	4	CR3-3	J
		39MA51027738	CR3-4	J	BLUE	3	CR3-3	J
		39MA51027739	CR3-4	J	BLUE	36	TB2-4	C
	14	39MA51027740	TB3-2	C	YELLOW	34	CR2-5	C
	15	39MA51027741	CR2-6	C	YELLOW	32	TB3-3	D
	16	39MA51027742	CR2-2	C	RED	11	J10-5 (UI-19)	E
	17	39MA51027743	CR2-4	C	BLACK	9	J11-5 (UI-19)	E
MAD	18	39MA51027744	TB4-1	C	RED	27	J2-7 (UO-01)	E
	19	39MA51027745	TB4-4	D	GREEN/YEL	25	J2-8 (UO-01)	E
RAD	20	39MA51027746	TB9-1	J	RED	24	TB4-1	D
EXD	21	39MA51027747	TB10-1	C	RED	6	TB9-1	D
HCV	22	39MA51027748	TB3-8	C	RED	18	J2-5 (UO-02)	E
2 Pos HCV	23	39MA51027749	TB3-6	C	WHITE	23	J4-6 (UO-10)	E
CCV	24	39MA51027750	TB1-1	C	RED	23	J2-3 (UO-03)	E
2 Pos CCV	25	39MA51027751	TB1-2	C	WHITE	27	J4-4 (UO-11)	E
PHV/F&B	26	39MA51027752	TB6-1	C	RED	25	J3-5 (UO-06)	E
2 Pos PHV	27	39MA51027753	TB6-2	C	WHITE	29	J4-2 (UO-12)	E
FLTS	28	39MA51027754	TB2-1	C	RED	32	J10-1 (UI-15)	E
	29	39MA51027755	TB2-2	C	BLACK	31	J11-1 (UI-15)	E
FLTS2	30	39MA51027756	TB2-11	C	RED	23	J16-4 (UI-04)	E
PREHEAT	31	39MA51027757	TB2-5	C	RED	26	J16-2 (UI-02)	E
HOT DECK	32	39MA51027758	TB2-6	C	RED	26	J16-3 (UI-03)	E
MAT	33	39MA51027759	TB2-7	C	RED	28	J10-3 (UI-17)	E
GND	34	39MA51027760	TB2-8	C	BLACK	24	J17-3 (UI-03)	E
	35	39MA51027761	TB2-9	J	BLACK	27	J11-3 (UI-17)	E
		39MA51027762	TB2-9	J	BLACK	3	TB2-12	C
SAT	36	39MA51027763	TB2-10	C	RED	26	J10-2 (UI-16)	E
HUMIDIFIER	37	39MA51027764	TB4-2	C	ORANGE	28	J3-1 (UO-08)	E
SF VFD	38	39MA51027765	TB8-1	C	RED	22	J2-1 (UO-04)	E
RF VFD	39	39MA51027766	TB8-2	C	RED	23	J3-7 (UO-05)	E

Table 1 — Sensor Only Wire Designations (cont)

CONNECTION DEVICE	WIRE NO.	WIRE PART NO.	"A" END WIRE LABEL	"A" END TERMINATION	WIRE COLOR	WIRE LENGTH (in.)	"B" END WIRE LABEL	"B" END TERMINATION
SF S/S	40	39MA51027767	TB3-3	C	YELLOW	24	J3-3 (UO-07)	E
	41	39MA51027768	TB3-4	C	YELLOW	23	J3-4 (UO-07)	E
RF S/S	42	39MA51027769	TB3-5	C	PINK	30	CR3-5	C
	43	39MA51027770	CR3-6	C	PINK	33	J4-7 (UO-09)	E
	44	39MA51027771	TB3-7	C	PINK	22	J4-8 (UO-09)	E
SFS	45	39MA51027772	TB3-11	C	RED	21	J10-6 (UI-20)	E
SFS	46	39MA51027773	TB3-12	C	BLACK	19	J11-6 (UI-20)	E
REFS	47	39MA51027774	TB7-1	C	RED	20	J16-1 (UI-01)	E
REFS	48	39MA51027775	TB7-2	C	BLACK	19	J17-1 (UI-01)	E
EH	49	39MA51027776	TB5-1	C	RED	27	J3-5 (UO-06)	E
DIST. BLOCK GND	50	39MA51027777	DIST. BLOCK L3	E	GREEN/YEL	5	CHASSIS GND	H
T1 120V POWER	51	39MA51027778	DIST. BLOCK L1	K	BLACK (14GA)	36	TRANS1-HOT PRIMARY	E
T2 120V POWER	52	39MA51027779	DIST. BLOCK L2	K	WHITE (14GA)	36	TRANS1-COM PRIMARY	E
T2 120V POWER	53	39MA51027780	DIST. BLOCK L1	K	BLACK (14GA)	36	TRANS2-HOT PRIMARY	E
T2 120V COM	54	39MA51027781	DIST. BLOCK L2	K	WHITE (14GA)	36	TRANS2.COM PRIMARY	E
RSKMD	55	39MA51027786	J5-5 (UO-14)	E	RED	24	TB12-5	D
	56	39MA51027787	J5-6 (UO-14)	E	BLACK	24	TB12-6	D
	57	39MA51027788	J7-6 (UI-27)	E	GREEN/YEL	24	TB12-7	D
	58	39MA51027789	J6-7 (UI-28)	E	BROWN	24	TB12-9	D
	59	39MA51027790	J7-7 (UI-28)	E	WHITE	24	TB12-10	D
	62	39MA51027793	J6-6 (UI-27)	E	RED	24	TB12-3	D

LEGEND for Table 1

A — 0.187 x 0.020 Female Quick Connect (in.)
B — Spring Type Fork Terminal
C — 0.250 x 0.032 Insulated Female Quick Connect (in.)
D — 0.250 Piggyback Quick Connect (in.)
E — 3/16-in. Min. to 1/4-in. Max. Stripped End
G — Crimp Cap
H — 0.204-in. ID Ring Terminal
J — 0.250 x 0.032 Insulated Female Quick Connect (in.)
K — #6 Spade Terminal

Table 2 — TruVu Wire Designations

CHANNEL NO.	DEVICE (CABLE NO.)	WIRE COLOR	TERMINAL	SIGNAL
	UNIVERSAL INPUT			
UI-28	SWITCH NO 85° POSITION SMOKE DAMPER BLADES (CABLE NO. 30)	WHITE	TB12-9	DRY CONTACT DI
		GREEN	TB12-10	SIGNAL GROUND
UI-27	SWITCH NC 10° POSITION SMOKE DAMPER BLADES (CABLE NO. 30)	RED	TB12-3	DRY CONTACT DI
		BLACK	TB12-7	SIGNAL GROUND
UI-26	BUILDING PRESSURE (FIELD SUPPLIED/INSTALLED)	FIELD INST.	J6-5	4-20 MA (+)
		FIELD INST.	J14-1	+24 VDC POWER
		FIELD INST.	J7-5	SIGNAL GROUND
UI-25	OUTDOOR AIR QUALITY (C02) (FIELD SUPPLIED/INSTALLED)	FIELD INST.	J6-4	4-20 MA (+)
		FIELD INST.	J9-2	+24 VDC POWER
		FIELD INST.	J7-4	SIGNAL GROUND
UI-24	SPACE INDOOR AIR QUALITY (CO_2) (FIELD SUPPLIED/INSTALLED)	FIELD INST.	J6-3	4-20 MA (+)
		FIELD INST.	J9-1	+24 VDC POWER
		FIELD INST.	J7-3	SIGNAL GROUND
UI-23	DUCT STATIC PRESSURE (FIELD SUPPLIED/INSTALLED)	FIELD INST.	J6-2	4-20 MA (+)
		FIELD INST.	J8-2	+24 VDC POWER
		FIELD INST.	J7-2	SIGNAL GROUND
UI-22	SPACE RH (FIELD SUPPLIED/INSTALLED)	FIELD INST.	J6-1	4-20 MA (+)
		FIELD INST.	J8-1	+24 VDC POWER
		FIELD INST.	J7-1	SIGNAL GROUND
UI-21	RETURN AIR TEMPERATURE (FIELD SUPPLIED/INSTALLED)	FIELD INST.	J10-7	10K THERMISTOR AI
		FIELD INST.	J11-7	SIGNAL GROUND
UI-20	SUPPLY FAN STATUS (CABLE NO. 21)	WHITE	TB3-11	DRY CONTACT DI
		BLACK	TB3-12	SIGNAL GROUND
UI-19	LOW TEMPERATURE THERMOSTAT (FREEZSTAT) (CABLE NO. 2)	WHITE	TB2-4	DRY CONTACT DI
		BLACK	TB2-3	SIGNAL GROUND
UI-18	OUTDOOR AIR TEMPERATURE (FIELD SUPPLIED/INSTALLED)	FIELD INST.	J10-4	10K THERMISTOR AI
		FIELD INST.	J11-4	SIGNAL GROUND

Table 2 — TruVu Wire Designations (cont)

CHANNEL NO.	DEVICE (CABLE NO.)	WIRE COLOR	TERMINAL	SIGNAL
UNIVERSAL INPUT (cont)				
UI-17	MIXED AIR TEMPERATURE (CABLE NO. 4)	WHITE	TB2-7	10K THERMISTOR AI
		BLACK	TB2-8	SIGNAL GROUND
UI-16	SUPPLY AIR TEMPERATURE (CABLE NO. 1)	WHITE	TB2-10	10K THERMISTOR AI
		BLACK	TB2-12	SIGNAL GROUND
UI-15	FILTER STATUS SWITCH (CABLE NO. 3)	WHITE	TB2-1	DRY CONTACT DI
		BLACK	TB2-2	SIGNAL GROUND
UI-14	NOT USED	N/A	N/A	N/A
UI-13	NOT USED	N/A	N/A	N/A
UI-12	NOT USED	N/A	N/A	N/A
UI-11	NOT USED	N/A	N/A	N/A
UI-10	ENTHALPY SWITCH	FIELD INST.	J12-3	DRY CONTACT DI
		FIELD INST.	J13-3	SIGNAL GROUND
UI-09	SMOKE MODE PURGE INPUT	FIELD INST.	J12-2	DRY CONTACT DI
		FIELD INST.	J13-2	SIGNAL GROUND
UI-08	SMOKE MODE PRESSURIZATION INPUT	FIELD INST.	J12-1	DRY CONTACT DI
		FIELD INST.	J13-1	SIGNAL GROUND
UI-07	SMOKE MODE EVACUATION INPUT	FIELD INST.	J16-7	DRY CONTACT DI
		FIELD INST.	J17-7	SIGNAL GROUND
UI-06	FIRE/SMOKE SHUTDOWN CONTACT	FIELD INST.	J16-6	DRY CONTACT DI
		FIELD INST.	J17-6	SIGNAL GROUND
UI-05	HIGH SUPPLY DUCT RH	FIELD INST.	J16-5	DRY CONTACT DI
		FIELD INST.	J17-5	SIGNAL GROUND
UI-04	FILTER STATUS-2 (CABLE NO. 17)	WHITE	TB2-11	DRY CONTACT DI
		BLACK	TB2-12	SIGNAL GROUND
UI-03	HOT DECK TEMPERATURE (CABLE NO.18)	WHITE	TB2-6	10K THERMISTOR AI
		BLACK	TB2-8	SIGNAL GROUND
UI-02	PRE-HEAT TEMPERATURE (CABLE NO. 7)	WHITE	TB2-5	10K THERMISTOR AI
		BLACK	TB2-8	SIGNAL GROUND
UI-01	RETURN/EXHAUST FAN STATUS (CABLE NO. 19)	WHITE	TB7-1	DRY CONTACT DI
		BLACK	TB7-2	SIGNAL GROUND
UNIVERSAL OUTPUT				
COMMON	COMMON	**FIELD INST.**	**TB1-4**	**GROUND**
UO-16	DX STAGE 2 (FIELD SUPPLIED/FIELD INSTALLED)	FIELD INST.	J5-1	DX STAGE 2 (24VAC)
UO-15	DX STAGE 1 (FIELD SUPPLIED/FIELD INSTALLED)	FIELD INST.	J5-3	DX STAGE 1 (24VAC)
UO-14	SMOKE DAMPER (CABLE NO. 30)	WHITE	TB12-5	+24 VAC SIGNAL
		BLACK	TB12-6	GROUND
UO-13	NOT USED	N/A	N/A	N/A
UO-12	2-POSITION PRE-HEAT VALVE (CABLE NO. 20)	RED	TB6-2	+24 VAC DO
		WHITE	N/C	—
		BLACK	TB6-4	POWER GROUND
		GREEN	N/C	—
U0-11	F/B 2-POSITION CW VALVE (CABLE NO. 8)	RED	TB1-2	+24 VAC DO
		WHITE	N/C	—
		BLACK	TB1-4	GROUND
		GREEN	N/C	—
UO-10	F/B 2-POSITION CW VALVE (CABLE NO. 9)	RED	TB3-6	+24 VAC DO
		WHITE	N/C	—
		BLACK	TB3-10	GROUND
		GREEN	N/C	—
UO-09	RETURN/EXHAUST FAN START/STOP (CABLE NO.11)	RED	N/C	—
		WHITE	TB3-5	MOTOR S/S
		BLACK	N/C	—
		GREEN	TB3-7	MOTOR S/S
UO-08	HUMIDIFIER ENABLE (CABLE NO.16)	RED	N/C	—
		WHITE	TB4-2	24 VAC SIGNAL DO
		BLACK	TB6-4	GROUND
		GREEN	N/C	—
UO-07	SUPPLY FAN START/STOP (CABLE NO.10)	RED	N/C	—
		WHITE	TB3-2	MOTOR S/S
		BLACK	N/C	—
		GREEN	TB3-4	MOTOR S/S
UO-06	ELECTRIC HEAT (CABLE NO. 12)	RED	TB5-1	0-10 VDC AO
		WHITE	TB5-3	+24 VAC
		BLACK	TB5-4	GROUND
		GREEN	N/C	—

Table 2 — TruVu Wire Designations (cont)

CHANNEL NO.	DEVICE (CABLE NO.)	WIRE COLOR	TERMINAL	SIGNAL
UNIVERSAL OUTPUT (cont)				
UO-06	ELECTRIC HEAT WITH SCR (CABLE NO. 12)	RED	TB5-1	0-10 VDC AO
		WHITE	N/C	—
		BLACK	TB5-4	GROUND
		GREEN	N/C	—
UO-06	F/B DAMPER (CABLE NO. 23)	RED	TB6-1	0-10 VDC AO
		WHITE	TB6-3	+ 24 VAC
		BLACK	TB6-4	GROUND
		GREEN	N/C	—
UO-06	PRE HEAT VALVE (CABLE NO. 20)	RED	TB6-1	0-10 VDC AO
		WHITE	TB6-3	+24 VAC
		BLACK	TB6-4	GROUND
		N/C	N/C	—
UO-05	RETURN FAN/EXHAUST FAN VARIABLE FREQUENCY SPEED (CABLE NO. 11)	RED	TB8-2	2-10 VDC AO
		BLACK	TB8-4	GROUND
UO-05	RETURN FAN/EXHAUST FAN ELECTRONICALLY COMMUTATED MOTOR SPEED (CABLE NO. 25)	WHITE	TB8-2	2-10 VDC AO
		GREEN	TB8-4	GROUND
UO-04	SUPPLY FAN ELECTRONICALLY COMMUTATED MOTOR SPEED (CABLE NO. 10)	WHITE	TB8-1	2-10 VDC AO
		GREEN	TB8-4	GROUND
UO-04	SUPPLY FAN ELECTRONICALLY COMMUTATED MOTOR SPEED (CABLE NO. 24)	WHITE	TB8-1	2-10 VDC AO
		GREEN	TB8-4	GROUND
UO-03	COOLING COIL VALVE (CABLE NO. 8) CW-Modulating, External F/B, Internal F/B	RED	TB1-1	0-10 VDC AO
		WHITE	TB1-3	+ 24 VAC
		BLACK	TB1-4	GROUND
		GREEN	N/C	—
UO-02	HEATING COIL VALVE (CABLE NO. 9)	RED	TB3-8	0-10 VDC AO
		WHITE	TB3-9	+ 24 VAC
		BLACK	TB3-10	GROUND
		GREEN	N/C	—
UO-01	MODULATING EXHAUST AIR DAMPER (CABLE NO. 6)	RED	TB10-1	0-10 VDC AO
		WHITE	TB10-3	+ 24 VAC
		BLACK	TB 10-4	GROUND
		GREEN	N/C	—
UO-01	MODULATING RETURN AIR DAMPER (CABLE NO. 22)	RED	TB9-1	0-10 VDC AO
		WHITE	TB9-3	+ 24 VAC
		BLACK	TB9-4	GROUND
		GREEN	N/C	—
UO-01	MIXED AIR/ MODULATING OUTSIDE AIR DAMPER (CABLE NO. 5)	RED	TB4-1	0-10 VDC AO
		WHITE	TB4-3	+ 24 VAC
		BLACK	TB4-4	POWER GROUND
		GREEN	N/C	
TERMINAL BLOCK ONLY				
—	SUPPPLY FAN ELECTRONICALLY COMMUTATED MOTOR NETWORK (CABLE NO. 24)	RED	TB11-1	MODBUS/BACNET +
		BLACK	TB11-2	MODBUS/BACNET -
—	RETURN FAN/EXHAUST FAN ELECTRONICALLY COMMUTATED MOTOR NETWORK (CABLE NO. 25)	RED	TB11-3	MODBUS/BACNET +
		BLACK	TB11-4	MODBUS/BACNET -

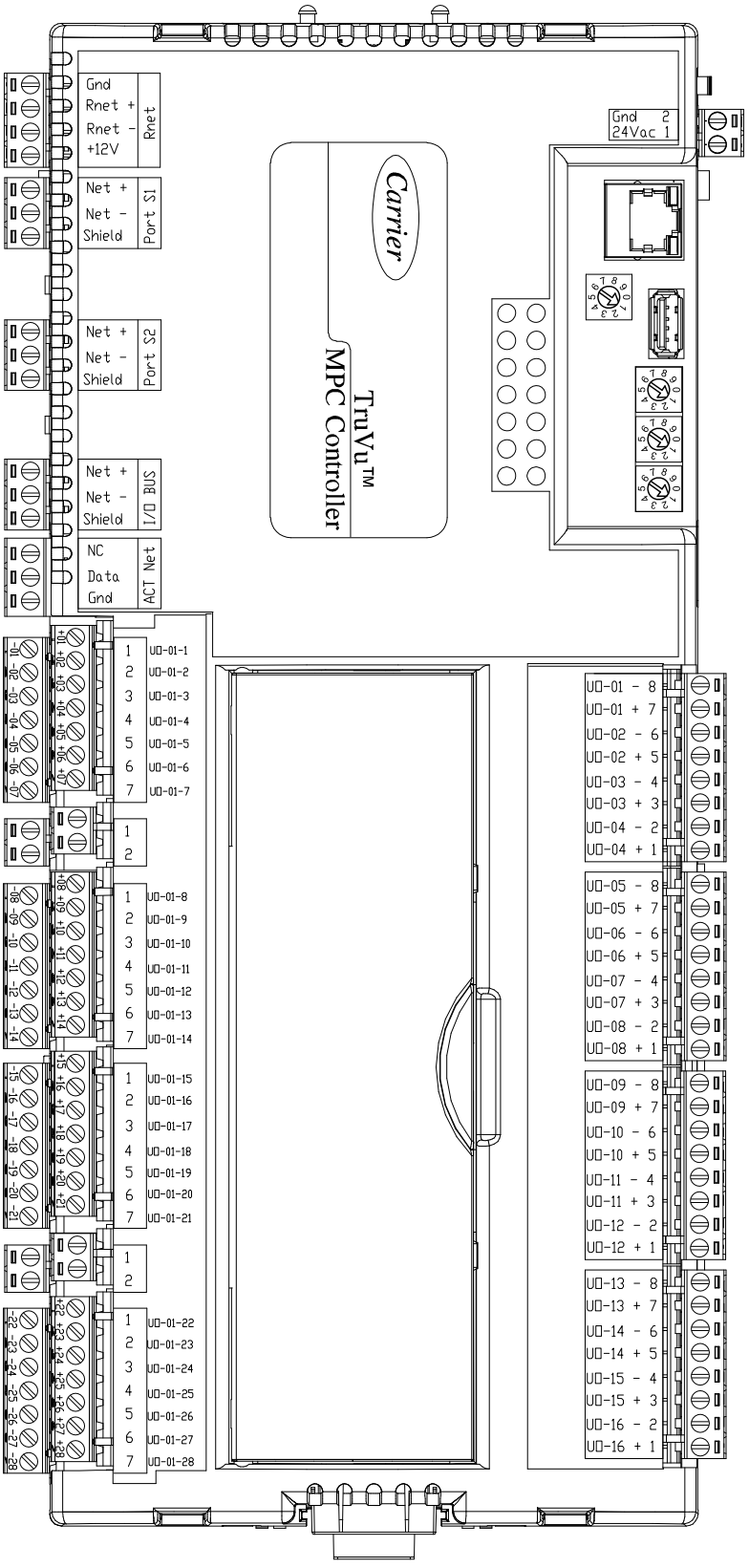


Fig. 7 — TruVu MPC Input and Output Terminal Designations

INSTALLATION

Leave protective coverings on the unit until it is installed indoors and protected from the elements, construction debris, and dirt.

The control box is shipped mounted in either the control plenum or external to the supply fan section. Visually inspect all components and wiring for any damage.

Control cable connectors are provided at each base rail split for easy disassembly and/or reassembly, allowing the unit to be shipped and/or installed in pieces.

TruVu MPC Control System

The TruVu MPC control system consists of a control board, sensors and controlled devices.

The TruVu MPC is able to be loaded with nearly any type of controls software to control the unit. The user communicates with the TruVu MPC controller with a service tool (laptop), using one of many types of software including i-Vu® Application Builder. Communications between the controller and other devices on the network are accomplished using a 3-wire bus that runs between controls.

The control board is powered from a 24 vac transformer connected to the power input connector. The control board monitors and controls components such as the supply fan, cooling and heating coil valves, mixed-air dampers, electric heat, etc.

Control System Wiring

The TruVu MPC wiring is all internal to the 39M air handler. Since air-handling systems are normally made up of multiple component sections, Carrier has designed the control system wiring using quick connect snap plugs on wires that run between sections.

There may be multiple devices mounted within the various sections, which all must connect back to the TruVu MPC controller. Figure 8 illustrates the connectivity between air-handling sections.

On the TruVu MPC controller, there is a red power plug which is connected to a dedicated transformer (T1) in the control box, providing 100vA. The controller supports up to 9 TruVu MPC I/O Expander modules. that can be wired for communication to the I/O Bus port, AC power is supplied separately for each device. (See Fig. 9 and 10.)

NOTE: Conductors and drain wire must be 22 or 24 AWG (American Wire Gauge) minimum, low-capacitance, twisted, stranded shielded copper wire. Individual conductors must be insulated with PVC, PVC/nylon, vinyl, Teflon[1], or polyethylene. An aluminum/polyester 100% foil shield and an outer jacket of PVC, PVC/nylon, chrome vinyl, or Teflon with a minimum operating temperature range of –20°C to 60°C is required. See Table 3 for cables that meet the requirements.

Table 3 — Cable Requirements

MANUFACTURER	CABLE NO.
Alpha[1]	2413 or 5463
American[1]	A22503
Belden[1]	8772
Columbia[1]	02525

When connecting the TruVu MPC communication bus to a system element, a color code system for the entire network recommended to simplify installation and checkout. The following color code is recommended in Table 4.

Table 4 — TruVu MPC Communications Bus to System Element Color Code System

SIGNAL TYPE	CCN BUS CONDUCTOR INSULATION COLOR
+12V	RED
Rnet-	BLACK
Rnet+	WHITE
Gnd	GREEN

If a cable with a different color scheme is selected, a similar color code should be adopted for the entire network. At each system element, the shields of its communication bus cables must be tied together. If the communication bus is entirely within one building, the resulting continuous shield must be connected to ground at only one point. If the communication bus cable exits from one building and enters another, the shields must be connected to ground at the lightning suppressor in each building where the cable enters or exits the building (one point only). Figures 9 and 10 show how to connect additional TruVu I/O Expander modules, as needed for specific applications.

1. Third-party trademarks and logos are the property of their respective owners.

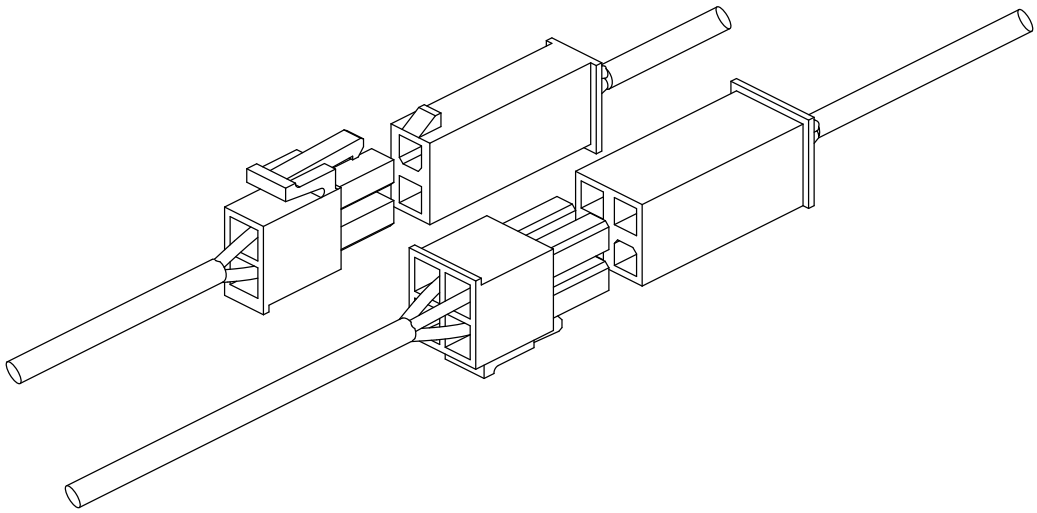
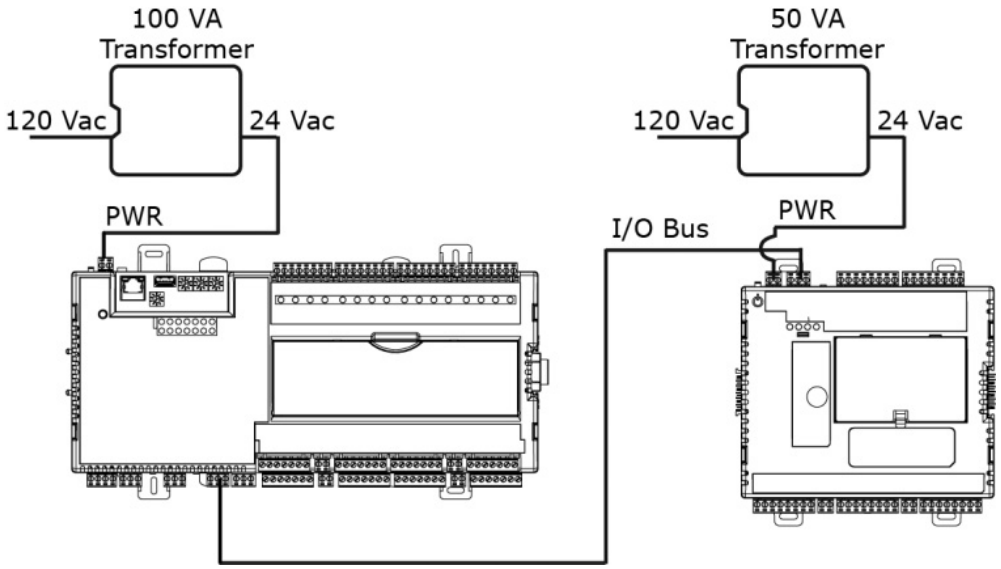


Fig. 8 — Section to Section Wiring Connectors

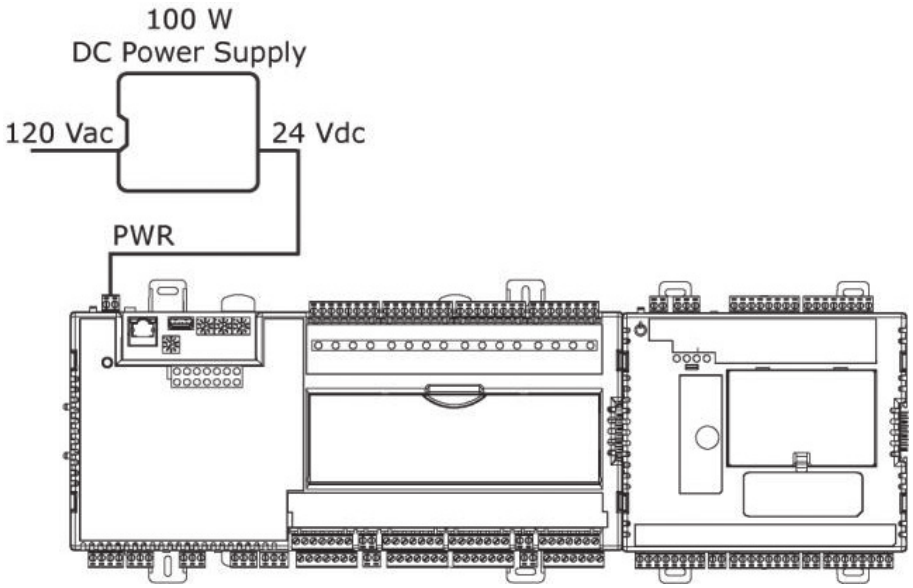
AC or **DC** - Wired to the **I/O Bus** port for communication and also wired to an external transformer for power



WARNING
Do not apply line voltage (mains voltage) to the controller's ports and terminals.

Fig. 9 — TruVu MPC I/O Expander Module — AC or DC

DC only - Directly-connected to the I/O bus edge connector that provides power and communication



WARNING
Do not apply line voltage (mains voltage) to the controller's ports and terminals.

Fig. 10 — TruVu MPC I/O Expander Module — DC Only

Controller Communication Protocols

The TruVu™ MPC can communicate on the following:

- BACnet on an MS/TP network segment communications at 9600 to 115200 bps in Port S1.
- Modbus serial network at 9600 to 115200 bps in Port S1.
- Modbus serial network at 9600 to 115200 bps at Port S2.
- 10/100/1000 Base T, full duplex, Ethernet port for BACnet/IP and/or BACnet/Ethernet, or Modbus TCP/IP communication in Gig-E port.

To set up the required type of communication see Table 5.

Table 5 — Communication Ports

PORT	PROTOCOL[a]	PORT TYPE(S)	SPEED(S)
Gig-E	BACnet/IP[b]	Ethernet	10/100/1000 Mbps (1 Gbps)
	BACnet/Ethernet		
	Modbus TCP/IP		
Port S1[c]	BACnet/MSTP	EIA-485	9.6 to 115.2 kbps[d]
	Modbus Serial		9.6 to 115.2 kbps[d]
Port S2	Modbus Serial	EIA-485	9.6 to 115.2 kbps[d]
Service Port[e]	HTTP/IP	Ethernet	10/100 Mbps
USB Port	USB 2.0	USB	—
Rnet Port	See "Wiring Devices to the TruVu Rnet Port" on page 18 for additional information.		
I/O Bus Port	See Fig. 9 or 10 for an example I/O Bus Port location		

NOTE(S):

a. Only one port can be configured for a BACnet communication type. The Gig-E port can run Modbus simultaneously with either BACnet/IP or BACnet/Ethernet.
b. Since only one port can be configured for a BACnet communication type, if you use the Gig-E port for BACnet/IP or BACnet/Ethernet, the **Port S1 Configuration** rotary switch must be set to 0, 3 or 4.
c. Set the **Port S1 Configuration** rotary switch to the following:
   • 0 - not used,
   • 1 - MS/TP,
   • 3 - Modbus.
d. Default for MS/TP is 76.8 kbps. Default for Modbus is 38.4 kbps.
e. See "To Setup the Controller Through the Service Port" on page 18.

Wire Specification

See Table 6 for wire considerations

Table 6 — Wiring Considerations

FOR	USE	MAXIMUM LENGTH
BACnet/IP	Cat5e or higher ethernet cable	328 ft (100 m)
BACnet/Ethernet		
MS/TP[a]	22 AWG, low-capacitance, twisted, stranded, shielded copper wire[a]	2000 ft (610 m)

NOTE(S):

a. For additional details, see the "Open Controller Network Wiring Guide."

⚠ WARNING

Do not apply line voltage (mains voltage) to the TruVu MPC controller ports and/or terminals.

Addressing the TruVu MPC

To access the controller setup through the Service Port:

1. Connect an ethernet cable from a computer to the controller's Service Port (see Fig. 11).

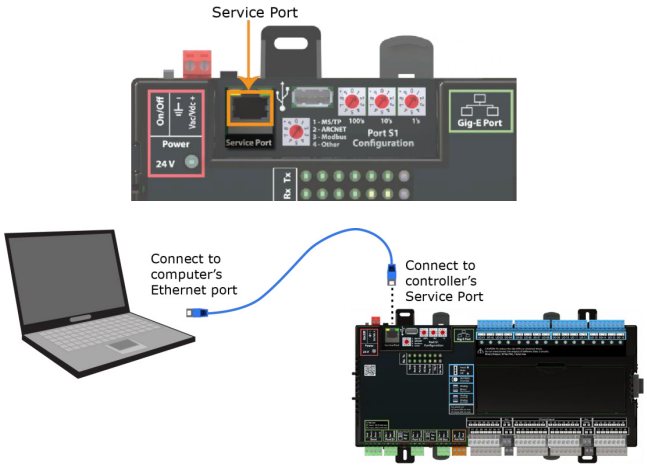


Fig. 11 — Service Port Connection

NOTE: DO NOT plug the ethernet cable into the Gig-E port. See Fig. 12).

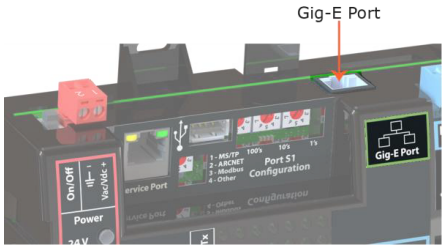


Fig. 12 — Ethernet Connection Port

2. Turn off the computer's WiFi connection (if it is on).
3. If the computer is set to use a DHCP address, do not change any settings.

   If the computer uses a static IP address, change the following settings:
   - Address: 169.254.1.x (where x is 2 to 7)
   - Subnet Mask: 255.255.255.248
   - Default Gateway: 169.254.1.1
4. Open a web browser on the computer.
5. Navigate to http://local.access or http://169.254.1.1 to see the controller setup pages.

Refer to the section "To Setup the Controller Through the Service Port" on page 18 for general information on using the controller setup pages.

Rotary Switch Settings

To set the BACnet/IP port address, see the section "To Set the IP Address" on page 16.

To set the Port S1 address on the controller's rotary switches, see the section "To Set Port S1 Address and Baud Rate" on page 17.

The rotary switch setting determine the controller number in the i-Vu® interface. Figure 13 provides an example where the rotary switches are set to generate the number 125.

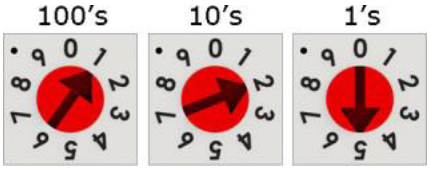


Fig. 13 — Rotary Switches — Set to 125 Value

⚠ CAUTION

Do not leave the rotary switches set to zero (0). This is the factory default setting. The TruVu MPC cannot be discovered if the rotary switches are left in the zero (0) position.

IMPORTANT: Rotary switch settings (see Fig. 13) are used to determine the following items in your system, so you should plan carefully before setting the switches.

DEFAULT IP ADDRESS

If the computer uses a default IP address, the final octet is the number created by the three rotary switch settings. This must be a unique number from 1 to 253. See the sections "To Set the IP Address" for additional information.

DEVICE INSTANCE

If you auto generate the computer device instance, this number is automatically set based on the following equation: **Device Instance = (IP Network Number x 100) + rotary switch settings**.

BACNET NETWORK NUMBER

If you auto generate the Bacnet Network number for Port S1, the number is automatically set based on the following equation: **BACnet Network Number = (IP Network Number + rotary switch settings) x 10**.

NOTE: Auto generating is set up through the controller setup. Refer to the section "Set Up Controller Through Service Port" for additional information.

To Set the IP Address

You must define the TruVu MPC's IP addressing (IP address, subnet mask, and default gateway) in the Service Port controller setup sections so that the controller can communicate with the i-Vu Server on the IP network.

IMPORTANT: Carefully plan your addressing scheme to avoid duplicating addresses. If third-party devices are integrated into the system, make sure your addresses do not conflict with any of their addresses.

Use one of the IP addressing schemes described in Table 7 with the associated instructions that follow.

Table 7 — IP Addressing Schemes

USE...	DESCRIPTION	IF...
DHCP IP Address	Generated by a DHCP server.	If the IP network uses a DHCP server for IP addressing.
Custom Static IP Address	Provided by your network administrator.	If a DHCP server is not used and the answer to any of the following questions is "**Yes**." Will the i-Vu system: • share a facility's existing IP data network? • have 254 or more devices with static IP addresses? • be connected to the internet? • have at least one device located on the other side of an IP router? • have any third-party IP devices?
Default IP Address	Generated by your system.	If the answer to all of the above questions is "**No**."

To Set a DHCP IP Address

1. On the controller setup Modstat tab, find the controller's Ethernet MAC address and write it down.
2. On the Ports tab, under IP Port, select **DHCP**.
3. Click **Save**.
4. Write down the IP address.
5. Give the DHCP network administrator the IP address and ethernet MAC address and ask that it be reserved for the controller so that the controller always receives the same IP address from the DHCP server.

To Set a Custom IP Address

1. Obtain the IP address, subnet mask, and default gateway address for the controller from the facility network administrator.
2. On the controller setup Ports tab under IP Port, select **Custom Static**.
3. Enter the IP Address, Subnet Mask, and Default Gateway addresses given to you by the network administrator.
4. Click **Save**.

To Set a Default IP Address

Default IP addressing assigns the following to the controller:

- IP address = 192.168.168.x

  where "x" is the setting on the rotary switches in the range from 1 to 253.
- Subnet Mask = 255.255.255.0
- Default Gateway = 192.168.168.254

1. Set the controller's three rotary switches to a unique address on the network. Set the left rotary switch to the hundreds digit, the middle switch to the tens digit, and the right switch to the ones digit. Refer to Fig. 13.
2. On the controller setup Ports tab under IP Port, select **Default IP Address**.
3. Click **Save**.

⚠ CAUTION

The Default IP address range is 1 to 253. Setting the rotary switches to 0 will set the Default IP address to 1. Setting the switches to 255 will set the Default IP to 253. Do not set the switches to 254.

⚠ CAUTION

If you set the Default IP address on the controller setup Ports tab and then change the rotary switches, you must do one of the following to correct the IP address in the controller:

- Go to the ***Controller Setup Ports*** tab and click the **Update IP Address**.
- Cycle the controller's power.

You will then need to correct the IP address in the i-Vu® application using ***Find Devices*** and ***Upload All Content***. See the i-Vu® Help for more information.

NOTE: The default address is an intranet address. Data packets from this address are not able to be routed to the Internet.

To Set Port S1 Address and Baud Rate

The port address should be in one of the following ranges based on the port's use:

- For MS/TP, the range is 0 to 127.
- For Modbus, the range is 1 to 247.

For MS/TP

For MS/TP, set up autobaud or the port's baud rate.

1. On the controller setup BACnet tab under Port S1, select the **MSTP Baud Rate** or select **Yes** for **MSTP Autobaud**. The default is 76,800 bps.

   NOTE: See "To Setup Autobaud" below for details.

   NOTE: If not using autobaud, enter the identical baud rate for all devices on the same MS/TP network segment.
2. Click **Save**.

Modbus

For Modbus, see the Modbus Integration Guide.

To Setup Autobaud

The TruVu MPC can automatically receive or establish the baud rate on an MS/TP or Modbus serial network. When you configure a device on the network for autobaud and then power it up, the device detects the incoming baud rate on the network and sets its baud to match.

Autobaud does not work unless there is a device on the network, whether Carrier or third-party, that has the baud rate already set. You can manually set the baud rate on more than one device, as long as the rate is the same for every device.

NOTE: The received baud rate stays intact during power cycles.

NOTE: We recommend you set the baud rate manually on the router for the network.

MS/TP

MSTP Autobaud can be configured in either of the following locations:

- **Service Port Controller Setup** pages → ***BACnet*** tab → ***Port S1***

or

- The i-Vu® interface, on the Network tree, select your TruVu MPC and go to ***Driver → BACnet Controller Properties → MS/TP Configuration on Port S1***. (See "To Communicate Using the BACnet/IP Service Port Network" on page 19.)

MODBUS

Modbus Serial Autobaud can be configured in either of the following locations:

- **Service Port Controller Setup** pages → ***Modbus*** tab → ***Modbus RS-485*** → **Port Configuration**.

or

- In the i-Vu® interface, on the Network tree, select your ***TruVu MPC → Driver → Communication Status → Modbus Serial***.

NOTE: See the Modbus Integration Guide.

NOTE: If you set Autobaud or make other changes in the controller setup pages, you must upload the changes to the system database the first time you access the controller in the i-Vu® interface. This preserves those settings when you download memory or parameters to the controller.

To Setup the Controller Through the Service Port

Using a computer and an Ethernet cable, you can communicate with the TruVu MPC through a web browser to:

- View the controller's Module Status (Modstat) report.
- View/change controller and network settings (changes take effect immediately).
- troubleshoot.
- Use BACnet/IP Service Port to access the i-Vu® application or a touchscreen device. See "To Communicate Using the BACnet/IP Service Port Network" section for more information.

1. Connect an ethernet cable from a computer to the controller's Service Port (see Fig. 14).

IMPORTANT: Be sure to NOT plug the cable into the Gig-E Port. See Fig. 15.

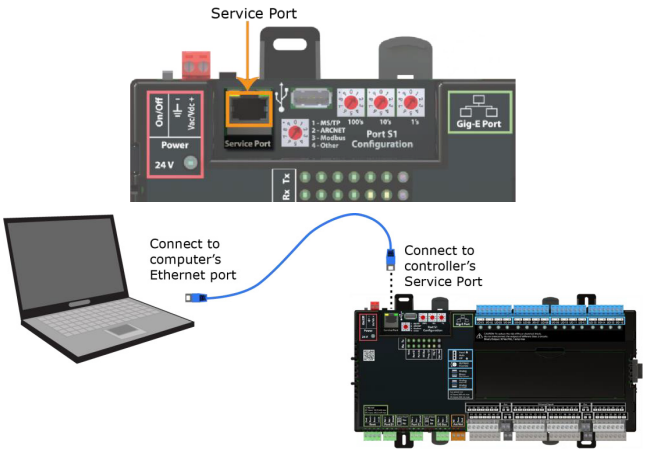


Fig. 14 — Service Port Connection

2. Turn off the computer's Wi-Fi if it is on.
3. If it uses a DHCP address, leave the address as it is.

   If your computer uses a static IP address, use the following settings:
   - Address: 169.254.1.x, where x is 2 to 7
   - Subnet Mask: 255.255.255.248
   - Default Gateway: 169.254.1.1
4. Open a web browser on the computer.
5. Navigate to http://local.access or http://169.254.1.1 to see the Service Port controller setup pages.

NOTE: The first time you access the controller in the i-Vu® interface after you have changed settings through the Service Port, be sure to upload the changes to the system database. This will preserve those settings when you download memory or parameters to the controller.

To Connect the TruVu MPC to the Ethernet

Connect an Ethernet cable to the Gig-E Ethernet port.

NOTE: Be careful NOT to plug your cable into the Service Port. See Fig. 14.

If your system has controllers on different IP subnets separated by an IP router, you must configure one controller on each subnet as a BACnet Broadcast Management Device (BBMD). Do not configure more than one BBMD per subnet as this may cause circular routes.

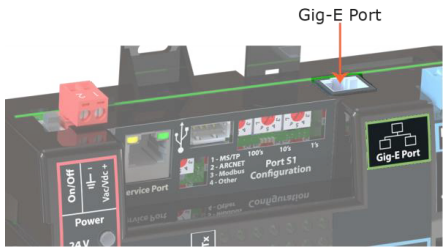


Fig. 15 — Ethernet Connection Port

To Wire to a BACnet MS/TP

An MS/TP network can be wired to either Port S1.

1. Turn on the TruVu MPC's power.
2. Check the communications wiring for shorts and grounds.
3. Connect the communications wiring to Port S1's screw terminals labeled Net +, Net – and Shield.

   NOTE: Use the same polarity throughout the network segment.
4. Set the Port S1 Configuration rotary switch to 1.
5. If you are using Port S1, and the controller has a Port S1 Configuration rotary switch, set it to 1.

   NOTE: If Port S1 is not being used for any network, set this rotary switch to 0.
6. If the TruVu MPC controller is at either end of a network segment, set the port's "End of Net?" switch to **Yes**.

   NOTE: The controller's End of Net switch applies network termination and bias. See the Open Controller Network Wiring Guide.
7. Turn on the controller's power.
8. To verify communication with the network, get a Module Status report in the i-Vu® interface for a controller on the MS/TP network.

   NOTE: This step requires that you have discovered and uploaded the controller in the i-Vu® application.

Wiring Devices to the TruVu Rnet Port

You can wire the following devices to the TruVu MPC's Rnet port in a daisy-chain configuration:

- ZS sensors
- Wireless Adapter that communicates with wireless sensors
- Equipment Touch
- TruVu ET Display

See the device's Installation and Start-up Guide for complete wiring instructions.

NOTE: ZS sensors, a Wireless Adapter, and an Equipment Touch can share the same Rnet.

NOTE: The Rnet communicates at a rate of 115.2 kbps.

To Communicate Using the BACnet/IP Service Port Network

You can connect to the Service Port to access your network through the i-Vu® Pro application.

1. Connect an Ethernet cable from a computer to the controller's Service Port, as shown below.

   NOTE: Be sure NOT to plug the cable into the Gig-E Port. Refer to Fig 15.
2. Turn off the computer's Wi-Fi if it is on.
3. If it uses a DHCP address, leave the address as it is.

   If your computer uses a static IP address, use the following settings:
   - Address: 169.254.1.x, where x is 2 to 7
   - Subnet Mask: 255.255.255.248
   - Default Gateway: 169.254.1.1
4. Open a web browser on the computer and login to your i-Vu® Pro application.
5. In the i-Vu® Pro interface, on the System Options tree, select **Connections**.
6. On the **Properties** page → ***Configure tab***, select **BACnet/IP Service Port Connection** from the drop-down list and click **Add**.
7. If needed, enter the Service Port Network Number as follows:
   - 0 = the TruVu MPC will communicate only with the computer or TruVu ET Display
   - 1 to 65534 = the TruVu MPC's network number for network communication
   - 65535 = searches for an available network number from 65531 to 65534. If any of these numbers are not available, you will have to assign a network number and enter it.
8. Click **Apply**.
9. On the right of the page, in the "Networks Using Selected Connection" table, click the check box next to the network you want to connect to.
10. Click **Apply**.
11. Select the ***BACnet/IP Service Port Connection*** and click **Start**. The status changes to **Connected**.
12. Click **Accept**.
13. On the navigation tree, right-click the controller that you are connected to and select **Module Status** (Modstat). If a Modstat report appears, the i-Vu® application is communicating with the controller.

COMPONENT INSTALLATION AND FIELD WIRING

Wiring Requirements

All field wiring must comply with NEC and all local requirements. The recommended wiring is shown in Table 8.

Table 8 — Wiring Requirements

INPUT	MAXIMUM LENGTH	MINIMUM GAUGE	SHIELDING
0-5 vdc **0-10 vdc**	500 feet (152 meters)	22 AWG	100 feet Unshielded 100-500 feet Shielded
0-20 mA	1000 feet (305 meters)	22 AWG	100 feet Unshielded 100-1000 feet Shielded
Thermistor **Dry Contact** **Pulse Counter** **TLO**	500 feet (152 meters)	22 AWG	100 feet Unshielded 100-500 feet Shielded
RTD	100 feet (30 meters)	22 AWG	Shielded
SPT Sensors	500 feet (152 meters)	18 AWG	Unshielded

LEGEND

AWG — American Wire Gauge
RTD — Resistance Temperature Device
SPT — Setpoint
TLO — Timed Local Override

Refer to Table 9 for recommended brands and part numbers.

Table 9 — Recommended Sensor and Device Wiring

WIRE TYPE	BELDEN PART NO.	CAROL PART NO.	ALPHA PART NO.
300-v, Non-Plenum, 60 C Minimum (CM)			
2-Conductor, 18 AWG Cable	9740	C6101 (or C5460[a])	1897C
4-Conductor, 18 AWG Cable	8489	C2404 (or C5084[a])	1898/4C
3-Conductor, 20 AWG Shielded Cable	8772	C2528	2413C/5463
150-v, Plenum Rated (CMP/CL2P)			
2-Conductor, 18 AWG Cable	82740	C8276	—
4-Conductor, 18 AWG Cable	82489	C8524	—
3-Conductor, 20 AWG Shielded Cable	83553	C8173	58133
600-v, High-Voltage Rated, 90 C[b]			
2-Conductor, 18 AWG Cable	9486	—	5606B1801
4-Conductor, 16 AWG Cable	—	—	7616/4
3-Conductor, 18 AWG Shielded Cable	—	—	5646B1801

NOTE(S):

a. Wire rated at 200-v.
b. For control wiring internal to a variable frequency drive, motor starter, electric heater, or condensing unit control box, which has a nameplate operating voltage greater than 300 VAC.

On units with factory-installed controls, each section (with factory-installed sensors or actuators) is wired back to the control plenum using UL listed, plenum type cable. All factory-supplied sensor wiring is terminated at the control box. Connectors are provided at each base rail split for easy disassembly.

NOTE: For application data regarding Space Temperature Sensors, Air Quality (CO_2) sensors and enthalpy and humidity sensors please see the 39M Controls Application Data. For installation and wiring instructions for these sensors please see the Carrier Sensor Installation Guide.

Supply-Air Temperature (SAT) Sensor

The SAT sensor is factory installed and wired when either of the "Factory Wired" control options is selected in the *AHU*Builder® program. See Fig. 16. The sensor is normally located in the discharge of the supply fan unless heating or cooling coils are located downstream of the fan (blow-thru fans only). In a blow-thru situation, the sensor is located on the discharge end of the last blow-thru coil. The sensor consists of a thermistor encased within a stainless steel probe and is mounted to a junction box. The sensor's thermistor has a range of –40°F to 245°F (–40°C to 118°C) with a nominal resistance of 10,000 ohms at 77°F (25°C) and an accuracy of ± 0.36°F (0.2°C). See Table 10.

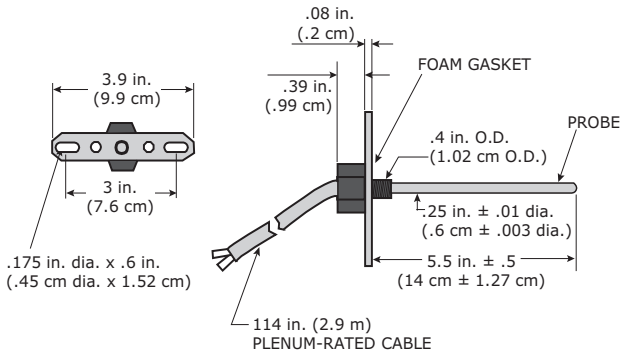


Fig. 16 — Supply-Air/Return-Air Temperature Sensor (33ZCSENSAT)

Table 10 — Temperature to Resistance Conversion — 10K MAT, SAT and Preheat Thermistors

TEMPERATURE		RESISTANCE (ohms)
°F	°C	10K Thermistor
–40	–40.0	336,000.0
–31	–35.0	242,700.0
–22	–30.0	177,000.0
–13	–25.0	130,402.0
–4	–20.0	97,060.0
5	–15.0	72,940.0
14	–10.0	55,319.0
23	–5.0	42,324.0
32	0.0	32,654.0
41	5.0	25,396.0
50	10.0	19,903.0
59	15.0	15,714.0
68	20.0	12,493.0
77	25.0	10,000.0
86	30.0	8,056.0
95	35.0	6,530.0
104	40.0	5,327.0
113	45.0	4,370.0
122	50.0	3,606.0
131	55.0	2,986.0
140	60.0	2,488.0
149	65.0	2,083.0
158	70.0	1,752.0
167	75.0	1,480.0
176	80.0	1,255.0
185	167.2	1,070.0
194	90.0	915.0
203	95.0	787.0
212	100.0	680.0
221	105.0	592.0
230	110.0	517.0
246	119.0	401.0
239	115.0	450.0

Fan Status Switch

The fan status switch monitors any change in AC current that is indicative of a motor failure, belt loss or slippage or mechanical failure of the fan. The fan status switch is factory-supplied with each supply, return or exhaust fan when either of the "Factory Wired" control options are selected. The switch is factory-installed and wired when a VFD (variable frequency drive), starter, disconnect or ECM fan power box is factory installed and sufficient room exists. Otherwise, the switch is factory-supplied for field installation. See Fig. 17-21 for installation locations.

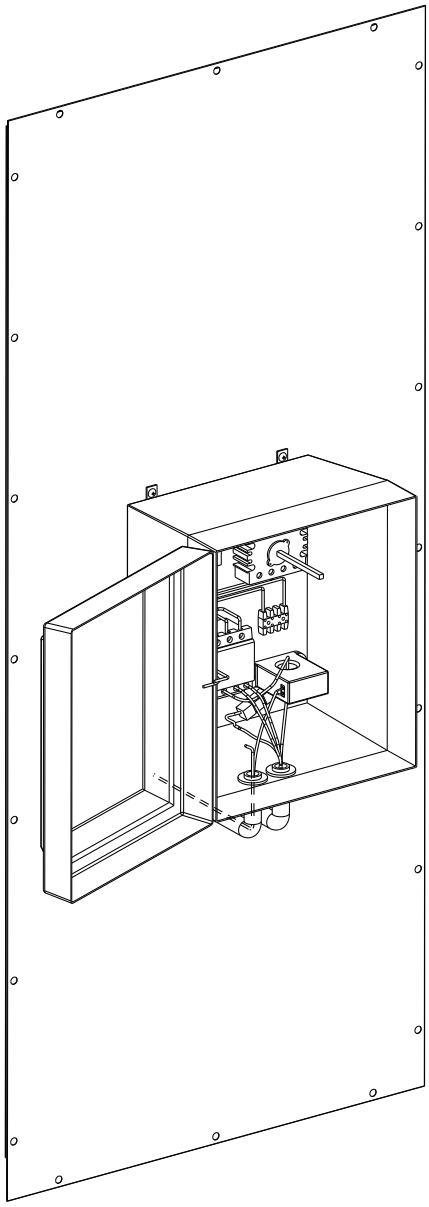


Fig. 17 — Fan Status Switch Installed in Motor Starter

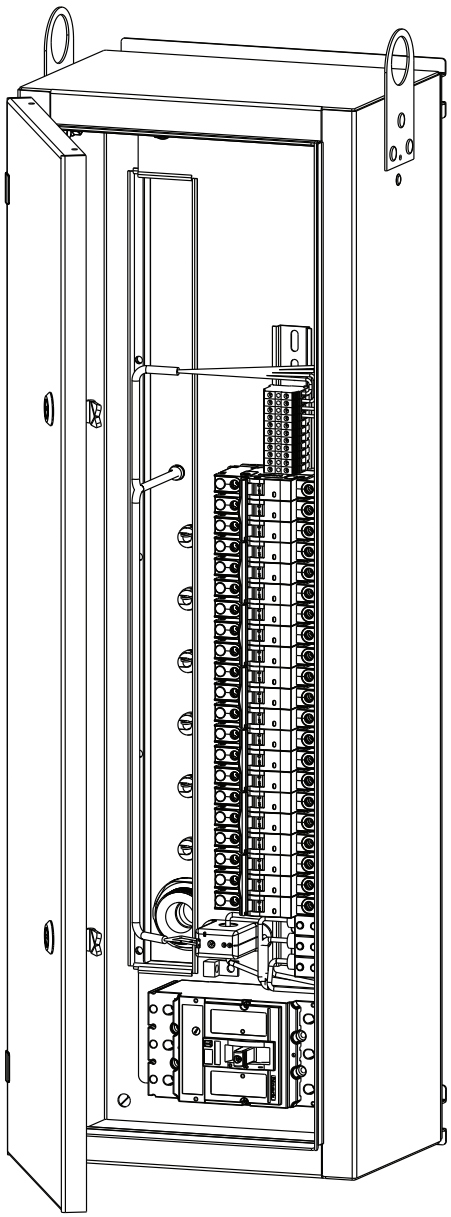


Fig. 18 — ECM Fan Power Box

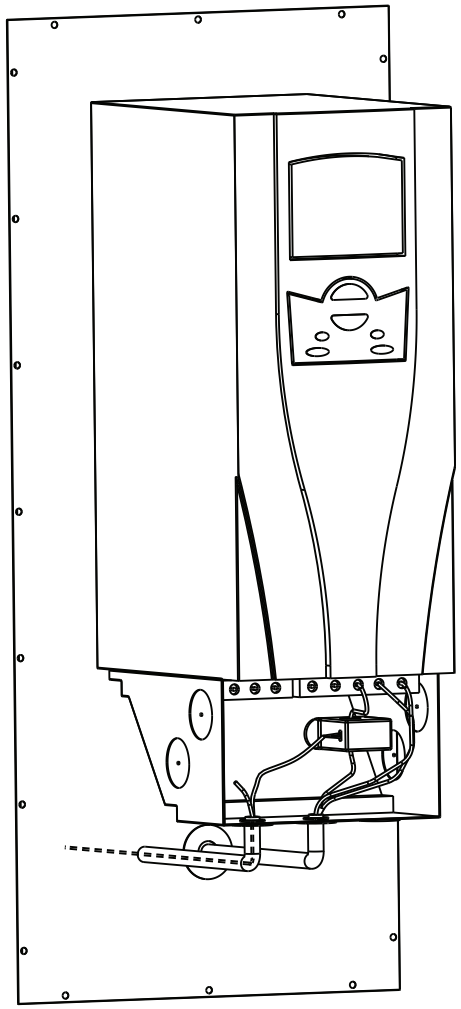


Fig. 19 — Fan Status Switch Installed in VFD

The fan status switch includes two status LED (light-emitting diode) indicators that will indicate one of three states; tripped on, current present but below trip point, and current off or below the low end of the adjustable trip point range.

Fan Status Switch Adjustment

The fan status is adjustable with an operating range of 0 to 150 amps and is factory set to the 100 amp trip point position. To adjust the trip point:

1. With current flowing through the aperture of the current switch, verify the Blue LED is on.
2. If the Blue LED is on, slowly adjust the potentiometer (labeled as “TRP ADJ” in Fig. 20) clockwise until the RED LED just turns on and stop immediately. The trip point is now set at the normal operating load current.

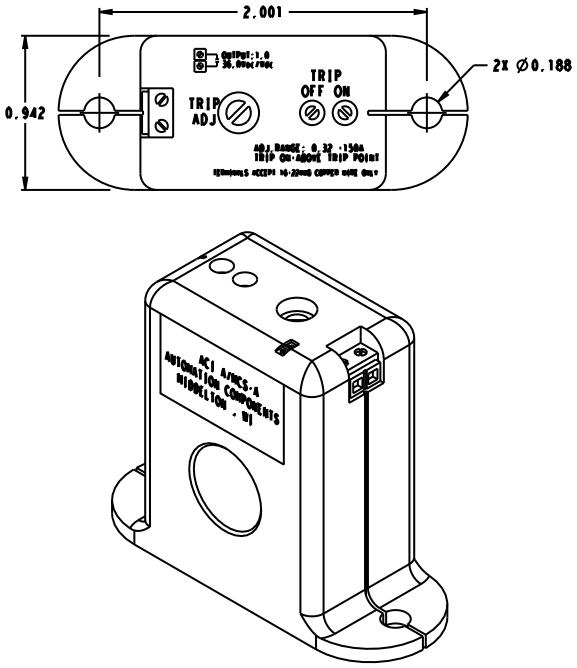


Fig. 20 — Fan Status Switch

Fan Status Switch Field Installation

If the AHU is ordered with no VFD, starter, disconnect or ECM fan power box and the fan status switch is supplied, then the fan status switch will ship in the fan section for field installation.

⚠ CAUTION

The fan status switches should be used on insulated conductors only.

1. The fan status switch may be mounted in any position using the provided Tek[1] screws and holes in the base. Leave a minimum distance of 1 inch between the current switch and any other magnetic devices such as contactors and transformers.
2. Loop (1 turn) "Black" wire from conduit assembly running into the starter/disconnect/VFD/bypass/ECM Fan Power Box from the motor through the sensor as shown in Fig. 21.
3. Connect the "Black" wire to the appropriate connector within the starter/disconnect/VFD/bypass/ECM fan power box.
4. Connect the control wiring to the control connection terminals near the top of the fan status switch as shown in Fig. 21.

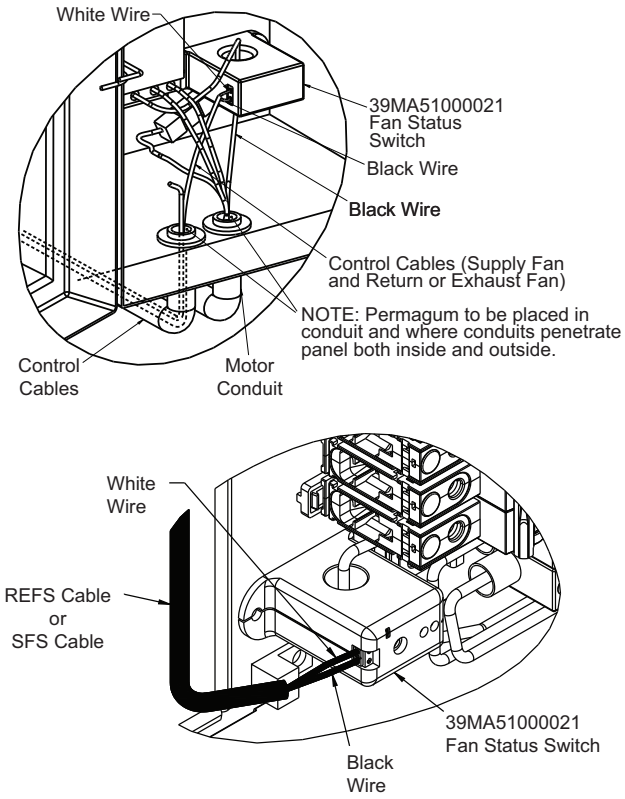


Fig. 21 — Fan Status Switch Installation

Return-Air Temperature Sensor

The return-air temperature sensor (RAT) is ordered separately and installed in the return-air duct (Fig. 16). Mount the sensor in the middle of the return-air duct upstream from the return-air damper. The sensor's probe tip should be centered within the duct.

Outdoor-Air Temperature Sensor (OAT) (P/N 33ZCSENOAT)

The OAT sensor is ordered separately for field installation and consists of a thermistor encased within a probe. See Fig. 22.

The OAT Sensor has an operating range of –40°F to 245°F (–40°C to 118°C) with a nominal resistance of 10,000 ohms at 77°F (25°C) and an accuracy of ± 0.36°F (0.2°C).

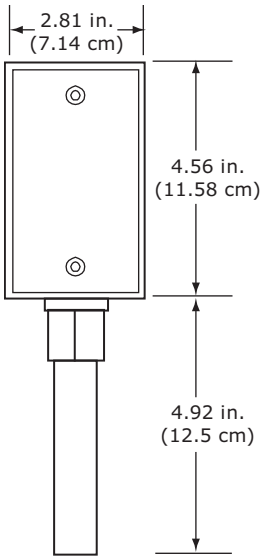


Fig. 22 — Outdoor-Air Temperature (OAT) Sensor

1. Third-party trademarks and logos are the property of their respective owners.

Mixed-Air Temperature Sensor

The mixed-air temperature sensor measures the temperature of the air leaving the mixing box. The MAT sensor is factory-supplied and installed when either of the "Factory Wired" control options is selected in the *AHU*Builder® program and a mixing box or filter mixing box is present. The sensor is located inside the last mixing box in the airflow, and the terminal box is mounted on the hand side of the unit.

This sensor uses multiple thermistor elements and provides both mechanical and electrical averaging to achieve an average temperature measurement over the entire element length. Polarity is not a consideration. See Fig. 23 for an installation.

Low-Temperature Thermostat (LTT)

The low-temperature thermostat (often referred to as a freezestat) is factory-supplied and installed when there is a factory-supplied and installed steam or water heating and/or cooling coil and either of the "Factory Wired" control options is selected in the *AHU*Builder® program. See Fig. 24. The thermostat is used to protect the equipment coils from freezing temperatures in the event of a malfunction, by detecting the presence of a potentially damaging condition. The TruVu MPC control will stop the fan if damaging conditions are detected. If field installed, the LTT should be done so on the entering air side of the first cooling coil in the equipment. (For heating only units, it is installed on the leaving air side of the first heating coil.) A single LTT is used for coil face areas up to 45 sq ft. For larger coils, one LTT is used for each 45 sq ft of coil face area. If multiple coils are used, such as a split coil, one LTT is used on each coil even if the total coil face area is 45 sq ft or less. The TruVu MPC controller accommodates multiple LTTs.

The factory-supplied LTT has a range of 35 to 60°F and is factory set at 35°F. The temperature setting is field adjustable. To adjust the temperature set point, turn the adjustment screw (located on the top of the case) until the position indicator is at the desired temperature. (A clockwise rotation increases the set point.)

The LTT operates two low voltage relays. The normally closed contacts of one relay is wired in series with the motor starter circuit. If a 1-ft section of the capillary tube senses cold air at or below the thermostat setting, the fan shuts down. A manual reset is provided in the control box to restart the fan after the abnormal condition is corrected. The temperature must exceed the set point by 5°F or more for the reset button to restore the circuit to normal operation.

⚠ CAUTION

DO NOT set the low-temperature thermostat below 35°F. Coil damage may result.

For all heating coils, the LTT sensor senses the temperature of the air leaving the coil (downstream). For all cooling coils, the LTT sensor sensing the temperature of the air entering the coil (upstream).

The sensor is mounted to the coil baffle panel, near the bottom. The capillary sensing tube is routed through the upper bushing in the coil baffle panel. It is run vertically up and down across the coil face and extends evenly across the coil face from side to side. It will form a "W" pattern as shown in Fig. 25 and 26. The LTT control assembly and reset switch is installed on the hand side of the section.

Preheat Temperature Sensor (PHEAT)

The preheat temperature sensor measures the temperature of the air leaving the preheat coil. The sensor is factory-supplied and installed when there is an extended length electric heating coil in its own section before a cooling coil and either of the "Factory Wired" control options is selected in the *AHU*Builder® program. The PHEAT sensor is normally on the downstream side of the heating coil in the heating coil section.

The sensor consists of multiple thermistors evenly spaced and encased within a flexible copper tube, which provides average temperature sensing. The sensor tubing is installed on the downstream side of the preheat coil and is serpentined so it can sense average temperature. The preheat sensor has a range of –40°F to 185°F (–40°C to 85°C) with a nominal resistance of 10,000 ohms at 77°F (25°C) and an accuracy of ± 0.36°F (0.2°C).

Filter Status Switch (P/N 33AMSENFLT000)

The filter status differential pressure switch (FLTS) is a snap action SPDT type switch. When a dirty filter element causes the pressure drop across the filter media to exceed the switch setting, the switch closes and sends an alarm signal to the control box. The switch has a set point range from 0.05 to 2.0 in. wg. Refer to the filter manufacturer's information for the maximum dirty filter pressure drop, or use Table 11 determine the appropriate set point for the specific filter type used.

Table 11 — Filter Pressure Settings

FILTER TYPE (Efficiency)	RECOMMENDED MAXIMUM PRESSURE SETTING (in. wg)
2-in. Flat (<35%)	0.5
2 to 4-in. Flat (35-65%)	1.0
Bag/Cartridge (65-85%)	1.2
Final (85-98%)	1.5

The filter status switch is factory installed in a filter or filter mixing box section if ordered in the *AHU*Builder® program when either of the "Factory Wired" control options is selected. The switch can be factory installed across the first filter section in the airstream on all types of air-handling units.

The filter switch will typically be factory-installed on the upstream side of the filter track. The 1/4-in. pneumatic tubing will be connected to the "low" pressure port and run into the downstream side of the filter. See Fig. 27.

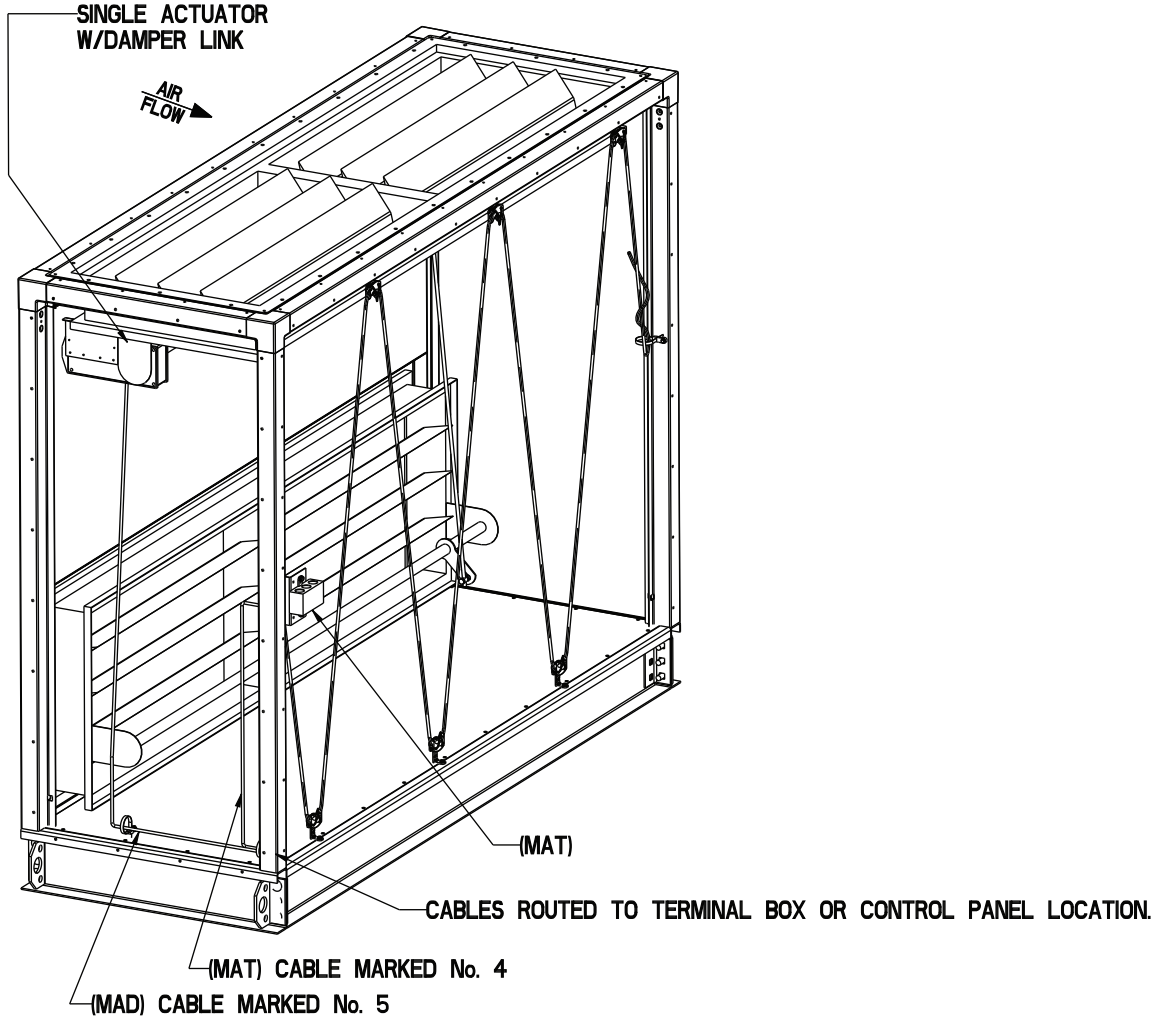


Fig. 23 — Typical MAT (Mixed-Air Temperature Sensor) Installation

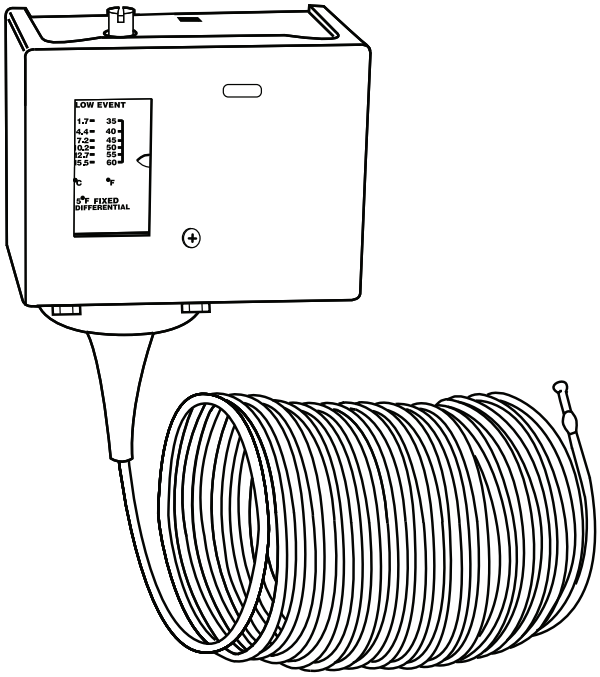


Fig. 24 — Low-Temperature Thermostat

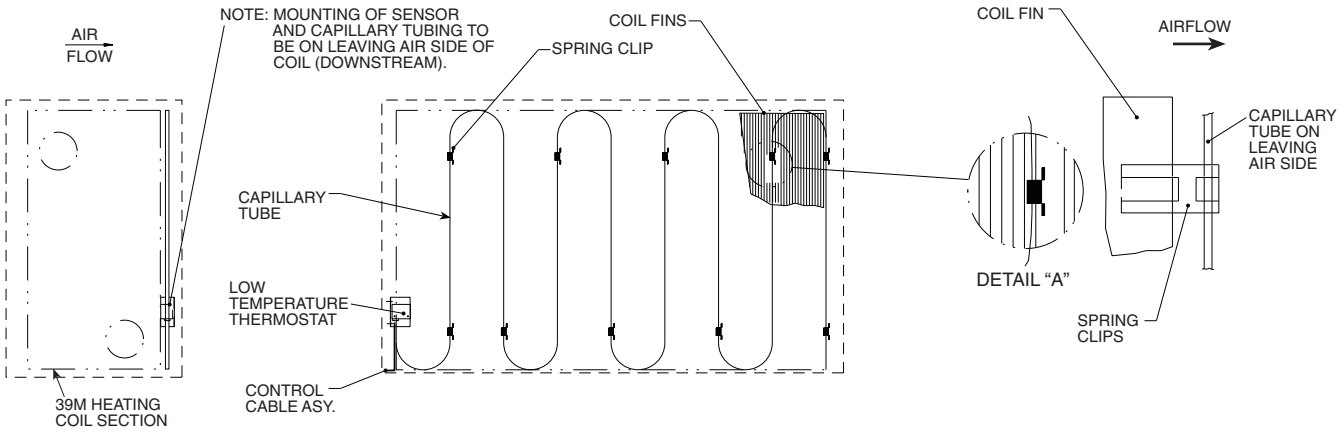


Fig. 25 — Heating Coil Section, Typical Capillary Tube Routing for LTT on Heating Only Applications

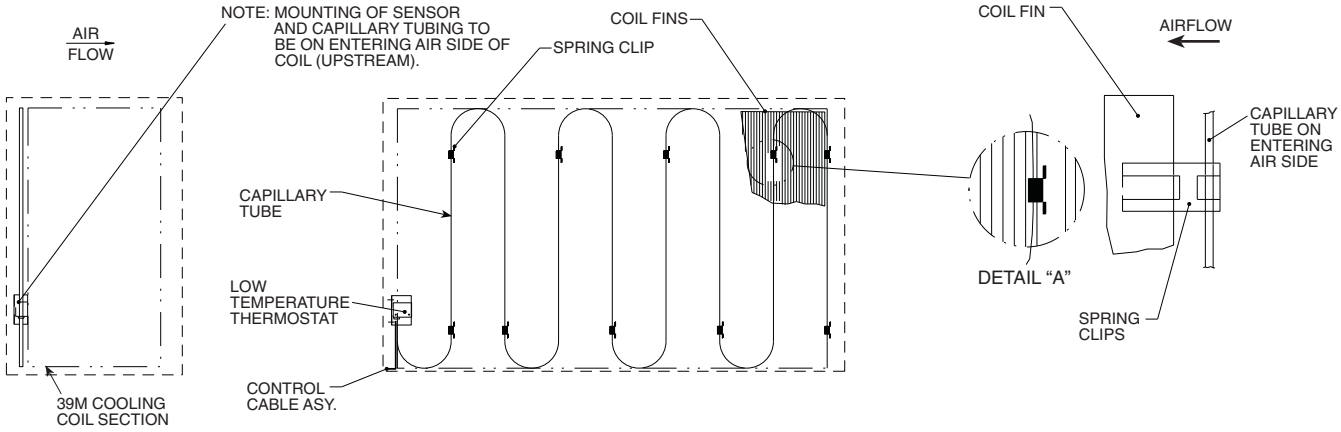


Fig. 26 — Cooling Coil Section, Capillary Tube Routing

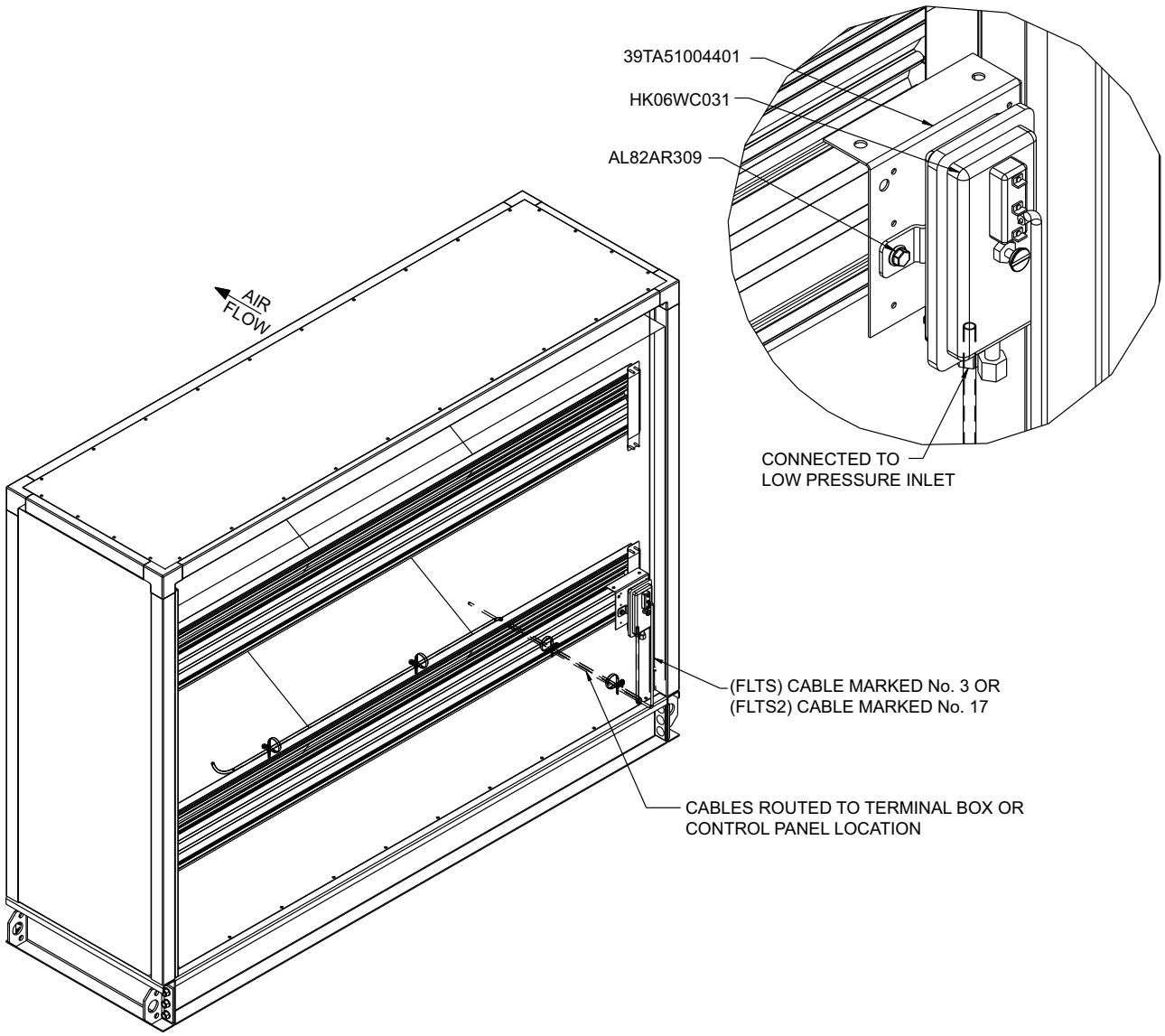


Fig. 27 — Filter Status Switch Installation

Steam/Water Valves

Steam and water valve assemblies are field-supplied and installed. All valves must be fully modulating and capable of being positioned at any point within the valve's travel range.

Valves must be able to accept a 4 to 20 mA or 0 to 10 vdc control signal.

⚠ CAUTION

To prevent electric shock and equipment damage, disconnect the power to the control box before installing any valve assemblies.

Field-Supplied Two-Position Water Valves

The TruVu MPC control supports two-position water valves for heating or CV cooling applications, although it is not recommended for air handler applications, except if face and bypass damper control is used.

All water valve assemblies must be field-supplied. For compatibility, 24 vac type actuators are required. Actuator power consumption must be rated under 25 va. The actuator must utilize a spring return method to reposition the valve back to the normal position if power is removed. Normally open or normally closed type valves are both acceptable and their selection depends on the application and specific customer requirements.

Mixing Box Damper Actuators

The spring return mixed-air damper actuators are factory-supplied and installed when ordered in the *AHU*Builder® program. When installed, the actuators are done so directly on the damper jackshaft. If more than one damper is located inside of the mixing box, either separate actuators on each damper or one actuator with damper linkage can be ordered. Spring return damper actuators are proportional modulating, direct shaft mount type, capable of being driven in both directions and holding position at any point in its travel range. The actuator is mechanically reversible. As installed from the factory it provides spring return closing of the outdoor-air damper on loss of power.

⚠ CAUTION

It is extremely important to properly link parallel blade outdoor-air and parallel blade return-air dampers. Failure to do so may cause mixing problems, stratification, or coil freezing under some conditions, especially in combination type filter mixing boxes. Opposed blade type outdoor-air dampers are recommended, in conjunction with parallel blade type return-air dampers. Using these together will minimize potential problems. See Fig. 27.

All factory-mounted actuators ordered with the equipment are mounted to the outdoor-air damper and have the linkages preset for spring return closed outdoor air. If the opposite damper will be used for outdoor air, the actuator must be removed from the damper and re-installed on the opposite damper. The linkages must also be readjusted for proper operation. The actuators are 24 V with a 2 to 10 vdc output signal and a 4 to 20 mA control signal.

NOTE: For shipping purposes, the secondary connecting rod which connects the outdoor-air damper to the return-air damper will be set so that both the outdoor air and return air dampers remain closed. Before operating the equipment, loosen the bolt that retains the rod and fully open the return air damper, then tighten the bolt to lock the rod in position (see Fig. 28).

NOTE: For field-mounted actuators, see Fig. 29.

Exhaust Damper Actuator

A separate exhaust/relief damper actuator may be factory-supplied. This damper actuator is the same make and type of spring return actuator used for the mixing box dampers and will be factory mounted to the exhaust damper inside a factory-supplied exhaust box if ordered via the *AHU*Builder® program. A separate cable is provided to control the exhaust air damper.

Face and Bypass Damper Actuators

Face and bypass damper actuators are factory-supplied and installed when ordered via the *AHU*Builder® program. These actuators are of the same make and type of spring return actuator as the mixed-air damper actuators.

All face and bypass damper actuators are wired to the TruVu MPC controller using plenum cable. Actuator connections depend on the application. Refer to Tables 1 and 2 for cable terminations of face and bypass heating and cooling actuators.

Smoke Damper Actuator

Smoke damper actuators shall be factory-supplied and installed when specified. Each actuator must include an electronically controlled reversible motor with spring return, designed for life-safety smoke control applications. The assembly shall comply with UL 555S requirements for reliable operation under elevated temperature conditions.

Actuators are mounted in their fail-safe position, with damper blades typically closed. When power is applied, the actuator drives the damper to the open position while simultaneously tensioning the internal spring. In the event of power loss, the spring returns the damper to its fail-safe position.

Actuators shall operate on 24V AC/DC, feature ON/OFF control, and include auxiliary switch.

The TruVu controller uses output UO-14 to send a signal to the relay coil. The relay functions as a switch to supply power to the smoke damper actuator. The actuator shall be powered by an external power source, terminal TB12-12 for Hot line and TB12-11 for COM.

Variable-Frequency Drives

Variable-frequency drives (VFDs) are used for fan volume control on VAV units. Variable frequency drives can be factory-supplied. The input for external frequency input for the variable frequency drive must accept a 4 to 20 mA signal. The TruVu MPC controller provides an isolated 4 to 20 mA control signal to the drive. The external start/stop input to the drive must accept a contact closure. Use 2-conductor, 18 or 20 AWG cable (single-shielded twisted pair or a 3-conductor shielded cable may be used) to connect the external frequency input and the external start/stop input to the output of the control.

IMPORTANT: Wire the VFD start/stop input so that if it is placed in the manual or bypass mode, the low temperature thermostat is still in the motor control circuit to protect the unit.

For VAV units, set the minimum VFD frequency output (speed at 4 mA external input signal) such that the desired supply duct static pressure is achieved when all the air terminals are set to maintain minimum airflow. Verify that the supply fan status shows the fan status is ON while the supply fan is operating at the lowest speed. Increase the VFD Minimum Frequency Output Value until the desired static pressure set point is achieved when the system airflow is at the lowest possible value.

DX Cooling Control

Direct expansion (DX) cooling applications are not directly controlled via the TruVu MPC controller. DX cooling applications are controlled only by the applicable condenser controller by controlling the staging of the compressors. The supply air temperature (SAT) sensor and the return air temperature (RAT) sensor in or near the AHU are necessary inputs for the condenser controller to control the compressor staging for both digital and standard type scroll compressors. These sensors are generally wired directly to the condenser's control module; however, they may pass the necessary signal to the condenser's module, either directly or indirectly, via the TruVu MPC controller and the BACnet network. For further information regarding DX control, see the 39M Control Product Data and the applicable condenser's control guide.

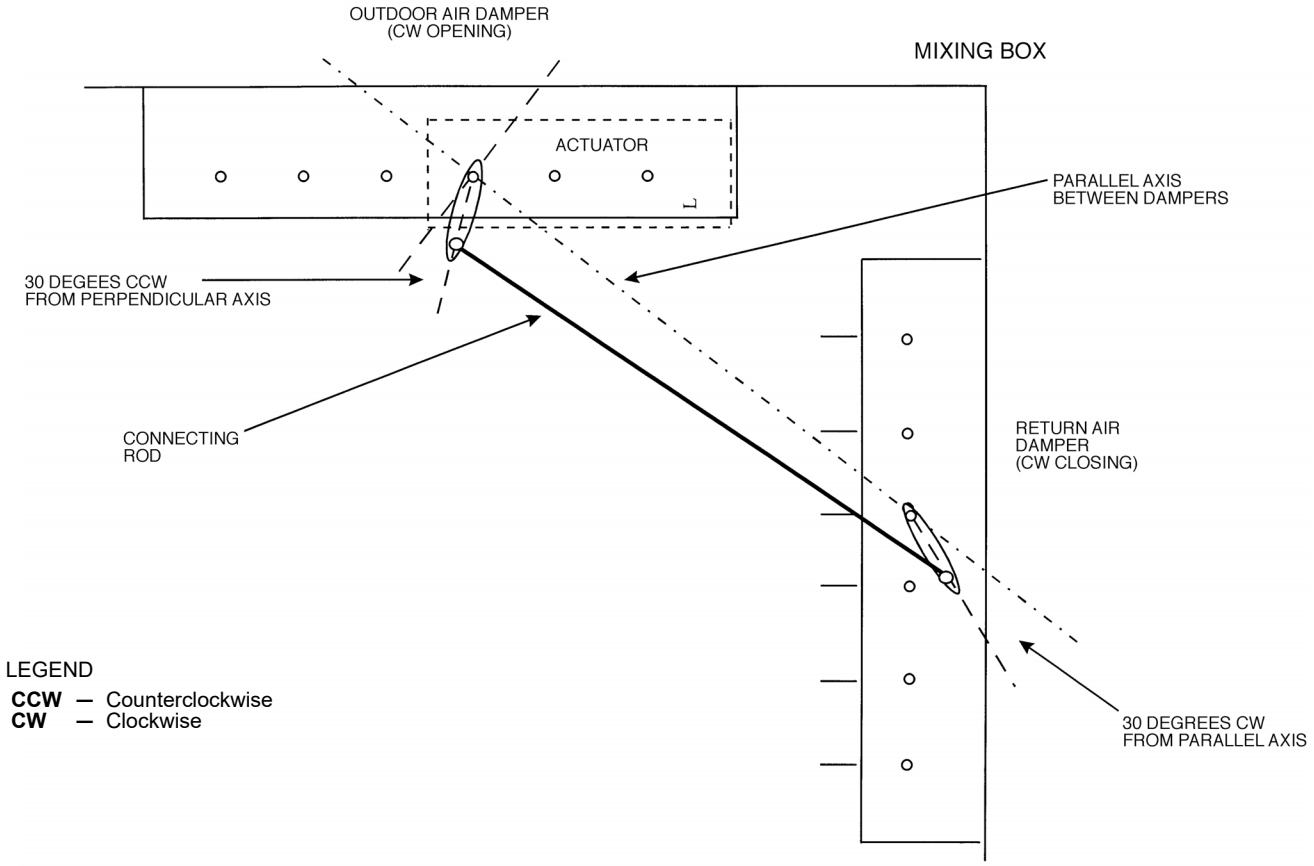


Fig. 28 — Typical Damper Secondary Linkage (Two Parallel Blade Dampers)

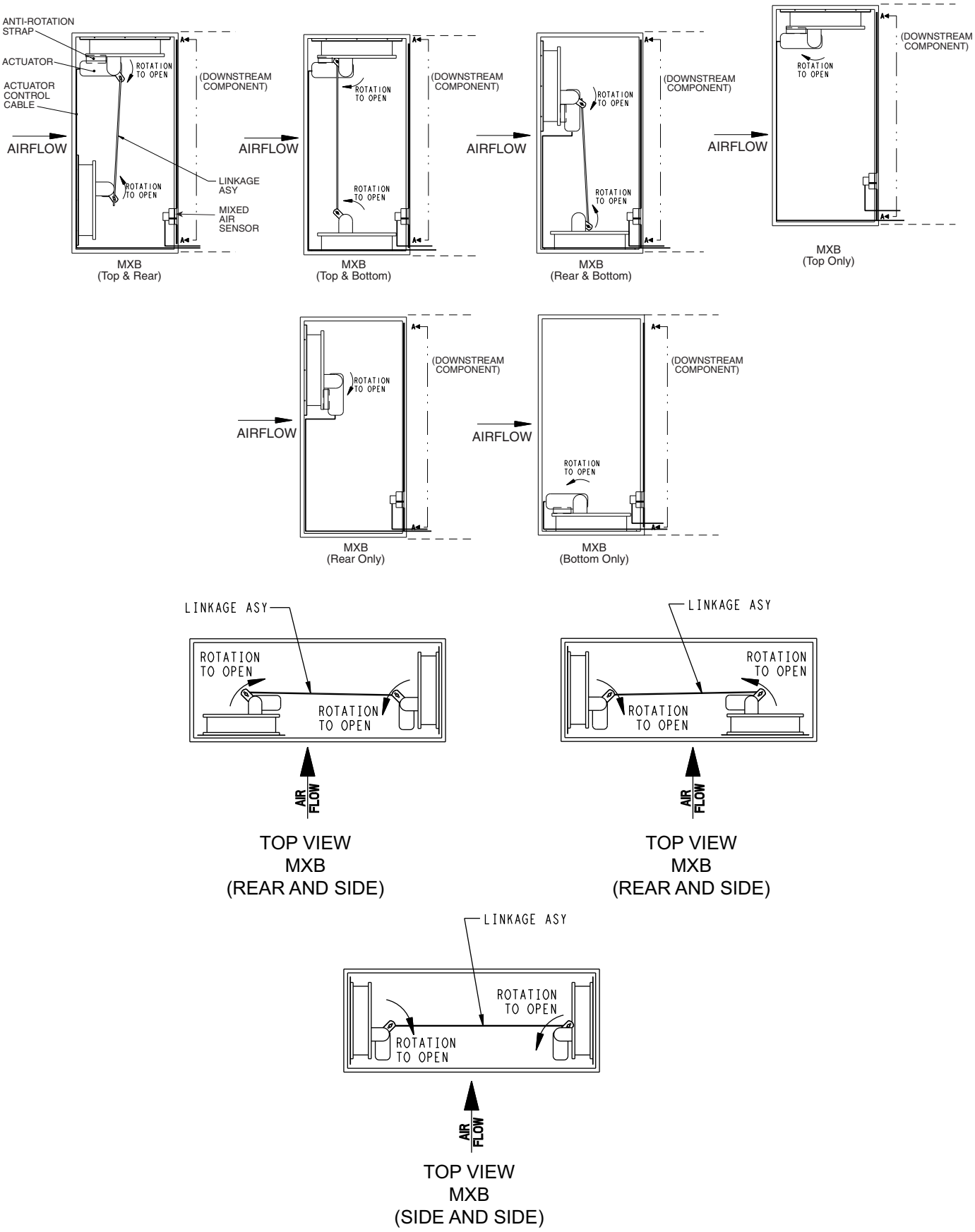


Fig. 29 — Actuator Field Mounting

Electric Heat Control

Electric heaters can be controlled via an electric heat sequencer, SCR controller or Vernier controller as described below.

Electric Heat Sequencer

The UCS-621E is a solid-state device used for multistage electric heater control. This transducer can be factory-supplied and wired if ordered via the *AHU*Builder® program and will be installed inside the electric heat control compartment. The UCS-621E provides six stages of relay control with adjustable relay set points and differentials, requires 24 vac/vdc power and provides an LED indication of relay status. The electric heat transducer accepts a 0 to 20 mA or 0 to 15 vdc input signal and has an operating temperature range of 32 to 158°F with a humidity limit of 5% to 95% relative, non-condensing. See Fig. 30 and Table 12.

SCR Controller

The silicon controlled rectifier is available via a drop down in *AHU*Builder® program for low kW electric heaters on unsheathed wire elements only. The SCR controller is a solid-state device that provides 0 to 100% power control. With no moving parts, the SCR controller is both step less and noiseless and provides a much longer operational life for an electric heater.

The SCR controller is installed in the electric heater control box as shown in Fig. 31.

The SCR controller is designed to receive a 0 to 10 vdc, 4 to 20 mA or 0 to 135 ohm control signal. The controller operates between 32 and 176°F from 0% to 95% relative humidity, non-condensing. The SCR provides an auto shut-off feature when the SCR ambient temperature is above 180°F. Controller is powered from a 24 vac transformer factory wired in to the electric heater power supply.

Vernier Controller

The Vernier controller is available via a drop down in *AHU*Builder® for high kW electric heaters on unsheathed wire elements only. The Vernier controller is a combination of a standard multi-stage controller and an SCR controller and provides 0 to 100% power control for an electric heater.

The Vernier controller is designed to receive a 0 to 10 vdc, 4 to 20 mA or 0 to 135 ohm control signal. The controller operates between 32 and 176°F from 0% to 95% relative humidity, non-condensing. The SCR provides an auto shut-off feature when the SCR ambient temperature is above 180°F. Controller is powered from a 24 vac transformer factory wired in to the electric heater power supply.

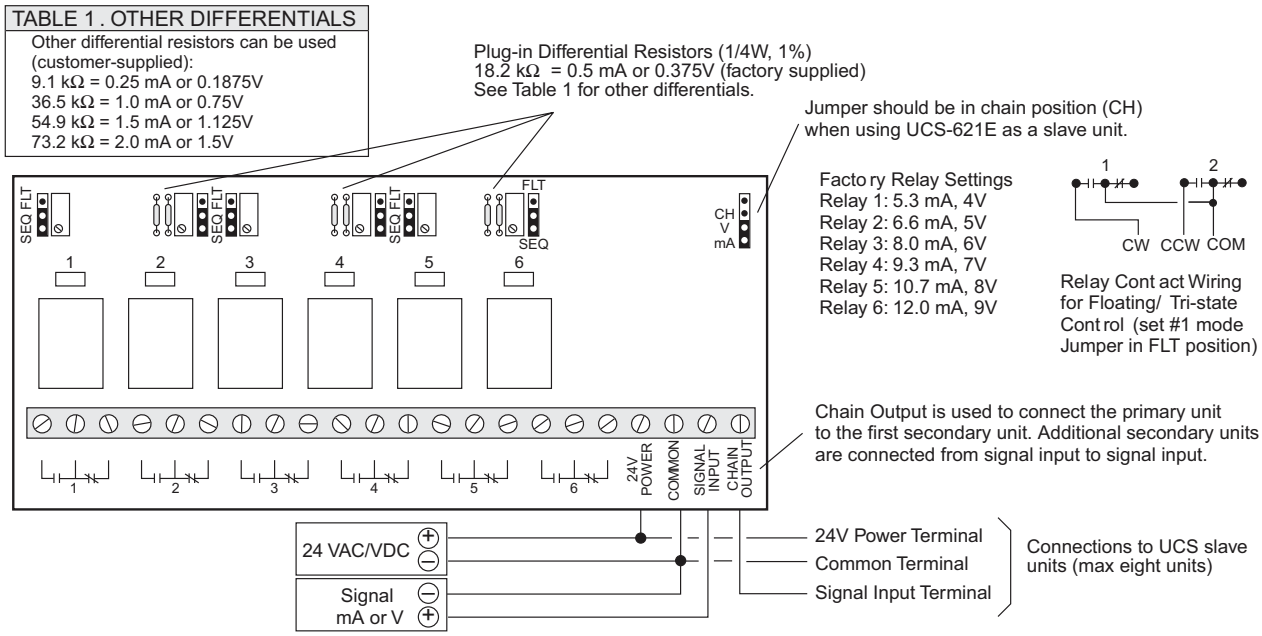


Fig. 30 — 6-Stage Electric Heat Sequencer

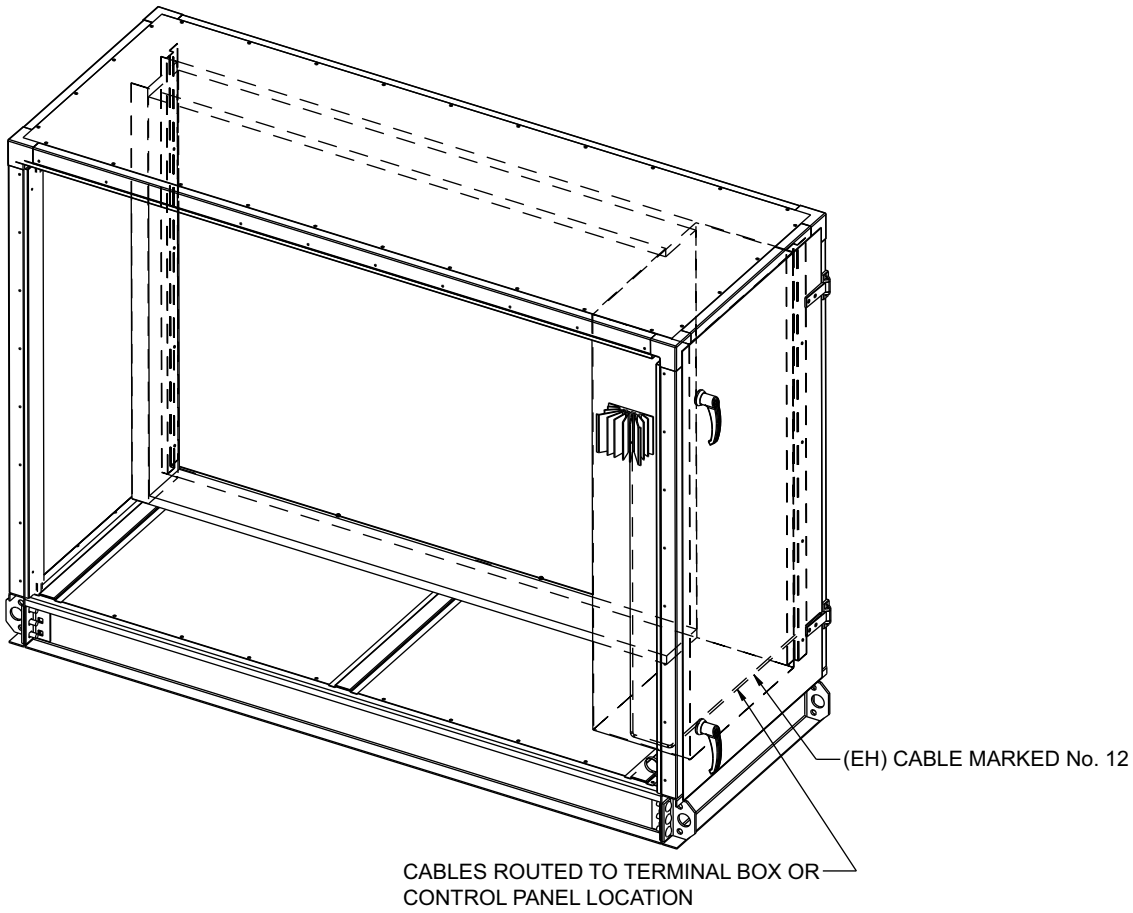


Fig. 31 — SCR Installation

Table 12 — Heater Wiring

TOTAL NO. OF HEATER CIRCUITS	NO. OF CIRCUITS CONTROLLED BY STAGE 1	STAGE 1 CAPACITY (%)	NO. OF CIRCUITS CONTROLLED BY STAGE 2	STAGE 2 CAPACITY (%)
1	1	100	0	0
2	1	50	1	50
3	1	33	2	67
4	2	50	2	50
5	2	40	3	60
6	2	33	4	67
7	3	43	4	57
8	3	38	5	62
9	4	44	5	56
10	4	40	6	60
11	4	36	7	64
12	5	42	7	58
13	5	38	8	62
14	5	36	9	64
15	6	40	9	60
16	6	38	10	62

NOTE(S):
All stages must be wired sequentially in order to provide proper heater safety operation. For example, if 3 circuits are to be connected to the stage 1 control relay, they must be the first 3 circuits (C1, C2, and C3).

TROUBLESHOOTING

If you have problems mounting, wiring, or addressing the TruVu MPC controller, contact Carrier Technical Support.

Communication LEDs

The LEDs indicate if the controller is speaking to the devices on the network. The LEDs should reflect communication traffic based on the baud rate set. See Table 13.

The Net (Network Status) and Sys (System Status) Tricolor LED's indicate controller and network status. See Tables 14 and 15.

The Prog 1/2 LEDs can be customized for site-specific purposes by configuring the BACnet Analog Output (BAO) microblock. In the i-Vu® interface, select the TV-MPCXP1628-NR on the navigation tree, and on the **Properties** page > ***I/O Points*** tab, under ***Hardware Configuration***, set as per Table 16.

Table 13 — Communication LEDs

LED	STATUS
Power	Lights when power is being supplied to the expander. NOTE: The TruVu MPC controller is protected by two fast acting 5mm x 20mm glass fuses: a 2.5A fuse for the TruVu MPC controller and a 4A fuse for the I/O bus edge connector. The power and network ports comply with the EMC requirements EN50491-5-2.
Rx	Lights when the controller receives data from the network segment; there is an Rx LED for ports: Gig-E, I/O Bus, Rnet, Ports S1 and S2.
Tx	Lights when the controller transits data from the network segment; there is a Tx LED for ports: Gig-E, I/O Bus, Rnet, Ports S1 and S2.
Prog 1/2	Lights according to the site-specific configuration of the BACnet Analog Output (BAO) microblock.
Output	Indicates the status of communications.
Net	Lights based on the network status.
Sys	Lights based on the system status.

Table 14 — Net (Network Status) Tricolor LED

COLOR	PATTERN	CONDITION	MESSAGE IN MODULE STATUS	POSSIBLE SOLUTIONS
Red	On	Ethernet connection problem.	No Ethernet Link	• Connect Ethernet Cable. • Check other network components.
	1 blink	One of the following BACnet/IP (Ethernet) DLL reporting issue: • Unable to create tasks. • Unable to open socket for BACnet port.	BACnet/IP error	Cycle power.
	2 blink	Current default IP address does not match the current rotary switch setting	Default IP address mismatch	• Use the controller setup Ports tab to set the IP address. • Cycle power to accept new IP address. • Change rotatory switches to match current default IP address.
Blue	On	One of the following issues: • Port communication firmware did not load properly. • Port communication firmware is not running. • Invalid protocol selected.	MSTP firmware error	• Change rotary switch to select valid protocol. • Cycle power.
	1 Blink	Invalid address selected for protocol.	Invalid address selection for MSTP	Change rotary switch to valid address.
	2 Blink	Controller has same MAC address as another connected device.	Duplicate address on MSTP	Change rotary switch to valid unique address.
	3 Blink	Controller is the only device on the network.	No other devices detected on MSTP	• Check that network cable is connected properly. • Check that baud rate is correct.
	4 Blink	Excessive errors detected over 3 second period.	Excessive communication errors on MSTP	• Check that network cable is connected properly. • Check that baud rate is correct.
Green	On	All enabled networks are functioning properly.	No errors	No action required.
Magenta	On	Operating system changes are downloading. **WARNING:** This process could take several minutes. Do NOT power off the controller during the download.	N/A	No action required.

Table 15 — Sys (System Status) Tricolor LED

COLOR	PATTERN	CONDITION	MESSAGE IN MODULE STATUS	POSSIBLE SOLUTIONS
Red	2 Blink	Restarting after an abnormal exit.	Auto restart delay due to system error on startup	After 5 minutes delay has expired, if condition occurs again then cycle power.
	4 Blink	Firmware image is corrupt.	Firmware error	Download driver again.
	Fast blink	Firmware error has caused the firmware to exit and restart.	Fatal error detected	No action required.
Green	1 blink	No errors.	Operational	No action required.
	2 blink	Download of driver is in progress.	Download in progress	No action required.
	3 blink	BACnet Device ID is not set.	Download required	Download the controller.
	Fast blink	Installation of recently downloaded driver is occurring.	N/A	No action required.
Blue	On	Controller is starting up.	N/A	No action required.
	Slow blink	Linux (operating system) is starting up.	N/A	No action required.
	Fast blink	Linux is running but it could not start the firmware application.	N/A	Download driver.
Magenta	On	Operating system changes are downloading. **WARNING:** This process could take several minutes. Do NOT power off the controller during the download.	N/A	No action required.

NOTE(S):

To help you troubleshoot, obtain a Module Status (Modstat) from the controller and review the System Error and Warning Details.

Table 16 — Configure Prog 1/2 LEDs

STATUS/ ATTRIBUTE	MICROBLOCK TYPE	EXPANDER NUMBER: CHANNEL NUMBER	I/O TYPE	DESCRIPTION
LED 1	BAO	0:61	Special	• ≤ 0 Normal • > 15 On The number of blinks equals the Present Value. The pulse pattern repeats after a 2 sec. delay LED will blink the number of times given the BAO with ON pulse 0.5 sec and Off pulse 0.5 sec.
LED 2	BAO	0:62	Special	• ≤ 0 Normal • > 15 On The number of blinks equals the Present Value. The pulse pattern repeats after a 2 sec. delay LED will blink the number of times given the BAO with ON pulse 0.5 sec and Off pulse 0.5 sec.

APPENDIX A — TruVu MPC Controller Specifications

Table A — TruVu MPC Controller Specifications

SPECIFICATION	DESCRIPTION
Driver	drv_fwex_< version >.driverx
Maximum number of control programs	999
Maximum number of BACnet objects	12000
Third-party BACnet integration points	1500
Third-party Modbus integration points	200
Power	24 vac ±15%, 50-60 Hz, 100 VA 24 vdc ±10%, 48 W
I/O expanders	Supports up to 9 TruVu™ MPC I/O expanders.
Gig-E port	10/100/1000 BaseT, full duplex, Ethernet port for BACnet/IP and/or BACnet/Ethernet, or Modbus TCP/IP communication.
Port S1	For communication with either of the following: • A BACnet MS/TP network at 9600 to 115200 bps. • A Modbus serial network at 9600 to 115200 bps. This port's End of Net? switch can be set to Yes to terminate the network segment.
Port S2	For communication with a Modbus serial network at 9600 to 115200 bps. This port's End of Net? switch can be set to Yes to terminate the network segment.
Rnet port	Supports Up to 15 ZS wireless and/or ZS sensors, and one Equipment Touch or TruVu™ ET Display • Supports local connection for a laptop running the i-Vu® application • Supplies 12 vdc power less than or equal to 162.5 mA when the TV-MPCXP1628-NR is powered from an AC source and less than or equal to 262.5 mA when powered by a DC source. NOTE(S): If the total power required by the sensors on the Rnet exceeds the power supplied by the Rnet port, use an external power source. The Wireless Adapter, Equipment Touch, or TruVu™ ET Display must be powered by an external power source. See the specifications in each device's Installation and Start-up Guide to determine the power required.
Act Net port	Supports up to 8 iVu® Smart Valves and Carrier actuators.
I/O Bus port	Provides communication for up to 9 wired TruVu™ MPC I/O expanders. For further information regarding I/O expanders see TruVu™ MPC I/O expanders guide.
I/O bus edge connector	6-pin connector that provides communication and power to a directly connected TruVu™ MPC I/O expander (DC only).
Service Port	Ethernet port at 10 or 100 Mbps for setting up the controller and troubleshooting through a local connection to a computer or connecting to the TruVu™ ET Display Supports local connection for a laptop running the i-Vu® application.
USB port	USB 2.0 host port for device recovery.
Aux 24V + DC	8 Terminals Supplies 24 vdc to external I/O devices, max 200mA total (when controller powered by AC) or max 500mA total (when controller powered by DC).
Universal inputs	28
	Inputs are configurable in the control program for 0-5 vdc, 0-1 vdc, 0-2mA, RTD, thermistor, dry contact, or pulse counter.
Inpuut resolution	16 bit A/D
Input pulse frequency	60 pulses per second. Minimum pulse width (on or off time) required for each pulse is 8.33 msec.
Universal outputs	16
	Outputs can be set as analog or binary outputs. Analog outputs can be used for 0-10 vdc or 0-20 mA devices. Binary outputs have built-in relay and can be used to switch external devices or relays up to 1A, 30 vac / vdc.
Output resolution	12 bit D/A
Controller microprocessor	32-bit ARM Cortex-A8, 600MHz, processor with multi-level cache memory.
Inputs and outputs microprocessor	Two 32 -bit microprocessors with 256 kB flash memory and 64 Kb SRAM.
Memory	8 GBs eMMC Flash memory and 512 MB DDR3 DRAM (22 MB available to use). User data is archived to non-volatile Flash memory when parameters are changed, every 90 seconds, and when the firmware deliberately restarted. NOTE(S): When you change a parameter, you must wait 30 seconds before turning the power off, in order for the change to be saved.
Real-time clock	Real-time clock keeps track of time in the event of a power failure for up to 3 days.
Protection	The TV-MPCXP1628-NR has two fast acting, 5mm x 20mm glass fuses: • A 2.5A fuse for the TV-MPCXP1628-NR's power. • A 4A fuse for the I/O bus edge connector. The power and network ports comply with the EMC requirements EN50491-5-2. **CAUTION:** To protect against large electrical surges on serial EIA-485 networks, place a PROT485 at each place wire enters or exits the building.
LED status indicators	See LEDs configuration on Tables 10, 11 and 13.
Environmental operating range	–40 to 158°F (–40 to 70°C), 10-95% relative humidity, non condensing. NOTE(S): • The TV-MPCXP1628-NR is suitable for installation inside or outside the building envelope. • Install in a UL listed enclosure only. • Do not change the position of the power or Enf of Net switch at temperatures below –22°F (–30°C) to ensure proper operation and electrical connectivity.
Physical	Fire-retardant plastic ABS, UL94-5VA.
Terminal blocks and connectors	Screw-type terminal blocks. 0.2 in (5.08mm) pitch connectors.

APPENDIX A — TruVu MPC Controller Specifications (cont)

Table A — TruVu MPC Controller Specifications (cont)

SPECIFICATION	DESCRIPTION
Overall Dimensions	Height: 12.75 in. (32.38 cm) Width: 6.95 in. (17.68 cm) Depth: 2.09 in. (5.31 cm)
Weight	2.7 lb (1.22 kg)
BACnet support	Conforms the BACnet Building Controller (B-BC) Standard Device Profile and BACnet Broadcast Management Device (B-BBMD) as defined in ANSI/ASHRAE Standard 135-2012 (BACnet) Annex L, Protocol Revision 14.
Compilance	United States of America: FCC CFR, Part 15, Class B
	Canada: Industry Canada Compliant, ICES-003, Class A cUL Listed UL 916, PAZX7, Energy Management Equipment.
	Europe: CE Mark, UK: UKCA EN50491-5-2;2009; Part 5-2:EMC requirements for HBES /BACS used in residential, commercial and light industry environment. RoHS Compliant: 2015/863/EU. REACH Compliant.

LEGEND

A/D — Analog to Digital
CE — Consumer Electronics
FCC — Federal Communications Commission
LED — Light Emitting Diode
UL — Underwriters Laboratories

Manufacturer reserves the right to discontinue, or change at any time, specifications or designs without notice and without incurring obligations.

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