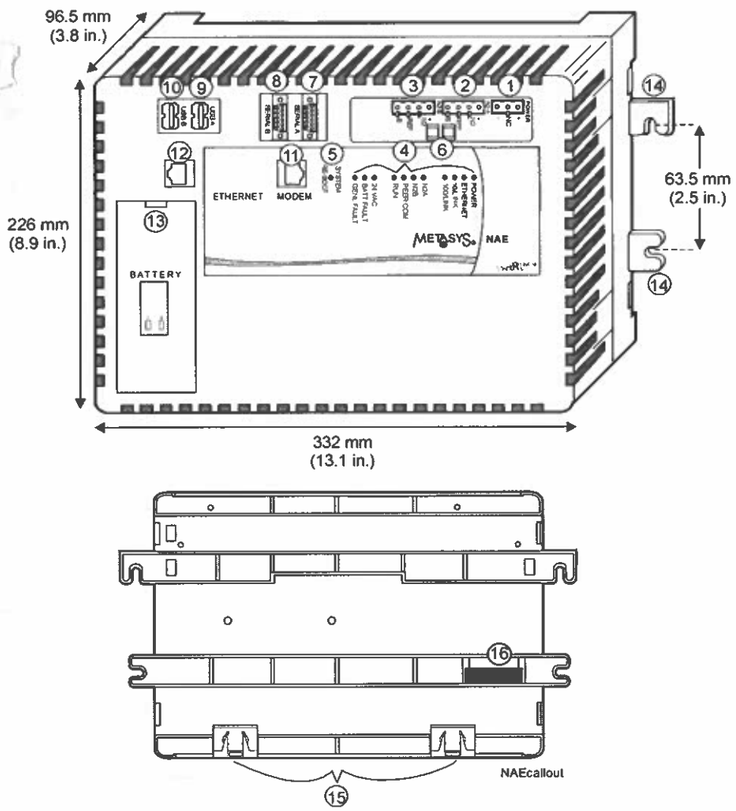
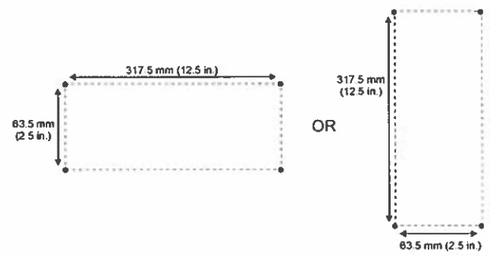
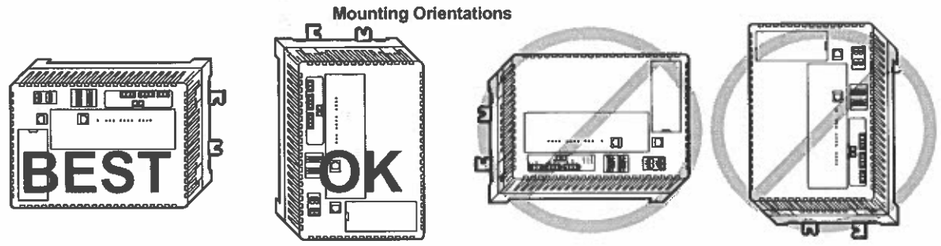


Table 1: NAE/NIE Callouts			
Callout	**Description**	**Callout**	**Description**
1	Pow er Termination	9	USB A connector
2	N2 A Bus termination	10	USB B connector
3	N2 B Bus termination	11	Modem RJ-11 connector
4	Light-Emitting Diodes (LEDs)	12	Ethernet RJ-45 connector
5	System Re-boot sw itch	13	Battery hatch
6	N2 End-of-Line (EOL) sw itches	14	Mounting feet (2 of 4)
7	Serial A RS-232 connector	15	DIN rail clips (2 of 2)
8	Serial B RS-232 connector	16	Battery Strap

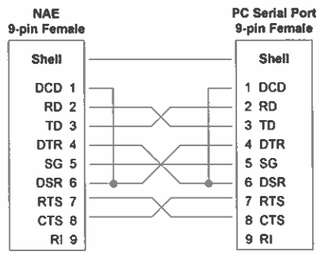


Mounting Hole Spacing

Mounting Orientations



PC Serial Ports (SER A, SER B)



USB Ports (USB A and USB B)

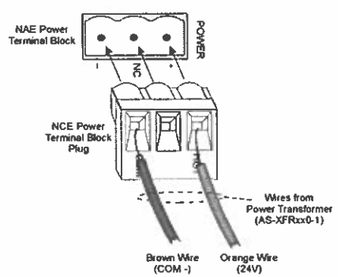
NAE USB Pinouts

+5 VDC	1
Data -	2
Data +	3
Ground	4

Ethernet Port

NAE Ethernet Pinouts

TD +	1
TD -	2
RD +	3
No Connection	4
No Connection	5
RD -	6
No Connection	7
No Connection	8



24VAC Power Connection

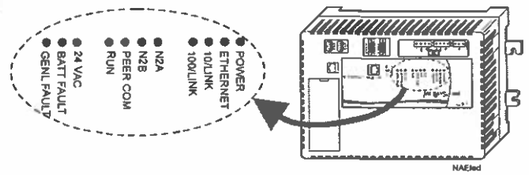
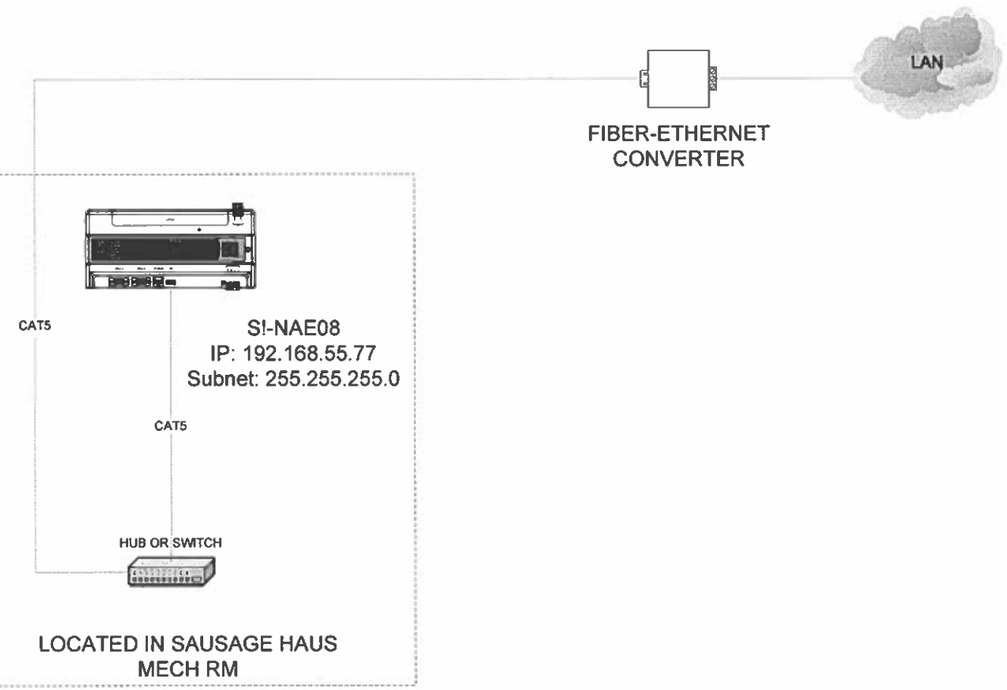


Table 4: NAE / NIE LEDs

LED	Normal	Descriptions / Other Conditions
POWER (GREEN)	On Steady	On Steady = Unit is getting power from either the battery or 24 VAC power. Also see the 24 VAC LED. Off Steady = Unit is shut down.
ETHERNET (GREEN)	Flicker	Flicker = Data is transferring on the Ethernet connection. Ethernet traffic is general traffic (may not be for the NAE / NIE). Off Steady = No Ethernet traffic, probably indicates a dead Ethernet network or bad Ethernet connection.
10/LINK (GREEN)	On Steady	On Steady = Ethernet connection is established at 10 Mb/sec.
100/LINK (GREEN)	On Steady	On Steady = Ethernet connection is established at 100 Mb/sec.
N2 A (GREEN) (NAE Only)	Flicker	Flicker = N2 A port is transmitting or receiving data. Flickers are generally in synch with data transmission, but should not be used to indicate specific transmission times. Off Steady = No traffic.
N2 B (GREEN) (NAE Only)	Flicker	Flicker = N2 B port is transmitting or receiving data. Flickers are generally in synch with data transmission, but should not be used to indicate specific transmission times. Off Steady = No traffic.
PEER COMM (GREEN)	Varies (see next column)	Flicker = Data traffic between NAE / NIE devices. For an NAE / NIE that is not a Site Director, this LED indicates regular heartbeat communications with the Site Director. For a Site Director NAE / NIE, flashes are more frequent and indicate heartbeat communications from all other NAE / NIE devices on the site.
Run	On Steady	On Steady = NAE / NIE software is running On 1 second, Off 1 second = NAE / NIE software is in startup mode. On 4 seconds, Off 1 second = NAE / NIE is in diagnostics mode. On 0.5 seconds, Off 0.5 seconds = NAE / NIE software is shutting down. Off Steady = Operating system is shutting down or software is not running.
24 VAC (GREEN)	On Steady	On Steady = 24 VAC power present. Off Steady = Loss of 24 VAC power. In the Off Steady condition, the NAE / NIE can be running on battery power. Also se the POWER LED.
BATT FAULT (RED)	Off Steady	On Steady = Battery fault. Replace the battery.
GENL FAULT (RED)	Off Steady	On Steady = General Fault. Fault conditions include excessive Central Processing Unit (CPU) flash, or memory use, or excessive CPU or Printed Wire Board (PWB) temperature. In normal operation, the GENL FAULT LED stays on steady for the first half of the startup sequence.

REVISION INFORMATION	Drawing Title: Visio NAE Reference Drawing									
NUMBER										
DATE: 12/28/12										
		REFERENCE DRAWING		NO	REVISION-LOCATION		ECN	DATE	BY	
		Sales Engineer	Project Manager	Application Engineer	DRAWN BY	DRAWN DATE	APPROVED BY	APPROVED DATE		
TIME: 09:56 AM	Project Title: Sausage Haus Controls	Johnson Controls			Branch Information		CONTRACT NUMBER: 00120006			
File: Visio NAE Reference Drawing001.vsd							DRAWING NUMBER: PAGE 2			

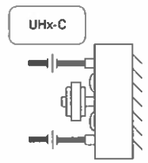


Drawing Title **FC Bus Riser**								
REFERENCE DRAWING		NO	REVISION LOCATION			ECN	DATE	BY
Sales Engineer	Project Manager	Application Engineer	DRAWN		APPROVED			
			BY	DATE	BY	DATE		
Project Title **Sausage Haus Controls**		Johnson Controls	Branch Information		CONTRACT NUMBER **00120006**			
					DRAWING NUMBER **PAGE 3**			

BILL OF MATERIALS

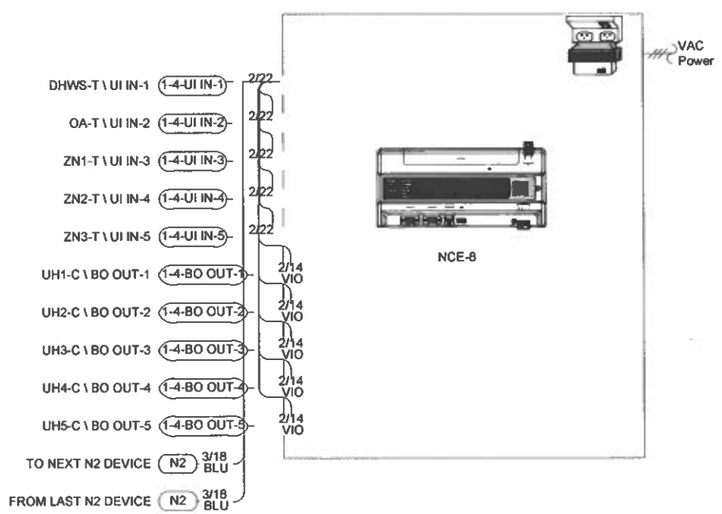
Designation	Qty	Part Number	Description
NCE-8	1	MS-NCE2566-700	33 PT NETWORK CONTROL ENGINE, INT DISP
DHWS-T	1	TE-631S-1	SENSOR, T-NI, 0.1%, STRAP MOUNT
OA-T	1	TE-6313P-1	SENSOR, T-NI, 0.1%, 3 IN OAT
ZNx-T	3	TE-68NT-0NN0S	WALL TEMP SENSOR 1K NI
UHx-C	5	RIBU1C	SPDT, 10A, HC=10-30VAC/DCD, W/LED

ELECTRIC UNIT HEATER*
TYPICAL OF 5

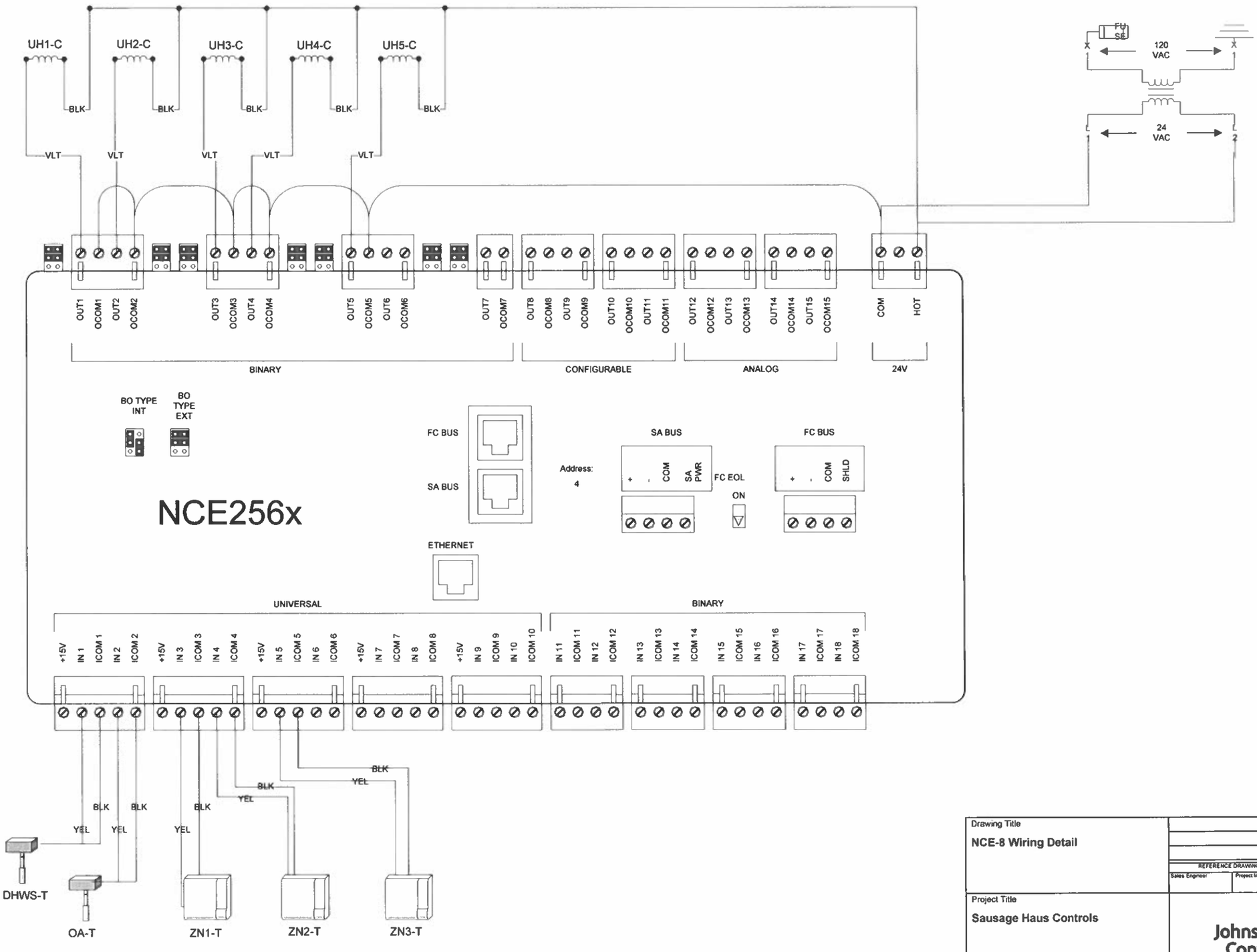


ZNx-T

*WHEN ENABLED TO OPERATE (THROUGH METASYS SCHEDULE) UNIT HEATERS CYCLE FAN AND HEATING COIL TO MAINTAIN SETPOINT OF LOCAL THERMOSTAT



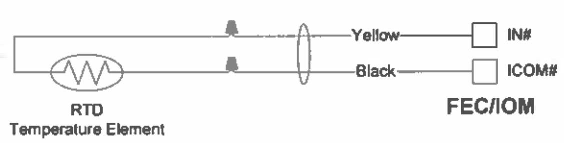
Drawing Title: **NCE-8 Panel Detail**						
REFERENCE DRAWING		NO	REVISION-LOCATION	ECN	DATE	BY
Sales Engineer	Project Manager	Application Engineer	DRAWN BY / DATE	APPROVED BY / DATE		
Project Title: **Sausage Haus Controls**	Johnson Controls	Branch Information	CONTRACT NUMBER: **00120006**	DRAWING NUMBER: **1.1**		



Drawing Title: NCE-8 Wiring Detail								
	REFERENCE DRAWING	NO	REVISION LOCATION		ECN	DATE	BY	
	Sales Engineer / Project Manager	Application Engineer	DRAWN BY / DATE	APPROVED BY / DATE				
Project Title: Sausage Haus Controls	Johnson Controls	Branch Information	CONTRACT NUMBER: 00120006	DRAWING NUMBER: 1.2				

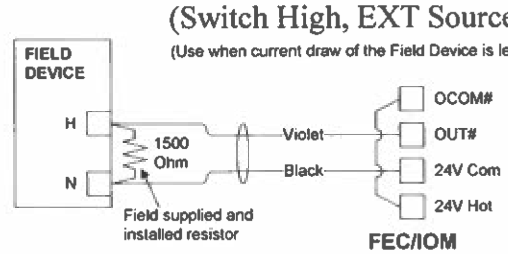
Electrician/Fitter	Point Information				Controller Information							Panel Information					Intermediate Device					Field Device					
Tag	Point Type	System Name	Object Name	Expanded ID	Controller Details	Trunk Type	Trunk Nbr	Trunk Addr.	Cable Destination Bay/Terminal	Module Type	Termination Out	Panel	Panel Location	Slot Number	Reference Drawing	Cable Number	Wiring /Tubing	Termination In	Device	Termination Out	Location	Wiring /Tubing	Termination In	Device	Location	Ref Detail Shape	Comment
		NCE-8			NCE25xx	MS/TP	1	4				EN-1	Mech Room	0	M12												BacNet FC Bus
	UI IN-1	NCE-8	DHWS-T	Domestic Hot Water Supply T	NCE25xx	MS/TP	1	4	UI IN-1		IN1, ICOM1	EN-1	Mech Room	0	M12	1-4-UI IN-1						2/22	2-Wire	TE		F131	
	UI IN-2	NCE-8	OA-T	Outdoor Air Temperature	NCE25xx	MS/TP	1	4	UI IN-2		IN2, ICOM2	EN-1	Mech Room	0	M12	1-4-UI IN-2						2/22	2-Wire	TE		F131	
	UI IN-3	NCE-8	ZN1-T	Multipurpose Rm Temperatur	NCE25xx	MS/TP	1	4	UI IN-3		IN3, ICOM3	EN-1	Mech Room	0	M12	1-4-UI IN-3						2/22	2-Wire	TE		F131	
	UI IN-4	NCE-8	ZN2-T	Mens Restroom Temperature	NCE25xx	MS/TP	1	4	UI IN-4		IN4, ICOM4	EN-1	Mech Room	0	M12	1-4-UI IN-4						2/22	2-Wire	TE		F131	
	UI IN-5	NCE-8	ZN3-T	Womens Restroom Temperat	NCE25xx	MS/TP	1	4	UI IN-5		IN5, ICOM5	EN-1	Mech Room	0	M12	1-4-UI IN-5						2/22	2-Wire	TE		F131	
	UI IN-6	NCE-8			NCE25xx	MS/TP	1	4	UI IN-6			EN-1	Mech Room	0	M12	1-4-UI IN-6											
	UI IN-7	NCE-8			NCE25xx	MS/TP	1	4	UI IN-7			EN-1	Mech Room	0	M12	1-4-UI IN-7											
	UI IN-8	NCE-8			NCE25xx	MS/TP	1	4	UI IN-8			EN-1	Mech Room	0	M12	1-4-UI IN-8											
	UI IN-9	NCE-8			NCE25xx	MS/TP	1	4	UI IN-9			EN-1	Mech Room	0	M12	1-4-UI IN-9											
	UI IN-10	NCE-8			NCE25xx	MS/TP	1	4	UI IN-10			EN-1	Mech Room	0	M12	1-4-UI IN-10											
	BI IN-11	NCE-8			NCE25xx	MS/TP	1	4	BI IN-11			EN-1	Mech Room	0	M12	1-4-BI IN-11											
	BI IN-12	NCE-8			NCE25xx	MS/TP	1	4	BI IN-12			EN-1	Mech Room	0	M12	1-4-BI IN-12											
	BI IN-13	NCE-8			NCE25xx	MS/TP	1	4	BI IN-13			EN-1	Mech Room	0	M12	1-4-BI IN-13											
	BI IN-14	NCE-8			NCE25xx	MS/TP	1	4	BI IN-14			EN-1	Mech Room	0	M12	1-4-BI IN-14											
	BI IN-15	NCE-8			NCE25xx	MS/TP	1	4	BI IN-15			EN-1	Mech Room	0	M12	1-4-BI IN-15											
	BI IN-16	NCE-8			NCE25xx	MS/TP	1	4	BI IN-16			EN-1	Mech Room	0	M12	1-4-BI IN-16											
	BI IN-17	NCE-8			NCE25xx	MS/TP	1	4	BI IN-17			EN-1	Mech Room	0	M12	1-4-BI IN-17											
	BI IN-18	NCE-8			NCE25xx	MS/TP	1	4	BI IN-18			EN-1	Mech Room	0	M12	1-4-BI IN-18											
	BO OUT-1	NCE-8	UH1-C	Multipurpose Unit Heater 1 C	NCE25xx	MS/TP	1	4	BO OUT-1		OUT1, 24V COM	EN-1	Mech Room	0	M12	1-4-BO OUT-	2/22	COIL (Wh/Yel,Wh/Blue)	RIB Relay	COM, NO (Yel, Org)		2/14	See wiring detail	Control Panel (NO) (Sw Hi, EXT Source)		F502	
	BO OUT-2	NCE-8	UH2-C	Multipurpose Unit Heater 2 C	NCE25xx	MS/TP	1	4	BO OUT-2		OUT2, 24V COM	EN-1	Mech Room	0	M12	1-4-BO OUT-	2/22	COIL (Wh/Yel,Wh/Blue)	RIB Relay	COM, NO (Yel, Org)		2/14	See wiring detail	Control Panel (NO) (Sw Hi, EXT Source)		F502	
	BO OUT-3	NCE-8	UH3-C	Mens Restroom Unit Heater C	NCE25xx	MS/TP	1	4	BO OUT-3		OUT3, 24V COM	EN-1	Mech Room	0	M12	1-4-BO OUT-	2/22	COIL (Wh/Yel,Wh/Blue)	RIB Relay	COM, NO (Yel, Org)		2/14	See wiring detail	Control Panel (NO) (Sw Hi, EXT Source)		F502	
	BO OUT-4	NCE-8	UH4-C	Womens Restroom Unit Heat	NCE25xx	MS/TP	1	4	BO OUT-4		OUT4, 24V COM	EN-1	Mech Room	0	M12	1-4-BO OUT-	2/22	COIL (Wh/Yel,Wh/Blue)	RIB Relay	COM, NO (Yel, Org)		2/14	See wiring detail	Control Panel (NO) (Sw Hi, EXT Source)		F502	
	BO OUT-5	NCE-8	UH5-C	Womens Restroom Unit Heat	NCE25xx	MS/TP	1	4	BO OUT-5		OUT5, 24V COM	EN-1	Mech Room	0	M12	1-4-BO OUT-	2/22	COIL (Wh/Yel,Wh/Blue)	RIB Relay	COM, NO (Yel, Org)		2/14	See wiring detail	Control Panel (NO) (Sw Hi, EXT Source)		F502	
	BO OUT-6	NCE-8			NCE25xx	MS/TP	1	4	BO OUT-6			EN-1	Mech Room	0	M12	1-4-BO OUT-6											
	BO OUT-7	NCE-8			NCE25xx	MS/TP	1	4	BO OUT-7			EN-1	Mech Room	0	M12	1-4-BO OUT-7											
	CO OUT-8	NCE-8			NCE25xx	MS/TP	1	4	CO OUT-8			EN-1	Mech Room	0	M12	1-4-CO OUT-8											
	CO OUT-9	NCE-8			NCE25xx	MS/TP	1	4	CO OUT-9			EN-1	Mech Room	0	M12	1-4-CO OUT-9											
	CO OUT-10	NCE-8			NCE25xx	MS/TP	1	4	CO OUT-10			EN-1	Mech Room	0	M12	1-4-CO OUT-10											
	CO OUT-11	NCE-8			NCE25xx	MS/TP	1	4	CO OUT-11			EN-1	Mech Room	0	M12	1-4-CO OUT-11											
	AO OUT-12	NCE-8			NCE25xx	MS/TP	1	4	AO OUT-12			EN-1	Mech Room	0	M12	1-4-AO OUT-12											
	AO OUT-13	NCE-8			NCE25xx	MS/TP	1	4	AO OUT-13			EN-1	Mech Room	0	M12	1-4-AO OUT-13											
	AO OUT-14	NCE-8			NCE25xx	MS/TP	1	4	AO OUT-14			EN-1	Mech Room	0	M12	1-4-AO OUT-14											
	AO OUT-15	NCE-8			NCE25xx	MS/TP	1	4	AO OUT-15			EN-1	Mech Room	0	M12	1-4-AO OUT-15											

DETAIL F131 TEMPERATURE SENSOR INPUT



DETAIL F502 24 VAC BINARY OUTPUT to LOW CURRENT DRAW DEVICE (Switch High, EXT Sourced)

(Use when current draw of the Field Device is less than 50 mA)



SET TRIAC JUMPER TO EXTERNALLY SOURCED (EXT) FOR ASSOCIATED BINARY OUTPUT(S).

Drawing Title **NCE-8 Point Schedule**	REFERENCE DRAWING	NO	REVISION-LOCATION	ECN	DATE	BY	
	Sales Engineer	Project Manager	Application Engineer	DRAWN BY	DATE	APPROVED BY	DATE
Project Title **Sausage Haus Controls**	Johnson Controls		Branch Information			CONTRACT NUMBER **00120006**	DRAWING NUMBER **1.3**

0012-0004
Suite Kitchen
FCU Control Upgrades

DRAWING NUMBER	DRAWING TITLE
TITLE	Title Page
PAGE 2	NAE Reference Drawing
PAGE 3	NAE Panel Detail Drawing
PAGE 4	Field Bus Riser (1 of 2)
1.1	FCU-1 Flow
1.2A	FCU-1 Wiring Detail – Existing
1.2B	FCU-2&3 Wiring Detail - Existing
1.2C	FCU-1 Wiring Detail - New
1.3	FCU-1 Sequence of Operations
1.4	FCU-1 Point Schedule
2.1	FCU-4 Flow
2.2A	FCU-4 Wiring Detail - Existing
2.2B	FCU-4 Wiring Detail - New
2.3	FCU-4 Sequence of Operations
2.4	FCU-4 Point Schedule
3.1	UNT-162 Panel Detail
3.2	UNT-162 Wiring Detail
3.3	UNT-162 Point Schedule
RS-1	Room Schedule

Johnson Controls

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- ■ **Environmental Control System**
- ■ **Facility Management System**
- ☐ **Air and Water System Balancing**
- ☐ **Fire Management System**
- ☐ **Security System**
- ☐ **Lighting Services**
- ☐ **Instrumentation System Installation**
- ☐ **Building Operations Management**
- ☐ **Energy Conservation Control**
- ☐ **Training Programs**
- ☐ **Performance Contracting**
- ☐ **Planned Service Agreements**

Air Conditioning
Heating
Diagnostic Services
Coil Cleaning
Refrigeration
Automatic Temperature Controls
Facility Management Systems
Fire Management
Security Management
Building Operations and Management
Water Treatment
Electrical Equipment
Emergency Generator / Lighting Equipment
Industrial Controls / Recording / Indication Equipment

PROJECT TITLE
MILLER PARK
SUITE KITCHEN
FCU CONTROL UPGRADES

ARCHITECT	ENGINEER
, Phone:	, Phone:
MECHANICAL CONTRACTOR	ELECTRICAL CONTRACTOR
, Phone:	, Phone:

REFERENCE DRAWING	NO	REVISION LOCATION	ECN	DATE	BY

Johnson Controls

Branch Information
, Phone Fax

SALES ENGINEER	PROJECT MANAGER	APPLICATION ENGINEER	DATE	CONTRACT NUMBER
	KDP	KDP	8/2012	0012-0004

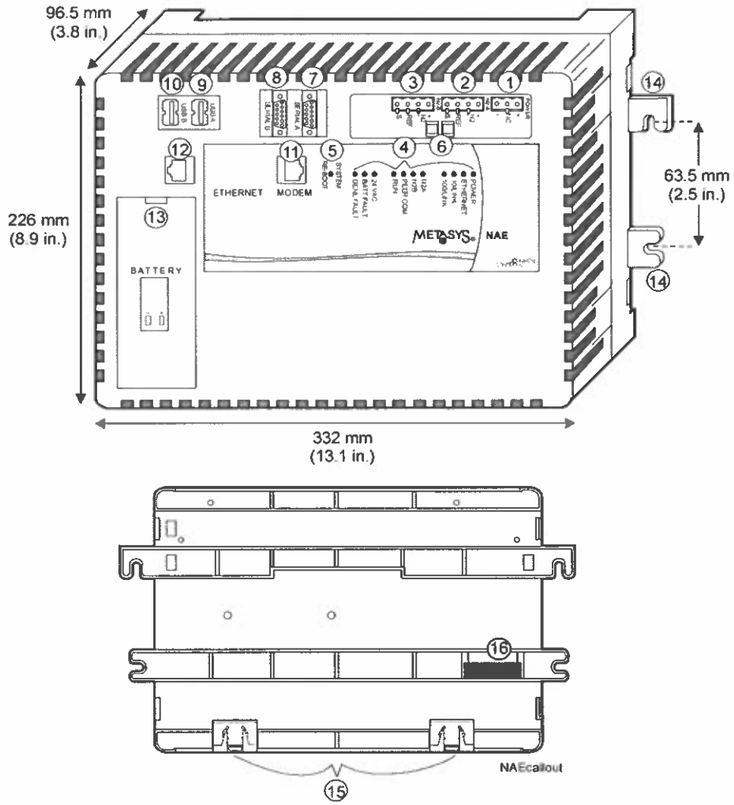
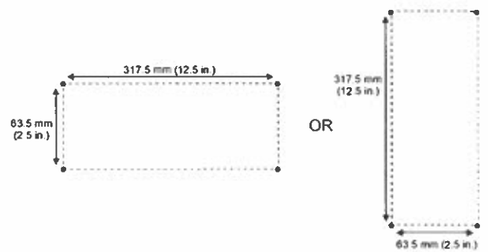
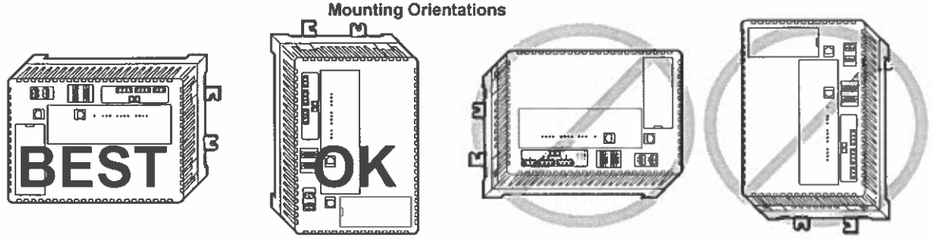


Table 1: NAE/NIE Callouts			
Callout	**Description**	**Callout**	**Description**
1	Power Termination	9	USB A connector
2	N2 A Bus termination	10	USB B connector
3	N2 B Bus termination	11	Modem RJ-11 connector
4	Light-Emitting Diodes (LEDs)	12	Ethernet RJ-45 connector
5	System Re-boot switch	13	Battery hatch
6	N2 End-of-Line (EOL) switches	14	Mounting feet (2 of 4)
7	Serial A RS-232 connector	15	DIN rail clips (2 of 2)
8	Serial B RS-232 connector	16	Battery Strap

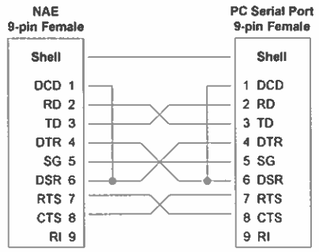


Mounting Hole Spacing

Mounting Orientations



PC Serial Ports (SER A, SER B)



USB Ports (USB A and USB B)

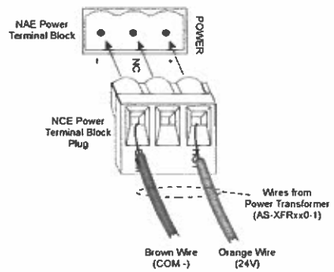
NAE USB Pinouts

+5 VDC	1
Data -	2
Data +	3
Ground	4

Ethernet Port

NAE Ethernet Pinouts

TD +	1
TD -	2
RD +	3
No Connection	4
No Connection	5
RD -	6
No Connection	7
No Connection	8



24VAC Power Connection

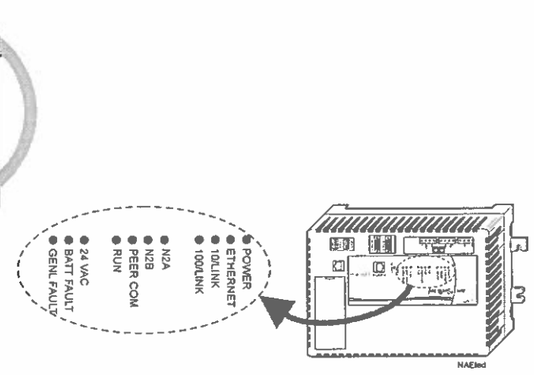
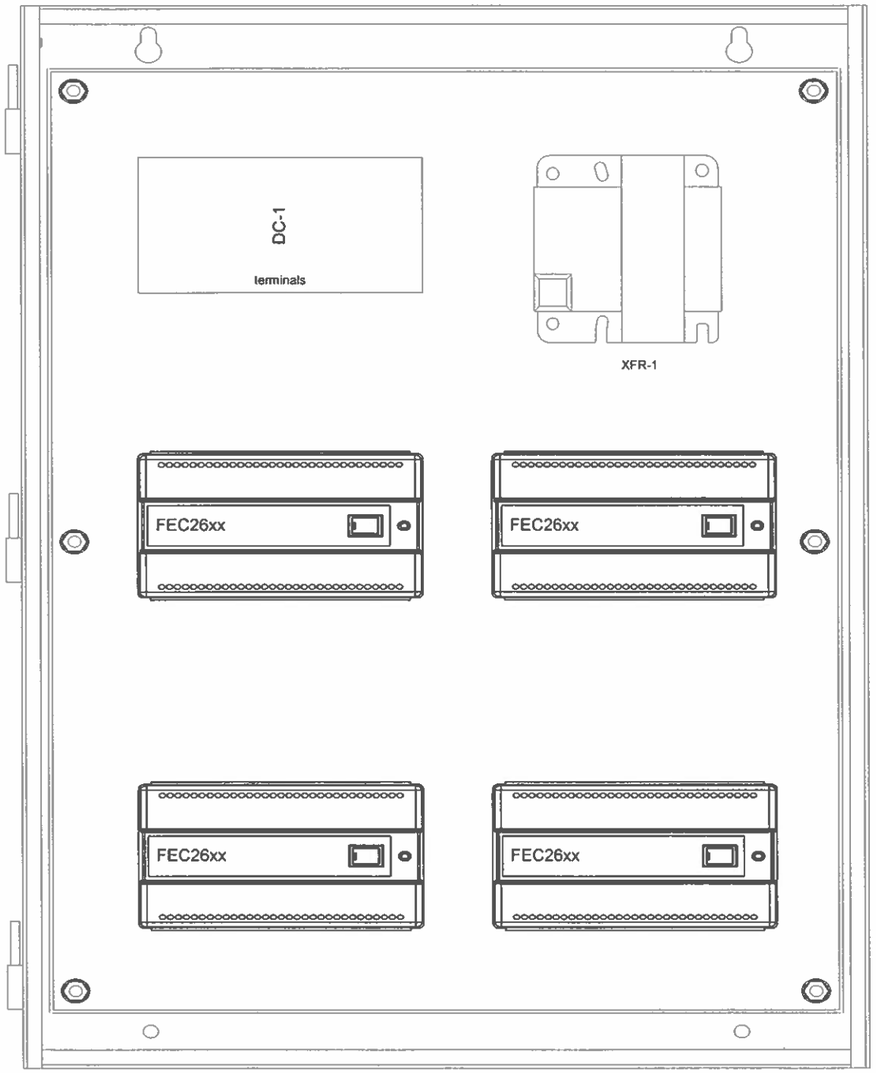


Table 4: NAE / NIE LEDs

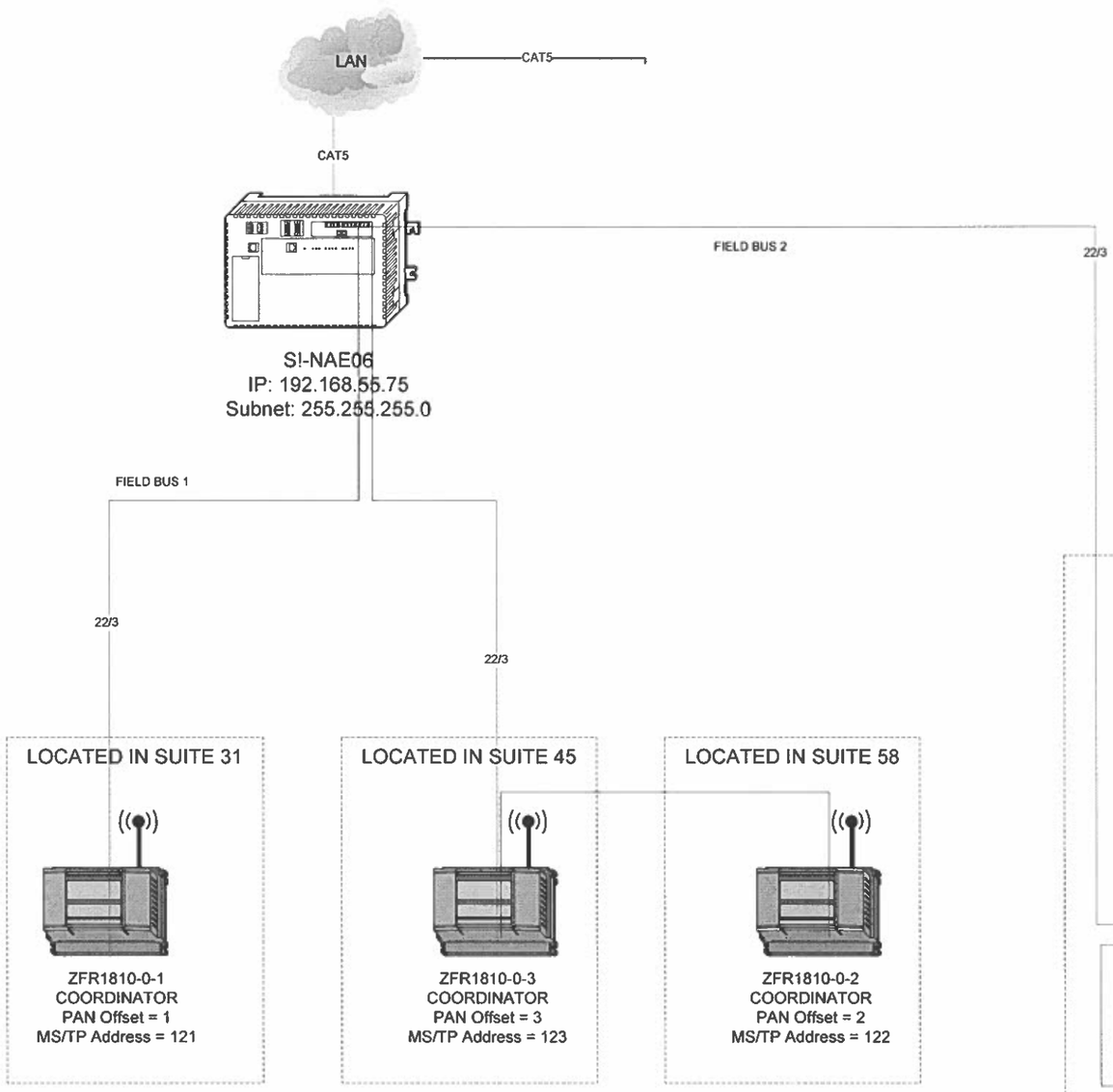
LED	Normal	Descriptions / Other Conditions
POWER (GREEN)	On Steady	On Steady = Unit is getting power from either the battery or 24 VAC power. Also see the 24 VAC LED. Off Steady = Unit is shut down.
ETHERNET (GREEN)	Flicker	Flicker = Data is transferring on the Ethernet connection. Ethernet traffic is general traffic (may not be for the NAE / NIE). Off Steady = No Ethernet traffic, probably indicates a dead Ethernet network or bad Ethernet connection.
10/LINK (GREEN)	On Steady	On Steady = Ethernet connection is established at 10 Mb/sec.
100/LINK (GREEN)	On Steady	On Steady = Ethernet connection is established at 100 Mb/sec.
N2 A (GREEN) (NAE Only)	Flicker	Flicker = N2 A port is transmitting or receiving data. Flickers are generally in synch with data transmission, but should not be used to indicate specific transmission times. Off Steady = No traffic.
N2 B (GREEN) (NAE Only)	Flicker	Flicker = N2 B port is transmitting or receiving data. Flickers are generally in synch with data transmission, but should not be used to indicate specific transmission times. Off Steady = No traffic.
PEER COMM (GREEN)	Varies (see next column)	Flicker = Data traffic between NAE / NIE devices. For an NAE / NIE that is not a Site Director, this LED indicates regular heartbeat communications with the Site Director. For a Site Director NAE / NIE, flashes are more frequent and indicate heartbeat communications from all other NAE / NIE devices on the site.
Run	On Steady	On Steady = NAE / NIE software is running On 1 second, Off 1 second = NAE / NIE software is in startup mode. On 4 seconds, Off 1 second = NAE / NIE is in diagnostics mode. On 0.5 seconds, Off 0.5 seconds = NAE / NIE software is shutting down. Off Steady = Operating system is shutting down or software is not running.
24 VAC (GREEN)	On Steady	On Steady = 24 VAC power present. Off Steady = Loss of 24 VAC power. In the Off Steady condition, the NAE / NIE can be running on battery power. Also se the POWER LED.
BATT FAULT (RED)	Off Steady	On Steady = Battery fault. Replace the battery.
GENL FAULT (RED)	Off Steady	On Steady = General Fault. Fault conditions include excessive Central Processing Unit (CPU) flash, or memory use, or excessive CPU or Printed Wire Board (PWB) temperature. In normal operation, the GENL FAULT LED stays on steady for the first half of the startup sequence.

REVISION INFORMATION	Drawing Title: **Visio NAE Reference Drawing**							
NUMBER								
	REFERENCE DRAWING	NO.	REVISION-LOCATION			ECN	DATE	BY
DATE: 08/17/12	Sales Engineer / Project Manager / Application Engineer		DRAWN BY / DATE		APPROVED BY / DATE			
TIME: 12:54 PM	Project Title: **Suite Kitchen Controls**		Branch Information		CONTRACT NUMBER: **00120004**			
File Name: Visio NAE Reference Drawing001.vsd	Johnson Controls				DRAWING NUMBER: **PAGE 2**			



ENC-1

Drawing Title **Visio Panel Detail Drawing**								
	REFERENCE DRAWING		NO	REVISION-LOCATION		ECN	DATE	BY
	Sales Engineer	Project Manager	Application Engineer	DRAWN BY	DRAWN DATE	APPROVED BY	APPROVED DATE	
Project Title **Suite Kitchen Controls**	Johnson Controls			Branch Information		CONTRACT NUMBER **00120004**		
						DRAWING NUMBER **PAGE 3**		

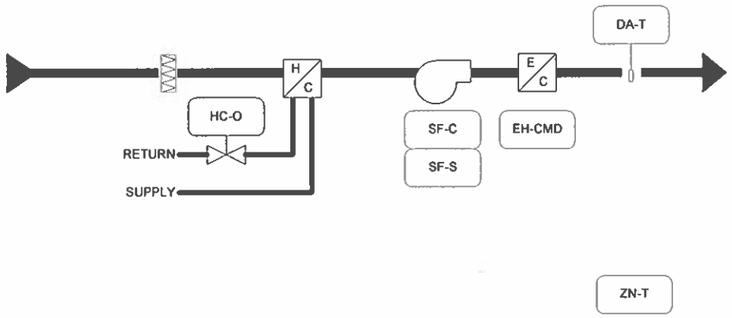


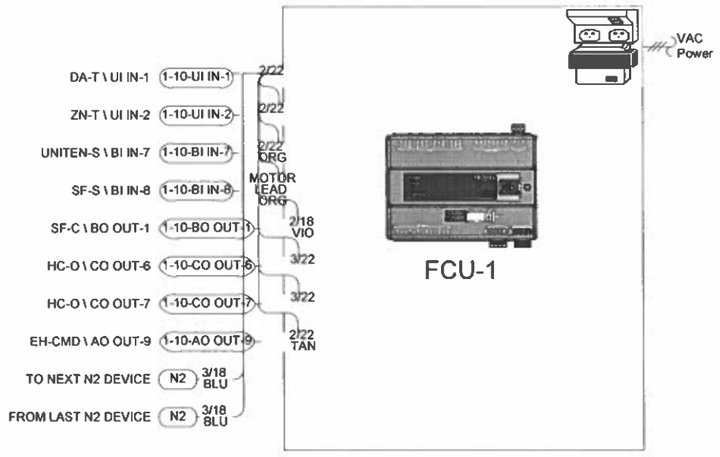
Drawing Title: FC Bus Riser						
REFERENCE DRAWING	NO	REVISION-LOCATION	ECN	DATE	BY	
Sales Engineer / Project Manager / Application Engineer	DRAWN BY / DATE	APPROVED BY / DATE				
Project Title: Suite Kitchen Controls	Johnson Controls	Branch Information	CONTRACT NUMBER: 00120004			
			DRAWING NUMBER: PAGE 4			

BILL OF MATERIALS

Designation	Qty	Part Number	Description
FCU-1	3	MS-FEC2611-0	FIELD EQUIP CONTR 17 W/ 6UI,2BI,3BO,4CO
ZN-T	2	TE-68NT-0NN0	WALL TEMP SENSOR 1K NI

ALL OTHER FIELD DEVICES/SENSORS EXISTING





Drawing Title

FCU-1 Flow Panel Detail (Typical of 3)

REFERENCE DRAWING	NO	REVISION-LOCATION	ECN	DATE	BY

Sales Engineer	Project Manager	Application Engineer	DRAWN BY	DRAWN DATE	APPROVED BY	APPROVED DATE

Project Title

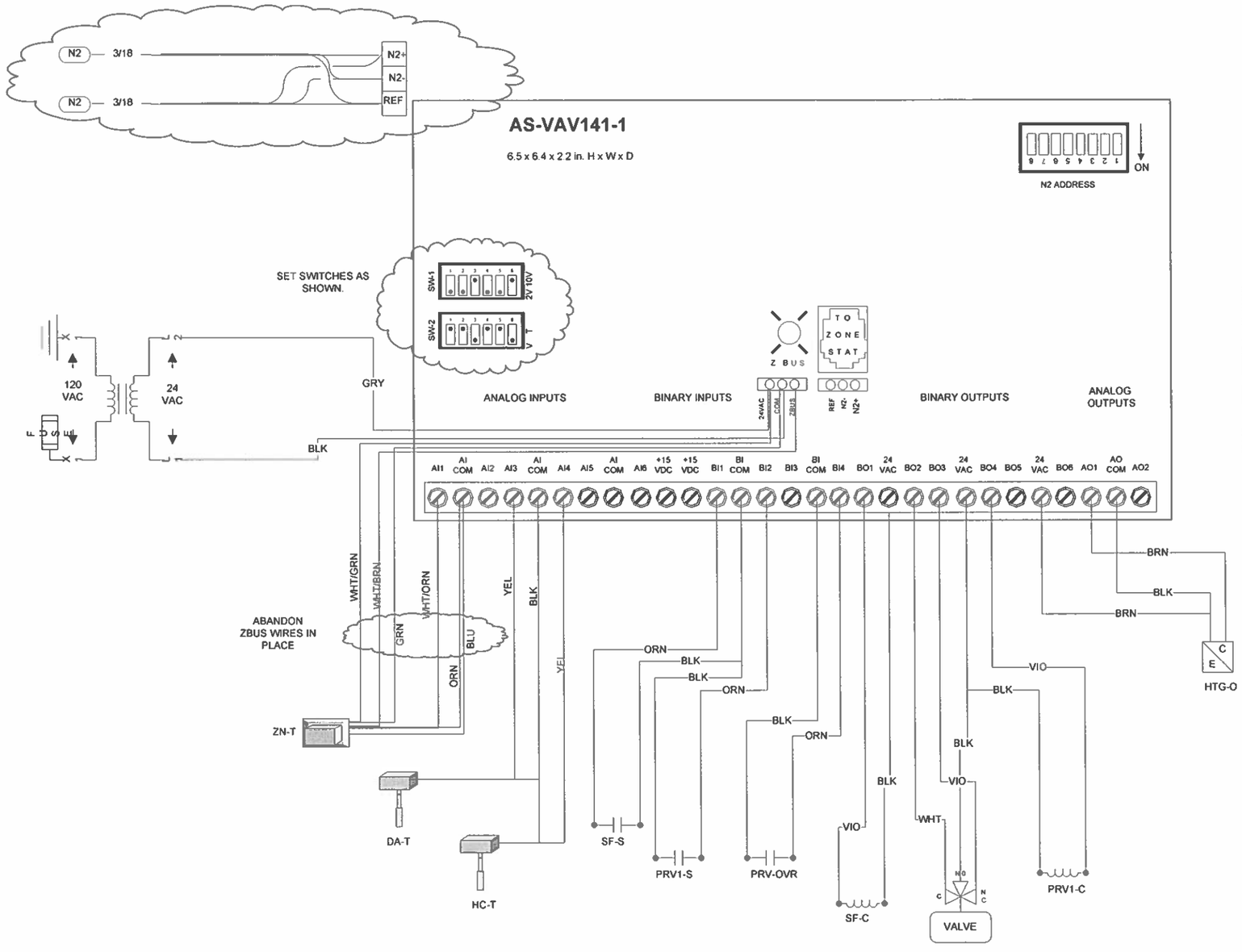
Suite Kitchen Controls

Branch Information

Johnson Controls

CONTRACT NUMBER **00120004**

DRAWING NUMBER **1.1**



JACK ON CONTROLLER & TE - 8 PIN RJ48	JACK ON TE 6 PIN RJ12
1 AI3 (HEATING)	NOT USED
2 AI2 (CLG, WMR/CLR)	24VAC
3 AI1 (SENSOR)	24VAC/ZnBs COM
4 AI1 (SENSOR COM)	NOT USED
5 24VAC	ZONE BUS
6 24VAC/ZnBs COM	NOT USED
7 AI2/3 COMMON	
8 ZONE BUS	

Drawing Title
FCU-1 Wiring Details - Existing

(1 of 3)

REFERENCE DRAWING	NO	REVISION LOCATION	ECN	DATE	BY

Sales Engineer | Project Manager | Applicaton Engineer | DRAWN BY DATE | APPROVED BY DATE

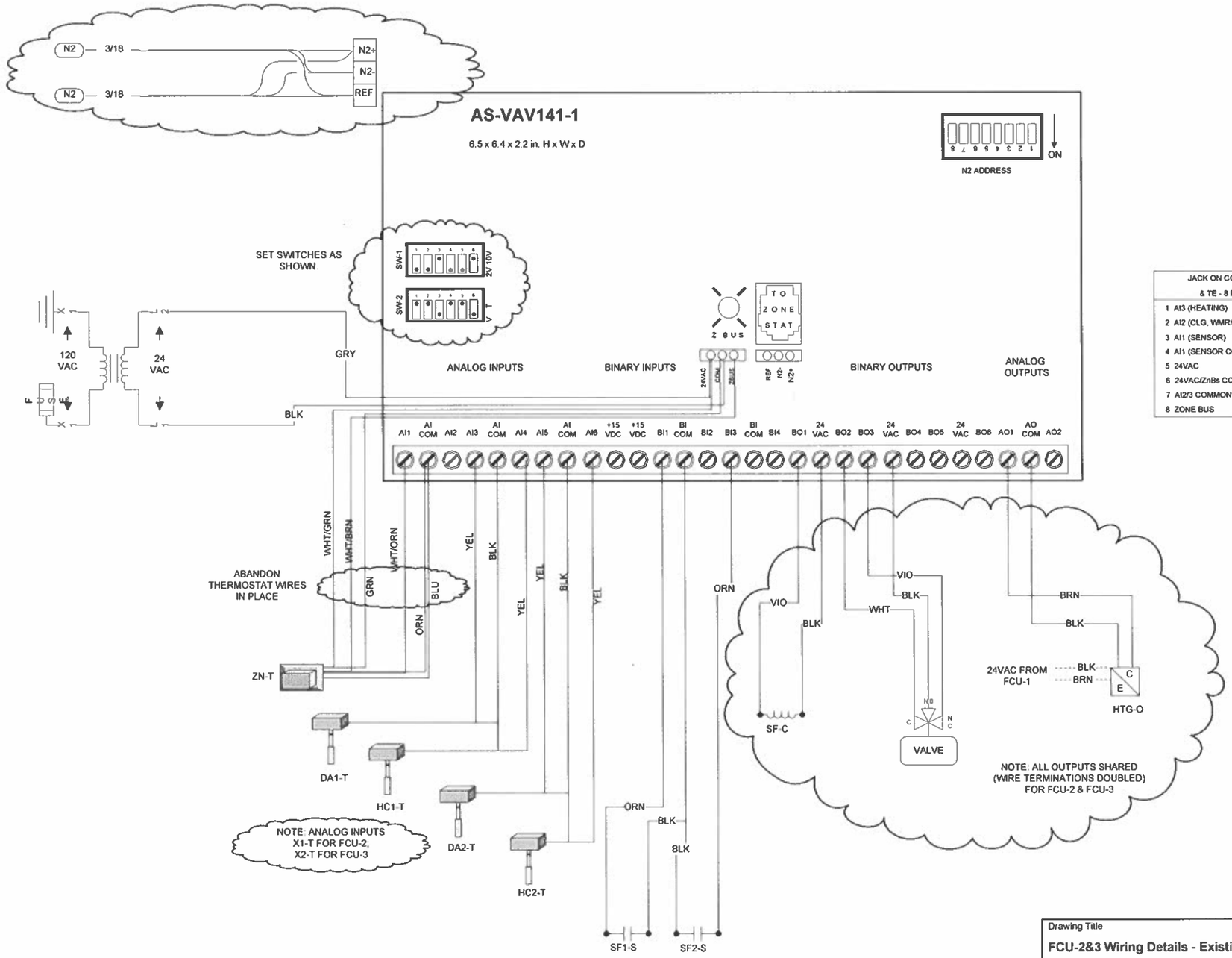
Project Title
Suite Kitchen Controls

Johnson Controls

Branch Information

CONTRACT NUMBER
00120004

DRAWING NUMBER
1.2A



JACK ON CONTROLLER & TE - 8 PIN RJ48	JACK ON TE 6 PIN RJ12
1 AI3 (HEATING)	NOT USED
2 AI2 (CLG, WMR/CLR)	24VAC
3 AI1 (SENSOR)	24VAC/ZnBs COM
4 AI1 (SENSOR COM)	NOT USED
5 24VAC	ZONE BUS
6 24VAC/ZnBs COM	NOT USED
7 AI2/3 COMMON	
8 ZONE BUS	

Drawing Title

FCU-2&3 Wiring Details - Existing

(2 of 3)

REFERENCE DRAWING	NO	REVISION LOCATION	ECN	DATE	BY

Sales Engineer	Project Manager	Application Engineer	DRAWN BY	DRAWN DATE	APPROVED BY	APPROVED DATE

Project Title

Suite Kitchen Controls

Branch Information

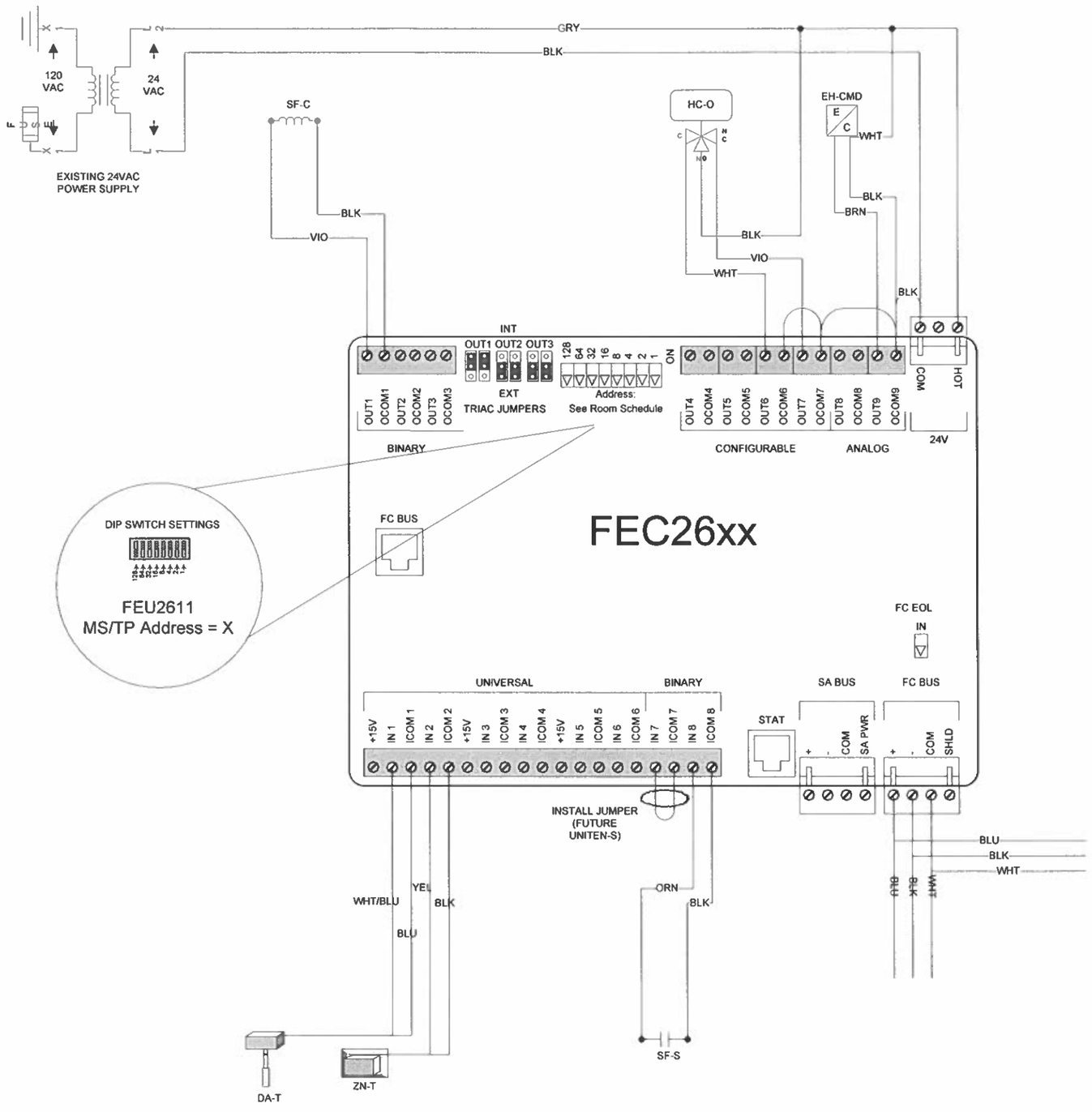
Johnson Controls

CONTRACT NUMBER

00120004

DRAWING NUMBER

1.2B



Drawing Title **FCU-1 Wiring Details - New (Typical of 3) (3 of 3)**						
	REFERENCE DRAWING	NO	REVISION LOCATION	ECN	DATE	BY
	Sales Engineer / Project Manager	Application Engineer	DRAWN BY DATE	APPROVED BY DATE		
Project Title **Suite Kitchen Controls**	Johnson Controls	Branch Information	CONTRACT NUMBER **00120004**	DRAWING NUMBER **1.2C**		

SEQUENCE OF OPERATIONS

Upon a call for Occupied Mode the supply fan will be energized.

Operation of the fan coil heating/cooling valve is determined by the Summer-Winter Switchover point which is commanded through the BAS.

During Summer mode, chilled water is supplied to the coil, and the valve will modulate open to maintain the zone temperature setpoint. If heating is required, the two-stage electric duct heater will energize to maintain the electric heating zone temperature setpoint.

During Winter mode, hot water is supplied to the coil, and the valve will modulate open to maintain the zone temperature setpoint.

During the Unoccupied Mode, the supply fan and heating/cooling valve will operate intermittently to maintain a minimum space temperature of 45° F, and a maximum space temperature of 85° F.

Drawing Title
FCU-1 Sequence of Operations

REFERENCE DRAWING	NO	REVISION-LOCATION	ECN	DATE	BY

Sales Engineer	Project Manager	Application Engineer	DRAWN BY	DRAWN DATE	APPROVED BY	APPROVED DATE

Project Title
Suite Kitchen Controls

Johnson Controls

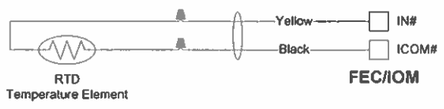
Branch Information

CONTRACT NUMBER
00120004

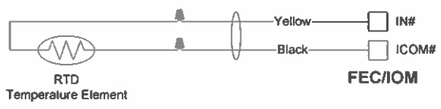
DRAWING NUMBER
1.3

Electrician/Fitter	Point Information				Controller Information							Panel Information						Intermediate Device			Field Device					
Tag	Point Type	System Name	Object Name	Expanded ID	Controller Details	Trunk Type	Trunk Nbr	Trunk Addr.	Cable Destination Bay/Terminal	Module Type	Termination Out	Panel	Panel Location	Slot Number	Reference Drawing	Cable Number	Wiring /Tubing	Termination In	Device	Termination Out	Location	Wiring /Tubing	Termination In	Device	Location	Ref Detail Shape	Comment
		FCU-1			FEC 26xx							EN-1	Mech Room		M12												Power to Controller
		FCU-1			FEC 26xx	MS/TP	1	10				EN-1	Mech Room	0	M12												BacNet FC Bus
	UI IN-1	FCU-1	DA-T	Discharge Air Temperature	FEC 26xx	MS/TP	1	10	UI IN-1		IN1, ICOM1	EN-1	Mech Room	0	M12	1-10-UI IN-1						2/22	2-Wire	TE		F131	
	UI IN-2	FCU-1	ZN-T	Zone Temperature	FEC 26xx	MS/TP	1	10	UI IN-2		IN2, ICOM2	EN-1	Mech Room	0	M12	1-10-UI IN-2						2/22	2-Wire	TE		F131	
	UI IN-3	FCU-1			FEC 26xx	MS/TP	1	10	UI IN-3			EN-1	Mech Room	0	M12	1-10-UI IN-3											
	UI IN-4	FCU-1			FEC 26xx	MS/TP	1	10	UI IN-4			EN-1	Mech Room	0	M12	1-10-UI IN-4											
	UI IN-5	FCU-1			FEC 26xx	MS/TP	1	10	UI IN-5			EN-1	Mech Room	0	M12	1-10-UI IN-5											
	UI IN-6	FCU-1			FEC 26xx	MS/TP	1	10	UI IN-6			EN-1	Mech Room	0	M12	1-10-UI IN-6											
	BI IN-7	FCU-1	UNITEN-S	Unit Enable Toggle Switch	FEC 26xx	MS/TP	1	10	BI IN-7		IN7, ICOM7	EN-1	Mech Room	0	M12	1-10-BI IN-7						2/22	See wiring detail	Dry Contact		F301	
	BI IN-8	FCU-1	SF-S	Supply Fan Status	FEC 26xx	MS/TP	1	10	BI IN-8		IN8, ICOM8	EN-1	Mech Room	0	M12	1-10-BI IN-8	2/22	OUT, COM	Current Relay	Motor Lead		Motor Lead	See wiring detail	Motor Status (Contact)		F301	
	BO OUT-1	FCU-1	SF-C	Supply Fan Command	FEC 26xx	MS/TP	1	10	BO OUT-1		OUT1, OCOM1	EN-1	Mech Room	0	M12	1-10-BO OUT-1						2/18	See wiring detail	24VAC OUT (Sw Low, INT Source)		F701	
	BO OUT-2	FCU-1			FEC 26xx	MS/TP	1	10	BO OUT-2			EN-1	Mech Room	0	M12	1-10-BO OUT-2											
	BO OUT-3	FCU-1			FEC 26xx	MS/TP	1	10	BO OUT-3			EN-1	Mech Room	0	M12	1-10-BO OUT-3											
	CO OUT-4	FCU-1			FEC 26xx	MS/TP	1	10	CO OUT-4			EN-1	Mech Room	0	M12	1-10-CO OUT-4											
	CO OUT-5	FCU-1			FEC 26xx	MS/TP	1	10	CO OUT-5			EN-1	Mech Room	0	M12	1-10-CO OUT-5											
	CO OUT-6	FCU-1	HC-O	Heating/Cooling Output	FEC 26xx	MS/TP	1	10	CO OUT-6		OUT-a OUT-b,24V COM	EN-1	Mech Room	0	M12	1-10-CO OUT-6						3/22	3, 2, 1	VA-7200 (Incr) (Sw Hi, EXT Source)		F981	
	CO OUT-7	FCU-1	HC-O	Heating/Cooling Output	FEC 26xx	MS/TP	1	10	CO OUT-7		OUT-a OUT-b,24V COM	EN-1	Mech Room	0	M12	1-10-CO OUT-7						3/22	3, 2, 1	VA-7200 (Incr) (Sw Hi, EXT Source)		F981	
	AO OUT-8	FCU-1			FEC 26xx	MS/TP	1	10	AO OUT-8			EN-1	Mech Room	0	M12	1-10-AO OUT-8											
	AO OUT-9	FCU-1	EH-CMD	Sideloop Output	FEC 26xx	MS/TP	1	10	AO OUT-9		OUT9, OCOM9	EN-1	Mech Room	0	M12	1-10-AO OUT-9						2/22	See wiring detail	Output (Voltage)		F201	

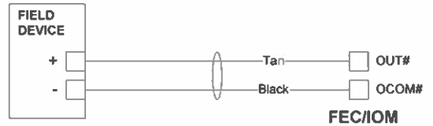
DETAIL F131 TEMPERATURE SENSOR INPUT



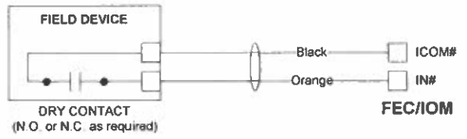
DETAIL F131 TEMPERATURE SENSOR INPUT



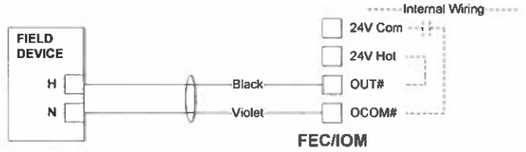
DETAIL F201 ANALOG OUTPUT (VOLTAGE)



DETAIL F301 BINARY INPUT (DRY CONTACT)

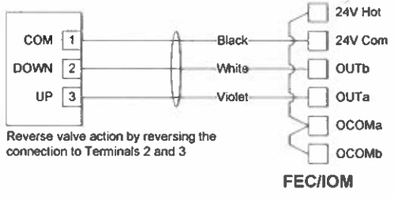


DETAIL F701 24 VAC BINARY OUTPUT (Switch Low, INT Sourced)



SET TRIAC JUMPER TO INTERNALLY SOURCED (INT) FOR ASSOCIATED BINARY OUTPUT(S).

DETAIL F981 INCREMENTAL CONTROL to VA-7150 / VA-7200 (Switch High, EXT Sourced)



Reverse valve action by reversing the connection to Terminals 2 and 3

Drawing Title
FCU-1 Point Schedule

REFERENCE DRAWING	NO	REVISION-LOCATION	ECN	DATE	BY

Sales Engineer	Project Manager	Application Engineer	DRAWN BY	DRAWN DATE	APPROVED BY	APPROVED DATE

Project Title
Suite Kitchen Controls

Johnson Controls

Branch Information

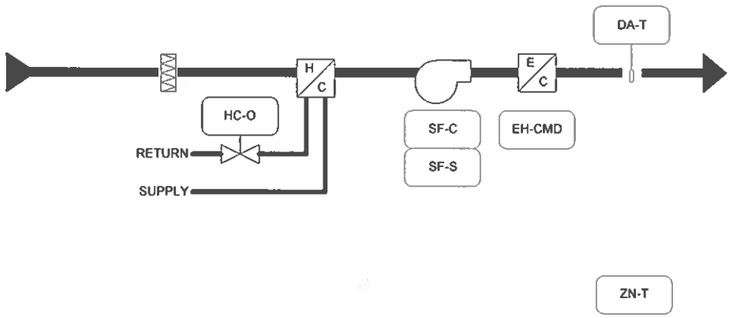
CONTRACT NUMBER
00120004

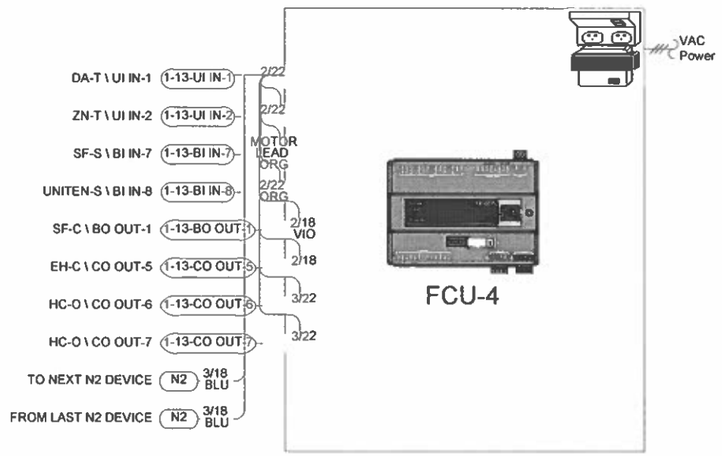
DRAWING NUMBER
1.4

BILL OF MATERIALS

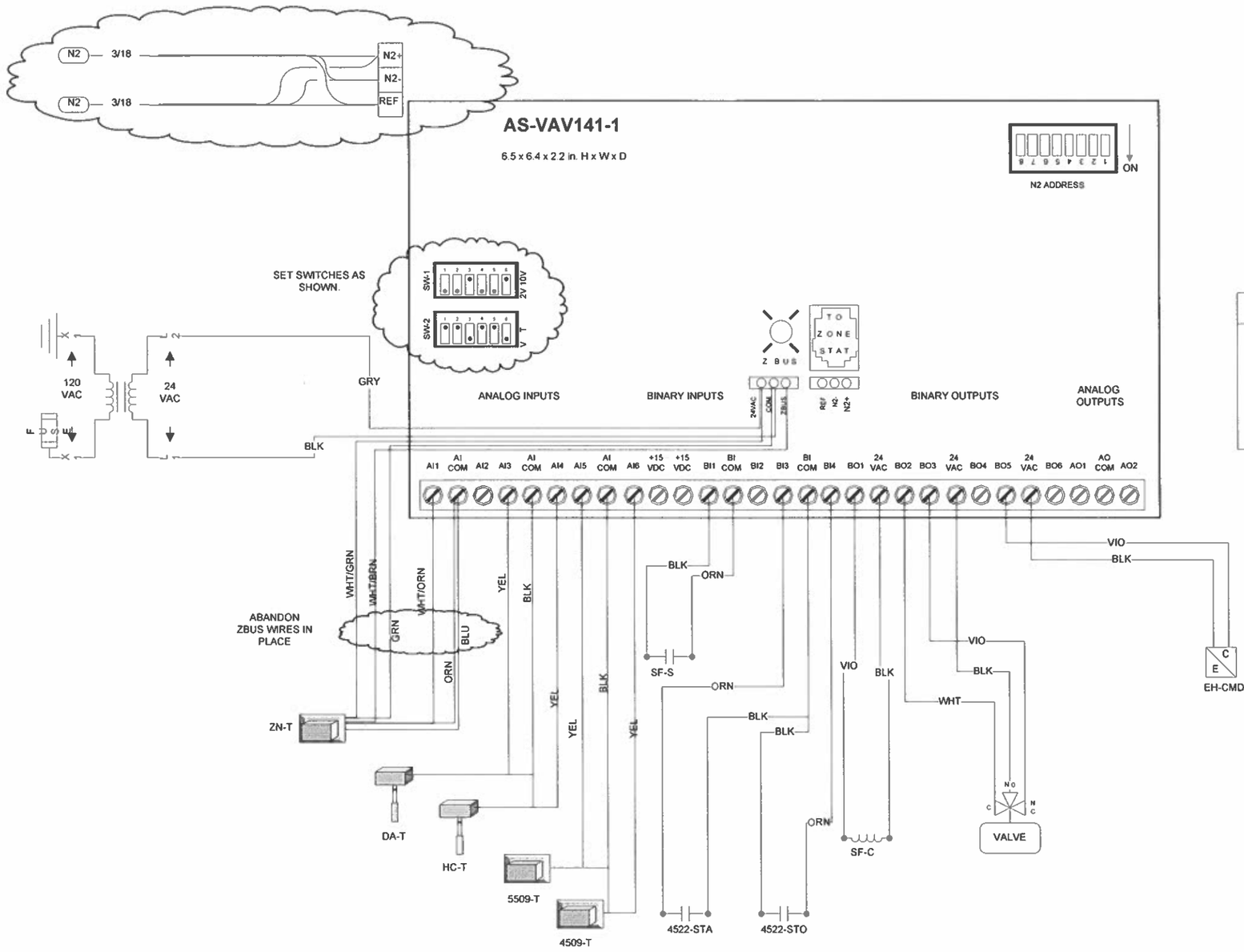
Designation	Qty	Part Number	Description
FCU-4	1	MS-FEC2611-0	FIELD EQUIP CONTR 17 W/ 6UI,2BI,3BO,4CO
ZN-T	1	TE-68NT-0NN0	WALL TEMP SENSOR 1K NI

ALL OTHER FIELD DEVICES/SENSORS EXISTING





Drawing Title: FCU-4 Flow Panel Detail						
REFERENCE DRAWING	NO	REVISION-LOCATION	ECN	DATE	BY	
Sales Engineer / Project Manager / Application Engineer	DRAWN BY / DATE	APPROVED BY / DATE				
Project Title: Suite Kitchen Controls	Johnson Controls	Branch Information	CONTRACT NUMBER: 00120004			
			DRAWING NUMBER: 2.1			



JACK ON CONTROLLER & TE - 8 PIN RJ48	JACK ON TE 6 PIN RJ12
1 AI3 (HEATING)	NOT USED
2 AI2 (CLG, WMR/CLR)	24VAC
3 AI1 (SENSOR)	24VAC/ZnBs COM
4 AI1 (SENSOR COM)	NOT USED
5 24VAC	ZONE BUS
6 24VAC/ZnBs COM	NOT USED
7 AI2/3 COMMON	
8 ZONE BUS	

Drawing Title
FCU-4 Wiring Details - Existing
(1 of 2)

REFERENCE DRAWING	NO	REVISION-LOCATION	ECN	DATE	BY

Sales Engineer | Project Manager | Application Engineer | DRAWN BY DATE | APPROVED BY DATE

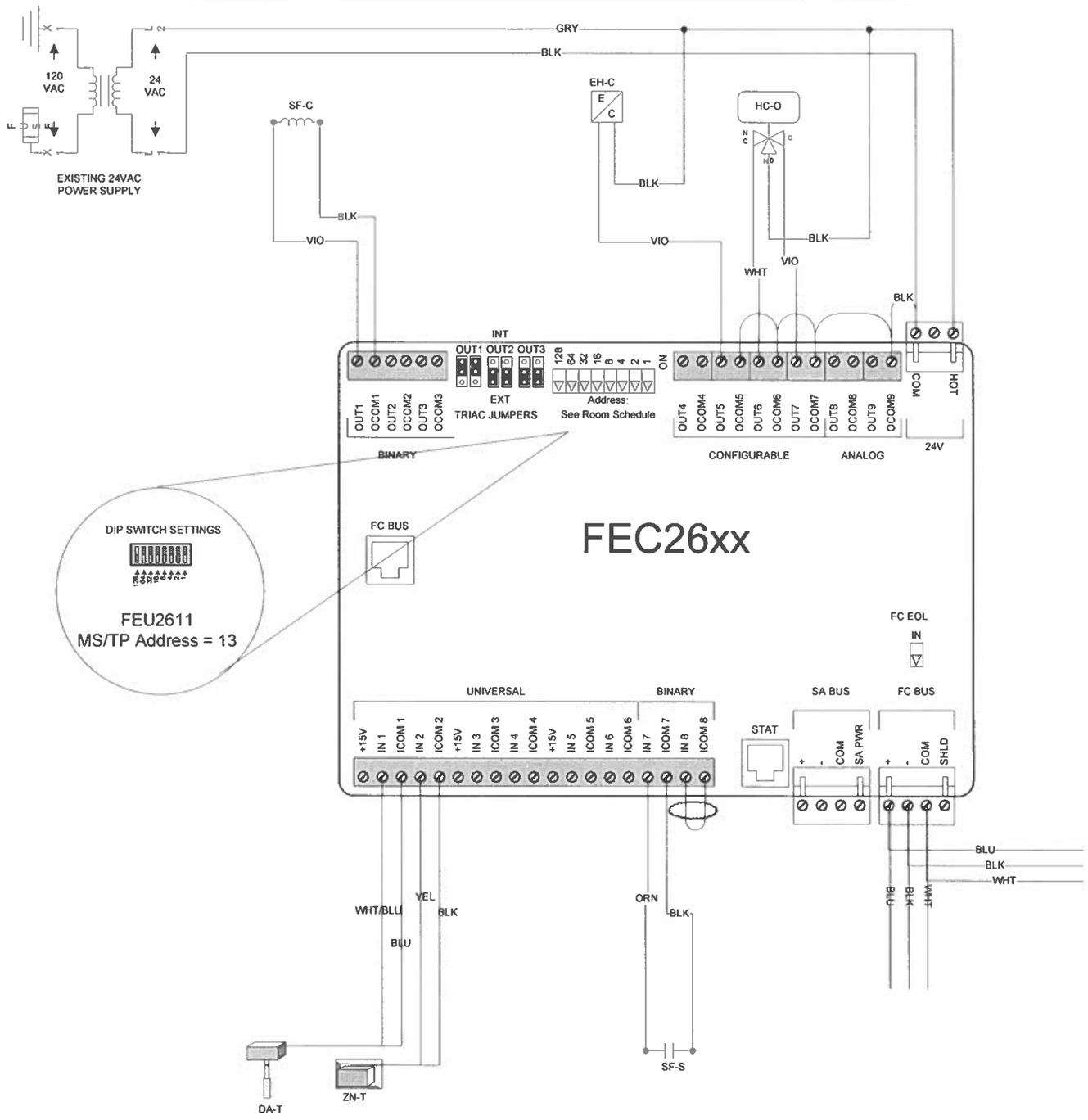
Project Title
Suite Kitchen Controls

Branch Information

Johnson Controls

CONTRACT NUMBER
00120004

DRAWING NUMBER
2.2A



Drawing Title: FCU-4 Wiring Details - New (2 of 2)							
	REFERENCE DRAWING	NO	REVISION-LOCATION	ECN	DATE	BY	
	Sales Engineer / Project Manager / Application Engineer		DRAWN BY / DATE	APPROVED BY / DATE			
Project Title: Suite Kitchen Controls	Johnson Controls	Branch Information	CONTRACT NUMBER: 00120004	DRAWING NUMBER: 2.2B			

SEQUENCE OF OPERATIONS

Upon a call for Occupied Mode, the outside air damper will move to the open position and the supply fan will be energized.

Operation of the fan coil heating/cooling valve is determined by the Summer-Winter Switchover point which is commanded through the BAS.

During Summer mode, chilled water is supplied to the coil, and the valve will modulate open to maintain the zone temperature setpoint. If heating is required, the two-stage electric duct heater will energize to maintain the electric heating zone temperature setpoint.

During Winter mode, hot water is supplied to the coil, and the valve will modulate open to maintain the zone temperature setpoint.

During the Unoccupied Mode, the supply fan and heating/cooling valve will operate intermittently to maintain a minimum space temperature of 45° F, and a maximum space temperature of 85° F.

Drawing Title
FCU-4 Sequence of Operations

REFERENCE DRAWING	NO	REVISION-LOCATION	ECN	DATE	BY

Sales Engineer	Project Manager	Application Engineer	DRAWN BY	DRAWN DATE	APPROVED BY	APPROVED DATE

Project Title
Suite Kitchen Controls

Johnson Controls

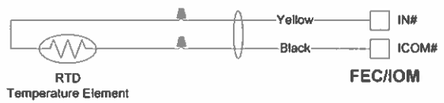
Branch Information

CONTRACT NUMBER
00120004

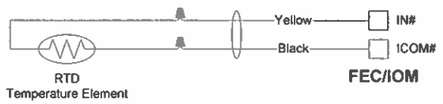
DRAWING NUMBER
2.3

Electrician/Fitter	Point Information				Controller Information							Panel Information						Intermediate Device			Field Device					
Tag	Point Type	System Name	Object Name	Expanded ID	Controller Details	Trunk Type	Trunk Nbr	Trunk Addr.	Cable Destination Bay/Terminal	Module Type	Termination Out	Panel	Panel Location	Slot Number	Reference Drawing	Cable Number	Wiring /Tubing	Termination In	Device	Termination Out	Location	Wiring /Tubing	Termination In	Device	Location	Ref Detail Shape	Comment
		FCU-4			FEC 26xx							EN-1	Mech Room		M12												Power to Controller
		FCU-4			FEC 26xx	MS/TP	2	13				EN-1	Mech Room	0	M12												BacNet FC Bus
	UI IN-1	FCU-4	DA-T	Discharge Air Temperature	FEC 26xx	MS/TP	2	13	UI IN-1		IN1, ICOM1	EN-1	Mech Room	0	M12	1-13-UI IN-1						2/22	2-Wire	TE		F131	
	UI IN-2	FCU-4	ZN-T	Zone Temperature	FEC 26xx	MS/TP	2	13	UI IN-2		IN2, ICOM2	EN-1	Mech Room	0	M12	1-13-UI IN-2						2/22	2-Wire	TE		F131	
	UI IN-3	FCU-4			FEC 26xx	MS/TP	2	13	UI IN-3			EN-1	Mech Room	0	M12	1-13-UI IN-3											
	UI IN-4	FCU-4			FEC 26xx	MS/TP	2	13	UI IN-4			EN-1	Mech Room	0	M12	1-13-UI IN-4											
	UI IN-5	FCU-4			FEC 26xx	MS/TP	2	13	UI IN-5			EN-1	Mech Room	0	M12	1-13-UI IN-5											
	UI IN-6	FCU-4			FEC 26xx	MS/TP	2	13	UI IN-6			EN-1	Mech Room	0	M12	1-13-UI IN-6											
	BI IN-7	FCU-4	SF-S	Supply Fan Status	FEC 26xx	MS/TP	2	13	BI IN-7		IN7, ICOM7	EN-1	Mech Room	0	M12	1-13-BI IN-7	2/22	OUT, COM	Current Relay	Motor Lead		Motor Lead	See wiring detail	Motor Status (Contact)		F301	
	BI IN-8	FCU-4	UNITEN-S	Unit Enable Toggle Switch	FEC 26xx	MS/TP	2	13	BI IN-8		IN8, ICOM8	EN-1	Mech Room	0	M12	1-13-BI IN-8						2/22	See wiring detail	Dry Contact		F301	
	BO OUT-1	FCU-4	SF-C	Supply Fan Command	FEC 26xx	MS/TP	2	13	BO OUT-1		OUT1, OCOM1	EN-1	Mech Room	0	M12	1-13-BO OUT-1						2/18	See wiring detail	24VAC OUT (Sw Low, INT Source)		F701	
	BO OUT-2	FCU-4			FEC 26xx	MS/TP	2	13	BO OUT-2			EN-1	Mech Room	0	M12	1-13-BO OUT-2											
	BO OUT-3	FCU-4			FEC 26xx	MS/TP	2	13	BO OUT-3			EN-1	Mech Room	0	M12	1-13-BO OUT-3											
	CO OUT-4	FCU-4			FEC 26xx	MS/TP	2	13	CO OUT-4			EN-1	Mech Room	0	M12	1-13-CO OUT-4											
	CO OUT-5	FCU-4	EH-C	Electric Heating Command	FEC 26xx	MS/TP	2	13	CO OUT-5		OUT5, 24V COM	EN-1	Mech Room	0	M12	1-13-CO OUT-5						2/18	See wiring detail	24VAC OUT (Sw Hi, EXT Source)		F901	
	CO OUT-6	FCU-4	HC-O	Heating/Cooling Output	FEC 26xx	MS/TP	2	13	CO OUT-6		OUT-a,OUT-b,24V COM	EN-1	Mech Room	0	M12	1-13-CO OUT-6						3/22	3, 2, 1	VA-7200 (Incr) (Sw Hi, EXT Source)		F981	
	CO OUT-7	FCU-4	HC-O	Heating/Cooling Output	FEC 26xx	MS/TP	2	13	CO OUT-7		OUT-a,OUT-b,24V COM	EN-1	Mech Room	0	M12	1-13-CO OUT-7						3/22	3, 2, 1	VA-7200 (Incr) (Sw Hi, EXT Source)		F981	
	AO OUT-8	FCU-4			FEC 26xx	MS/TP	2	13	AO OUT-8			EN-1	Mech Room	0	M12	1-13-AO OUT-8											
	AO OUT-9	FCU-4			FEC 26xx	MS/TP	2	13	AO OUT-9			EN-1	Mech Room	0	M12	1-13-AO OUT-9											

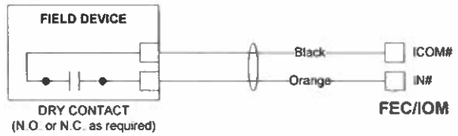
DETAIL F131 TEMPERATURE SENSOR INPUT



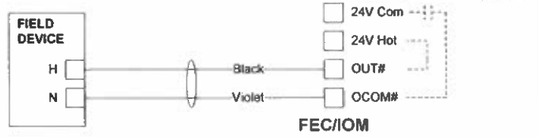
DETAIL F131 TEMPERATURE SENSOR INPUT



DETAIL F301 BINARY INPUT (DRY CONTACT)

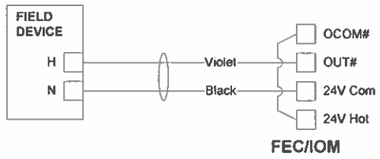


DETAIL F701 24 VAC BINARY OUTPUT (Switch Low, INT Sourced)

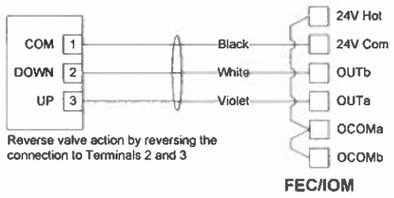


SET TRIAC JUMPER TO INTERNALLY SOURCED (INT) FOR ASSOCIATED BINARY OUTPUT(S)

DETAIL F901 24 VAC TRIAC OUTPUT (Switch High, EXT Sourced)



DETAIL F981 INCREMENTAL CONTROL to VA-7150 / VA-7200 (Switch High, EXT Sourced)



Reverse valve action by reversing the connection to Terminals 2 and 3

Drawing Title
FCU-4 Point Schedule

REFERENCE DRAWING	NO	REVISION-LOCATION	ECN	DATE	BY

Sales Engineer	Project Manager	Application Engineer	DRAWN BY	DRAWN DATE	APPROVED BY	APPROVED DATE

Project Title
Suite Kitchen Controls

Johnson Controls

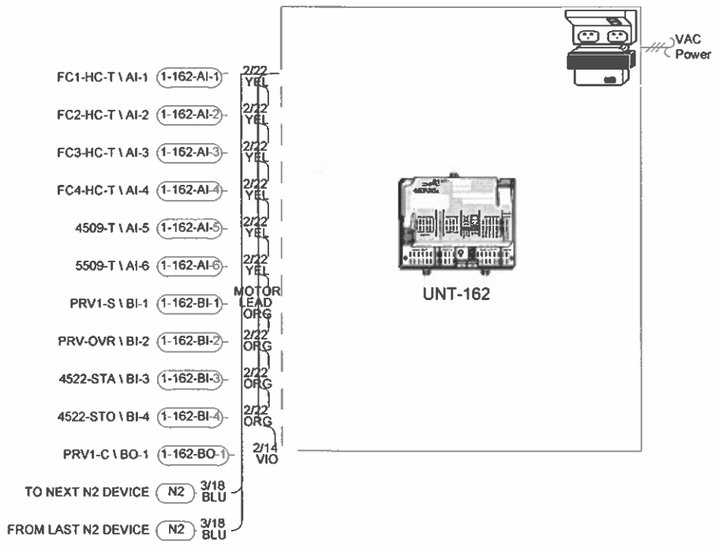
Branch Information

CONTRACT NUMBER
00120004

DRAWING NUMBER
2.4

BILL OF MATERIALS

Designation	Qty	Part Number	Description
UNT-162	1	AS-UNT140-1	UNITARY CONTROLLER, SCREW TERMINAL



Drawing Title

UNT-162 Panel Detail

REFERENCE DRAWING	NO	REVISION-LOCATION	ECN	DATE	BY

Sales Engineer	Project Manager	Application Engineer	DRAWN BY	DRAWN DATE	APPROVED BY	APPROVED DATE

Project Title

Suite Kitchen Controls

Johnson Controls

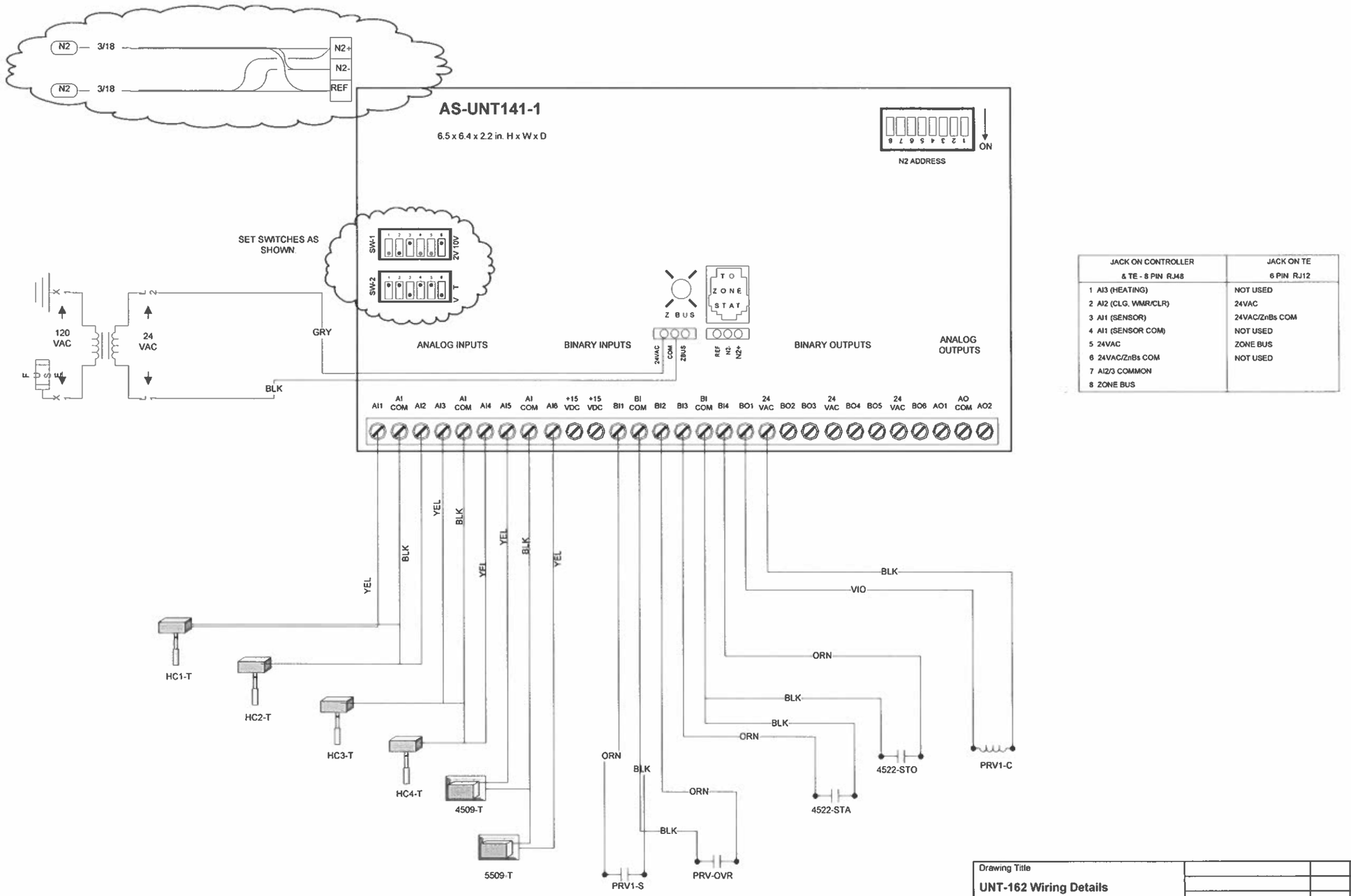
Branch Information

CONTRACT NUMBER

00120004

DRAWING NUMBER

3.1



JACK ON CONTROLLER & TE - 8 PIN RJ48	JACK ON TE 6 PIN RJ12
1 AI3 (HEATING)	NOT USED
2 AI2 (CLG, WMR/CLR)	24VAC
3 AI1 (SENSOR)	24VAC/ZnBs COM
4 AI1 (SENSOR COM)	NOT USED
5 24VAC	ZONE BUS
6 24VAC/ZnBs COM	NOT USED
7 AI2/3 COMMON	
8 ZONE BUS	

Drawing Title
UNT-162 Wiring Details

REFERENCE DRAWING	NO.	REVISION-LOCATION	ECN	DATE	BY

Sales Engineer	Project Manager	Application Engineer	DRAWN BY	DRAWN DATE	APPROVED BY	APPROVED DATE

Project Title
Suite Kitchen Controls

Johnson Controls

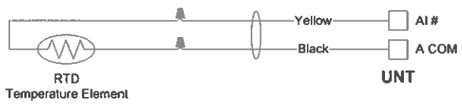
Branch Information

CONTRACT NUMBER
00120004

DRAWING NUMBER
3.2

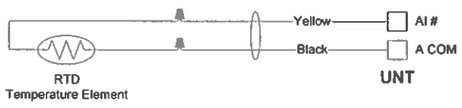
Electrician/Fitter	Point Information				Controller Information							Panel Information					Intermediate Device				Field Device						
Tag	Point Type	System Name	Object Name	Expanded ID	Controller Details	Trunk Type	Trunk Nbr	Trunk Addr.	Cable Destination Bay/Terminal	Module Type	Termination Out	Panel	Panel Location	Slot Number	Reference Drawing	Cable Number	Wiring /Tubing	Termination In	Device	Termination Out	Location	Wiring /Tubing	Termination In	Device	Location	Ref Detail Shape	Comment
		UNT-162			UNT 141	N2	1	162				EN-1	Mech Room	0	M12												N2 Trunk
	AI-1	UNT-162	FC1-HC-T	FCU-1 Water Temp	UNT 141	N2	1	162 AI-1			AI1,A COM	EN-1	Mech Room	0	M12	1-162-AI-1						2/22	2-Wire	TE		UT131	
	AI-2	UNT-162	FC2-HC-T	FCU-2 Water Temp	UNT 141	N2	1	162 AI-2			AI2,A COM	EN-1	Mech Room	0	M12	1-162-AI-2						2/22	2-Wire	TE		UT131	
	AI-3	UNT-162	FC3-HC-T	FCU-3 Water Temp	UNT 141	N2	1	162 AI-3			AI3,A COM	EN-1	Mech Room	0	M12	1-162-AI-3						2/22	2-Wire	TE		UT131	
	AI-4	UNT-162	FC4-HC-T	FCU-4 Water Temp	UNT 141	N2	1	162 AI-4			AI4,A COM	EN-1	Mech Room	0	M12	1-162-AI-4						2/22	2-Wire	TE		UT131	
	AI-5	UNT-162	4509-T	Fire Rm 4509 Temp	UNT 141	N2	1	162 AI-5			AI5,A COM	EN-1	Mech Room	0	M12	1-162-AI-5						2/22	2-Wire	TE		UT131	
	AI-6	UNT-162	5509-T	Fire Rm 5509 Temp	UNT 141	N2	1	162 AI-6			AI6,A COM	EN-1	Mech Room	0	M12	1-162-AI-6						2/22	2-Wire	TE		UT131	
	BI-1	UNT-162	PRV1-S	PRV-1 Status	UNT 141	N2	1	162 BI-1			BI1,24VAC	EN-1	Mech Room	0	M12	1-162-BI-1	2/22	OUT, COM	Current Relay	Motor Lead		Motor Lead	See wiring detail	Motor Status		UT301	
	BI-2	UNT-162	PRV-OVR	Suite Kitch PRV Override	UNT 141	N2	1	162 BI-2			BI2,24VAC	EN-1	Mech Room	0	M12	1-162-BI-2						2/22	See wiring detail	Dry Contact		UT301	
	BI-3	UNT-162	4522-STA	Start Push Button Status	UNT 141	N2	1	162 BI-3			BI3,24VAC	EN-1	Mech Room	0	M12	1-162-BI-3						2/22	See wiring detail	Dry Contact		UT301	
	BI-4	UNT-162	4522-STO	Stop Push Button Status	UNT 141	N2	1	162 BI-4			BI4,24VAC	EN-1	Mech Room	0	M12	1-162-BI-4						2/22	See wiring detail	Dry Contact		UT301	
	BO-1	UNT-162	PRV1-C	PRV-1 Command	UNT 141	N2	1	162 BO-1			BO1,RTN	EN-1	Mech Room	0	M12	1-162-BO-1	2/22	COIL (24V, Com)	Current Relay	COM, NO		2/14	See wiring detail	Starter (NO) (Sw Hi)		UT502	
	BO-2	UNT-162			UNT 141	N2	1	162 BO-2				EN-1	Mech Room	0	M12	1-162-BO-2											
	BO-3	UNT-162			UNT 141	N2	1	162 BO-3				EN-1	Mech Room	0	M12	1-162-BO-3											
	BO-4	UNT-162			UNT 141	N2	1	162 BO-4				EN-1	Mech Room	0	M12	1-162-BO-4											
	BO-5	UNT-162			UNT 141	N2	1	162 BO-5				EN-1	Mech Room	0	M12	1-162-BO-5											
	BO-6	UNT-162			UNT 141	N2	1	162 BO-6				EN-1	Mech Room	0	M12	1-162-BO-6											
	AO-1	UNT-162			UNT 141	N2	1	162 AO-1				EN-1	Mech Room	0	M12	1-162-AO-1											
	AO-2	UNT-162			UNT 141	N2	1	162 AO-2				EN-1	Mech Room	0	M12	1-162-AO-2											

DETAIL UT131 TEMPERATURE SENSOR INPUT



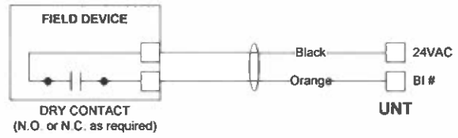
Set SW1 to Position "T"
and SW2 to Position "2V"

DETAIL UT131 TEMPERATURE SENSOR INPUT



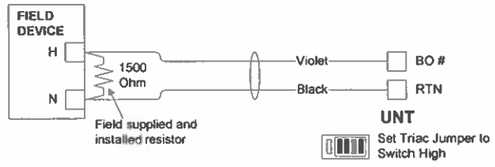
Set SW1 to Position "T"
and SW2 to Position "2V"

DETAIL UT301 BINARY INPUT (DRY CONTACT)



DETAIL UT502 24 VAC BINARY OUTPUT to LOW CURRENT DRAW DEVICE (Switch High)

(Use when current draw of the Field Device is less than 50 mA)



Drawing Title
UNT-162 Point Schedule

REFERENCE DRAWING	NO	REVISION-LOCATION	ECN	DATE	BY

Sales Engineer	Project Manager	Application Engineer	DRAWN BY	DRAWN DATE	APPROVED BY	APPROVED DATE

Project Title
Suite Kitchen Controls

Johnson Controls

Branch Information

CONTRACT NUMBER
00120004

DRAWING NUMBER
3.3

Contract Name
Contract Number

Room Schedule

Box Location								Controller Information							Box Information										
	Room							Controller Required						Sensor			Box Config Required						Required (N2)		
Bldg./Flr.	No.	Name	System Name	Mech. Dwg.	System Serving this Box	Box Mfgr.	Mfgr Box Type	JCI Ctrl Dwg No.	Controller Part No.	NC/ NAE Addr	Trunk ID	Device Addr	PAN Offset	CSModel or Template	Code No.	Box Heat	Supplemental Heat	Config File Name	Inlet Size (Inches)	Inlet Area (Sq. Ft.)	K Factor	Clg Min Flow	Clg Max Flow	VMA Box Config	Comments	Generate Flag
Club Level Sect 5	4522A	Suite Kitchen Cold Prep	FC-C60			Trane		1.1	MS-FEC2611-0	S1-NAE06	2	10		SuiteKitchFCU	TE-68NT-0NN0											
Club Level Sect 5	4522B	Suite Kitchen Grills	FC-C61			Trane		1.1	MS-FEC2611-0	S1-NAE06	2	11		SuiteKitchFCU	TE-68NT-0NN0											
Club Level Sect 5	4522B	Suite Kitchen Grills	FC-C62			Trane		1.1	MS-FEC2611-0	S1-NAE06	2	12		SuiteKitchFCU	TE-68NT-0NN0											
Club Level Sect 5	4526	Suite Kitchen Office	FC-C63			Trane		2.1	MS-FEC2611-0	S1-NAE06	2	13		SuiteKitchFCU	TE-68NT-0NN0											

0012-0002

Seating Bowl CO2 Monitoring & Demand Control Ventilation

DRAWING NUMBER	DRAWING TITLE
TITLE	Title Page
PAGE 2	CO2 Sensor Locations
1.1	AHU Flow
1.2	AHU Wiring Detail
1.3	Sequence of Operations
1.4	AH-F01 Point Schedule
1.5	AH-F02 Point Schedule
1.6	AH-F05 Point Schedule
1.7	AH-F06 Point Schedule
1.8	AH-T01 Point Schedule
1.9	AH-T02 Point Schedule
1.10	AH-TB02 Point Schedule
1.11	AH-TB03 Point Schedule
1.12	AH-TB05 Point Schedule
1.13	AH-TB06 Point Schedule

Johnson Controls

Creating a better climate for business.

- [x] Environmental Control System
- [x] Facility Management System
- [ ] Air and Water System Balancing
- [ ] Fire Management System
- [ ] Security System
- [ ] Lighting Services
- [ ] Instrumentation System Installation
- [ ] Building Operations Management
- [ ] Energy Conservation Control
- [ ] Training Programs
- [ ] Performance Contracting
- [ ] Planned Service Agreements

Air Conditioning
Heating
Diagnostic Services
Coil Cleaning
Refrigeration
Automatic Temperature Controls
Facility Management Systems
Fire Management
Security Management
Building Operations and Management
Water Treatment
Electrical Equipment
Emergency Generator / Lighting Equipment
Industrial Controls / Recording / Indication Equipment

PROJECT TITLE

MILLER PARK
SEATING BOWL CO2 MONITORING
DEMAND CONTROL VENTILATION

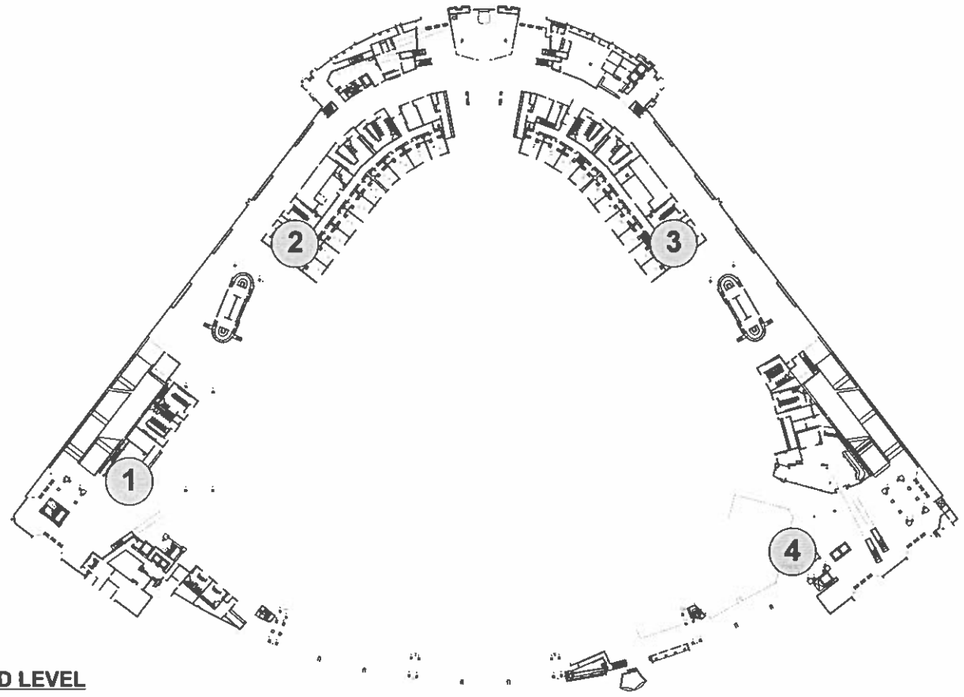
ARCHITECT	ENGINEER
, Phone:	, Phone:
MECHANICAL CONTRACTOR	ELECTRICAL CONTRACTOR
, Phone:	, Phone:

REFERENCE DRAWING	NO	REVISION-LOCATION	ECN	DATE	BY

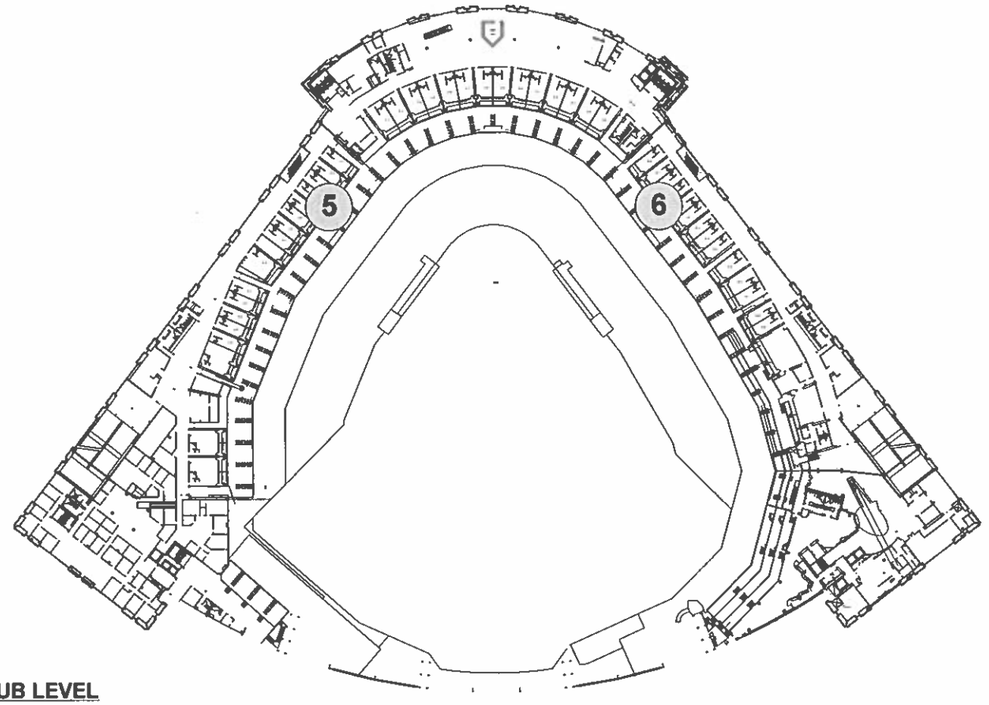
Johnson Controls

Branch Information
Phone:
Fax:

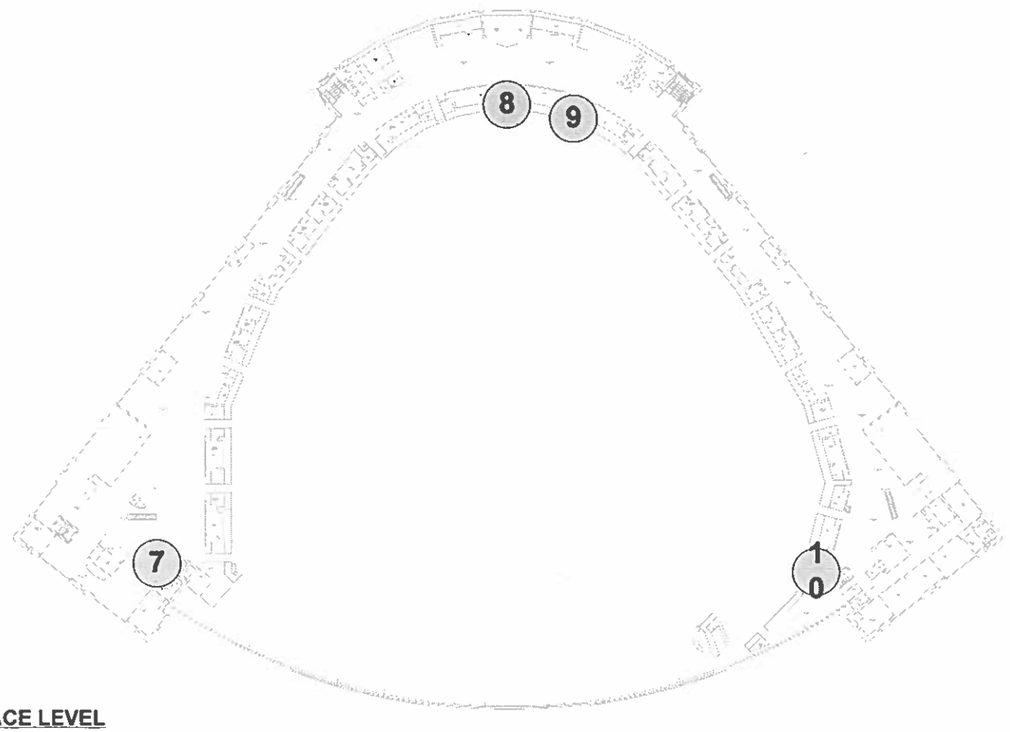
SALES ENGINEER	PROJECT MANAGER	APPLICATION ENGINEER	DATE	CONTRACT NUMBER
	KDP	KDP	1/2012	0012-0002



FIELD LEVEL



CLUB LEVEL



TERRACE LEVEL

LEGEND

1- Field Level Sector 8 – Located in AH-F01 RA Plenum
2- Field Level Sector 6 – Located in AH-F02 RA Plenum
3- Field Level Sector 3 – Located in AH-F05 RA Plenum
4- Field Level Sector 1 – Located in AH-F06 RA Plenum
5- Club Level Sector 6 – Located Suite 58 Exterior
6- Club Level Sector 3 – Located Suite 39 Exterior
7- Terrace Level Sector 8 – Located Level 6 Stairwell #16
8- Terrace Level Sector 5 – Located Terrace Sec. 422 Seating Entry
9- Terrace Level Sector 4 - Located Terrace Sec. 424 Seating Entry
10- Terrace Level Sector 1 - Located Terrace Sec. 440 Seating Entry

Drawing Title
CO2 Sensor Locations

REFERENCE DRAWING	NO	REVISION/LOCATION	ECN	DATE	BY

Sales Engineer | Project Manager | Application Engineer | DRAWN BY / DATE | APPROVED BY / DATE

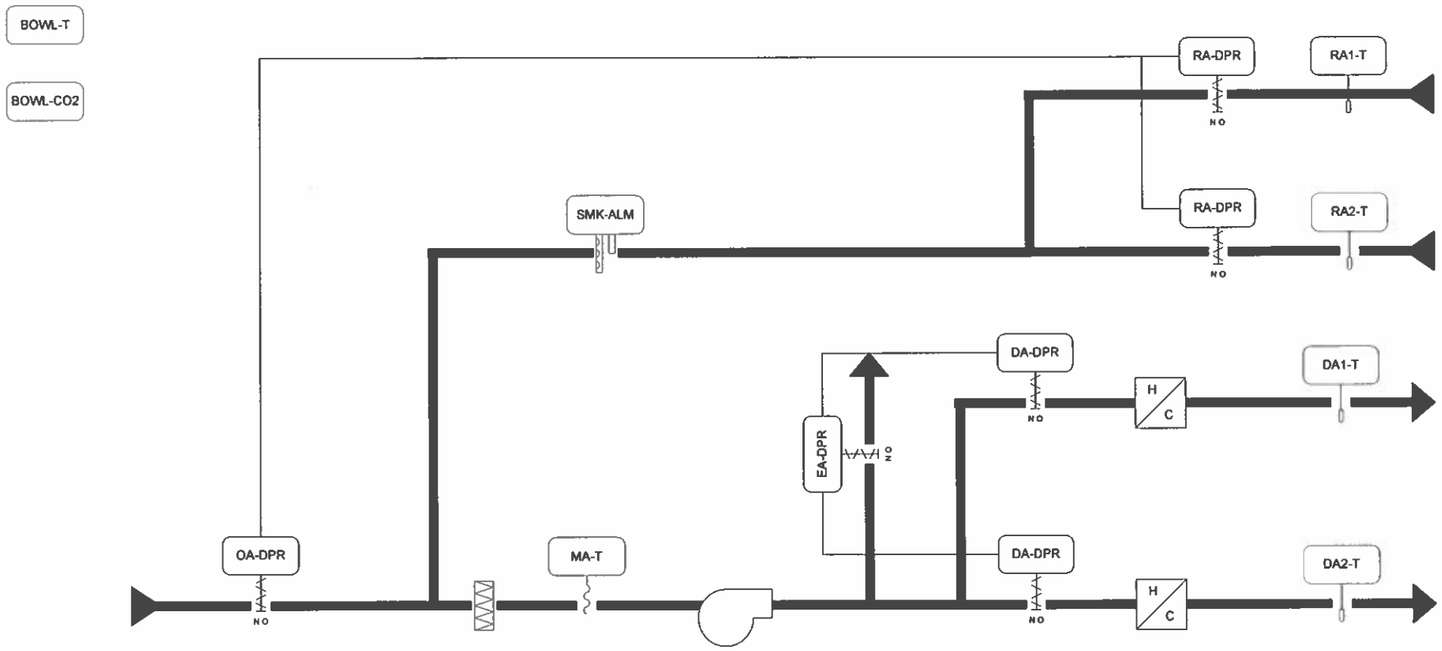
Project Title
Seating Bowl CO2 Monitoring Demand Control Ventilation

Johnson Controls

Branch Information

CONTRACT NUMBER
00120002

DRAWING NUMBER
PAGE 2

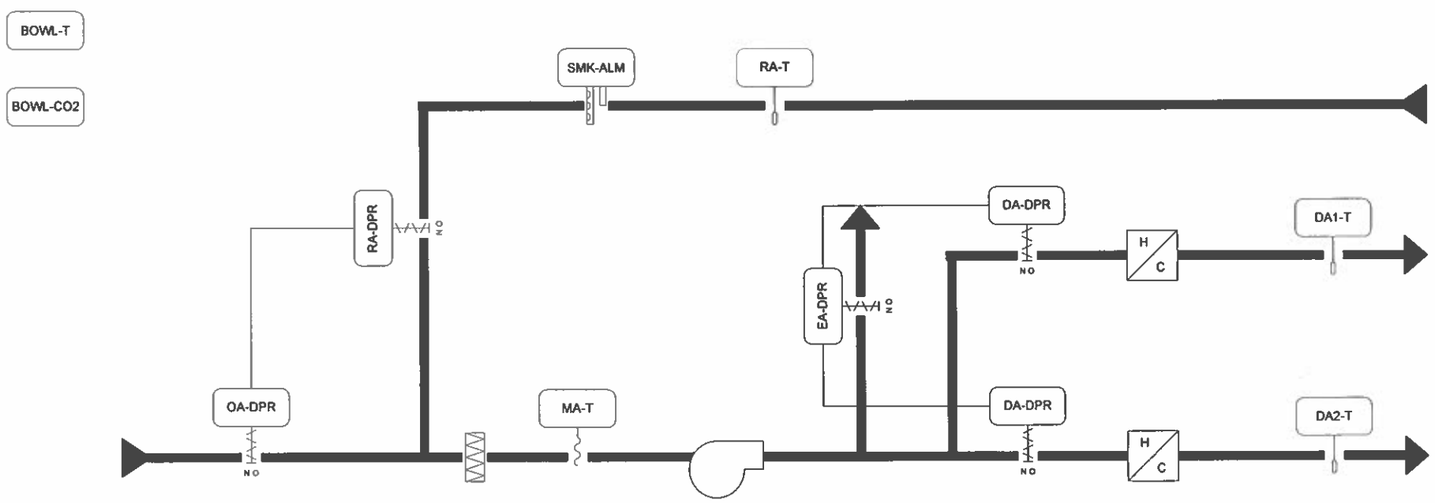


BILL OF MATERIALS

Designation	Qty	Part Number	Description
BOWL-CO2	10	CD-W00-00-1	CD-W00-00-1, WALL MNTCO2

TYPICAL OF 6

FIELD/LOGE BOWL AHU
AH-F01, AH-F02, AH-F03, AH-F04, AH-F05, AH-F06



TYPICAL OF 4

TERRACE BOWL AHU
AH-TB01, AH-TB02, AH-TB03, AH-TB04

Drawing Title
AHU Flow

REFERENCE DRAWING	NO	REVISION LOCATION	ECN	DATE	BY

Sales Engineer | Project Manager | Application Engineer | DRAWN BY DATE | APPROVED BY DATE

Project Title
Seating Bowl CO2 Monitoring Demand Control Ventilation

Branch Information

Johnson Controls

CONTRACT NUMBER
00120002

DRAWING NUMBER
1.1

Field Equipment Controller (FEC) Series Catalog Page

Code No. LIT-1900346
Issued January 26, 2012

The Field Equipment Controller (FEC) Series products are programmable BACnet® Application Specific Controllers (B-ASCs) with integral Master-Slave/Token Passing (MS/TP) communications. FEC models include the 10-point FEC16 Series and the 17-point FEC26 Series. FEC controllers integrate into the Web-based Metasys® system.

FECs feature 32-bit microprocessor architecture, patented continuous tuning adaptive control, peer to peer communications, and are available with an optional built-in Liquid Crystal Display (LCD) screen and six-button local User Interface (UI).

A full range of FEC models combined with the Input/Output Module (IOM) models can be applied to a wide variety of building applications ranging from simple fan coil or heat pump control to advanced central plant management.

All FEC series controllers support wireless communications using the ZigBee ZFR1800 Series Wireless Field Bus System series accessories.

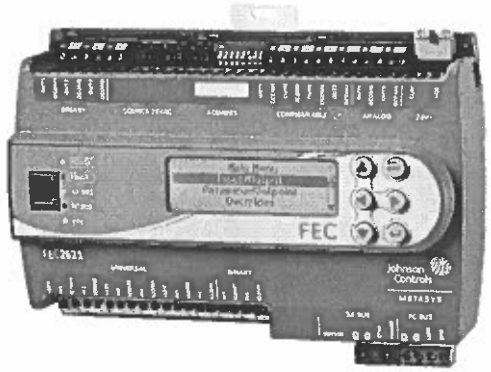
Refer to the *Metasys® System Field Equipment Controllers and Related Products Product Bulletin (LIT-12011042)* for product application details.

Features

- BACnet® MS/TP communication protocol provides open system compatibility.
- A 32-bit microprocessor ensures optimum performance and meets industry specifications.
- Universal and Configuration inputs and outputs support multiple signal options and increase controller application flexibility.
- BACnet Automatic Discovery support enables easy controller integration into Metasys Building Automation System (BAS).
- Integral End-of-Line (EOL) switch to enable field controller as a terminating device on the communications bus.
- Pluggable communications bus and supply power terminal blocks expedite installation and troubleshooting.
- Wireless capabilities via ZFR1800 Series Wireless Field Bus System enable wireless mesh connectivity between FECs to WRZ Series Wireless Room Temperature Sensors, and to NAE/NCE devices facilitate easy initial location and relocation.
- Patented proportional adaptive control (P-Adaptive) and Pattern Recognition Adaptive Control (PRAC) technologies provide continuous loop tuning.
- Writable flash memory allows standard or customized applications to be downloaded from the Controller Configuration Tool (CCT) and enables persistent application data.
- Large product family provides a wide range of point mix to meet application requirements and allows for the addition of one or more Input/Output Module (IOM)s and/or Network Sensors to provide even more application capacity.
- Local UI display (integral display or stand-alone display provides enhanced local monitoring.
- User-friendly graphic theme and clear push-button identification facilitate easy navigation of the integral or optional UI/display.

If this product fails to operate within its specifications, replace the product. For a replacement, contact the nearest Johnson Controls® representative.

Figure 1: FEC2621 Field Equipment Controller with Integral Local Display



Selection Charts

Table 1: FEC Series Point Type Counts per Model

Point Types	Signals Accepted	FEC16	FEC26
Universal Input (UI)	Analog Input, Voltage Mode, 0–10 Analog Input, Current Mode, 4–20 mA[1] Analog Input, Resistive Mode, 0–2k ohm, Resistence Temperature Device (RTD) (1k NI [Johnson Controls], 1k PT, A99B SI), Negative Temperature Coefficient (NTC) (10k Type L, 2.252k Type 2) Binary Input, Dry Contact Maintained Mode	2	6
Binary Input (BI)	Dry Contact Maintained Mode Pulse Counter/Accumulator Mode (High Speed), 100 Hz	1	2
Analog Output (AO)	Analog Output, Voltage Mode, 0–10 VDC Analog Output, Current Mode, 4–20 mA		2
Binary Output (BO)	24 Triac	3	3

Johnson Controls

Table 1: FEC Series Point Type Counts per Model

Point Types	Signals Accepted	FEC16	FEC26
Configurable Output (CO)	Analog Output, Voltage Mode, 0–10 VDC Binary Output Mode, 24 VAC Triac	4	4

[1] Analog Input, Current Mode is set by hardware for the FEC26, and by software for the FEC16.

Table 2: FEC Series Ordering Information

Product Code Number	Description
MS-FEC1611-0	10-Point Field Equipment Controller with 2 UI, 1 BI, 3 BO, and 4 CO; 24 VAC; FC and SA Bus Support
MS-FEC1621-0	10-Point Field Equipment Controller with 2 UI, 1 BI, 3 BO, and 4 CO; 24 VAC; FC and SA Bus Support; Integral Display and 6-Button Navigation Touch Pad
MS-FEC2611-0	17-Point Field Equipment Controller with 6 UI, 2 BI, 3 BO, 2 AO, and 4 CO; 24 VAC; FC and SA Bus Support
MS-FEC2621-0	17-Point Field Equipment Controller with 6 UI, 2 BI, 3 BO, 2 AO, and 4 CO; 24 VAC; FC and SA Bus Support; Integral Display and 6-Button Navigation Touch Pad

Table 3: FEC Series for Smoke Control Ordering Information

Product Code Number[1]	Description
MS-FEU1610-0U	10-Point Field Equipment Controller with 2 UI, 1 BI, 3 BO, and 4 CO; 24 VAC; FC and SA Bus Support; Mounting Base and Cover
MS-FEU1620-0U	10-Point Field Equipment Controller with 2 UI, 1 BI, 3 BO, and 4 CO; 24 VAC; FC and SA Bus Support; Mounting Base and Cover; Integral Display and 6-Button Navigation Touch Pad
MS-FEU2610-0U	17-Point Field Equipment Controller with 6 UI, 2 BI, 3 BO, 2 AO, and 4 CO; 24 VAC; FC and SA Bus Support; Mounting Base and Cover
MS-FEU2620-0U	17-Point Field Equipment Controller with 6 UI, 2 BI, 3 BO, 2 AO, and 4 CO; 24 VAC; FC and SA Bus Support; Mounting Base and Cover; Integral Display and 6-Button Navigation Touch Pad

[1] These devices are UL Listed, File S4977, UUKL 864 - 9th Edition, Smoke Control Equipment.

Accessories (Order Separately)

Product Code Number	Description
MS-DIS1710-0	Local Controller Display: Refer to *Local Controller Display Product Bulletin (LIT-12011273)* for more information.
MS-BTCVT-1	Wireless Commissioning Converter, with Bluetooth® technology
LP-KIT204-000C	BACnet IP to MS/TP router for connecting a computer with CCT to MS/TP field controllers.
MS-ZFR1811-0	Wireless Field Bus Router, 10 mW Transmission Power. Functions with Metasys BACnet FECs, VMA1600s, and WRZ-TTx Series Wireless Mesh Room Temperature Sensors.
MS-ZFRCBL-0	Wire Harness for use with ZFR1811 Router. Allows ZFR1811 Router to function with FEC1620; and with FEC1610, VMA1610, or VMA1620 controllers in conjunction with NS Series Sensors, Wireless Commissioning Converter, or DIS1710 Local Controller Display.
MS-BTCVTCBL-700	Cable replacement Set for the MS-BTCVT-1 or the NS-ATV7003-0; includes ones 5 ft (1.5 m) retractable cable
WRZ Series Sensors	WRZ Series Wireless Room Sensors: Refer to the *WRZ Series Wireless Room Sensors Product Bulletin (LIT-12011653)* for specific sensor model descriptions.
NS Series Sensors	NS Series Network Sensors: Refer to the *NS Series Network Sensors Product Bulletin (LIT-12011574)* for specific sensor model descriptions.
Y64T15-0	Transformer, 120/208/240 VAC Primary to 24 VAC Secondary, 92 VA, Foot Mount, 30 in. Primary Leads and 30 in. Secondary Leads, Class 2
Y65A13-0	Transformer, 120 VAC Primary to 24 VAC Secondary, 40 VA, Foot Mount (Y65AS), 8 in. Primary Leads and 30 in. Secondary Leads, Class 2
Y65T42-0	Transformer, 120/208/240 VAC Primary to 24 VAC Secondary, 40 VA, Hub Mount (Y65SP+), 8 in. Primary Leads and Secondary Screw Terminals, Class 2
Y65T31-0	Transformer, 120/208/240 VAC Primary to 24 VAC Secondary, 40 VA, Foot Mount (Y65AR+), 8 in. Primary Leads and Secondary Screw Terminals, Class 2
AP-TBK4SA-0	Replacement MS/TP SA Bus Terminal, 4-Position Connector, Brown, Bulk Pack
AP-TBK4FC-0	Replacement MS/TP FC Bus Terminal, 4-Position Connector, Blue, Bulk Pack
AP-TBK3PW-0	Replacement Power Terminal, 3-Position Connector, Gray, Bulk Pack

Technical Specifications

Product Code Numbers	**MS-FEC1611-0** – 10-Point FEC **MS-FEC2611-0** – 17-Point FEC **MS-FEC1621-0** – 10-Point FEC with Integral Display and Push Button User Interface **MS-FEC2621-0** – 17-Point FEC with Integral Display and Push Button User Interface
Supply Voltage	24 VAC (nominal, 20 VAC minimum/30 VAC maximum), 50/60 Hz, power supply Class 2 (North America), Safety, Extra-Low Voltage (SELV) (Europe)
Power Consumption	14 VA maximum for FEC1611 and FEC2611 (no integral display) 20 VA maximum for FEC1621 and FEC 2621 (with integral display) **Note:** VA ratings do not include any power supplied to the peripheral devices connected to Binary Outputs (BOs) or Configurable Outputs (COs), which can consume up to 12 VA for each BO or CO, for a possible total consumption of an additional 84 VA (maximum).
Ambient Conditions	**Operating:** 0 to 50° C (32 to 122° F); 10 to 90% RH non-condensing **Storage:** -40 to 80°C (-40 to 176°F); 5 to 95% RH non-condensing
Controller Addressing	DIP switch set; valid field controller device addresses 4-127 (Device addresses 0-3 and 128-255 are reserved and not valid field controller addresses.)
Communications Bus[1]	BACnet MS/TP, RS-485: 3-wire FC Bus between the supervisory controller and field controllers 4-wire SA Bus between field controller, network sensors, and other sensor/actuator devices, includes a lead to source 15 VDC supply power (from field controller) to bus devices
Processor	H8SX/166xR Renesas® microcontroller
Memory	1 MB Flash Memory and 512 KB Random Access Memory (RAM)
Input and Output Capabilities	**FEC16 Models:** 2 - Universal Inputs: Defined as 0–10 VDC, 4–20 mA, 0–600k ohm, or Binary Dry Contact 1 - Binary Inputs: Defined as Dry Contact Maintained or Pulse Counter/Accumulator Mode 3 - Binary Outputs: Defined as 24 VAC Triac (selectable internal or external source power) 4 - Configurable Outputs: Defined as 0–10 VDC or 24 VAC Triac BO **FEC26 Models:** 6 - Universal Inputs: Defined as 0–10 VDC, 4–20 mA, 0–600k ohm, or Binary Dry Contact 2 - Binary Inputs: Defined as Dry Contact Maintained or Pulse Counter/Accumulator Mode 3 - Binary Outputs: Defined as 24 VAC Triac (selectable internal or external source power) 4 - Configurable Outputs: Defined as 0–10 VDC or 24 VAC Triac BO 2 - Analog Outputs: Defined as 0–10 VDC or 4–20 mA
Analog Input/Analog Output Resolution and Accuracy	Analog Input: 16-bit resolution Analog Output: 16-bit resolution and ±200 mV in 0–10 VDC applications
Terminations	Input/Output: Fixed screw terminal blocks FC Bus, SA Bus, and Supply Power: 3-wire and 4-wire pluggable screw terminal blocks FC Bus Port and Sensor Port: RJ-12 6-pin modular jacks
Mounting	Horizontal on single 35 mm DIN rain mount (preferred), or screw mount on flat surface with three integral mounting clips on controller
Housing	Enclosure material: ABS and polycarbonate UL94 5VB; self-extinguishing; Plenum-rated protection class: IP20 (IEC529)
Dimensions (Height x Width x Depth)	**FEC16 Models:** 150 x 164 x 53 mm (5-7/8 x 6-7/16 x 2-1/8 in.) including terminals and mounting clips **FEC26 Models:** 150 x 190 x 53 mm (5-7/8 x 7-1/2 x 2-1/8 in.) including terminals and mounting clips **Note:** Mounting space for all field controllers requires an additional 50 mm (2 in.) space on top, bottom, and front face of controller for easy cover removal, ventilation, and wire terminations.
Weight	**FEC16 Models:** 0.4 kg (0.9 lb) **FEC26 Models:** 0.5 kg (1.1 lb)

Compliance CE	**United States:** UL Listed, File E107041, CCN PAZX, UL 916, Energy Management Equipment; FCC Compliant to CFR47, Part 15, Subpart B, Class A
	Canada: UL Listed, File E107041, CCN PAZX7, CAN/CSA C22.2 No. 205, Signal Equipment; Industry Canada Compliant, ICES-003
	Europe: CE Mark – Johnson Controls, Inc., declares that this product is in compliance with the essential requirements and other relevant provisions of the EMC Directive 2004/108/EC **Note:** For FEC26 models, conducted RF Immunity within EN 61000-6-2 meets performance criteria B.
	Australia and New Zealand: C-Tick Mark, Australia/NZ Emissions Compliant
	BACnet International: BACnet Testing Laboratories™ (BTL) 135-2004 Listed BACnet Application Specific Controller (B-ASC)

[1] For more information, refer to the *MS/TP Communications Bus Technical Bulletin (LIT-12011034)*.

Building Efficiency
507 E. Michigan Street, Milwaukee, WI 53202

JOHNSON CONTROLS

Controls Group 507 E. Michigan Street
P.O. Box 423, Milwaukee, WI 53202
Code No. LIT-1928145

UNT Series

Unitary Controller

Unitary Controller

Description

The Unitary (UNT) Controller is an electronic device for digital control of packaged air handling units, unit ventilators, fan coils, heat pumps, and other terminal units serving a single zone or room. It can also be configured as a generic input/output device for basic point monitoring applications when used within a Metasys Network.

You can easily configure point inputs and outputs and software features to control a wide variety of HVAC equipment applications.

You may use the UNT as a standalone controller or connected to the Metasys Network through a Network Control Module (NCM), N30, or Companion Supervisory Controller.

Features

- standalone control enhances system reliability
- network communications over N2 bus provides facility-wide control efficiencies and cost effective sensor sharing
- multiple modes of operation for various occupancy conditions provide comfort with economy
- removable N2 and 24 VAC power plugs allow disconnection of an individual controller without disrupting other controller connections
- built-in control program library within HVAC PRO software tool allows easy configuration
- multiple packaging options for both field and factory installations allow for installation flexibility
- isolated N2 circuitry for more reliable operation
- LED indicator for Power/Zone Bus provides visual indication of proper system function
- screw terminals for I/O connections available in some models; "Quick Connect" lugs and crimping tool not required
- UNT112/113 include isolated binary outputs when separate power sources are used.

To Order

See the selection chart on the next page.

Options

Application Options	Software Options
Primary Equipment Types	Unit Vents ASHRAE Cycle 1 ASHRAE Cycle 2 ASHRAE Cycle 3 ASHRAE Cycle W Heat Pumps Water to Air Air to Air Packaged Rooftops Fan Coils
Primary Control Strategies	Room/zone control
Economizer Changeover Strategies	- Dry bulb - Outside air enthalpy - Differential outside/return air temperature - Binary input from external economizer - Supervisory network command
Mixed Air Control Strategies	Proportional output to OA/RA damper actuator Binary output to economizer actuator
Heating/Cooling Configuration	Modulated single coil Staged (2-stage max) Modulated common heating/cooling coil Reversing valve logic
Fan Start/Stop	Continuous Operation Cycled with call for heating/cooling
Lighting Control	On and off outputs to lighting relay in conjunction with Occ/Unocc mode.
Unoccupied Control	Setup and setback, morning warmup and cooldown
Pump Led / Lag	Lead/Standby pumps with common or separate flow switch(s)

Specifications

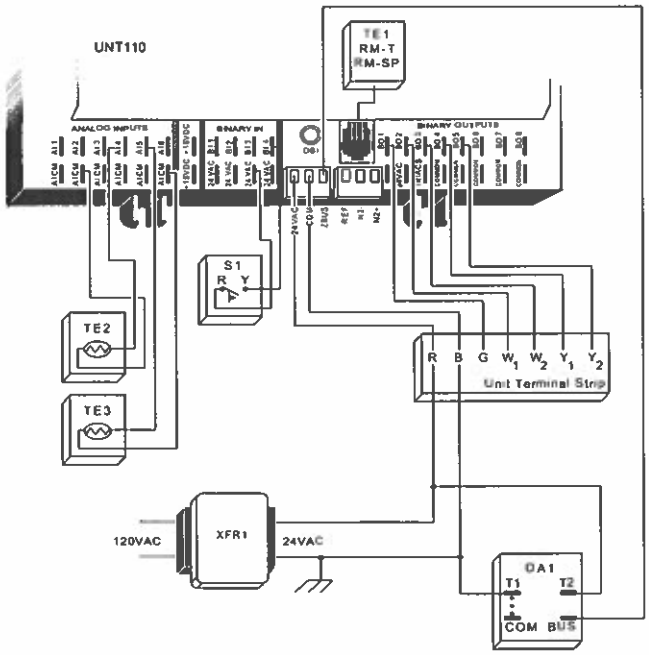
Unitary Controllers	
Product Codes	Spade quick connects: AS-UNT110-1, AS-UNT111-1 AS-UNT112-1, AS-UNT113-1 Screw terminations: AS-UNT140-1, AS-UNT141-1
Ambient Operating Conditions	0 to 60°C (32 to 140°F) and 10 to 90% RH
Dimensions (H x W x D)	165 x 163 x 56 mm (6.5. x 6.4 x 2.2 in.) without enclosure 173 x 185 x 119 mm (6.8 x 7.3 x 4.7 in.) with enclosure
Low Ambient Temperature Models	
Product Codes	Spade Quick Connects: AS-UNT120-1, AS-UNT121-1
Ambient Operating Conditions	-40 to 60°C (-40 to 140°F) 10 to 90% RH
Dimensions (H x W x D)	165 x 163 x 56 mm (6.5 x 6.4 x 2.2 in.) without enclosure 259 x 248 x 76 mm (10.2 x 9.8 x 3 in.) with enclosure
Low Ambient Temperature Models in Enclosures	
Product Codes	Spade quick connects: AS-UNT110-101, AS-UNT111-101 Screw terminations: AS-UNT140-101, AS-UNT 141-101 (mounted in EN-EWC10 enclosure with 50 VA Transformer)
Ambient Operating Conditions	0 to 60°C (32 to 140°F) and 10 to 90% RH
Dimensions (H x W x D)	7 x 13 x 6 in. (180 x 330 x 150 mm without enclosure
All Models	
Ambient Storage Conditions	-40 to 70°C (-40 to 158°F) 10 to 90% RH
Power Requirements	24 VAC, 50/60 Hz at 40 VA (per typical system)
N2 Bus	Isolated
Zone Bus	8-Pin Phone Jack or Terminal Block on Controller
Shipping Weight	0.64 kg (1.4 lbs)
Agency Compliance	CSA C22.2 No. 205, FCC Part 15, Subpart J, Class A, IEEE 446, IEEE 472, IEEE 518, IEEE 587 Category A, UL 916, UL 864; NEMA ICS 2, Part 2-230, VDE 0871 Class B
Agency Listings	UL Listed and CSA Certified as part of the Metasys Network

UNT Series Unitary Controller (Continued)

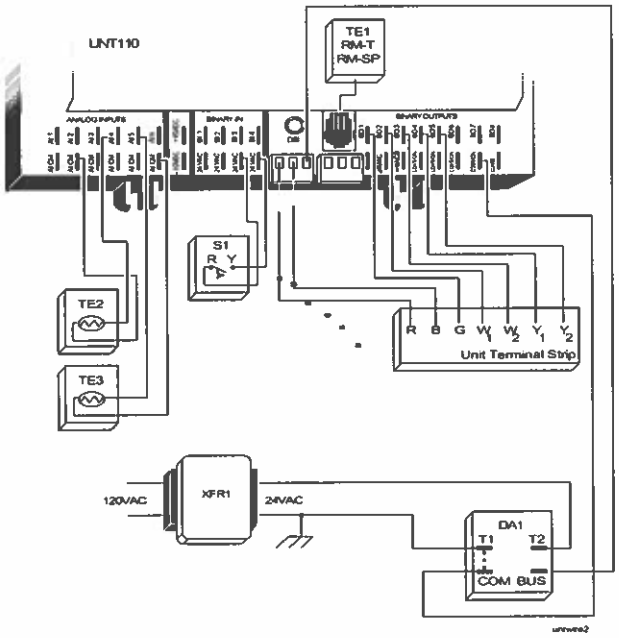
Selection Chart

Code Number	Termination Type	Analog Inputs	Binary Inputs	Analog Outputs	Binary Outputs
AS-UNT110-1	Spade Lug	6 • RTD Temp. Elem. (NI, SI or PT) • 0-10 VDC Trans. • 2K ohm Setpoint Potentiometers	4 • 4-Dry Contacts • 1-Momentary Push Button at Zone Sensor • BI4-Accum. Input	0	8 • 24 VAC Triacs at 0.5 amps • Low or High Side Common Selectable
AS-UNT111-1				2 • 0 to 10 VDC at 10 mA	6 (same as above)
AS-UNT112-1	Spade Lug	6 • RTD Temp. Elem. (NI, SI or PT) • 0-10 VDC Trans. • 2K ohm Setpoint Potentiometers	4 • 4-Dry Contacts • 1-Momentary Push Button at Zone Sensor • BI4-Accum. Input	0	8 • 24 VAC Triacs at 0.5 amps • Low or High Side Common Selectable • **Electrically Isolated BO's**
AS-UNT113-1				2 • 0 to 10 VDC at 10 mA	6 (same as above)
AS-UNT120-1	Spade Lug	6 • RTD Temp. Elem. (NI, SI or PT.) • 0-10 VDC Trans. • 2K ohm Setpoint Potentiometers	4 • 4-Dry Contacts • 1-Momentary Push Button at Zone Sensor • BI4-Accum. Input	0	8 • 24 VAC Triacs at 0.5 amps • Low or High Side Common Selectable
AS-UNT121-1				2 • 0 to 10 VDC at 10 mA	6 (same as above)
AS-UNT140-1	Screw Terminal	6 • RTD Temp. Elem. (NI, SI or PT.) • 0-10 VDC Trans. • 2K ohm Setpoint Potentiometers	4 • 4-Dry Contacts • 1-Momentary Push Button at Zone Sensor BI4-Accum. Input	0	8 • 24 VAC Triacs at 0.5 amps • Low or High Side Common Selectable
AS-UNT141-1				2 • 0 to 10 VDC at 10 mA	6 (same as above)

Wiring Diagram 1 – External Control Power

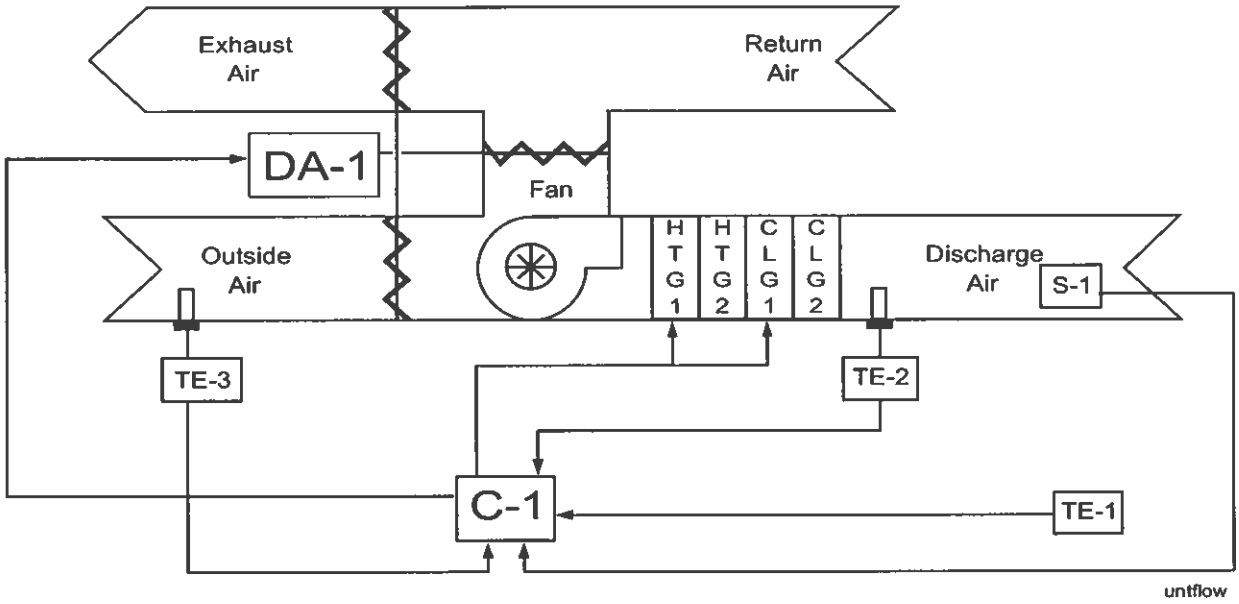


Wiring Diagram 2 – Internal Control Power



UNT Series Unitary Controller (Continued)

Room Control of Packaged Rooftop Unit - Flow Diagram



Configuration Selections

HVAC PRO Configuration Selections	
Economizer Output Type: Zone Bus	
Economizer Changeover Type	Dry Bulb
Heating Type	Two Stages
Cooling Type	Two Stages
Outdoor Air Lockout of Heating / Cooling	Two Stages
Zone Reset from Humidity	No
Heating / Cooling Diagnostics	Yes
Lighting Interface	No

Sequence of Operation

Digital Controller, C_1, shall modulate an economizer damper motor, DA_1, via zone bus and energize up to 2 stages each of heating or cooling to maintain a room temperature of 70°F. Economizer changeover shall be based on outdoor air temperature. The heating and cooling stages should be locked out based on 65°F or 50°F outdoor air temperature respectively.

Bill of Materials

ID	Qty.	Code Number	Description
C-1	1	AS-UNT110-1	Digital Controller
TE-1	1	TE-67NP-1B00	Zone Temperature Sensor
TE-2	1	TE-6100-2	Discharge Air Sensor
TE-3	1	TE-6001-2 TE-6000-1	Outdoor Air Sensor
S-1	1	P32AC-2	Air Flow Switch
DA-1	1	M110CGA-2	Damper Actuator
XFR-1	1	AS-XFR050-0	120/24 VAC, 50 VA Transformer

Code No. LIT-1900601
Issued July 21, 2010

TE-6800 Series

Temperature Sensors

Description

The TE-68xx-xN00S Series provides temperature sensing in room wall mount applications. It allows local setpoint temperature adjustment and temporary occupancy override.

A warmer/cooler dial is included on certain models for minor temperature adjustments from the setpoint. An occupancy override button allows the user to request a time-of-day scheduling override when the space is occupied outside of the normal occupied hours schedule. All sensors have DIP switches that enable or disable unit functions.

Depending on the model chosen, the wires connecting the sensor to the controller can be terminated using a screw terminal block or modular jack connection, offering wiring flexibility. All models include a Zone Bus access port for connecting accessories to access the 6-pin modular jack. This feature allows a technician to commission or service the controller via the sensor.

Refer to the *TE-6800 Series Temperature Sensors Product Bulletin (LIT-12011542)* for important product application information.

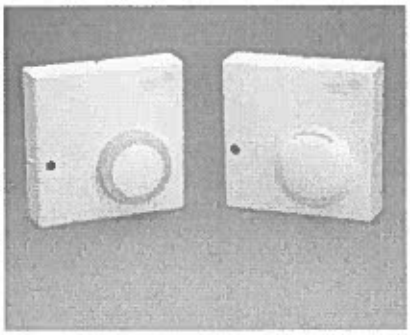
Features

- controller configuration switch — allows users to adjust room comfort and to choose occupancy features that match the application and controller
- occupancy Light-Emitting Diode (LED) indicator — displays the current operating mode of the controller (VMA1200 and VMA1400 Series controllers only)
- manual override Pushbutton (PB) — overrides time-of-day scheduling when the space is occupied outside of normal occupied hours schedule

Repair Information

Do not field repair the TE-6800 Series Temperature Sensors. As with any electrical device, keep the air vents clean and free from dust or obstruction.

If the TE-6800 Series Temperature Sensor fails to operate within its specifications, replace the unit. For a replacement sensor, contact the nearest Johnson Controls® representative.



TE-6800 Series Temperature Sensors

IMPORTANT: Do not remove the Printed Circuit Board (PCB). Removing the PCB voids the product warranty.

Selection Chart

Product Code Number	Temperature Sensing Element	Warmer/Cooler Temperature Setpoint Adjustment Override	Temperature Display	Connection	Enclosure Dimension, mm
TE-68NT-0N00S	Ni1000	No	No	Terminal Block	80 x 80
TE-68NT-1N00S	Ni1000	Yes	No	Terminal Block	80 x 80
TE-68NP-0N00S	Ni1000	No	No	Modular Jack	80 x 80
TE-68NP-1N00S	Ni1000	Yes	No	Modular Jack	80 x 80
TE-68PP-0N00S	Pt1000	No	No	Modular Jack	80 x 80
TE-68PP-1N00S	Pt1000	Yes	No	Modular Jack	80 x 80
TE-68PT-0N00S	Pt1000	No	No	Terminal Block	80 x 80
TE-68PT-1N00S	Pt1000	Yes	No	Terminal Block	80 x 80

Accessories

Product Code Number	Description
ACC-INSL-0[1]	Wallbox Mounting Pad (10/bag)
ACC-INSL-1[1]	Surface Mounting Pad (10/bag)
NS-WALLPLATE-0	Adapts a TE-6800 Sensor (80 x 80 mm) to a standard 80 x 120 mm wallbox
T-4000-119	Hex-head Adjustment Tool (30/bag)

1. These foam pads help prevent drafts from entering the unit through the wall, and make installation easier when mounting on an uneven surface.

TE-6800 Series Temperature Sensors (Continued)

Technical Specifications

TE-6800 Series Temperature Sensors		
Nickel Sensor	Temperature Sensor	1000 ohm thin-film nickel
	Temperature Coefficient	Approximately 3 ohms per F° (5.4 ohms per C°)
	Reference Resistance	1000 ohms at 70°F (21°C)
	Accuracy	±0.34F° at 70°F (±0.18C° at 21°C)
Platinum Sensor	Temperature Sensor	1000 ohm thin-film platinum
	Temperature Coefficient	Approximately 2 ohms per F° (3.9 ohms per C°)
	Reference Resistance	1000 ohms at 32°F (0°C)
	Accuracy	±0.35F° at 70°F (±0.19C° at 21°C)
Setpoint Range	Single Adjustment	Warmer/Cooler
Sensor Response Time	10 minutes at 10 feet per minute	
Field Connections	Modular Jack	8-position modular jack connector
	Terminal Block	Screw type terminals for 18 to 24 AWG wire
Zone Bus Access	6-pin connector with front bottom access for a laptop with HVAC PRO software and CVTPRO converter	
Manual Override	Integral momentary push button (DIP switch selectable)	
LED Light	Green LED light indicates two modes of operation (VMA1200 and VMA1400 Series controllers only)	
Ambient Operating Conditions	32 to 131°F (0 to 55°C) 10 to 95% RH, noncondensing; 86°F (30°C) maximum dew point	
Ambient Storage Conditions	-40 to 140°F (-40 to 60°C) 5 to 95% RH, noncondensing; 86°F (30°C) maximum dew point	
Materials	White thermoplastic	
Accessory	NS-WALLPLATE-0	Adapts a TE-6800 Sensor (80 x 80 mm) to a standard 80 x 120 mm wallbox
Dimensions (H x W x D)	3-1/4 x 3-1/4 x 1-7/16 in. (80 x 80 x 36 mm)	
Shipping Weight	1 lb (0.5 kg)	
Compliance CE	United States	UL Listed, File E107041, CCN PAZX, Under UL 916, Energy Management Equipment
	Canada	UL Listed, File E107041, CCN PAZX7, Under CAN/CSA C22.2 No. 205, Signal Equipment
	Europe	CE Mark – Johnson Controls, Inc. declares that the TE-6800 Series Temperature Sensors are in compliance with the essential requirements and other relevant provisions of the EMC Directive 2004/108/EC
	Australia and New Zealand	C-Tick Mark, Australia/NZ Emissions Compliant

Code No. LIT-1900455
Issued December 12, 2011

MS-NCE25xx-x

Network Control Engine

Description

The Metasys® Network Control Engine (NCE) Series controllers combine the network supervisor capabilities and Internet Protocol (IP) network connectivity of a Network Automation Engine (NAE) with the Input/Output (I/O) point connectivity and direct digital control capabilities of a Field Equipment Controller (FEC). NCEs provide a cost-effective solution designed for integrating central plants and large built-up air handlers into your Metasys networks.

All NCE models provide IP Ethernet network connectivity, the Metasys Site Management Portal User Interface (UI), and the network supervisory capabilities featured on NAE35/NAE45 Series network automation engines.

NCEs provide connectivity to and supervisory control of a specified field bus trunk with up to 32 field controllers. Depending on the model, an NCE supports either a BACnet® Master-Slave/Token-Passing (MS/TP) trunk, an N2 Bus trunk, or a LONWORKS® network trunk; except the MS-NCE2000-0 and MS-NCE2506-0 models, which do not provide a physical field controller trunk connection.

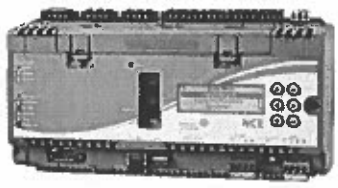
All NCE models feature 33 integral I/O points and a Sensor Actuator (SA) Bus, which allow you to increase the NCE's I/O field point capacity and also integrate NS Series Network Sensors and Variable Frequency Drives (VFDs) into your NCE application.

Some NCE models feature an integral field controller display screen with a navigation keypad. In addition, some NCE models feature an internal modem that supports standard dial-up capabilities.

Refer to the *Network Control Engine (NCE) Product Bulletin (LIT-12011283)* and the *NCE Technical Bulletin (LIT-12011267)* for important product application information.

Features

- use of commonly accepted Information Technology (IT) standards at the automation and enterprise level
- Web-based user interface
- supervision of either an N2 Bus, LONWORKS network, or BACnet MS/TP bus field controller trunk



NCE25 Network Control Engine

- multiple connection options for data access
- integral field controller with 33 I/O points
- expandable I/O point capacity, NS sensor connectivity, and VFD control on field controller SA Bus

Repair Information

If the NAE fails to operate within its specifications, refer to the *Network Control Engine (NCE) Product Bulletin (LIT-12011283)* for a list of repair parts available.

Selection Chart

Product Code Number [1]	Description
MS-NCE25xx-x (Base Features on Each NCE25)	Each NCE25 Series model requires a 24 VAC power supply and includes one RS-232-C serial port, one RS-485 optically isolated SA Bus port, one USB serial port, one Ethernet port, and an MS-BAT1020-0 Data Protection Battery. Each NCE25 Series model has 33 integral I/O points and supports up to 128 additional I/O points on the SA Bus.
MS-NCE2500-0[2]	Base features with no physical field controller trunk connection.
MS-NCE2506-0[2]	Base features with no physical field controller trunk connection. Includes integral display screen.
MS-NCE2510-0	Supports one N2 Bus trunk with up to 32 N2 devices.
MS-NCE2511-0	Supports one N2 Bus trunk with up to 32 N2 devices. Includes an internal modem.
MS-NCE2516-0	Supports one N2 Bus trunk with up to 32 N2 devices. Includes integral display screen.
MS-NCE2517-0	Supports one N2 Bus trunk with up to 32 N2 devices. Includes integral display screen and an internal modem.
MS-NCE2520-0	Supports one LONWORKS Network trunk with up to 32 LONWORKS devices.
MS-NCE2521-0	Supports one LONWORKS Network trunk with up to 32 LONWORKS devices. Includes an internal modem.
MS-NCE2526-0	Supports one LONWORKS Network trunk with up to 32 LONWORKS devices. Includes integral display screen.
MS-NCE2527-0	Supports one LONWORKS Network trunk with up to 32 LONWORKS devices. Includes integral display screen and an internal modem.
MS-NCE2560-0	Supports one MS/TP Bus trunk with up to 32 MS/TP devices.
MS-NCE2560-0U	Supports one MS/TP Bus trunk with up to 32 MS/TP devices. Note: This model is UL Listed, File S4977, UUKL 864 - 9th Edition Smoke Control Equipment.
MS-NCE2561-0	Supports one MS/TP Bus trunk with up to 32 MS/TP devices. Includes an internal modem.
MS-NCE2566-0	Supports one MS/TP Bus trunk with up to 32 MS/TP devices. Includes integral display screen.
MS-NCE2567-0	Supports one MS/TP Bus trunk with up to 32 MS/TP devices. Includes integral display screen and an internal modem.

1. Some models are also available in a Buy American version (add a G after the code number). For repair parts, add -700 after the code number.
2. NCE25 model available in Europe only.

Accessories

Product Code Number	Description (Part 1 of 2)
MS-BAT1020-0	Replacement data protection battery for NAE35, NAE45, and NCE25. Rechargeable NiMH battery: 3.6 VDC 500 mAh, with a typical life of 5 to 7 years at 21°C (70°F)
MS-BTCVT-1	Wireless Commissioning Converter, with Bluetooth® technology, for configuring and commissioning the NCE field controller and the devices on the NCE SA Bus.

Network Control Engine (Continued)

Product Code Number	Description (Part 2 of 2)
MS-DIS1710-0	Local Controller Display connects to NCE on SA Bus and provides menu display and navigation keypad for monitoring status and controlling parameters on the NCE's integral field controller. Note: A DIS1710 does not operate on NCE models that have an integral controller display.
AS-XFR100-1	Power transformer (Class 2, 24 VAC, 92 VA maximum output), with enclosure
AS-XFR010-1	Power transformer (Class 2, 24 VAC, 92 VA maximum output), no enclosure
MS-RAP-0	Ready Access Portal Server, which provides a user interface that is a natural, complementary extension of the Metasys Site Management Portal UI. Note: This option is not necessary for sites that have an ADS/ADX as the Site Director because it is provided with the ADS/ADX solution.
MS-EXPORT-0	Metasys Export Utility, which extracts historical trend, alarm, and audit data from the system and presents the historical data in a variety of formats. Note: This option is not necessary for sites that have an ADS/ADX as the Site Director because it is provided with the ADS/ADX solution.

Technical Specifications

	NCE25
Power Requirement	Dedicated nominal 24 VAC, Class 2 power supply (North America), Safety Extra-Low Voltage (SELV) power supply (Europe), at 50/60 Hz (20 VAC minimum to 30 VAC maximum)
Power Consumption	25 VA maximum for NCE25 power only Note: The 25 VA rating does not include any power supplied by the NCE to devices connected at the NCE Binary Outputs (BOs). BO devices connected to and powered by an NCE can require an additional 125 VA (maximum).
Ambient Operating Conditions	0–50°C (32–122°F); 10–90% RH, 30°C (86°F) maximum dew point
Ambient Storage Conditions	-40–70°C (-40–158°F); 5–95% RH, 30°C (86°F) maximum dew point
Data Protection Battery	Supports data protection on power failure. Rechargeable NiMH battery: 3.6 VDC 500 mAh, with a typical life of 5 to 7 years at 21°C (70°F); Product Code Number: MS-BAT1020-0
Processors	Supervisory Controller: 192 MHz Renesas™ SH4 7760 RISC processor Field Controller: 20 MHz Renesas H8S2398 processor
Memory	Supervisory Controller: 128 MB Flash nonvolatile memory for operating system, configuration data, and operations data storage and backup and 128 MB Synchronous Dynamic Random Access Memory (SDRAM) for operations data dynamic memory Field Controller: 1 MB Flash and 1 MB Random Access Memory (RAM)
Operating System	Microsoft® Windows® CE embedded
Network and Serial Interfaces (Depending on NCE model. See NCE25 Selection Chart for model information.)	One Ethernet port; 10/100 MB; 8-pin RJ-45 connector One optically isolated RS-485 port SA Bus; with a pluggable and keyed 4-position terminal block (on all NCE25 models) One optically isolated RS-485 port; with a pluggable and keyed 4-position terminal block (only on NCE25 models that support an N2 Bus or MS/TP Bus trunk) One LONWORKS port; FTT10 78 Kbps; pluggable, keyed 3-position terminal block (only on NCE25 models that support a LONWORKS Network trunk) One RS-232-C serial port with standard 9-pin sub-D connector that supports standard baud rates One USB serial port with standard USB connector Option: One 6-pin modular jack for connecting to internal modem; up to 56 Kbps
Analog Input/Analog Output Resolution and Accuracy	Analog Input Points: 16-bit resolution Analog Output Points: 16-bit resolution and ±200 mV accuracy on 0-10 VDC applications
Dimensions (Height x Width x Depth)	155 x 270 x 64 mm (6.1 x 10.6 x 2.5 in.) Minimum mounting space required: 250 x 370 x 110 mm (9.8 x 14.6 x 4.3 in.)
Housing	Plastic housing Plastic material: ABS and polycarbonate Protection: IP20 (IEC60529)
Mounting	On flat surface with screws on three mounting clips or a single 35 mm DIN rail
Shipping Weight	1.2 kg (2.7 lb)
Compliance	**United States:** UL Listed, File E107041, CCN PAZX, UL 916, Energy Management Equipment FCC Compliant to CFR47, Part 15, Subpart B, Class A
	Canada: UL Listed, File E107041, CCN PAZX7, CAN/CSA C22.2 No. 205, Signal Equipment Industry Canada Compliant, ICES-003
CE	**Europe:** CE Mark – Johnson Controls, Inc., declares that this product is in compliance with the essential requirements and other relevant provisions of the EMC Directive 2004/108/EC.
	Australia and New Zealand: C-Tick Mark, Australia/NZ Emissions Compliant
	BACnet International: BACnet Testing Laboratories™ (BTL) 135-2004 Listed BACnet Building Controller (B-BC)

Functional Devices, Inc.
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RIBU1C

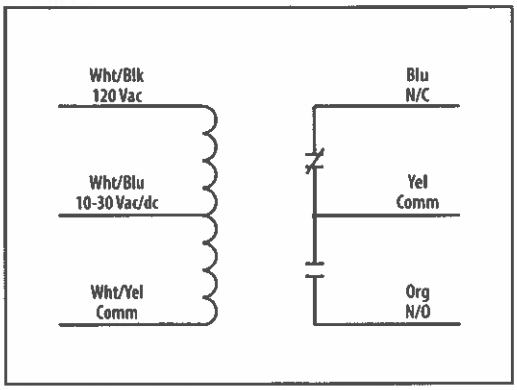
Enclosed Relay 10 Amp SPDT with 10-30 Vac/dc/120 Vac Coil

Functional Devices, Inc. A6000 2006

LISTED

MADE IN USA

Contact Ratings:
10 Amp Resistive @ 120-277 Vac
10 Amp Resistive @ 28 Vdc
480 VA Pilot Duty @ 240-277 Vac
480 VA Ballast @ 277 Vac
600 Watt Tungsten @ 120 Vac N/O
240 Watt Tungsten @ 120 Vac N/C
1/3 HP for N/O @ 120-240 Vac
1/6 HP for N/C @ 120-240 Vac
1/4 HP for N/O @ 277 Vac
1/8 HP for N/C @ 277 Vac



Coil Current:

30 mA @ 10 Vac	12 mA @ 10 Vdc
32 mA @ 12 Vac	14 mA @ 12 Vdc
42 mA @ 24 Vac	16 mA @ 24 Vdc
50 mA @ 30 Vac	18 mA @ 30 Vdc
25 mA @ 120 Vac	

Coil Voltage Input:
10-30 Vac/dc ; 120 Vac ; 50-60 Hz
Drop Out = 2.1 Vac / 2.8 Vdc
Pull In = 9 Vac / 10 Vdc

# Relays & Contact Type:	One (1) SPDT Continuous Duty Coil
Expected Relay Life:	10 million cycles minimum mechanical
Operating Temperature:	-30 to 140° F
Operate Time:	20mS
Relay Status:	LED On = Activated
Dimensions:	1.70" x 2.80" x 1.50" with .50" NPT nipple
Wires:	16", 600V Rated
Approvals:	UL Listed, UL916, UL864, UL924, C-UL California State Fire Marshal, CE
Housing Rating:	Plenum, NEMA 1
Gold Flash:	Yes
Override Switch:	No

RIBU1C-RD
- Red housing

RIBU1C-N4
- NEMA 4X housing

NOTES

Johnson Controls

Code No. LIT-1900217
Issued May 6, 2011

TE-6300 Series Temperature Sensors

Description

The TE-6300 Temperature Sensor line provides economical solutions for a wide variety of temperature sensing needs, including wall-mount, outdoor-air, duct, strap-mount, well-insertion, duct-averaging, and Variable Air Volume (VAV) flange-mount duct-probe applications. The TE-6300 line offers both a metal and a plastic enclosure for the most popular models.

Sensors are available in the following types:

- 1k ohm thin-film nickel
- 1k ohm nickel averaging
- 1k ohm thin-film platinum
- 100 ohm platinum equivalent averaging
- 1k ohm platinum equivalent averaging
- 2.2k (2,252) ohm thermistor
- 10k ohm thermistor, Johnson Controls® Type II

Each sensor is packaged with the necessary mounting accessories to maximize ordering and installation ease and reduce both commissioning time and cost.

Refer to the *TE-6300 Temperature Sensors Product Bulletin (LIT-216320)* for important product application information.

Features

- full line of versatile sensors — supports all your temperature sensing needs from a single supplier: wall mount, outdoor air, duct probe, duct averaging, strap-mount, well insertion, and flange mount duct probe
- single assembly ordering — simplifies ordering; provides a complete assembly in one box
- models featuring an integral NPT Adaptor — increase sensor connection strength, which eliminates the need for a special adaptor
- models with a stainless steel sensor probe — protect the sensor while increasing corrosion resistance
- metal enclosure (TE-63xxM Models only) — meets plenum requirements
- models featuring a retainer for the sensor holder — allow you to lock the sensor holder into the conduit box
- brushed stainless steel mounting plate — offers a durable, aesthetically-pleasing design
- low profile flush mount design — provides a tamper-proof installation ideally suited for schools, sporting complexes, retailers, prisons, and more

All TE-6300 series sensors are two-wire, passive, resistance output devices.

TE-63xxA Models

The TE-63xxA (adjustable length) models:

- provide a thermoplastic mounting flange and gland nut to adjust the length of the probe
- include two hex-head self-drilling screws for mounting
- come equipped with a 10 ft (3 m) plenum-rated cable with 1/4 in. (6.35 mm) female insulated quick-connect terminations on leads

TE-63xxF Models

The TE-63xxF (flush mount) models:

- provide a low profile when installed in an electrical box
- feature thermally isolated sensor from the wall with a foam pad
- offer a rugged stainless steel cover
- provide 22 AWG lead wires with low voltage installation

TE-63xxM Models

The TE-63xxM (metal enclosure) models:

- come with a corrosion-protected steel enclosure with a 0.88 in. (22 mm) hole for a 1/2 in. (12.7 mm) conduit fitting
- include two hex-head self-drilling screws for mounting the duct and duct averaging models
- offer (well models only) either a direct mount or 1/2-14 NPT threaded well sensor holder for mounting in TE-6300W Series thermal wells (Order the thermal well separately.)
- provide optional well sensor holders (order separately) to mount duct models in thermal wells.
- meet UL 1995 plenum use requirements
- offer optional accessory kit (order separately) to replace plastic hole plug and wiring bushing to meet International Mechanical Code (IMC) requirements

TE-63xxP Models

The TE-63xxP (plastic enclosure) models:

- provide a thermoplastic conduit box with 1/2-14 NPT female thread for connecting to conduit
- provide aluminum mounting plate and 1/2-14 NPT threaded hub mounting options for the duct and duct averaging models
- use the 1/2-14 NPT female thread to mount the Outdoor Air models directly to ridged conduit
- provide optional sensor holders (order separately) to mount duct models in thermal wells
- offer an optional accessory metal cover kit (order separately) to replace the plastic cover to meet UL 1995 plenum use requirements

TE-6300 Series Temperature Sensors

- include a replaceable sensing probe on duct probe, outdoor air, and well insertion models

TE-63x4P Wall Mount Models

The TE-63x4P (plastic enclosure) models:

- come with a white thermoplastic ventilated cover with a brushed aluminum face plate and a steel mounting plate for surface mounting
- include faceplates for both horizontal and vertical mounting
- offer an accessory mounting kit for mounting to a standard electrical box
- offer optional covers

TE-63xS Models

The TE-63xS (Strap-Mount) models:

- provide a 1/4 in. (6.35 mm) diameter stainless steel probe without an enclosure
- include three cable ties for mounting to pipe up to 2-5/8 in. (67 mm) diameter
- come equipped with a 10 ft (3 m) plenum rated cable
- meet UL 1995 plenum use requirements
- offer an accessory mounting kit for mounting to a pipe up to 11 in. (280 mm) diameter

TE-63xxV Models

The TE-63xxV (VAV flange mount) models:

- provide a stainless steel mounting flange with two hex-head self-drilling mounting screws
- come equipped with a 10 ft (3 m) plenum rated cable with 1/4 in. (6.35 mm) female insulated quick-connect terminations on leads
- meet UL 1995 plenum use requirements

Repair Information

If the TE-6300 Series Temperature Sensor fails to operate within its specifications, refer to the *TE-6300 Series Temperature Sensors Product Bulletin (LIT-216320)* for a list of repair parts available.

TE-6300 Series Temperature Sensors (Continued)

Selection Charts

Sensor	Mounting Style	Probe Length in. (mm)	Product Code Number
Nickel (1k ohm)	Adjustable[1]	8 ft (203)	TE-6311A-1
		8 ft (2.4 m)	TE-6315M-1
			TE-6315V-2[1]
		17 ft (5.2 m)	TE-6316M-1
			TE-6316V-2[1]
	Duct	4 (102)	TE-631GM-1
		8 (203)	TE-6311M-1
			TE-6311P-1
		18 (457)	TE-631JM-1
	Flange	4 (102)	TE-631GV-2
		8 (203)	TE-6311V-2
	Flush	N/A	TE-6310F-1
	Outdoor Air	3 (76)	TE-6313P-1
	Strap-Mount	3 (76)	TE-631S-1
	Wall[2]	N/A	TE-6314P-1
	Well	6 (152)	TE-631AM-2
		8 (203)	TE-6312M-1
Platinum (1k ohm)	Adjustable	8 (203)	TE-6351-A
	Duct	4 (102)	TE-635GM-1
		8 (203)	TE-6351M-1
			TE-6351P-1
		18 (457)	TE-635JM-1
	Flange	4 (102)	TE-635GV-2
		8 (203)	TE-6351V-2
	Flush	N/A	TE-6350F-1
	Strap-Mount	3 (76)	TE-635S-1
	Outdoor Air	3 (76)	TE-6353P-1
	Wall[2]	N/A	TE-6324P-1
	Well	6 (152)	TE-635AM-2
		8 (203)	TE-6352M-1
Platinum Equivalent	1k ohm Averaging[1]	10 ft (3 m)	TE-6327P-1
		20 ft (6.1 m)	TE-6328P-1
	100 ohm Averaging[1]	10 ft (3 m)	TE-6337P-1
		20 ft (6.1 m)	TE-6338P-1
Thermistor (2.2k ohm)	Adjustable	8 (203)	TE-6341A-1
	Duct	8 (203)	TE-6341P-1
	Flange	4 (102)	TE-634GV-2
		8 (203)	TE-6341V-2
	Outdoor Air	3 (76)	TE-6343P-1
	Wall[2]	N/A	TE-6344P-1
	Well	8 (203)	TE-6342M-1
		6 (152)	TE-634AM-2
Thermistor (10k ohm) Type II	Adjustable	8 (203)	TE-6361A-1
	Duct	4 (102)	TE-636GM-1
		8 (203)	TE-6361M-1
			TE-6361P-1
		18 (457)	TE-636JM-1
	Flange	4 (102)	TE-636GV-2
		8 (203)	TE-6361V-2
	Flush	N/A	TE-6360F-1
	Outdoor Air	3 (76)	TE-6363P-1
	Strap-Mount	3 (76)	TE-636S-1
	Well	6 (152)	TE-636AM-2
		8 (203)	TE-6362M-1

1. Two TE-6001-8 Element Holders come with the platinum equivalent averaging sensors. Order separately to use with a nickel averaging sensor.
2. Order the TE-1800-9600 Mounting Hardware separately to mount the wall unit to a wallbox.

Optional Accessories

Product Code Number	Description
F-1000-182	Thermal Conductive Grease for element wells (8 oz.)
T-4000-xxxx	Wall Mount Cover
T-4000-119	Allen Head Tool for Wall Mount Cover Screws (order in multiples of 30)
TE-1800-9600	Mounting Hardware for mounting the wall mount unit to a wall box
TE-6001-8	Element Holder for mounting an averaging sensor (order in multiples of 10)
TE-6001-13	Metal Cover and Gasket Kit (5 per package)
TE-6300-101	12 in. (305 mm) (1k ohm) Nickel Probe (cut to an appropriate length)[1]
TE-6300-105	12 in. (305 mm) (1k ohm) Platinum Class A Probe (cut to an appropriate length)[1]
TE-6300-103	1/2-14 NPT Plastic Sensor Holder without retainer (order in multiples of 10)
TE-6300-104	12 in. (305 mm) (2.2k ohm) Thermistor Probe (cut to an appropriate length)[1]
TE-6300-613	IMC Kit, Metal Knockout Plug, Metal Clamp Connector (order in multiples of 10)
TE-6300-614	Cable Tie Mounting Kit, 0.50 to 2.625 in. (12.7 to 66.7 mm) Bundle Diameter (10 per package)
TE-6300-615	Cable Tie Mounting Kit, 11 in. (280 mm) Max Bundle Diameter
TE-6300-616	8 in. (203 mm) 1k ohm Platinum Class A Probe
TE-6300-617	3 in. (76 mm) 1k ohm Platinum Class A Probe
TQ-6000-1	4 to 20 mA Output Transmitter for use with the 100 ohm platinum sensor
TE-6300W-102	6 in. (152 mm) Stainless Steel Well (direct mount)
TE-6300W-101	6 in. (152 mm) Brass Well (direct mount with thermal grease included)
TE-6300W-110	8 in. (203 mm) Stainless Steel Well

1. Cut 12 in. probes to a minimum of 3 in. (76 mm).

TE-6300 Series Temperature Sensors (Continued)

T-4000 Covers Available for the Wall Mount TE-63x4P Series

Product Code Number	Horizontal Johnson Controls Logo	Vertical Johnson Controls Logo	Thermometer, with °F/°C Scale	Faceplate/Cover Color
T-4000-2138[1]	—	—	—	Brushed Aluminum/Beige
T-4000-2139	X	—	—	
T-4000-2140	X	—	X	
T-4000-2144	—	X	—	
T-4000-2639	X	—	—	Brown and Gold/Beige
T-4000-2640	X	—	X	
T-4000-2644	—	X	—	
T-4000-3139	X	—	—	Brushed Aluminum/White
T-4000-3140	X	—	X	
T-4000-3144	—	X	—	

1. Without Johnson Controls logo

Technical Specifications

TE-6300 Series Temperature Sensors (Part 1 of 2)		
Sensor Reference Resistance	1k ohm Nickel	1k ohms at 70°F (21°C)
	1k ohm Nickel Averaging	
	1k ohm Platinum	1k ohms at 32°F (0°C)
	100 ohm Platinum Averaging	100 ohms at 32°F (0°C)
	1k ohm Platinum Averaging	1k ohms at 32°F (0°C)
	2.2k ohm Thermistor	2,252 ohms at 77°F (25°C)
	10k ohm Thermistor	10.0k ohms at 77°F (25°C)
Sensor Accuracy	1k ohm Nickel	±0.34F° at 70°F (±0.19C° at 21°C)
	1k ohm Nickel Averaging	±3.4F° at 70°F (±1.9C° at 21°C)
	1k ohm Platinum Class A	±0.35F° at 70°F (±0.19C° at 21°C), DIN Class A
	1k ohm Platinum Class B	±0.73F° at 70°F (±0.41C° at 21°C), DIN Class B
	100 ohm Platinum Averaging	±1.0F°at 70°F (± 0.58C° at 21°C)
	1k ohm Platinum Averaging	
	2.2k ohm Thermistor	±0.36F° (±0.2C°) in the range: 32 to 158°F (0 to 70°C)
	10k ohm Thermistor	±0.9F° (±0.5C°) in the range: 32 to 158°F (0 to 70°C)
Sensor Temperature Coefficient	1k ohm Nickel	Approximately 3 ohms/F° (5.4 ohms/C°)
	1k ohm Nickel Averaging	
	1k ohm Platinum	Approximately 2 ohms/F° (3.9 ohms/C°) 3850 ppm/K
	100 ohm Platinum Averaging	Approximately 0.2 ohms/F° (0.39 ohms/C°)
	1k ohm Platinum Averaging	Approximately 2 ohms/F° (3.9 ohms/C°)
	2.2k ohm Thermistor	Nonlinear, Negative Temperature Coefficient (NTC)
	10k ohm Thermistor	Nonlinear NTC, Johnson Controls Type II
Electrical Connection	TE-63xxM	22 AWG (0.6 mm diameter) x 6 in. (152 mm) long
	TE-63xxP	
	TE-63xxF-1	22 AWG (0.6 mm diameter) x 12 ft (3 m) braided-copper wires, low voltage insulation, half-stripped ends
	TE-63xxP Nickel Averaging	18 AWG (1.0 mm diameter) x 6 in. (152 mm) long
	TE-63xS	22 AWG (0.6 mm diameter) x 10 ft (3 m) long plenum-rated cable
	TE-63xxA, TE-63xxV	22 AWG (0.6 mm diameter) x 10 ft (3 m) long plenum-rated cable with 0.25 in. (6.35 mm) female quick-connect terminals

TE-6300 Series Temperature Sensors (Continued)

TE-6300 Series Temperature Sensors (Part 2 of 2)		
Materials	**Probes**	Nickel Averaging: 0.094 in. (2.4 mm) Outside Diameter (O.D.) copper tubing Nickel Averaging Adaptor: 0.25 in. (6.35 mm) O.D. Brass Platinum Averaging Probe: 0.19 in. (4.8 mm) Aluminum tubing All others (except Averaging): 0.25 in. (6.35 mm) O.D. Stainless Steel
	TE-63xxA	Mounting Adapter Plate and Gland: Thermoplastic
	TE-63xxF-1	Flush Mount: Stainless Steel
	TE-63xxM	Enclosure: Corrosion-Protected Steel Well Sensor Holder: 0.875 in. (22.2 mm) Hex Brass
	TE-63xxP	Conduit box and Shield: Rigid Thermoplastic Mounting Plate: Aluminum Sensor Holder: Rigid Thermoplastic Wall Mount Base Plate: Corrosion-Protected Steel Wall Mount Cover: Rigid Thermoplastic (White) Wall Mount Face Plate: Brushed Aluminum
	TE-63xxV	Mounting Flange: Stainless Steel
Operating Conditions	**TE-63xxA**	-50 to 140°F (-46 to 60°C)
	TE-63xxF	32 to 104°F (0 to 40°C)
	TE-63xxM	-50 to 220°F (-46 to 104°C)
	TE-63xxP	Enclosure: -50 to 122°F (-46 to 50°C) Sensor Probe: -50 to 220°F (-46 to 104°C)
	TE-63xS	Sensor Probe: -50 to 220°F (-46 to 104°C) Wire Harness: -50 to 122°F (-46 to 50°C)
	TE-63xxV	
Shipping Weight	**TE-63xxA**	0.2 lb (0.09 kg)
	TE-63xxF	0.25 lb (113.4 kg)
	TE-63xxM	Duct Averaging: 0.9 lb (0.41 kg) Duct Mount: 0.4 lb (0.18 kg) Well Insertion: 0.5 lb (0.23 kg)
	TE-63xxP	Duct Averaging: 0.5 lb (0.23 kg) Duct Mount: 0.4 lb (0.18 kg) Outdoor Air: 0.5 lb (0.23 kg) Wall Mount: 0.2 lb (0.09 kg) Well Insertion: 0.35 lb (0.16 kg)
	TE-63xS	Strap-Mount: 0.2 lb (0.09 kg)
	TE-63xxV	Duct Averaging: 0.7 lb (0.32 kg) Duct Mount: 0.2 lb (0.09 kg)
Dimensions (H x W x D)	**TE-63xxA**	2.17 in. (55 mm) diameter plus 4 or 8 in. (102 or 203 m) element
	TE-63xxF	Flush Mount: 4.50 x 2.75 in. (114.3 x 69.85 mm)
	TE-63xxM	Duct Averaging: 1.87 x 1.87 x 1.80 in. (47.5 x 47.5 x 45.8 mm) plus 8 or 17 ft (2.4 or 5.2 m) element Duct Mount: 1.87 x 1.87 x 1.80 in. (47.5 x 47.5 x 45.8 mm) plus 4, 8, or 18 in. (102, 203, or 457 mm) element Well Insertion: 1.87 x 1.87 x 1.80 in. (47.5 x 47.5 x 45.8 mm) plus 6 or 8 in. (152 or 203 mm) element
	TE-63xxP	Duct Averaging: 5.97 x 1.38 x 2.75 in. (152 x 35 x 70 mm) plus 8, 10, 17, or 20 ft (2.4, 3.0, 5.2, or 6.1 m) element Duct Mount: 5.97 x 1.38 x 2.75 in. (152 x 35 x 70 mm) plus 6 or 8 in. (152 or 203 mm) probe Outdoor Air: 5.97 x 3.47 x 4.46 in. (152 x 88 x 113 mm) Wall Mount: 2.09 x 3.12 x 1.80 in. (53 x 79 x 46 mm) Well Insertion: 5.97 x 1.38 x 2.75 in. (152 x 35 x 70 mm) plus 6 or 8 in. (152 or 203 mm) probe
	TE-63xS	Strap-Mount: 0.25 in. (6.35 mm) diameter x 3.00 in. (76 mm.) long
	TE-63xxV	Duct Averaging: 2.25 x 1.50 in. (57 x 38 mm) plus 8 or 17 ft (2.4 or 5.2 m) element Duct Mount: 2.25 x 1.50 in. (57 x 38 mm) plus 4 or 8 in. (102 or 203 m) element

TE-68xx-xN00S

TE-6800 Series Temperature Sensors

Description

The TE-68xx-xN00S Series provides temperature sensing in room wall mount applications. It allows local setpoint temperature adjustment and temporary occupancy override.

A warmer/cooler dial is included on certain models for minor temperature adjustments from the setpoint. An occupancy override button allows the user to request a time-of-day scheduling override when the space is occupied outside of the normal occupied hours schedule. All sensors have DIP switches that enable or disable unit functions.

Depending on the model chosen, the wires connecting the sensor to the controller can be terminated using a screw terminal block or modular jack connection, offering wiring flexibility. All models include a Zone Bus access port for connecting accessories to access the 6-pin modular jack. This feature allows a technician to commission or service the controller via the sensor.

Refer to the *TE-6800 Series Temperature Sensors Product Bulletin (LIT-12011542)* for important product application information.

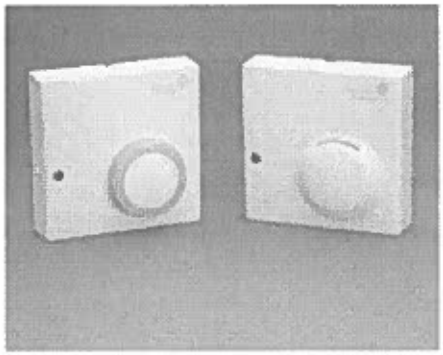
Features

- controller configuration switch — allows users to adjust room comfort and to choose occupancy features that match the application and controller
- occupancy Light-Emitting Diode (LED) indicator — displays the current operating mode of the controller (VMA1200 and VMA1400 Series controllers only)
- manual override Pushbutton (PB) — overrides time-of-day scheduling when the space is occupied outside of normal occupied hours schedule

Repair Information

Do not field repair the TE-6800 Series Temperature Sensors. As with any electrical device, keep the air vents clean and free from dust or obstruction.

If the TE-6800 Series Temperature Sensor fails to operate within its specifications, replace the unit. For a replacement sensor, contact the nearest Johnson Controls® representative.



TE-6800 Series Temperature Sensors

IMPORTANT: Do not remove the Printed Circuit Board (PCB). Removing the PCB voids the product warranty.

Selection Chart

Product Code Number	Temperature Sensing Element	Warmer/Cooler Temperature Setpoint Adjustment Override	Temperature Display	Connection	Enclosure Dimension, mm
TE-68NT-0N00S	Ni1000	No	No	Terminal Block	80 x 80
TE-68NT-1N00S	Ni1000	Yes	No	Terminal Block	80 x 80
TE-68NP-0N00S	Ni1000	No	No	Modular Jack	80 x 80
TE-68NP-1N00S	Ni1000	Yes	No	Modular Jack	80 x 80
TE-68PP-0N00S	Pt1000	No	No	Modular Jack	80 x 80
TE-68PP-1N00S	Pt1000	Yes	No	Modular Jack	80 x 80
TE-68PT-0N00S	Pt1000	No	No	Terminal Block	80 x 80
TE-68PT-1N00S	Pt1000	Yes	No	Terminal Block	80 x 80

Accessories

Product Code Number	Description
ACC-INSL-0[1]	Wallbox Mounting Pad (10/bag)
ACC-INSL-1[1]	Surface Mounting Pad (10/bag)
NS-WALLPLATE-0	Adapts a TE-6800 Sensor (80 x 80 mm) to a standard 80 x 120 mm wallbox
T-4000-119	Hex-head Adjustment Tool (30/bag)

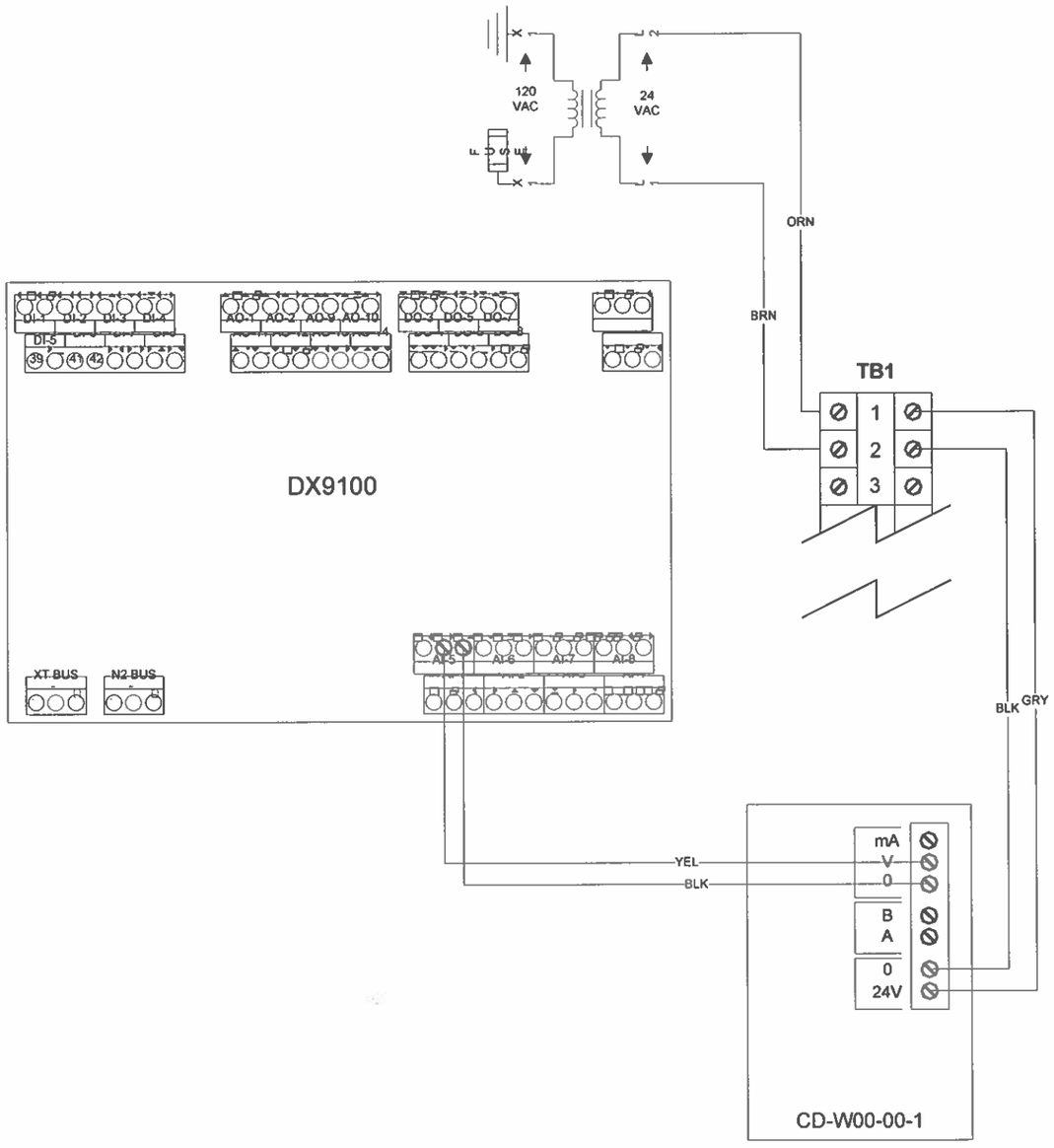
1. These foam pads help prevent drafts from entering the unit through the wall, and make installation easier when mounting on an uneven surface.

TE-6800 Series Temperature Sensors (Continued)

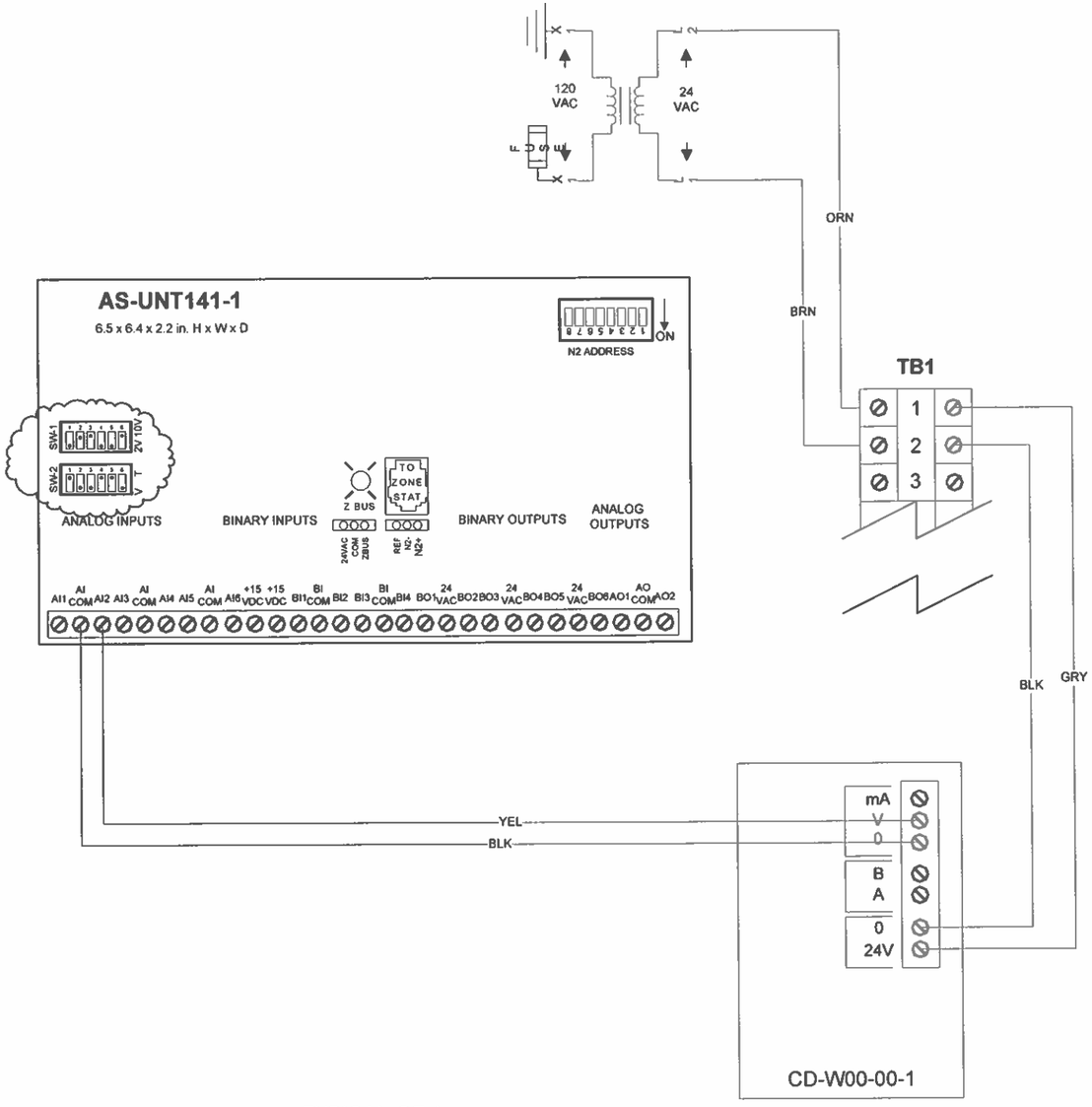
Technical Specifications

TE-6800 Series Temperature Sensors

Nickel Sensor	Temperature Sensor	1000 ohm thin-film nickel
	Temperature Coefficient	Approximately 3 ohms per F° (5.4 ohms per C°)
	Reference Resistance	1000 ohms at 70°F (21°C)
	Accuracy	±0.34F° at 70°F (±0.18C° at 21°C)
Platinum Sensor	Temperature Sensor	1000 ohm thin-film platinum
	Temperature Coefficient	Approximately 2 ohms per F° (3.9 ohms per C°)
	Reference Resistance	1000 ohms at 32°F (0°C)
	Accuracy	±0.35F° at 70°F (±0.19C° at 21°C)
Setpoint Range	Single Adjustment	Warmer/Cooler
Sensor Response Time	10 minutes at 10 feet per minute	
Field Connections	Modular Jack	8-position modular jack connector
	Terminal Block	Screw type terminals for 18 to 24 AWG wire
Zone Bus Access	6-pin connector with front bottom access for a laptop with HVAC PRO software and CVTPRO converter	
Manual Override	Integral momentary push button (DIP switch selectable)	
LED Light	Green LED light indicates two modes of operation (VMA1200 and VMA1400 Series controllers only)	
Ambient Operating Conditions	32 to 131°F (0 to 55°C) 10 to 95% RH, noncondensing; 86°F (30°C) maximum dew point	
Ambient Storage Conditions	-40 to 140°F (-40 to 60°C) 5 to 95% RH, noncondensing; 86°F (30°C) maximum dew point	
Materials	White thermoplastic	
Accessory	NS-WALLPLATE-0	Adapts a TE-6800 Sensor (80 x 80 mm) to a standard 80 x 120 mm wallbox
Dimensions (H x W x D)	3-1/4 x 3-1/4 x 1-7/16 in. (80 x 80 x 36 mm)	
Shipping Weight	1 lb (0.5 kg)	
Compliance	United States	UL Listed, File E107041, CCN PAZX, Under UL 916, Energy Management Equipment
	Canada	UL Listed, File E107041, CCN PAZX7, Under CAN/CSA C22.2 No. 205, Signal Equipment
CE	Europe	CE Mark – Johnson Controls, Inc. declares that the TE-6800 Series Temperature Sensors are in compliance with the essential requirements and other relevant provisions of the EMC Directive 2004/108/EC
	Australia and New Zealand	C-Tick Mark, Australia/NZ Emissions Compliant



TYPICAL OF 6



TYPICAL OF 4

Drawing Title: **AHU Wiring Details**						
	REFERENCE DRAWING	NO	REVISION-LOCATION	ECN	DATE	BY
	Sales Engineer / Project Manager / Application Engineer	DRAWN BY / DATE	APPROVED BY / DATE			
Project Title: **Seating Bowl CO2 Monitoring Demand Control Ventilation**	Johnson Controls	Branch Information	CONTRACT NUMBER: **00120002**	DRAWING NUMBER: **1.2**		

SEQUENCE OF OPERATIONS

Mechanical ventilation of the seating bowl is required at any time that the operable roof is in the CLOSED position and public access to the ballpark seating areas is open (generally 1.5 hours prior to first pitch). The only exception to this is when operating in "Bowl Heating" mode, as mechanical ventilation is provided in the course of operating in heating mode.

Seating Bowl Carbon Dioxide (CO2) levels are measured at ten locations throughout the ballpark. For the purposes of the demand control ventilation sequence, the control value will be based on an average of these ten sensors.

Seating "Bowl Ventilation" mode is enabled and disabled through the Metasys BAS.

When the roof is in the CLOSED position and Average Bowl CO2 is below 950 PPM, the seating bowl AHU economizer minimum damper positions are set to 66% of design condition (as defined by ASHRAE 62.1 – see Table 1), and the primary bowl AHU's (AH-F01, AH-F02, AH-F03, AH-F04, AH-F05, AH-F06, AH-TB01, AH-TB02, AH-TB03 & AH-TB04 will go to the Occupied mode.

When Average Bowl CO2 is greater than 950 PPM, the seating bowl AHU economizer minimum damper positions are set to 82% of design condition (as defined by ASHRAE 62.1 – see Table 1). The primary bowl AHU's will continue to operate and the 100% OA Club seating bowl AHU's (AH-T01 & AH-T02) will go to the Occupied mode. If at any time the average bowl CO2 levels decline below 950 PPM, the Club seating bowl AHU's (AH-T01 & AH-T02) will return to the Unoccupied mode, and the sating bowl AHU economizer minimum damper positions will be returned to 66% of design condition (See Table 1).

When Average Bowl CO2 is greater than 1,000 PPM, the seating bowl air handling unit economizer minimum damper positions are set to 100% of design condition (as defined by ASHRAE 62.1 - see Table 1). The primary bowl AHU's and Club seating bowl AHU's will continue to operate and the 100% OA Terrace seating bowl AHU's (AH-TB05 & AH-TB06) will go to the Occupied mode. If at any time the average bowl CO2 levels decline below 1,000 PPM, the Terrace seating bowl AHU's (AH-TB05 & AH-TB06) will return to the Unoccupied mode, and the sating bowl AHU economizer minimum damper positions will be returned to 82% of design condition (See Table 1).

If at any time during "Bowl Ventilation" mode the roof is moved to the OPEN position, bowl ventilation mode is to be disabled through the Metasys BAS.

If at any time during "Bowl Heating" mode the seating bowl becomes satisfied (based on meeting "Bowl Cycle Temperature Setpoint" and bowl AHU's begin to cycle to the Unoccupied mode, "Bowl Ventilation" mode must be enabled through the Metasys BAS to ensure proper mechanical ventilation of the seating bowl.

TABLE 1

	AVG-CO2 <950 PPM (MIN-DPR 66% design)	AVG-CO2 >950 PPM (MIN-DPR 82% design)	AVG-CO2 >1000 PPM (MIN-DPR 100% design)
AH-F01	30%	37%	45%
AH-F02	23%	29%	35%
AH-F03	26%	33%	40%
AH-F04	26%	33.2	40%
AH-F05	33%	41%	50%
AH-F06	23%	29%	35%
AH-TB01	17%	21%	25%
AH-TB02	36%	45%	54%
AH-TB03	30%	37%	45%
AH-TB04	24%	30%	37%

Drawing Title
Sequence of Operations

REFERENCE DRAWING	NO	REVISION-LOCATION	ECN	DATE	BY

Sales Engineer | Project Manager | Application Engineer | DRAWN BY / DATE | APPROVED BY / DATE

Project Title
Seating Bowl CO2 Monitoring Demand Control Ventilation

Johnson Controls

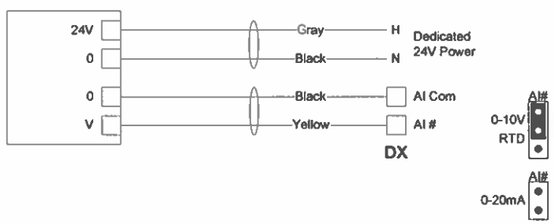
Branch Information

CONTRACT NUMBER
00120002

DRAWING NUMBER
1.3

Electrician/Fitter	Point Information				Controller Information							Panel Information					Intermediate Device				Field Device					
Tag	Point Type	System Name	Object Name	Expanded ID	Controller Details	Trunk Type	Trunk Nbr	Trunk Addr.	Cable Destination Bay/Terminal	Module Type	Termination Out	Panel	Panel Location	Slot Number	Reference Drawing	Cable Number	Wiring /Tubing	Termination In	Device	Termination Out	Location	Wiring /Tubing	Termination In	Device	Location	Ref Detail Shape	Comment
		AH-F01			DX 9100							EN-1	Mech Room		M12												Power to Controller
		AH-F01			DX 9100	N2	1	141				EN-1	Mech Room	0	M12												N2 Trunk
	DO-3	AH-F01			DX 9100	N2	1	141	DO-3			EN-1	Mech Room	0	M12	1-141-DO-3											
	DO-4	AH-F01			DX 9100	N2	1	141	DO-4			EN-1	Mech Room	0	M12	1-141-DO-4											
	DO-5	AH-F01			DX 9100	N2	1	141	DO-5			EN-1	Mech Room	0	M12	1-141-DO-5											
	DO-6	AH-F01	IDF-C	Induction Fan Command	DX 9100	N2	1	141	DO-6			EN-1	Mech Room	0	M12	1-141-DO-6											
	DO-7	AH-F01	SEDPR-C	Smoke Exhaust Damper	DX 9100	N2	1	141	DO-7			EN-1	Mech Room	0	M12	1-141-DO-7											
	DO-8	AH-F01	CoolDown	Cool Down Heater	DX 9100	N2	1	141	DO-8			EN-1	Mech Room	0	M12	1-141-DO-8											
	DI-1	AH-F01			DX 9100	N2	1	141	DI-1			EN-1	Mech Room	0	M12	1-141-DI-1											
	DI-2	AH-F01			DX 9100	N2	1	141	DI-2			EN-1	Mech Room	0	M12	1-141-DI-2											
	DI-3	AH-F01			DX 9100	N2	1	141	DI-3			EN-1	Mech Room	0	M12	1-141-DI-3											
	DI-4	AH-F01	Gas2Hot	Gas Heater Too Hot Stat	DX 9100	N2	1	141	DI-4			EN-1	Mech Room	0	M12	1-141-DI-4											
	DI-5	AH-F01	IP-S	Induction Fan Status	DX 9100	N2	1	141	DI-5			EN-1	Mech Room	0	M12	1-141-DI-5											
	DI-6	AH-F01	HI-SP	Hi Static Pressure Alarm	DX 9100	N2	1	141	DI-6			EN-1	Mech Room	0	M12	1-141-DI-6											
	DI-7	AH-F01	LT-ALM	Low Temperature Alarm	DX 9100	N2	1	141	DI-7			EN-1	Mech Room	0	M12	1-141-DI-7											
	DI-8	AH-F01	SMK-ALM	Smoke Alarm	DX 9100	N2	1	141	DI-8			EN-1	Mech Room	0	M12	1-141-DI-8											
	AI-1	AH-F01			DX 9100	N2	1	141	AI-1			EN-1	Mech Room	0	M12	1-141-AI-1											
	AI-2	AH-F01			DX 9100	N2	1	141	AI-2			EN-1	Mech Room	0	M12	1-141-AI-2											
	AI-3	AH-F01			DX 9100	N2	1	141	AI-3			EN-1	Mech Room	0	M12	1-141-AI-3											
	AI-4	AH-F01	RA2-T	Return Air Temp. 2	DX 9100	N2	1	141	AI-4			EN-1	Mech Room	0	M12	1-141-AI-4											
	AI-5	AH-F01	MA-T	Mixed Air Temperature	DX 9100	N2	1	141	AI-5			EN-1	Mech Room	0	M12	1-141-AI-5											
	AI-6	AH-F01	FLS8-CO2	FL S8 Carbon Dioxide	DX 9100	N2	1	141	AI-6		AI6,AICom,24VAC,COM	EN-1	Mech Room	0	M12	1-141-AI-6						2/22 / 2/18	OUT, GND, 24V	CD-W00 CO2 (Vdc)		D122	
	AI-7	AH-F01			DX 9100	N2	1	141	AI-7			EN-1	Mech Room	0	M12	1-141-AI-7											
	AI-8	AH-F01			DX 9100	N2	1	141	AI-8			EN-1	Mech Room	0	M12	1-141-AI-8											
	AO-1	AH-F01	MA-DPR	Mixed Air Dampers %	DX 9100	N2	1	141	AO-1			EN-1	Mech Room	0	M12	1-141-AO-1											
	AO-2	AH-F01	HTG1-O	Heating Stage 1 %	DX 9100	N2	1	141	AO-2			EN-1	Mech Room	0	M12	1-141-AO-2											
	AO-9	AH-F01	HTG2-O	Heating Stage 2 %	DX 9100	N2	1	141	AO-9			EN-1	Mech Room	0	M12	1-141-AO-9											
	AO-10	AH-F01			DX 9100	N2	1	141	AO-10			EN-1	Mech Room	0	M12	1-141-AO-10											
	AO-11	AH-F01			DX 9100	N2	1	141	AO-11			EN-1	Mech Room	0	M12	1-141-AO-11											
	AO-12	AH-F01			DX 9100	N2	1	141	AO-12			EN-1	Mech Room	0	M12	1-141-AO-12											
	AO-13	AH-F01			DX 9100	N2	1	141	AO-13			EN-1	Mech Room	0	M12	1-141-AO-13											
	AO-14	AH-F01			DX 9100	N2	1	141	AO-14			EN-1	Mech Room	0	M12	1-141-AO-14											
		AH-F01			XT (Expansion Module)							EN-1	Mech Room		M12												Power to Controller
		AH-F01			XT (Expansion	N2	1	142				EN-1	Mech Room	0	M12												N2 Trunk
	XT1DI1	AH-F01	OADPR-S	Discharge Air Dampers	XP 9104 (4DI,	N2	1	142	DI-1			EN-1	Mech Room	0	M12	1-142A-DI-1											
	XT1DI2	AH-F01	EADPR-S	Exhaust Air Dampers	XP 9104 (4DI,	N2	1	142	DI-2			EN-1	Mech Room	0	M12	1-142A-DI-2											
	XT1DI3	AH-F01	OADPR-S	Outside Air Dampers	XP 9104 (4DI,	N2	1	142	DI-3			EN-1	Mech Room	0	M12	1-142A-DI-3											
	XT1DI4	AH-F01	RADPR-S	Return Air Dampers	XP 9104 (4DI,	N2	1	142	DI-4			EN-1	Mech Room	0	M12	1-142A-DI-4											
	XT1DO5	AH-F01	SFSTO-C	Supply Fan Stop Command	XP 9104 (4DI,	N2	1	142	DO-5			EN-1	Mech Room	0	M12	1-142A-DO-5											
	XT1DO6	AH-F01	SFSTA-C	Supply Fan Start Command	XP 9104 (4DI,	N2	1	142	DO-6			EN-1	Mech Room	0	M12	1-142A-DO-6											
	XT1DO7	AH-F01	CADPR-C	Combustion Air Damper	XP 9104 (4DI,	N2	1	142	DO-7			EN-1	Mech Room	0	M12	1-142A-DO-7											
	XT1DO8	AH-F01	EFF05-C	Toilet Exh. F05 Command	XP 9104 (4DI,	N2	1	142	DO-8			EN-1	Mech Room	0	M12	1-142A-DO-8											
	XT2DI1	AH-F01	CADPR-S	Combustion Air Dampers	XP 9104 (4DI,	N2	1	142	DI-1			EN-1	Mech Room	0	M12	1-142B-DI-1											
	XT2DI2	AH-F01	IDFVSD-S	Induction VFD Status	XP 9104 (4DI,	N2	1	142	DI-2			EN-1	Mech Room	0	M12	1-142B-DI-2											
	XT2DI3	AH-F01			XP 9104 (4DI,	N2	1	142	DI-3			EN-1	Mech Room	0	M12	1-142B-DI-3											
	XT2DI4	AH-F01	EFF05-S	Toilet Exhaust F05 Stat	XP 9104 (4DI,	N2	1	142	DI-4			EN-1	Mech Room	0	M12	1-142B-DI-4											
	XT2DO5	AH-F01	UH2704-D	Unit Heater 2704 Disable	XP 9104 (4DI,	N2	1	142	DO-5			EN-1	Mech Room	0	M12	1-142B-DO-5											
	XT2DO6	AH-F01	UH2706-D	Unit Heater 2706 Disable	XP 9104 (4DI,	N2	1	142	DO-6			EN-1	Mech Room	0	M12	1-142B-DO-6											
	XT2DO7	AH-F01	UH3801-D	Unit Heater 3801 Disable	XP 9104 (4DI,	N2	1	142	DO-7			EN-1	Mech Room	0	M12	1-142B-DO-7											
	XT2DO8	AH-F01	UH3802-D	Unit Heater 3802 Disable	XP 9104 (4DI,	N2	1	142	DO-8			EN-1	Mech Room	0	M12	1-142B-DO-8											

DETAIL D122 VOLTAGE INPUT from CD-W00 CO2 SENSOR



Drawing Title
AH-F01 Point Schedule

REFERENCE DRAWING	NO	REVISION-LOCATION	ECN	DATE	BY

Sales Engineer	Project Manager	Application Engineer	DRAWN BY	DRAWN DATE	APPROVED BY	APPROVED DATE

Project Title
Seating Bowl CO2 Monitoring Demand Control Ventilation

Johnson Controls

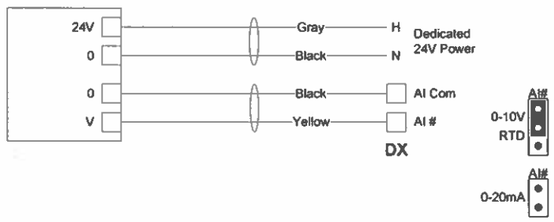
Branch Information

CONTRACT NUMBER
00120002

DRAWING NUMBER
1.4

Electrician/Fitter	Point Information				Controller Information							Panel Information					Intermediate Device					Field Device					
Tag	Point Type	System Name	Object Name	Expanded ID	Controller Details	Trunk Type	Trunk Nbr	Trunk Addr.	Cable Destination Bay/Terminal	Module Type	Termination Out	Panel	Panel Location	Slot Number	Reference Drawing	Cable Number	Wiring /Tubing	Termination In	Device	Termination Out	Location	Wiring /Tubing	Termination In	Device	Location	Ref Detail Shape	Comment
		AH-F02			DX 9100	N2	1	143				EN-1	Mech Room	0	M12												N2 Trunk
	DO-3	AH-F02	SF-C	Supply Fan Command	DX 9100	N2	1	143	DO-3			EN-1	Mech Room	0	M12	1-143-DO-3											
	DO-4	AH-F02	HTG-C	Heating Command	DX 9100	N2	1	143	DO-4			EN-1	Mech Room	0	M12	1-143-DO-4											
	DO-5	AH-F02	UH2606-D	Unit Heater 2606 Disable	DX 9100	N2	1	143	DO-5			EN-1	Mech Room	0	M12	1-143-DO-5											
	DO-6	AH-F02	IDF-C	Induction Fan Command	DX 9100	N2	1	143	DO-6			EN-1	Mech Room	0	M12	1-143-DO-6											
	DO-7	AH-F02	SEDPR-C	Smoke Exhaust Damper Cmc	DX 9100	N2	1	143	DO-7			EN-1	Mech Room	0	M12	1-143-DO-7											
	DO-8	AH-F02	CoolDown	Cool Down Heater	DX 9100	N2	1	143	DO-8			EN-1	Mech Room	0	M12	1-143-DO-8											
	DI-1	AH-F02	SF-S	Supply Fan Status	DX 9100	N2	1	143	DI-1			EN-1	Mech Room	0	M12	1-143-DI-1											
	DI-2	AH-F02	HTG-S	Heating Status	DX 9100	N2	1	143	DI-2			EN-1	Mech Room	0	M12	1-143-DI-2											
	DI-3	AH-F02	CADPR-S	Combination Air Damper	DX 9100	N2	1	143	DI-3			EN-1	Mech Room	0	M12	1-143-DI-3											
	DI-4	AH-F02	Gas2Hot	Gas Burner Too Hot Stat	DX 9100	N2	1	143	DI-4			EN-1	Mech Room	0	M12	1-143-DI-4											
	DI-5	AH-F02	IP-S	Inducer Pressure Status	DX 9100	N2	1	143	DI-5			EN-1	Mech Room	0	M12	1-143-DI-5											
	DI-6	AH-F02	HI-SP	High Static Pressure	DX 9100	N2	1	143	DI-6			EN-1	Mech Room	0	M12	1-143-DI-6											
	DI-7	AH-F02	LT-ALM	Freeze Stat Alarm	DX 9100	N2	1	143	DI-7			EN-1	Mech Room	0	M12	1-143-DI-7											
	DI-8	AH-F02	SMK-ALM	Smoke Alarm	DX 9100	N2	1	143	DI-8			EN-1	Mech Room	0	M12	1-143-DI-8											
	AI-1	AH-F02	DA-T	Discharge Air Temp	DX 9100	N2	1	143	AI-1			EN-1	Mech Room	0	M12	1-143-AI-1											
	AI-2	AH-F02	RA1-T	Return Air Temperature 1	DX 9100	N2	1	143	AI-2			EN-1	Mech Room	0	M12	1-143-AI-2											
	AI-3	AH-F02	RA2-T	Return Air Temperature 2	DX 9100	N2	1	143	AI-3			EN-1	Mech Room	0	M12	1-143-AI-3											
	AI-4	AH-F02	MA-T	Mixed Air Temp	DX 9100	N2	1	143	AI-4			EN-1	Mech Room	0	M12	1-143-AI-4											
	AI-5	AH-F02	FLS5-CO2	FL S5 Carbon Dioxide	DX 9100	N2	1	143	AI-5		AI5,AICom 24VAC,COM	EN-1	Mech Room	0	M12	1-143-AI-5						2/22 / 2/18	OUT, GND, 24V	CD-W00 CO2 (Vdc)		D122	
	AI-6	AH-F02			DX 9100	N2	1	143	AI-6			EN-1	Mech Room	0	M12	1-143-AI-6											
	AI-7	AH-F02			DX 9100	N2	1	143	AI-7			EN-1	Mech Room	0	M12	1-143-AI-7											
	AI-8	AH-F02			DX 9100	N2	1	143	AI-8			EN-1	Mech Room	0	M12	1-143-AI-8											
	AO-1	AH-F02	MA-DPR	Mixed Air Damper	DX 9100	N2	1	143	AO-1			EN-1	Mech Room	0	M12	1-143-AO-1											
	AO-2	AH-F02	HTG-O	Heating Output	DX 9100	N2	1	143	AO-2			EN-1	Mech Room	0	M12	1-143-AO-2											
	AO-9	AH-F02			DX 9100	N2	1	143	AO-9			EN-1	Mech Room	0	M12	1-143-AO-9											
	AO-10	AH-F02			DX 9100	N2	1	143	AO-10			EN-1	Mech Room	0	M12	1-143-AO-10											
	AO-11	AH-F02			DX 9100	N2	1	143	AO-11			EN-1	Mech Room	0	M12	1-143-AO-11											
	AO-12	AH-F02			DX 9100	N2	1	143	AO-12			EN-1	Mech Room	0	M12	1-143-AO-12											
	AO-13	AH-F02			DX 9100	N2	1	143	AO-13			EN-1	Mech Room	0	M12	1-143-AO-13											
	AO-14	AH-F02			DX 9100	N2	1	143	AO-14			EN-1	Mech Room	0	M12	1-143-AO-14											
		AH-F02			XT (Expansion Module)							EN-1	Mech Room		M12												Power to Controller
		AH-F02			XT (Expansion	N2	1	144				EN-1	Mech Room	0	M12												N2 Trunk
	XT1DI1	AH-F02	DADPR-S	Discharge Air Damper	XP 9104 (4DI,	N2	1	144	DI-1			EN-1	Mech Room	0	M12	1-144A-DI-1											
	XT1DI2	AH-F02	EADPR-S	Exhaust Air Damper	XP 9104 (4DI,	N2	1	144	DI-2			EN-1	Mech Room	0	M12	1-144A-DI-2											
	XT1DI3	AH-F02	OADPR-S	Outside Air Damper	XP 9104 (4DI,	N2	1	144	DI-3			EN-1	Mech Room	0	M12	1-144A-DI-3											
	XT1DI4	AH-F02	RADPR-S	Return Air Damper	XP 9104 (4DI,	N2	1	144	DI-4			EN-1	Mech Room	0	M12	1-144A-DI-4											
	XT1DO5	AH-F02	SFSTO-C	Supply Fan Stop Command	XP 9104 (4DI,	N2	1	144	DO-5			EN-1	Mech Room	0	M12	1-144A-DO-5											
	XT1DO6	AH-F02	SFSTA-C	Supply Fan Start Command	XP 9104 (4DI,	N2	1	144	DO-6			EN-1	Mech Room	0	M12	1-144A-DO-6											
	XT1DO7	AH-F02	CADPR-C	Combustion Air Command	XP 9104 (4DI,	N2	1	144	DO-7			EN-1	Mech Room	0	M12	1-144A-DO-7											
	XT1DO8	AH-F02	UH2608-D	Unit Heater 2608 Disable	XP 9104 (4DI,	N2	1	144	DO-8			EN-1	Mech Room	0	M12	1-144A-DO-8											
	XT2DI1	AH-F02	IDFVSD-S	Induction Fan VFD Status	XP 9104 (4DI,	N2	1	144	DI-1			EN-1	Mech Room	0	M12	1-144B-DI-1											
	XT2DI2	AH-F02	SEF-2	Smoke Exhaust Fan Status	XP 9104 (4DI,	N2	1	144	DI-2			EN-1	Mech Room	0	M12	1-144B-DI-2											
	XT2DI3	AH-F02	EFS11-S	Exhaust Fan S11 Status	XP 9104 (4DI,	N2	1	144	DI-3			EN-1	Mech Room	0	M12	1-144B-DI-3											
	XT2DI4	AH-F02			XP 9104 (4DI,	N2	1	144	DI-4			EN-1	Mech Room	0	M12	1-144B-DI-4											
	XT2DO5	AH-F02	SEF-2-C	Smoke Exh Fan 2 Command	XP 9104 (4DI,	N2	1	144	DO-5			EN-1	Mech Room	0	M12	1-144B-DO-5											
	XT2DO6	AH-F02	EF-S11	Exhaust Fan S11 Command	XP 9104 (4DI,	N2	1	144	DO-6			EN-1	Mech Room	0	M12	1-144B-DO-6											
	XT2DO7	AH-F02			XP 9104 (4DI,	N2	1	144	DO-7			EN-1	Mech Room	0	M12	1-144B-DO-7											
	XT2DO8	AH-F02			XP 9104 (4DI,	N2	1	144	DO-8			EN-1	Mech Room	0	M12	1-144B-DO-8											

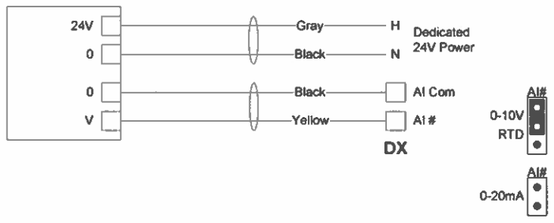
DETAIL D122 VOLTAGE INPUT from CD-W00 CO2 SENSOR



Drawing Title: AH-F02 Point Schedule					
REFERENCE DRAWING	NO.	REVISION-LOCATION	ECN	DATE	BY
Sales Engineer / Project Manager / Application Engineer	DRAWN BY / DATE	APPROVED BY / DATE			
Project Title: Seating Bowl CO2 Monitoring Demand Control Ventilation	Johnson Controls	Branch Information	CONTRACT NUMBER: 00120002	DRAWING NUMBER: 1.5	

Electrician/Fitter	Point Information				Controller Information							Panel Information					Intermediate Device					Field Device					
Tag	Point Type	System Name	Object Name	Expanded ID	Controller Details	Trunk Type	Trunk Nbr	Trunk Addr.	Cable Destination Bay/Terminal	Module Type	Termination Out	Panel	Panel Location	Slot Number	Reference Drawing	Cable Number	Wiring /Tubing	Termination In	Device	Termination Out	Location	Wiring /Tubing	Termination In	Device	Location	Ref Detail Shape	Comment
		AH-F05			DX 9100							EN-1	Mech Room		M12												Power to Controller
		AH-F05			DX 9100	N2	1	29				EN-1	Mech Room	0	M12												N2 Trunk
	DO-3	AH-F05			DX 9100	N2	1	29	DO-3			EN-1	Mech Room	0	M12	1-29-DO-3											
	DO-4	AH-F05			DX 9100	N2	1	29	DO-4			EN-1	Mech Room	0	M12	1-29-DO-4											
	DO-5	AH-F05	UH2307-D	Unit Heat 2307 Disable	DX 9100	N2	1	29	DO-5			EN-1	Mech Room	0	M12	1-29-DO-5											
	DO-6	AH-F05	UH2309-D	Unit Heat 2309 Disable	DX 9100	N2	1	29	DO-6			EN-1	Mech Room	0	M12	1-29-DO-6											
	DO-7	AH-F05	SEDPR-C	Smoke Exhaust Damper	DX 9100	N2	1	29	DO-7			EN-1	Mech Room	0	M12	1-29-DO-7											
	DO-8	AH-F05	IDF-C	Induct Fan Command	DX 9100	N2	1	29	DO-8			EN-1	Mech Room	0	M12	1-29-DO-8											
	DI-1	AH-F05			DX 9100	N2	1	29	DI-1			EN-1	Mech Room	0	M12	1-29-DI-1											
	DI-2	AH-F05			DX 9100	N2	1	29	DI-2			EN-1	Mech Room	0	M12	1-29-DI-2											
	DI-3	AH-F05			DX 9100	N2	1	29	DI-3			EN-1	Mech Room	0	M12	1-29-DI-3											
	DI-4	AH-F05			DX 9100	N2	1	29	DI-4			EN-1	Mech Room	0	M12	1-29-DI-4											
	DI-5	AH-F05			DX 9100	N2	1	29	DI-5			EN-1	Mech Room	0	M12	1-29-DI-5											
	DI-6	AH-F05	HI-SP	High Static Pressure	DX 9100	N2	1	29	DI-6			EN-1	Mech Room	0	M12	1-29-DI-6											
	DI-7	AH-F05			DX 9100	N2	1	29	DI-7			EN-1	Mech Room	0	M12	1-29-DI-7											
	DI-8	AH-F05	SMK-ALM	Smoke Alarm	DX 9100	N2	1	29	DI-8			EN-1	Mech Room	0	M12	1-29-DI-8											
	AI-1	AH-F05			DX 9100	N2	1	29	AI-1			EN-1	Mech Room	0	M12	1-29-AI-1											
	AI-2	AH-F05			DX 9100	N2	1	29	AI-2			EN-1	Mech Room	0	M12	1-29-AI-2											
	AI-3	AH-F05	RA2-T	Return Air 2 Temp.	DX 9100	N2	1	29	AI-3			EN-1	Mech Room	0	M12	1-29-AI-3											
	AI-4	AH-F05	MA-T	Mixed Air Temp.	DX 9100	N2	1	29	AI-4			EN-1	Mech Room	0	M12	1-29-AI-4											
	AI-5	AH-F05	FLS4-CO2	FL S4 Carbon Dioxide	DX 9100	N2	1	29	AI-5		AI5,AICom,24VAC,COM	EN-1	Mech Room	0	M12	1-29-AI-5						2/22 / 2/18	OUT, GND, 24V	CD-W00 CO2 (Vdc)		D122	
	AI-6	AH-F05			DX 9100	N2	1	29	AI-6			EN-1	Mech Room	0	M12	1-29-AI-6											
	AI-7	AH-F05			DX 9100	N2	1	29	AI-7			EN-1	Mech Room	0	M12	1-29-AI-7											
	AI-8	AH-F05			DX 9100	N2	1	29	AI-8			EN-1	Mech Room	0	M12	1-29-AI-8											
	AO-1	AH-F05	MA-DPR	Mixed Air Dampers %	DX 9100	N2	1	29	AO-1			EN-1	Mech Room	0	M12	1-29-AO-1											
	AO-2	AH-F05	HTG-O	Heating Output %	DX 9100	N2	1	29	AO-2			EN-1	Mech Room	0	M12	1-29-AO-2											
	AO-9	AH-F05			DX 9100	N2	1	29	AO-9			EN-1	Mech Room	0	M12	1-29-AO-9											
	AO-10	AH-F05			DX 9100	N2	1	29	AO-10			EN-1	Mech Room	0	M12	1-29-AO-10											
	AO-11	AH-F05			DX 9100	N2	1	29	AO-11			EN-1	Mech Room	0	M12	1-29-AO-11											
	AO-12	AH-F05			DX 9100	N2	1	29	AO-12			EN-1	Mech Room	0	M12	1-29-AO-12											
	AO-13	AH-F05			DX 9100	N2	1	29	AO-13			EN-1	Mech Room	0	M12	1-29-AO-13											
	AO-14	AH-F05			DX 9100	N2	1	29	AO-14			EN-1	Mech Room	0	M12	1-29-AO-14											
		AH-F05			XT (Expansion Module)							EN-1	Mech Room		M12												Power to Controller
		AH-F05			XT (Expansion	N2	1	30				EN-1	Mech Room	0	M12												N2 Trunk
	XT1DI1	AH-F05	DADPR-S	Discharge Air Damper	XP 9104 (4DI,	N2	1	30	DI-1			EN-1	Mech Room	0	M12	1-30A-DI-1											
	XT1DI2	AH-F05	EADPR-S	Exhause Air Dampers	XP 9104 (4DI,	N2	1	30	DI-2			EN-1	Mech Room	0	M12	1-30A-DI-2											
	XT1DI3	AH-F05	OADPR-S	Outside Air Dampers	XP 9104 (4DI,	N2	1	30	DI-3			EN-1	Mech Room	0	M12	1-30A-DI-3											
	XT1DI4	AH-F05	RADPR-S	Return Air Dampers	XP 9104 (4DI,	N2	1	30	DI-4			EN-1	Mech Room	0	M12	1-30A-DI-4											
	XT1DO5	AH-F05	SFSTO-C	Supply Fan Stop Command	XP 9104 (4DI,	N2	1	30	DO-5			EN-1	Mech Room	0	M12	1-30A-DO-5											
	XT1DO6	AH-F05	SFSTA-C	Supply Fan Start Command	XP 9104 (4DI,	N2	1	30	DO-6			EN-1	Mech Room	0	M12	1-30A-DO-6											
	XT1DO7	AH-F05	CADPR-C	Combustion Damper Cmd	XP 9104 (4DI,	N2	1	30	DO-7			EN-1	Mech Room	0	M12	1-30A-DO-7											
	XT1DO8	AH-F05	CoolDown	Cool Down Heater	XP 9104 (4DI,	N2	1	30	DO-8			EN-1	Mech Room	0	M12	1-30A-DO-8											
	XT2DI1	AH-F05			XP 9104 (4DI,	N2	1	30	DI-1			EN-1	Mech Room	0	M12	1-30B-DI-1											
	XT2DI2	AH-F05			XP 9104 (4DI,	N2	1	30	DI-2			EN-1	Mech Room	0	M12	1-30B-DI-2											
	XT2DI3	AH-F05			XP 9104 (4DI,	N2	1	30	DI-3			EN-1	Mech Room	0	M12	1-30B-DI-3											
	XT2DI4	AH-F05			XP 9104 (4DI,	N2	1	30	DI-4			EN-1	Mech Room	0	M12	1-30B-DI-4											
	XT2DO5	AH-F05			XP 9104 (4DI,	N2	1	30	DO-5			EN-1	Mech Room	0	M12	1-30B-DO-5											
	XT2DO6	AH-F05			XP 9104 (4DI,	N2	1	30	DO-6			EN-1	Mech Room	0	M12	1-30B-DO-6											
	XT2DO7	AH-F05			XP 9104 (4DI,	N2	1	30	DO-7			EN-1	Mech Room	0	M12	1-30B-DO-7											
	XT2DO8	AH-F05			XP 9104 (4DI,	N2	1	30	DO-8			EN-1	Mech Room	0	M12	1-30B-DO-8											

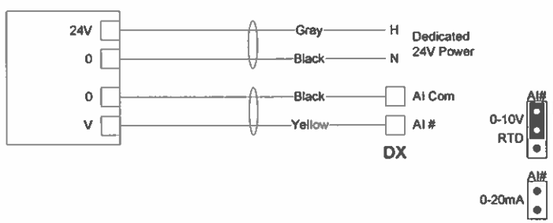
DETAIL D122 VOLTAGE INPUT from CD-W00 CO2 SENSOR



Drawing Title: AH-F05 Point Schedule					
REFERENCE DRAWING	NO	REVISION-LOCATION	ECN	DATE	BY
Sales Engineer / Project Manager / Application Engineer	DRAWN BY / DATE	APPROVED BY / DATE			
Project Title: Seating Bowl CO2 Monitoring Demand Control Ventilation	Johnson Controls	Branch Information	CONTRACT NUMBER: 00120002		
			DRAWING NUMBER: 1.6		

Electrician/Fitter	Point Information				Controller Information							Panel Information						Intermediate Device				Field Device					
Tag	Point Type	System Name	Object Name	Expanded ID	Controller Details	Trunk Type	Trunk Nbr	Trunk Addr.	Cable Destination Bay/Terminal	Module Type	Termination Out	Panel	Panel Location	Slot Number	Reference Drawing	Cable Number	Wiring /Tubing	Termination In	Device	Termination Out	Location	Wiring /Tubing	Termination In	Device	Location	Ref Detail Shape	Comment
		AH-F06			DX 9100							EN-1	Mech Room		M12												Power to Controller
		AH-F06			DX 9100	N2	1	31				EN-1	Mech Room	0	M12												N2 Trunk
	DO-3	AH-F06			DX 9100	N2	1	31	DO-3			EN-1	Mech Room	0	M12	1-31-DO-3											
	DO-4	AH-F06			DX 9100	N2	1	31	DO-4			EN-1	Mech Room	0	M12	1-31-DO-4											
	DO-5	AH-F06	HTG2-C	Heating Stage 2 Command	DX 9100	N2	1	31	DO-5			EN-1	Mech Room	0	M12	1-31-DO-5											
	DO-6	AH-F06	IDF-C	Induction Fan Command	DX 9100	N2	1	31	DO-6			EN-1	Mech Room	0	M12	1-31-DO-6											
	DO-7	AH-F06	SEDPR-C	Smoke Exhaust Dampers	DX 9100	N2	1	31	DO-7			EN-1	Mech Room	0	M12	1-31-DO-7											
	DO-8	AH-F06	SF2-C	Supply Fan 2 Command	DX 9100	N2	1	31	DO-8			EN-1	Mech Room	0	M12	1-31-DO-8											
	DI-1	AH-F06			DX 9100	N2	1	31	DI-1			EN-1	Mech Room	0	M12	1-31-DI-1											
	DI-2	AH-F06			DX 9100	N2	1	31	DI-2			EN-1	Mech Room	0	M12	1-31-DI-2											
	DI-3	AH-F06	HTG1-S	Heating Stage 1 Status	DX 9100	N2	1	31	DI-3			EN-1	Mech Room	0	M12	1-31-DI-3											
	DI-4	AH-F06	HTG2-S	Heating Stage 2 Status	DX 9100	N2	1	31	DI-4			EN-1	Mech Room	0	M12	1-31-DI-4											
	DI-5	AH-F06	Gas2Hot	Gas Heater Too Hot Stat	DX 9100	N2	1	31	DI-5			EN-1	Mech Room	0	M12	1-31-DI-5											
	DI-6	AH-F06	HI-SP	Hi Static Pressure Alarm	DX 9100	N2	1	31	DI-6			EN-1	Mech Room	0	M12	1-31-DI-6											
	DI-7	AH-F06	LT-ALM	Low Temperature Alarm	DX 9100	N2	1	31	DI-7			EN-1	Mech Room	0	M12	1-31-DI-7											
	DI-8	AH-F06	SMK-ALM	Smoke Alarm	DX 9100	N2	1	31	DI-8			EN-1	Mech Room	0	M12	1-31-DI-8											
	AI-1	AH-F06			DX 9100	N2	1	31	AI-1			EN-1	Mech Room	0	M12	1-31-AI-1											
	AI-2	AH-F06			DX 9100	N2	1	31	AI-2			EN-1	Mech Room	0	M12	1-31-AI-2											
	AI-3	AH-F06	RA1-T	Return Air Temp 1	DX 9100	N2	1	31	AI-3			EN-1	Mech Room	0	M12	1-31-AI-3											
	AI-4	AH-F06	RA2-T	Return Air Temp. 2	DX 9100	N2	1	31	AI-4			EN-1	Mech Room	0	M12	1-31-AI-4											
	AI-5	AH-F06	RA3-T	Return Air Temp. 3	DX 9100	N2	1	31	AI-5			EN-1	Mech Room	0	M12	1-31-AI-5											
	AI-6	AH-F06	MA-T	Mixed Air Temperature	DX 9100	N2	1	31	AI-6			EN-1	Mech Room	0	M12	1-31-AI-6											
	AI-7	AH-F06	FLS1-CO2	FL S1 Carbon Dioxide	DX 9100	N2	1	31	AI-7		AI7,AICom,24VAC,COM	EN-1	Mech Room	0	M12	1-31-AI-7						2/22 / 2/18	OUT, GND, 24V	CD-W00 CO2 (Vdc)		D122	
	AI-8	AH-F06			DX 9100	N2	1	31	AI-8			EN-1	Mech Room	0	M12	1-31-AI-8											
	AO-1	AH-F06			DX 9100	N2	1	31	AO-1			EN-1	Mech Room	0	M12	1-31-AO-1											
	AO-2	AH-F06	HTG1-O	Heating Stage 1%	DX 9100	N2	1	31	AO-2			EN-1	Mech Room	0	M12	1-31-AO-2											
	AO-9	AH-F06	HTG2-O	Heating Stage 2 %	DX 9100	N2	1	31	AO-9			EN-1	Mech Room	0	M12	1-31-AO-9											
	AO-10	AH-F06			DX 9100	N2	1	31	AO-10			EN-1	Mech Room	0	M12	1-31-AO-10											
	AO-11	AH-F06			DX 9100	N2	1	31	AO-11			EN-1	Mech Room	0	M12	1-31-AO-11											
	AO-12	AH-F06			DX 9100	N2	1	31	AO-12			EN-1	Mech Room	0	M12	1-31-AO-12											
	AO-13	AH-F06			DX 9100	N2	1	31	AO-13			EN-1	Mech Room	0	M12	1-31-AO-13											
	AO-14	AH-F06			DX 9100	N2	1	31	AO-14			EN-1	Mech Room	0	M12	1-31-AO-14											
		AH-F06			XT (Expansion Module)							EN-1	Mech Room		M12												Power to Controller
		AH-F06			XT (Expansion	N2	1	32				EN-1	Mech Room	0	M12												N2 Trunk
	XT1DI1	AH-F06	DADPR-S	Discharge Air Dampers	XP 9104 (4DI,	N2	1	32	DI-1			EN-1	Mech Room	0	M12	1-32A-DI-1											
	XT1DI2	AH-F06	EADPR-S	Exhaust Air Dampers	XP 9104 (4DI,	N2	1	32	DI-2			EN-1	Mech Room	0	M12	1-32A-DI-2											
	XT1DI3	AH-F06	OADPR-S	Outside Air Dampers	XP 9104 (4DI,	N2	1	32	DI-3			EN-1	Mech Room	0	M12	1-32A-DI-3											
	XT1DI4	AH-F06	RADPR-S	Return Air Dampers	XP 9104 (4DI,	N2	1	32	DI-4			EN-1	Mech Room	0	M12	1-32A-DI-4											
	XT1DO5	AH-F06	SFSTO-C	Supply Fan Stop Command	XP 9104 (4DI,	N2	1	32	DO-5			EN-1	Mech Room	0	M12	1-32A-DO-5											
	XT1DO6	AH-F06	SFSTA-C	Supply Fan Start Command	XP 9104 (4DI,	N2	1	32	DO-6			EN-1	Mech Room	0	M12	1-32A-DO-6											
	XT1DO7	AH-F06	CADPR-C	Combustion Air Damper	XP 9104 (4DI,	N2	1	32	DO-7			EN-1	Mech Room	0	M12	1-32A-DO-7											
	XT1DO8	AH-F06	CoolDown	Cool Down Heater	XP 9104 (4DI,	N2	1	32	DO-8			EN-1	Mech Room	0	M12	1-32A-DO-8											
	XT2DI1	AH-F06	CADPR-S	Cumbustion Air Dampers	XP 9104 (4DI,	N2	1	32	DI-1			EN-1	Mech Room	0	M12	1-32B-DI-1											
	XT2DI2	AH-F06	IP-S	Induction Fan Status	XP 9104 (4DI,	N2	1	32	DI-2			EN-1	Mech Room	0	M12	1-32B-DI-2											
	XT2DI3	AH-F06	IDFVSD-S	Induction VFD Status	XP 9104 (4DI,	N2	1	32	DI-3			EN-1	Mech Room	0	M12	1-32B-DI-3											
	XT2DI4	AH-F06			XP 9104 (4DI,	N2	1	32	DI-4			EN-1	Mech Room	0	M12	1-32B-DI-4											
	XT2DO5	AH-F06	UH2004-D	Unit Heater 2004 Disable	XP 9104 (4DI,	N2	1	32	DO-5			EN-1	Mech Room	0	M12	1-32B-DO-5											
	XT2DO6	AH-F06	UH2005-D	Unit Heater 2005 Disable	XP 9104 (4DI,	N2	1	32	DO-6			EN-1	Mech Room	0	M12	1-32B-DO-6											
	XT2DO7	AH-F06	UH2103-D	Unit Heater 2103 Disable	XP 9104 (4DI,	N2	1	32	DO-7			EN-1	Mech Room	0	M12	1-32B-DO-7											
	XT2DO8	AH-F06	UH2104-D	Unit Heater 2104 Disable	XP 9104 (4DI,	N2	1	32	DO-8			EN-1	Mech Room	0	M12	1-32B-DO-8											

DETAIL D122 — VOLTAGE INPUT from CD-W00 CO2 SENSOR

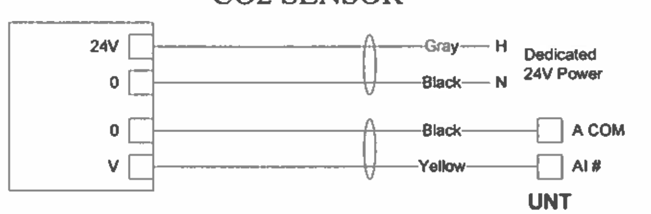


Drawing Title: AH-F06 Point Schedule					
	REFERENCE DRAWING	NO	REVISION-LOCATION	ECN	DATE / BY
	Sales Engineer / Project Manager	Application Engineer	DRAWN / APPROVED	BY / DATE	BY / DATE
Project Title: Seating Bowl CO2 Monitoring Demand Control Ventilation	Johnson Controls	Branch Information	CONTRACT NUMBER: 00120002	DRAWING NUMBER: 1.7	

Electrician/Fitter	Point Information				Controller Information							Panel Information					Intermediate Device					Field Device					
Tag	Point Type	System Name	Object Name	Expanded ID	Controller Details	Trunk Type	Trunk Nbr	Trunk Addr.	Cable Destination Bay/Terminal	Module Type	Termination Out	Panel	Panel Location	Slot Number	Reference Drawing	Cable Number	Wiring /Tubing	Termination In	Device	Termination Out	Location	Wiring /Tubing	Termination In	Device	Location	Ref Detail Shape	Comment
		AH-T01			UNT 141							EN-1	Mech Room		M12												Power to Controller
		AH-T01			UNT 141	N2	1	150				EN-1	Mech Room	0	M12												N2 Trunk
	AI-1	AH-T01	OA-T	Outside Air Temperature	UNT 141	N2	1	150	AI-1			EN-1	Mech Room	0	M12	1-150-AI-1											
	AI-2	AH-T01	CLS6-CO2	CL S6 Carbon Dioxide	UNT 141	N2	1	150	AI-2		AI2,A COM / 24VAC	EN-1	Mech Room	0	M12	1-150-AI-2						2/22 / 2/18	OUT, GND, 24V	CD-W00 CO2 (Vdc)		UT122	
	AI-3	AH-T01	DA-T	Disch Air Temp	UNT 141	N2	1	150	AI-3			EN-1	Mech Room	0	M12	1-150-AI-3											
	AI-4	AH-T01	BOWL-T	Bowl Temperature	UNT 141	N2	1	150	AI-4			EN-1	Mech Room	0	M12	1-150-AI-4											
	AI-5	AH-T01			UNT 141	N2	1	150	AI-5			EN-1	Mech Room	0	M12	1-150-AI-5											
	AI-6	AH-T01			UNT 141	N2	1	150	AI-6			EN-1	Mech Room	0	M12	1-150-AI-6											
	BI-1	AH-T01	SF-S	Supply Airflow	UNT 141	N2	1	150	BI-1			EN-1	Mech Room	0	M12	1-150-BI-1											
	BI-2	AH-T01			UNT 141	N2	1	150	BI-2			EN-1	Mech Room	0	M12	1-150-BI-2											
	BI-3	AH-T01	SMK-ALM	Smoke Alarm	UNT 141	N2	1	150	BI-3			EN-1	Mech Room	0	M12	1-150-BI-3											
	BI-4	AH-T01	HTG-S	Heating Status	UNT 141	N2	1	150	BI-4			EN-1	Mech Room	0	M12	1-150-BI-4											
	BO-1	AH-T01	PHP-C	Preheat Pump	UNT 141	N2	1	150	BO-1			EN-1	Mech Room	0	M12	1-150-BO-1											
	BO-2	AH-T01	SF-C	Supply Fan	UNT 141	N2	1	150	BO-2			EN-1	Mech Room	0	M12	1-150-BO-2											
	BO-3	AH-T01			UNT 141	N2	1	150	BO-3			EN-1	Mech Room	0	M12	1-150-BO-3											
	BO-4	AH-T01			UNT 141	N2	1	150	BO-4			EN-1	Mech Room	0	M12	1-150-BO-4											
	BO-5	AH-T01			UNT 141	N2	1	150	BO-5			EN-1	Mech Room	0	M12	1-150-BO-5											
	BO-6	AH-T01			UNT 141	N2	1	150	BO-6			EN-1	Mech Room	0	M12	1-150-BO-6											
	AO-1	AH-T01	PH-O	Preheat Valve	UNT 141	N2	1	150	AO-1			EN-1	Mech Room	0	M12	1-150-AO-1											
	AO-2	AH-T01			UNT 141	N2	1	150	AO-2			EN-1	Mech Room	0	M12	1-150-AO-2											

DETAIL UT122

VOLTAGE INPUT from CD-W00 CO2 SENSOR

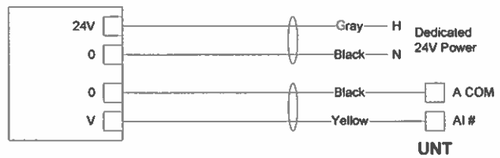


Set SW1 to Position "V" and SW2 to Position "10V"

Drawing Title	REFERENCE DRAWING	NO.	REVISION-LOCATION	ECN	DATE	BY	
AH-T01 Point Schedule	Sales Engineer	Project Manager	Application Engineer	DRAWN BY	DRAWN DATE	APPROVED BY	APPROVED DATE
Project Title				Branch Information	CONTRACT NUMBER		
Seating Bowl CO2 Monitoring Demand Control Ventilation	Johnson Controls				**00120002**		
					DRAWING NUMBER		
					1.8		

Electrician/Fitter	Point Information				Controller Information							Panel Information					Intermediate Device				Field Device					
Tag	Point Type	System Name	Object Name	Expanded ID	Controller Details	Trunk Type	Trunk Nbr	Trunk Addr.	Cable Destination Bay/Terminal	Module Type	Termination Out	Panel	Panel Location	Slot Number	Reference Drawing	Cable Number	Wiring /Tubing	Termination In	Device	Termination Out	Location	Wiring /Tubing	Termination In	Device	Location	Ref Detail Shape	Comment
		AH-T02			UNT 141							EN-1	Mech Room		M12												Power to Controller
		AH-T02			UNT 141	N2	1	42				EN-1	Mech Room	0	M12												N2 Trunk
	AI-1	AH-T02	OA-T	Outside Air Temperature	UNT 141	N2	1	42 AI-1				EN-1	Mech Room	0	M12	1-42-AI-1											
	AI-2	AH-T02	CLS3-CO2	CL S3 Carbon Dioxide	UNT 141	N2	1	42 AI-2			AI2,A COM / 24VAC	EN-1	Mech Room	0	M12	1-42-AI-2						2/22 / 2/18	OUT, GND, 24V	CD-W00 CO2 (Vdc)		UT122	
	AI-3	AH-T02	DA-T	Disch Air Temp	UNT 141	N2	1	42 AI-3				EN-1	Mech Room	0	M12	1-42-AI-3											
	AI-4	AH-T02	BOWL-T	Bowl Temperature	UNT 141	N2	1	42 AI-4				EN-1	Mech Room	0	M12	1-42-AI-4											
	AI-5	AH-T02	4414-T	FP Rm 4414 Temperature	UNT 141	N2	1	42 AI-5				EN-1	Mech Room	0	M12	1-42-AI-5											
	AI-6	AH-T02	5416-T	FP Rm 5416 Temperature	UNT 141	N2	1	42 AI-6				EN-1	Mech Room	0	M12	1-42-AI-6											
	BI-1	AH-T02	SF-S	Supply Airflow	UNT 141	N2	1	42 BI-1				EN-1	Mech Room	0	M12	1-42-BI-1											
	BI-2	AH-T02			UNT 141	N2	1	42 BI-2				EN-1	Mech Room	0	M12	1-42-BI-2											
	BI-3	AH-T02	SMK-ALM	Smoke Alarm	UNT 141	N2	1	42 BI-3				EN-1	Mech Room	0	M12	1-42-BI-3											
	BI-4	AH-T02	HTG-S	Heating Status	UNT 141	N2	1	42 BI-4				EN-1	Mech Room	0	M12	1-42-BI-4											
	BO-1	AH-T02	PHP-C	Preheat Pump	UNT 141	N2	1	42 BO-1				EN-1	Mech Room	0	M12	1-42-BO-1											
	BO-2	AH-T02	SF-C	Supply Fan	UNT 141	N2	1	42 BO-2				EN-1	Mech Room	0	M12	1-42-BO-2											
	BO-3	AH-T02	BO - 3	BO - 3	UNT 141	N2	1	42 BO-3				EN-1	Mech Room	0	M12	1-42-BO-3											
	BO-4	AH-T02			UNT 141	N2	1	42 BO-4				EN-1	Mech Room	0	M12	1-42-BO-4											
	BO-5	AH-T02			UNT 141	N2	1	42 BO-5				EN-1	Mech Room	0	M12	1-42-BO-5											
	BO-6	AH-T02			UNT 141	N2	1	42 BO-6				EN-1	Mech Room	0	M12	1-42-BO-6											
	AO-1	AH-T02	PH-O	Preheat Valve	UNT 141	N2	1	42 AO-1				EN-1	Mech Room	0	M12	1-42-AO-1											
	AO-2	AH-T02			UNT 141	N2	1	42 AO-2				EN-1	Mech Room	0	M12	1-42-AO-2											

DETAIL UT122 VOLTAGE INPUT from CD-W00 CO2 SENSOR



Set SW1 to Position "V"
and SW2 to Position "10V"

Drawing Title
AH-T02 Point Schedule

REFERENCE DRAWING	NO	REVISION-LOCATION	ECN	DATE	BY

Sales Engineer | Project Manager | Application Engineer | DRAWN BY / DATE | APPROVED BY / DATE

Project Title
Seating Bowl CO2 Monitoring Demand Control Ventilation

Johnson Controls

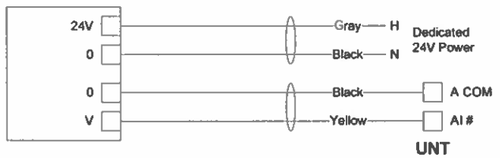
Branch Information

CONTRACT NUMBER
00120002

DRAWING NUMBER
1.9

Electrician/Fitter		Point Information			Controller Information							Panel Information						Intermediate Device				Field Device					
Tag	Point Type	System Name	Object Name	Expanded ID	Controller Details	Trunk Type	Trunk Nbr	Trunk Addr.	Cable Destination Bay/Terminal	Module Type	Termination Out	Panel	Panel Location	Slot Number	Reference Drawing	Cable Number	Wiring /Tubing	Termination In	Device	Termination Out	Location	Wiring /Tubing	Termination In	Device	Location	Ref Detail Shape	Comment
		AH-TB06			UNT 141							EN-1	Mech Room		M12												Power to Controller
		AH-TB06			UNT 141	N2	1	157				EN-1	Mech Room	0	M12												N2 Trunk
	AI-1	AH-TB06	OA-T	Outside Air Temperature	UNT 141	N2	1	157	AI-1			EN-1	Mech Room	0	M12	1-157-AI-1											
	AI-2	AH-TB06	TLS8-CO2	TL S8 Carbon Dioxide	UNT 141	N2	1	157	AI-2		AI2,A COM / 24VAC	EN-1	Mech Room	0	M12	1-157-AI-2						2/22 / 2/18	OUT, GND, 24V	CD-W00 CO2 (Vdc)		UT122	
	AI-3	AH-TB06	DA-T	Disch Air Temp	UNT 141	N2	1	157	AI-3			EN-1	Mech Room	0	M12	1-157-AI-3											
	AI-4	AH-TB06	BOWL-T	Bowl Temperature	UNT 141	N2	1	157	AI-4			EN-1	Mech Room	0	M12	1-157-AI-4											
	AI-5	AH-TB06	EL8_9-T	Elev 8&9 Room Temperature	UNT 141	N2	1	157	AI-5			EN-1	Mech Room	0	M12	1-157-AI-5											
	AI-6	AH-TB06			UNT 141	N2	1	157	AI-6			EN-1	Mech Room	0	M12	1-157-AI-6											
	BI-1	AH-TB06	SF-S	Supply Airflow	UNT 141	N2	1	157	BI-1			EN-1	Mech Room	0	M12	1-157-BI-1											
	BI-2	AH-TB06	CADPR-S	Combustion Damper Status	UNT 141	N2	1	157	BI-2			EN-1	Mech Room	0	M12	1-157-BI-2											
	BI-3	AH-TB06	SMK-ALM	Smoke Alarm	UNT 141	N2	1	157	BI-3			EN-1	Mech Room	0	M12	1-157-BI-3											
	BI-4	AH-TB06	HTG-S	Heating Status	UNT 141	N2	1	157	BI-4			EN-1	Mech Room	0	M12	1-157-BI-4											
	BO-1	AH-TB06	HTG-C	Heating Command	UNT 141	N2	1	157	BO-1			EN-1	Mech Room	0	M12	1-157-BO-1											
	BO-2	AH-TB06	SF-C	Supply Fan	UNT 141	N2	1	157	BO-2			EN-1	Mech Room	0	M12	1-157-BO-2											
	BO-3	AH-TB06	PHP-C	Preheat Pump	UNT 141	N2	1	157	BO-3			EN-1	Mech Room	0	M12	1-157-BO-3											
	BO-4	AH-TB06			UNT 141	N2	1	157	BO-4			EN-1	Mech Room	0	M12	1-157-BO-4											
	BO-5	AH-TB06			UNT 141	N2	1	157	BO-5			EN-1	Mech Room	0	M12	1-157-BO-5											
	BO-6	AH-TB06			UNT 141	N2	1	157	BO-6			EN-1	Mech Room	0	M12	1-157-BO-6											
	AO-1	AH-TB06	PH-O	Preheat Valve	UNT 141	N2	1	157	AO-1			EN-1	Mech Room	0	M12	1-157-AO-1											
	AO-2	AH-TB06			UNT 141	N2	1	157	AO-2			EN-1	Mech Room	0	M12	1-157-AO-2											

DETAIL UT122 VOLTAGE INPUT from CD-W00 CO2 SENSOR



Set SW1 to Position "V"
and SW2 to Position "10V"

Drawing Title
AH-TB06 Point Schedule

REFERENCE DRAWING	NO	REVISION-LOCATION	ECN	DATE	BY

Sales Engineer | Project Manager | Application Engineer | DRAWN BY | DRAWN DATE | APPROVED BY | APPROVED DATE

Project Title
Seating Bowl CO2 Monitoring Demand Control Ventilation

Branch Information

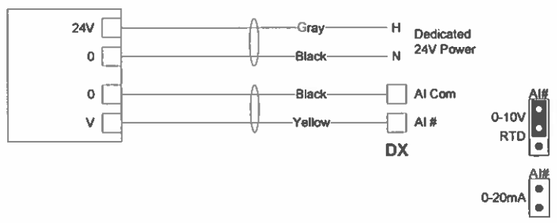
Johnson Controls

CONTRACT NUMBER
00120002

DRAWING NUMBER
1.10

Electrician/Fitter	Point Information				Controller Information							Panel Information					Intermediate Device					Field Device					
Tag	Point Type	System Name	Object Name	Expanded ID	Controller Details	Trunk Type	Trunk Nbr	Trunk Addr.	Cable Destination Bay/Terminal	Module Type	Termination Out	Panel	Panel Location	Slot Number	Reference Drawing	Cable Number	Wiring /Tubing	Termination In	Device	Termination Out	Location	Wiring /Tubing	Termination In	Device	Location	Ref Detail Shape	Comment
		AH-TB02			DX 9100							EN-1	Mech Room		M12												Power to Controller
		AH-TB02			DX 9100	N2	1	155				EN-1	Mech Room	0	M12												N2 Trunk
	DO-3	AH-TB02			DX 9100	N2	1	155	DO-3			EN-1	Mech Room	0	M12	1-155-DO-3											
	DO-4	AH-TB02			DX 9100	N2	1	155	DO-4			EN-1	Mech Room	0	M12	1-155-DO-4											
	DO-5	AH-TB02			DX 9100	N2	1	155	DO-5			EN-1	Mech Room	0	M12	1-155-DO-5											
	DO-6	AH-TB02	CoolDown	Cool Down Heater	DX 9100	N2	1	155	DO-6			EN-1	Mech Room	0	M12	1-155-DO-6											
	DO-7	AH-TB02	SEDPR-C	Smoke Exhaust Dampers	DX 9100	N2	1	155	DO-7			EN-1	Mech Room	0	M12	1-155-DO-7											
	DO-8	AH-TB02			DX 9100	N2	1	155	DO-8			EN-1	Mech Room	0	M12	1-155-DO-8											
	DI-1	AH-TB02			DX 9100	N2	1	155	DI-1			EN-1	Mech Room	0	M12	1-155-DI-1											
	DI-2	AH-TB02			DX 9100	N2	1	155	DI-2			EN-1	Mech Room	0	M12	1-155-DI-2											
	DI-3	AH-TB02			DX 9100	N2	1	155	DI-3			EN-1	Mech Room	0	M12	1-155-DI-3											
	DI-4	AH-TB02			DX 9100	N2	1	155	DI-4			EN-1	Mech Room	0	M12	1-155-DI-4											
	DI-5	AH-TB02			DX 9100	N2	1	155	DI-5			EN-1	Mech Room	0	M12	1-155-DI-5											
	DI-6	AH-TB02			DX 9100	N2	1	155	DI-6			EN-1	Mech Room	0	M12	1-155-DI-6											
	DI-7	AH-TB02	Gas2Hot	Gas Burner Too Hot Stat	DX 9100	N2	1	155	DI-7			EN-1	Mech Room	0	M12	1-155-DI-7											
	DI-8	AH-TB02	SMK-ALM	Smoke Alarm	DX 9100	N2	1	155	DI-8			EN-1	Mech Room	0	M12	1-155-DI-8											
	AI-1	AH-TB02			DX 9100	N2	1	155	AI-1			EN-1	Mech Room	0	M12	1-155-AI-1											
	AI-2	AH-TB02			DX 9100	N2	1	155	AI-2			EN-1	Mech Room	0	M12	1-155-AI-2											
	AI-3	AH-TB02	MA-T	Mixed Air Temperature	DX 9100	N2	1	155	AI-3			EN-1	Mech Room	0	M12	1-155-AI-3											
	AI-4	AH-TB02	BOWL-T	Home Plate Right Bowl	DX 9100	N2	1	155	AI-4			EN-1	Mech Room	0	M12	1-155-AI-4											
	AI-5	AH-TB02	TLS5-CO2	TL S5 Carbon Dioxide	DX 9100	N2	1	155	AI-5		AI5,AICom,24VAC,COM	EN-1	Mech Room	0	M12	1-155-AI-5						2/22 / 2/18	OUT, GND, 24V	CD-W00 CO2 (Vdc)		D122	
	AI-6	AH-TB02			DX 9100	N2	1	155	AI-6			EN-1	Mech Room	0	M12	1-155-AI-6											
	AI 7	AH-TB02			DX 9100	N2	1	155	AI-7			EN-1	Mech Room	0	M12	1-155-AI-7											
	AI-8	AH-TB02			DX 9100	N2	1	155	AI-8			EN-1	Mech Room	0	M12	1-155-AI-8											
	AO-1	AH-TB02	MA-DPR	Mixed Air Dampers %	DX 9100	N2	1	155	AO-1			EN-1	Mech Room	0	M12	1-155-AO-1											
	AO-2	AH-TB02	HTG-O	Heating Valve %	DX 9100	N2	1	155	AO-2			EN-1	Mech Room	0	M12	1-155-AO-2											
	AO-9	AH-TB02			DX 9100	N2	1	155	AO-9			EN-1	Mech Room	0	M12	1-155-AO-9											
	AO-10	AH-TB02			DX 9100	N2	1	155	AO-10			EN-1	Mech Room	0	M12	1-155-AO-10											
	AO-11	AH-TB02			DX 9100	N2	1	155	AO-11			EN-1	Mech Room	0	M12	1-155-AO-11											
	AO-12	AH-TB02			DX 9100	N2	1	155	AO-12			EN-1	Mech Room	0	M12	1-155-AO-12											
	AO-13	AH-TB02			DX 9100	N2	1	155	AO-13			EN-1	Mech Room	0	M12	1-155-AO-13											
	AO-14	AH-TB02			DX 9100	N2	1	155	AO-14			EN-1	Mech Room	0	M12	1-155-AO-14											
		AH-TB02			XT (Expansion Module)							EN-1	Mech Room		M12												Power to Controller
		AH-TB02			XT (Expansion	N2	1	156				EN-1	Mech Room	0	M12												N2 Trunk
	XT1DI1	AH-TB02	DADPR-S	Discharge Air Dampers	XP 9104 (4DI,	N2	1	156	DI-1			EN-1	Mech Room	0	M12	1-156A-DI-1											
	XT1DI2	AH-TB02	EADPR-S	Exhaust Air Dampers	XP 9104 (4DI,	N2	1	156	DI-2			EN-1	Mech Room	0	M12	1-156A-DI-2											
	XT1DI3	AH-TB02	OADPR-S	Outside Air Dampers	XP 9104 (4DI,	N2	1	156	DI-3			EN-1	Mech Room	0	M12	1-156A-DI-3											
	XT1DI4	AH-TB02	RADPR-S	Return Air Dampers	XP 9104 (4DI,	N2	1	156	DI-4			EN-1	Mech Room	0	M12	1-156A-DI-4											
	XT1DO5	AH-TB02	SFSTO-C	Supply Fan Stop Command	XP 9104 (4DI,	N2	1	156	DO-5			EN-1	Mech Room	0	M12	1-156A-DO-5											
	XT1DO6	AH-TB02	SFSTA-C	Supply Fan Start Command	XP 9104 (4DI,	N2	1	156	DO-6			EN-1	Mech Room	0	M12	1-156A-DO-6											
	XT1DO7	AH-TB02			XP 9104 (4DI,	N2	1	156	DO-7			EN-1	Mech Room	0	M12	1-156A-DO-7											
	XT1DO8	AH-TB02			XP 9104 (4DI,	N2	1	156	DO-8			EN-1	Mech Room	0	M12	1-156A-DO-8											

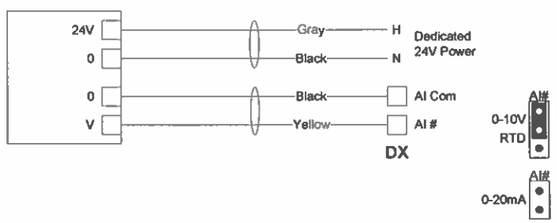
DETAIL D122 VOLTAGE INPUT from CD-W00 CO2 SENSOR



Drawing Title: AH-TB02 Point Schedule					
REFERENCE DRAWING	NO	REVISION-LOCATION	ECN	DATE	BY
Sales Engineer / Project Manager / Application Engineer	DRAWN BY / DATE	APPROVED BY / DATE			
Project Title: Seating Bowl CO2 Monitoring Demand Control Ventilation	Johnson Controls	Branch Information	CONTRACT NUMBER: 00120002	DRAWING NUMBER: 1.11	

Electrician/Fitter	Point Information				Controller Information							Panel Information						Intermediate Device				Field Device					
Tag	Point Type	System Name	Object Name	Expanded ID	Controller Details	Trunk Type	Trunk Nbr	Trunk Addr.	Cable Destination Bay/Terminal	Module Type	Termination Out	Panel	Panel Location	Slot Number	Reference Drawing	Cable Number	Wiring /Tubing	Termination In	Device	Termination Out	Location	Wiring /Tubing	Termination In	Device	Location	Ref Detail Shape	Comment
		AH-TB03			DX 9100							EN-1	Mech Room		M12												Power to Controller
		AH-TB03			DX 9100	N2	1	159				EN-1	Mech Room	0	M12												N2 Trunk
	DO-3	AH-TB03			DX 9100	N2	1	159	DO-3			EN-1	Mech Room	0	M12	1-159-DO-3											
	DO-4	AH-TB03			DX 9100	N2	1	159	DO-4			EN-1	Mech Room	0	M12	1-159-DO-4											
	DO-5	AH-TB03			DX 9100	N2	1	159	DO-5			EN-1	Mech Room	0	M12	1-159-DO-5											
	DO-6	AH-TB03	CoolDown	Cool Down Heater	DX 9100	N2	1	159	DO-6			EN-1	Mech Room	0	M12	1-159-DO-6											
	DO-7	AH-TB03	SEDPR-C	Smoke Exhaust Dampers	DX 9100	N2	1	159	DO-7			EN-1	Mech Room	0	M12	1-159-DO-7											
	DO-8	AH-TB03			DX 9100	N2	1	159	DO-8			EN-1	Mech Room	0	M12	1-159-DO-8											
	DI-1	AH-TB03			DX 9100	N2	1	159	DI-1			EN-1	Mech Room	0	M12	1-159-DI-1											
	DI-2	AH-TB03			DX 9100	N2	1	159	DI-2			EN-1	Mech Room	0	M12	1-159-DI-2											
	DI-3	AH-TB03			DX 9100	N2	1	159	DI-3			EN-1	Mech Room	0	M12	1-159-DI-3											
	DI-4	AH-TB03			DX 9100	N2	1	159	DI-4			EN-1	Mech Room	0	M12	1-159-DI-4											
	DI-5	AH-TB03			DX 9100	N2	1	159	DI-5			EN-1	Mech Room	0	M12	1-159-DI-5											
	DI-6	AH-TB03	HI-SP	Hi Static Pressure Alarm	DX 9100	N2	1	159	DI-6			EN-1	Mech Room	0	M12	1-159-DI-6											
	DI-7	AH-TB03	Gas2Hot	Gas Burner Too Hot Stat	DX 9100	N2	1	159	DI-7			EN-1	Mech Room	0	M12	1-159-DI-7											
	DI-8	AH-TB03	SMK-ALM	Smoke Alarm	DX 9100	N2	1	159	DI-8			EN-1	Mech Room	0	M12	1-159-DI-8											
	AI-1	AH-TB03			DX 9100	N2	1	159	AI-1			EN-1	Mech Room	0	M12	1-159-AI-1											
	AI-2	AH-TB03			DX 9100	N2	1	159	AI-2			EN-1	Mech Room	0	M12	1-159-AI-2											
	AI-3	AH-TB03	MA-T	Mixed Air Temperature	DX 9100	N2	1	159	AI-3			EN-1	Mech Room	0	M12	1-159-AI-3											
	AI-4	AH-TB03	BOWL-T	Home Plate Left Bowl	DX 9100	N2	1	159	AI-4			EN-1	Mech Room	0	M12	1-159-AI-4											
	AI-5	AH-TB03	TLS4-CO2	TL S4 Carbon Dioxide	DX 9100	N2	1	159	AI-5		AI5,AICom,24VAC,COM	EN-1	Mech Room	0	M12	1-159-AI-5						2/22 / 2/18	OUT, GND, 24V	CD-W00 CO2 (Vdc)		D122	
	AI-6	AH-TB03	OA-T	Primary Outdoor Air Temp	DX 9100	N2	1	159	AI-6			EN-1	Mech Room	0	M12	1-159-AI-6											
	AI 7	AH-TB03			DX 9100	N2	1	159	AI-7			EN-1	Mech Room	0	M12	1-159-AI-7											
	AI-8	AH-TB03			DX 9100	N2	1	159	AI-8			EN-1	Mech Room	0	M12	1-159-AI-8											
	AO-1	AH-TB03	MA-DPR	Mixed Air Dampers %	DX 9100	N2	1	159	AO-1			EN-1	Mech Room	0	M12	1-159-AO-1											
	AO-2	AH-TB03	HTG-O	Heating Valve %	DX 9100	N2	1	159	AO-2			EN-1	Mech Room	0	M12	1-159-AO-2											
	AO-9	AH-TB03			DX 9100	N2	1	159	AO-9			EN-1	Mech Room	0	M12	1-159-AO-9											
	AO-10	AH-TB03			DX 9100	N2	1	159	AO-10			EN-1	Mech Room	0	M12	1-159-AO-10											
	AO-11	AH-TB03			DX 9100	N2	1	159	AO-11			EN-1	Mech Room	0	M12	1-159-AO-11											
	AO-12	AH-TB03			DX 9100	N2	1	159	AO-12			EN-1	Mech Room	0	M12	1-159-AO-12											
	AO-13	AH-TB03			DX 9100	N2	1	159	AO-13			EN-1	Mech Room	0	M12	1-159-AO-13											
	AO-14	AH-TB03			DX 9100	N2	1	159	AO-14			EN-1	Mech Room	0	M12	1-159-AO-14											
		AH-TB03			XT (Expansion Module)							EN-1	Mech Room		M12												Power to Controller
		AH-TB03			XT (Expansion	N2	1	160				EN-1	Mech Room	0	M12												N2 Trunk
	XT1DI1	AH-TB03	DADPR-S	Discharge Air Dampers	XP 9104 (4DI,	N2	1	160	DI-1			EN-1	Mech Room	0	M12	1-160A-DI-1											
	XT1DI2	AH-TB03	EADPR-S	Exhaust Air Dampers	XP 9104 (4DI,	N2	1	160	DI-2			EN-1	Mech Room	0	M12	1-160A-DI-2											
	XT1DI3	AH-TB03	OADPR-S	Outside Air Dampers	XP 9104 (4DI,	N2	1	160	DI-3			EN-1	Mech Room	0	M12	1-160A-DI-3											
	XT1DI4	AH-TB03	RADPR-S	Return Air Dampers	XP 9104 (4DI,	N2	1	160	DI-4			EN-1	Mech Room	0	M12	1-160A-DI-4											
	XT1DO5	AH-TB03	SFSTO-C	Supply Fan Stop Command	XP 9104 (4DI,	N2	1	160	DO-5			EN-1	Mech Room	0	M12	1-160A-DO-5											
	XT1DO6	AH-TB03	SFSTA-C	Supply Fan Start Command	XP 9104 (4DI,	N2	1	160	DO-6			EN-1	Mech Room	0	M12	1-160A-DO-6											
	XT1DO7	AH-TB03			XP 9104 (4DI,	N2	1	160	DO-7			EN-1	Mech Room	0	M12	1-160A-DO-7											
	XT1DO8	AH-TB03			XP 9104 (4DI,	N2	1	160	DO-8			EN-1	Mech Room	0	M12	1-160A-DO-8											

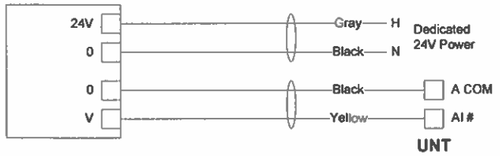
DETAIL D122 VOLTAGE INPUT from CD-W00 CO2 SENSOR



Drawing Title: AH-TB03 Point Schedule					
	REFERENCE DRAWING	NO	REVISION-LOCATION	ECN	DATE / BY
	Sales Engineer / Project Manager / Application Engineer	DRAWN BY / DATE	APPROVED BY / DATE		
Project Title: Seating Bowl CO2 Monitoring Demand Control Ventilation	Johnson Controls	Branch Information	CONTRACT NUMBER: 00120002	DRAWING NUMBER: 1.12	

Electrician/Fitter	Point Information				Controller Information							Panel Information					Intermediate Device				Field Device						
Tag	Point Type	System Name	Object Name	Expanded ID	Controller Details	Trunk Type	Trunk Nbr	Trunk Addr.	Cable Destination Boy/Terminal	Module Type	Termination Out	Panel	Panel Location	Slot Number	Reference Drawing	Cable Number	Wiring /Tubing	Termination In	Device	Termination Out	Location	Wiring /Tubing	Termination In	Device	Location	Ref Detail Shape	Comment
		AH-TB05			UNT 141							EN-1	Mech Room		M12												Power to Controller
		AH-TB05			UNT 141	N2	1	57				EN-1	Mech Room	0	M12												N2 Trunk
	AI-1	AH-TB05	OA-T	Outside Air Temperature	UNT 141	N2	1	57 AI-1				EN-1	Mech Room	0	M12	1-57-AI-1											
	AI-2	AH-TB05	TLS1-CO2	TL S1 Carbon Dioxide	UNT 141	N2	1	57 AI-2			AI2.A COM / 24VAC	EN-1	Mech Room	0	M12	1-57-AI-2						2/22 / 2/18	OUT, GND, 24V	CD-W00 CO2 (Vdc)		UT122	
	AI-3	AH-TB05	DA-T	Disch Air Temp	UNT 141	N2	1	57 AI-3				EN-1	Mech Room	0	M12	1-57-AI-3											
	AI-4	AH-TB05	BOWL-T	Bowl Temperature	UNT 141	N2	1	57 AI-4				EN-1	Mech Room	0	M12	1-57-AI-4											
	AI-5	AH-TB05	6101-T	Elev Rm 6101 Temperature	UNT 141	N2	1	57 AI-5				EN-1	Mech Room	0	M12	1-57-AI-5											
	AI-6	AH-TB05			UNT 141	N2	1	57 AI-6				EN-1	Mech Room	0	M12	1-57-AI-6											
	BI-1	AH-TB05	SF-S	Supply Airflow	UNT 141	N2	1	57 BI-1				EN-1	Mech Room	0	M12	1-57-BI-1											
	BI-2	AH-TB05	CADPR-S	Combustion Damper Status	UNT 141	N2	1	57 BI-2				EN-1	Mech Room	0	M12	1-57-BI-2											
	BI-3	AH-TB05	SMK-ALM	Smoke Alarm	UNT 141	N2	1	57 BI-3				EN-1	Mech Room	0	M12	1-57-BI-3											
	BI-4	AH-TB05	HTG-S	Heating Status	UNT 141	N2	1	57 BI-4				EN-1	Mech Room	0	M12	1-57-BI-4											
	BO-1	AH-TB05	HTG-C	Heating Command	UNT 141	N2	1	57 BO-1				EN-1	Mech Room	0	M12	1-57-BO-1											
	BO-2	AH-TB05	SF-C	Supply Fan	UNT 141	N2	1	57 BO-2				EN-1	Mech Room	0	M12	1-57-BO-2											
	BO-3	AH-TB05	PHP-C	Preheat Pump	UNT 141	N2	1	57 BO-3				EN-1	Mech Room	0	M12	1-57-BO-3											
	BO-4	AH-TB05			UNT 141	N2	1	57 BO-4				EN-1	Mech Room	0	M12	1-57-BO-4											
	BO-5	AH-TB05			UNT 141	N2	1	57 BO-5				EN-1	Mech Room	0	M12	1-57-BO-5											
	BO-6	AH-TB05			UNT 141	N2	1	57 BO-6				EN-1	Mech Room	0	M12	1-57-BO-6											
	AO-1	AH-TB05	PH-O	Preheat Valve	UNT 141	N2	1	57 AO-1				EN-1	Mech Room	0	M12	1-57-AO-1											
	AO-2	AH-TB05			UNT 141	N2	1	57 AO-2				EN-1	Mech Room	0	M12	1-57-AO-2											

DETAIL UT122 VOLTAGE INPUT from CD-W00 CO2 SENSOR



Set SW1 to Position "V" and SW2 to Position "10V"

Drawing Title
AH-TB05 Point Schedule

REFERENCE DRAWING	NO	REVISION-LOCATION	ECN	DATE	BY

Sales Engineer	Project Manager	Application Engineer	DRAWN BY	DRAWN DATE	APPROVED BY	APPROVED DATE

Project Title
Seating Bowl CO2 Monitoring Demand Control Ventilation

Johnson Controls

Branch Information

CONTRACT NUMBER
00120002

DRAWING NUMBER
1.13

Code No. LIT-1900399
Issued January 20, 2012

CD-W00-00-1, CD-W00-N0-1

CD-W00-x0-1 Series Wall Mount CO_2 Transmitters

Description

Johnson Controls® offers carbon dioxide (CO_2) transmitters for measuring and transmitting CO_2 levels, ranging from 0 to 2,000 parts per million (ppm), within Heating, Ventilating, and Air Conditioning (HVAC) CO_2 applications. Specific HVAC CO_2 applications include Demand Control Ventilation (DCV), fresh air and Indoor Air Quality (IAQ), and rooftop air handling Economizer controls systems.

Features

- DCV strategies — offer potential for 10 to 70% energy savings
- Vaisala CARBOCAP® single-beam, dual-wavelength design — provides superior performance compared to other technologies
- CARBOCAP silicon, micro-machined construction — provides reliable CO2 measurement in room environments
- offers 5 years of reliable calibration
- stable infrared reference — compensates for light-source drift

Applications

This compact wall-mounted device produces 0 to 10 V and 4 to 20 mA signals. It is designed to work:

- in stand-alone mode
- as part of any integrated Building Automation System (BAS)

The CO_2 transmitter is easy to install, offers a full 3-year warranty, and requires no maintenance or field calibration.

Repair Information

If the CD-W00-x0-1 Series Wall Mount CO_2 Transmitters fail to operate within their specifications, replace the units. For a replacement CO_2 transmitter, contact the nearest Johnson Controls representative. Refer to the *CD-W00-x0-1 Series Wall Mount CO_2 Transmitters Product Bulletin (LIT-12011187)* for important product application information.

CD-W00-00-1 Wall Mount CO_2 Transmitter with Logo

Selection Chart

Product Code Number	Description
CD-W00-00-1	Wall Mount CO_2 Transmitter with Logo
CD-W00-N0-1	Wall Mount CO_2 Transmitter without Logo

Accessories

Product Code Number	Description
ACC-DWCLIP-0	Drywall Spring-Clip Mounting Kit
Y65T31-0	Multiple Primary Transformer, 40 VA, 120/208/240 V Primary, 24 V Class 2 Secondary with Screw Terminals: Foot Mounting or 4 x 4 in. (100 x 100 mm) Plate

Technical Specifications

CD-W00-00-1 and CD-W00-N0-1 Wall Mount CO_2 Transmitters		
Measuring Range		0 to 2,000 ppm CO_2
Accuracy at 77°F (25°C)		±[50 ppm + 3.0% of reading] (includes calibration uncertainty, repeatability, and non-linearity). All accuracy specifications reflect the testing of the transmitter using high-grade certified gases. The transmitter is intended for an altitude range of 0 to 2,000 ft (0 to 600 m) above sea level without compensation.
Temperature Dependence of Output		-0.35% of reading/°C, typical (may vary between individual units)
Long-Term Stability		<5.0% of Full Scale/5 Years
Response Time (0 to 63%)		1 Minute
Operating Temperature Range		23 to 113°F (-5 to 45°C)
Storage Temperature Range		-4 to 158°F (-20 to 70°C)
Humidity Range		0 to 85% RH (noncondensing), 85°F (29°C) maximum dew point
Transmitter CO_2 Output Signal		4 to 20 mA or 0 to 10 VDC; Maximum Output Current: 25 mA; Maximum Output Voltage: 12.5 V
Resolution of Analog Outputs		2.5 ppm CO_2
Recommended External Load		Current Output: Maximum 500 ohms Load Resistance; Voltage Output: Minimum 1,000 ohms Load Resistance
Power Supply Range		20 to 30 VAC (18 to 30 VDC), Class 2
Power Consumption		<2.0 W Average, excluding current output consumption
Current Consumption		150 mA peak (70 mA average)
Warm-Up Time		<1 Minute; <10 Minutes for Full Specification
Dimensions (H x W x D)		4-23/32 x 3-5/32 x 1-7/32 in. (120 x 80 x 31 mm)
Shipping Weight		0.26 lb (117 g)
Compliance	United States	UL Listed, File E27734, CCN XAPX, UL 873, Temperature Indicating and Regulating Equipment, FCC Compliant to CFR 47, Part 15, Subpart B, Class A
	Canada	UL Listed, File E27734, CCN XAPX7, CAN/CSA C22.2 No. 24, Temperature Indicating and Regulating Equipment. Industry Canada Compliant, ICES-003
CE	Europe	CE Mark – Johnson Controls, Inc., declares that the Wall Mount CO_2 Transmitters are in compliance with the essential requirements and other relevant provisions of the EMC Directive 2004/108/EC.

0011-0003

AH-S13 Variable Frequency Drive Paint Booth Static Pressure Control

DRAWING NUMBER	DRAWING TITLE
TITLE	Title Page
PAGE 2	NAE Reference Drawing
1.1	AH-S13 Flow
1.2A	AH-S13 Wiring Detail - Existing
1.2B	AH-S13 Wiring Detail - New
1.3	AH-S13 Sequence of Operations
1.4A	AH-S13 Point Schedule (1 of 2)
1.4B	AH-S13 Point Schedule (2 of 2)

Johnson Controls

Creating a better climate for business.

- ■ Environmental Control System
- ■ Facility Management System
- ☐ Air and Water System Balancing
- ☐ Fire Management System
- ☐ Security System
- ☐ Lighting Services
- ☐ Instrumentation System Installation
- ☐ Building Operations Management
- ☐ Energy Conservation Control
- ☐ Training Programs
- ☐ Performance Contracting
- ☐ Planned Service Agreements

Air Conditioning
Heating
Diagnostic Services
Coil Cleaning
Refrigeration
Automatic Temperature Controls
Facility Management Systems
Fire Management
Security Management
Building Operations and Management
Water Treatment
Electrical Equipment
Emergency Generator / Lighting Equipment
Industrial Controls / Recording / Indication Equipment

PROJECT TITLE
MILLER PARK
AH-S13 VARIABLE FREQUENCY DRIVE
PAINT BOOTH STATIC PRESSURE CONTROL

ARCHITECT	ENGINEER
, Phone:	, Phone:
MECHANICAL CONTRACTOR	ELECTRICAL CONTRACTOR
, Phone:	, Phone:

REFERENCE DRAWING	NO	REVISION/LOCATION	ECN	DATE	BY

Johnson Controls

Branch Information
, Phone:
Fax:

SALES ENGINEER	PROJECT MANAGER	APPLICATION ENGINEER	DATE	CONTRACT NUMBER
	KDP	KDP	11/2011	00110003

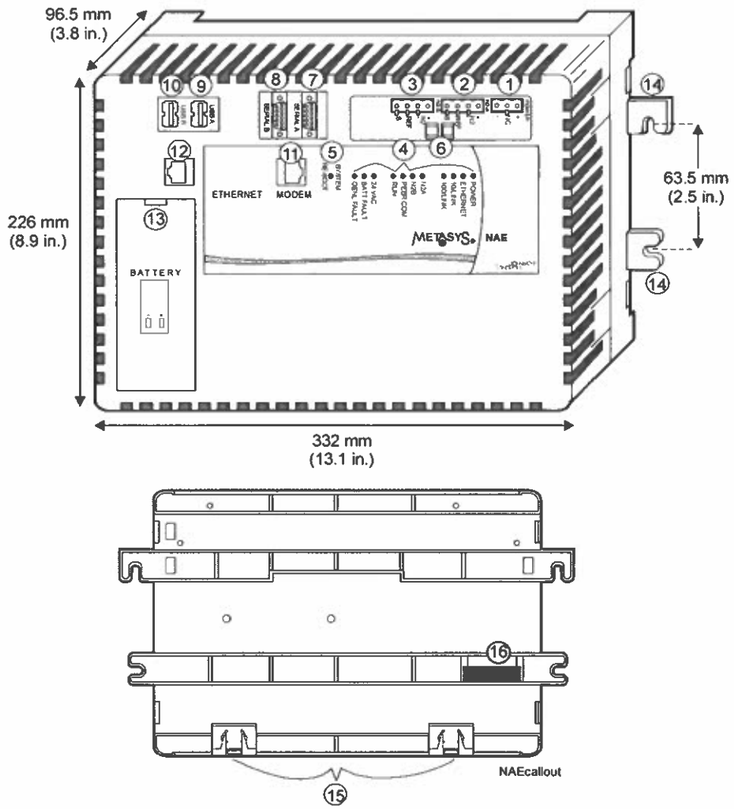
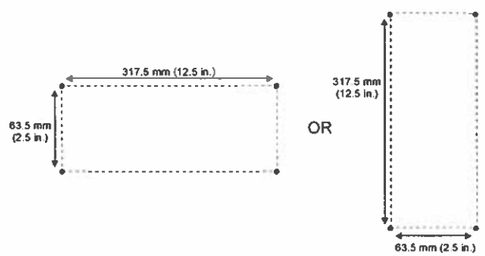
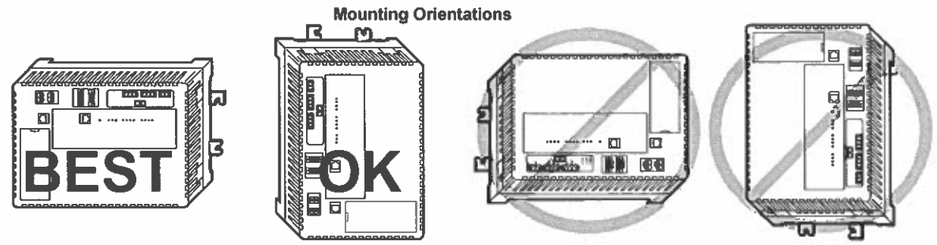


Table 1: NAE/NIE Callouts			
Callout	**Description**	**Callout**	**Description**
1	Power Termination	9	USB A connector
2	N2 A Bus termination	10	USB B connector
3	N2 B Bus termination	11	Modem RJ-11 connector
4	Light-Emitting Diodes (LEDs)	12	Ethernet RJ-45 connector
5	System Re-boot switch	13	Battery hatch
6	N2 End-of-Line (EOL) switches	14	Mounting feet (2 of 4)
7	Serial A RS-232 connector	15	DIN rail clips (2 of 2)
8	Serial B RS-232 connector	16	Battery Strap

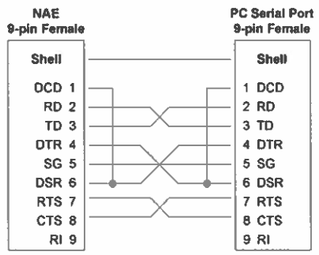


Mounting Hole Spacing

Mounting Orientations



PC Serial Ports (SER A, SER B)



USB Ports (USB A and USB B)

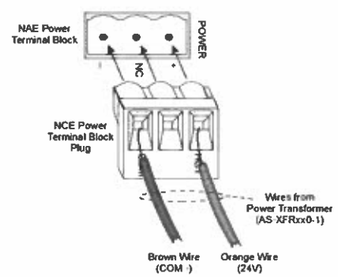
NAE USB Pinouts

+5 VDC	1
Data -	2
Data +	3
Ground	4

Ethernet Port

NAE Ethernet Pinouts

TD +	1
TD -	2
RD +	3
No Connection	4
No Connection	5
RD -	6
No Connection	7
No Connection	8



24VAC Power Connection

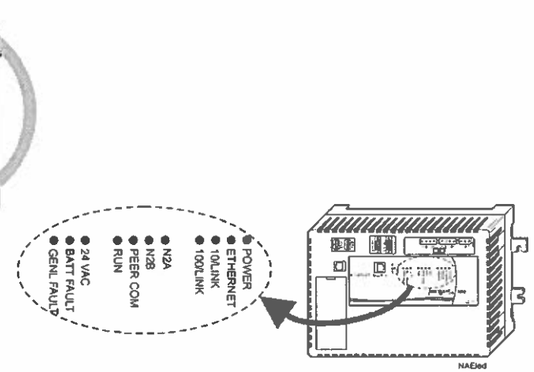
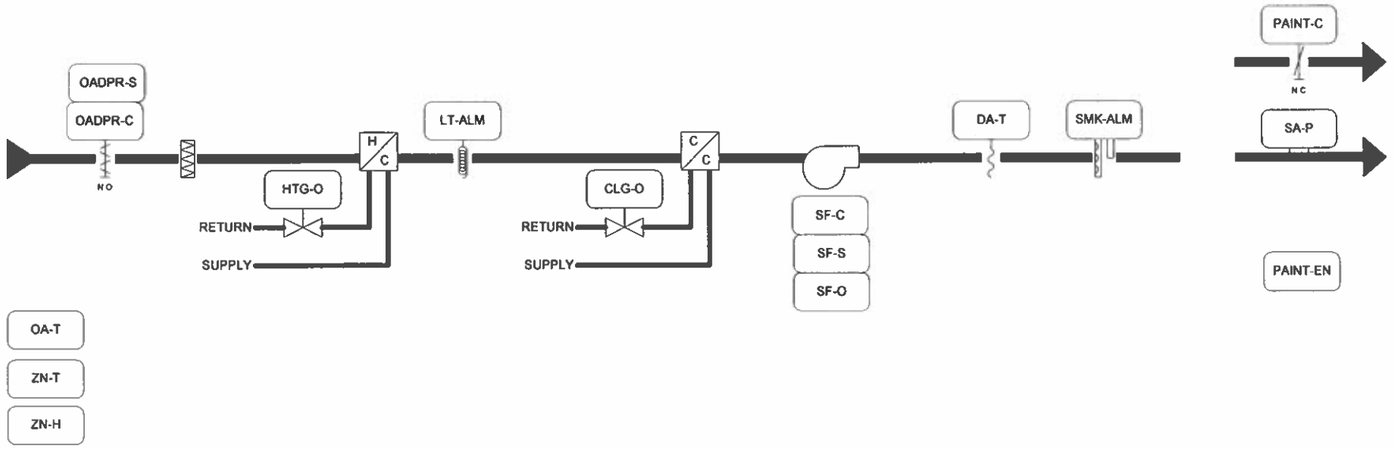


Table 4: NAE / NIE LEDs

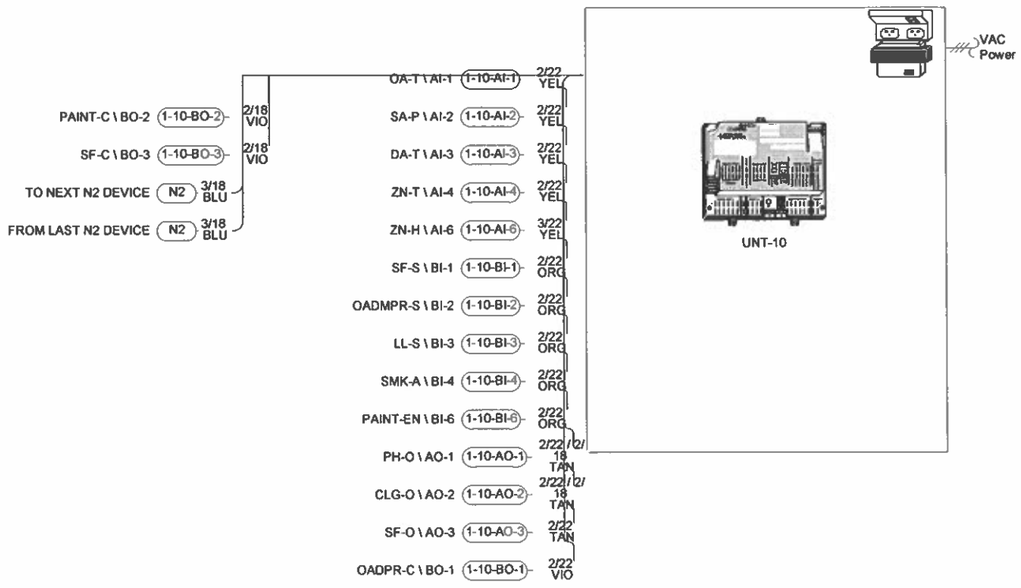
LED	Normal	Descriptions / Other Conditions
POWER (GREEN)	On Steady	On Steady = Unit is getting power from either the battery or 24 VAC power. Also see the 24 VAC LED. Off Steady = Unit is shut down.
ETHERNET (GREEN)	Flicker	Flicker = Data is transferring on the Ethernet connection. Ethernet traffic is general traffic (may not be for the NAE / NIE). Off Steady = No Ethernet traffic, probably indicates a dead Ethernet network or bad Ethernet connection.
10/LINK (GREEN)	On Steady	On Steady = Ethernet connection is established at 10 Mb/sec.
100/LINK (GREEN)	On Steady	On Steady = Ethernet connection is established at 100 Mb/sec.
N2 A (GREEN) (NAE Only)	Flicker	Flicker = N2 A port is transmitting or receiving data. Flickers are generally in synch with data transmission, but should not be used to indicate specific transmission times. Off Steady = No traffic.
N2 B (GREEN) (NAE Only)	Flicker	Flicker = N2 B port is transmitting or receiving data. Flickers are generally in synch with data transmission, but should not be used to indicate specific transmission times. Off Steady = No traffic.
PEER COMM (GREEN)	Varies (see next column)	Flicker = Data traffic between NAE / NIE devices. For an NAE / NIE that is not a Site Director, this LED indicates regular heartbeat communications with the Site Director. For a Site Director NAE / NIE, flashes are more frequent and indicate heartbeat communications from all other NAE / NIE devices on the site.
Run	On Steady	On Steady = NAE / NIE software is running On 1 second, Off 1 second = NAE / NIE software is in startup mode. On 4 seconds, Off 1 second = NAE / NIE is in diagnostics mode. On 0.5 seconds, Off 0.5 seconds = NAE / NIE software is shutting down. Off Steady = Operating system is shutting down or software is not running.
24 VAC (GREEN)	On Steady	On Steady = 24 VAC power present. Off Steady = Loss of 24 VAC power. In the Off Steady condition, the NAE / NIE can be running on battery power. Also se the POWER LED.
BATT FAULT (RED)	Off Steady	On Steady = Battery fault. Replace the battery.
GENL FAULT (RED)	Off Steady	On Steady = General Fault. Fault conditions include excessive Central Processing Unit (CPU) flash, or memory use, or excessive CPU or Printed Wire Board (PWB) temperature. In normal operation, the GENL FAULT LED stays on steady for the first half of the startup sequence.

REVISION INFORMATION	Drawing Title								
NUMBER	**NAE Reference Drawing**								
DATE 02/02/12		REFERENCE DRAWING	NO	REVISION-LOCATION		ECN	DATE	BY	
TIME 12:42 PM	Project Title	Sales Engineer / Project Manager / Application Engineer	DRAWN BY / DATE	APPROVED BY / DATE	Branch Information	CONTRACT NUMBER			
File Name NAE Reference Drawing001.vsd	**AH-S13 Modification**	Johnson Controls				00110003			
						DRAWING NUMBER PAGE 2			

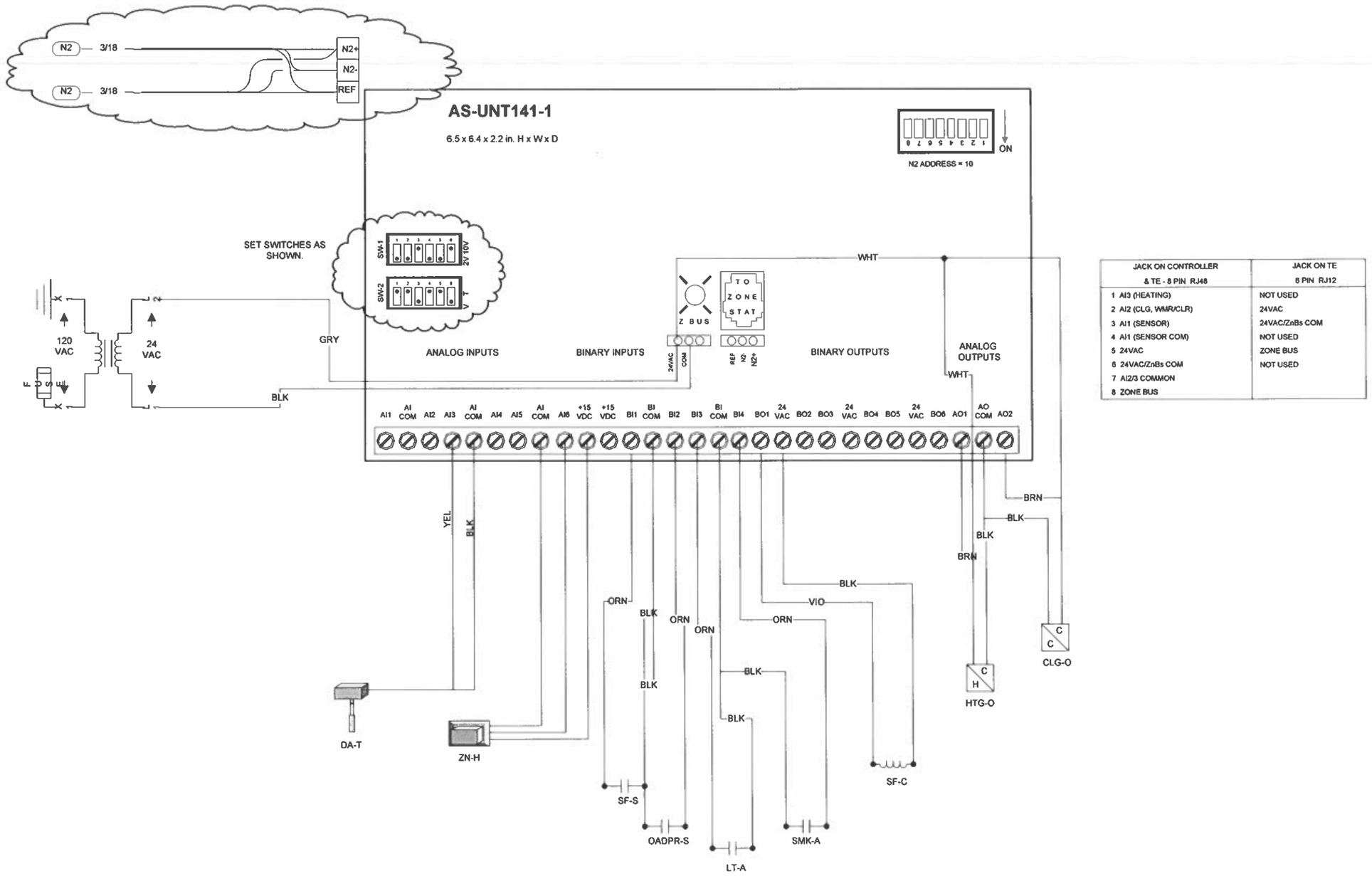


BILL OF MATERIALS

Designation	Qty	Part Number	Description
UNT-10	1	AS-UNT1144-0	AS-UNT1144-0 W/4BO, 4AO
VND-30	1	VS030420A-N0000	VSD 30HP 480VAC TYPE 12 N2 COM
SA-P	1	PXDXX02S	0-10V DIG PRESS TRANS/DRY MEDIA
PAINT-C	1		18" ROUND CTRL DPR W/24V ACTUATOR
PAINT-EN	1		TOGGLE SWITCH



Drawing Title: AH-S13 Flow Panel Detail						
	REFERENCE DRAWING	NO	REVISION-LOCATION	ECN	DATE	BY
	Sales Engineer / Project Manager / Application Engineer		DRAWN BY / DATE	APPROVED BY / DATE		
Project Title: AH-S13 Modification	Johnson Controls		Branch Information	CONTRACT NUMBER: 00110003		
				DRAWING NUMBER: 1.1		



JACK ON CONTROLLER & TE - 8 PIN RJ48	JACK ON TE 6 PIN RJ12
1 AI3 (HEATING)	NOT USED
2 AI2 (CLG, WMR/CLR)	24VAC
3 AI1 (SENSOR)	24VAC/ZnBs COM
4 AI1 (SENSOR COM)	NOT USED
5 24VAC	ZONE BUS
6 24VAC/ZnBs COM	NOT USED
7 AI2/3 COMMON	
8 ZONE BUS	

Drawing Title
AH-S13 Wiring Details - Existing
(1 of 2)

REFERENCE DRAWING	NO	REVISION-LOCATION	ECN	DATE	BY

Sales Engineer | Project Manager | Application Engineer | DRAWN BY DATE | APPROVED BY DATE

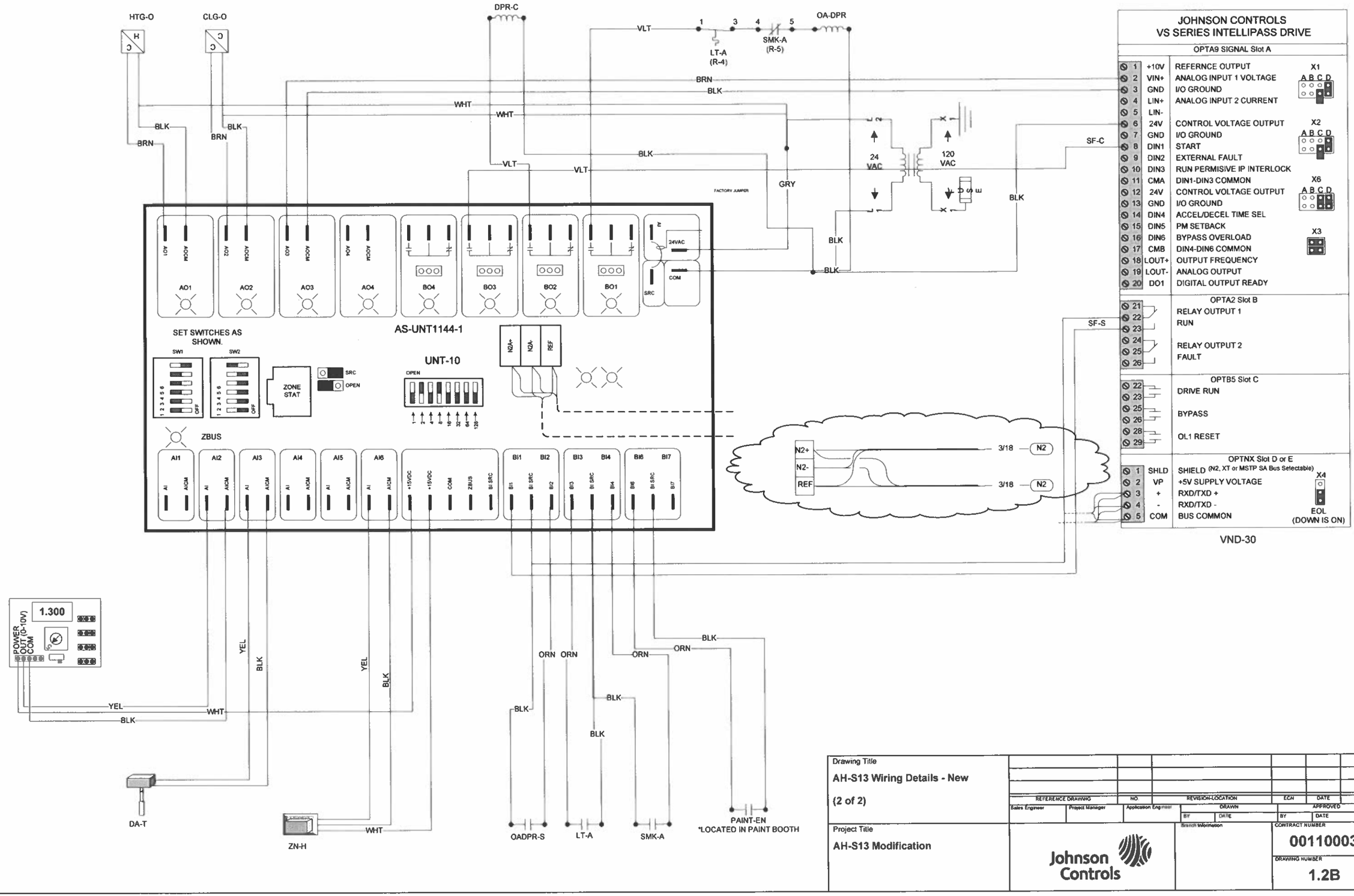
Project Title
AH-S13 Modification

Branch Information

Johnson Controls

CONTRACT NUMBER
00110003

DRAWING NUMBER
1.2A



Drawing Title
AH-S13 Wiring Details - New
(2 of 2)

Project Title
AH-S13 Modification

REFERENCE DRAWING	NO.	REVISION-LOCATION	ECN	DATE	BY

Sales Engineer | Project Manager | Application Engineer | DRAWN BY / DATE | APPROVED BY / DATE

Branch Information

Johnson Controls

CONTRACT NUMBER
00110003

DRAWING NUMBER
1.2B

SEQUENCE OF OPERATIONS

Upon a call for Occupied Mode, the outside air damper will move to the open position and the supply fan will be energized once the outside air damper end switch proves the open position.

The supply air volume is modulated via a variable frequency drive (VFD) based on a static pressure sensor located in the supply air ductwork. The VFD will modulate to maintain the duct static pressure setpoint. A manual-reset high static pressure controller is also electrically interlocked with the supply fan to shutdown if duct static pressure reaches 3.0" w.c.

The heating and cooling valves are modulated in sequence to prevent simultaneous heating and cooling, and to maintain discharge air temperature setpoint. Discharge air temperature setpoint is reset based on outside air temperature as follows:

OA-T	DA-T
50° F	65° F
90° F	55° F

Upon a call for cooling, the cooling valve will modulate open to maintain the desired discharge air temperature setpoint.

Upon a call for heating the heating valve will modulate open to maintain the desired discharge air temperature setpoint.

During the Unoccupied Mode, the supply fan and heating and cooling valves will operate intermittently to maintain a minimum space temperature of 60° F, and a maximum space temperature of 85° F.

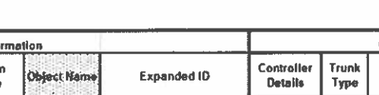
Freeze Protection. A manual-reset temperature low limit switch is provided to prevent freezing of the heating coil. In the event that air entering the coil is below 40° F, the supply fan will shut down and the heating valve will move to the fully open position. A low temperature alarm will be reported to the BAS, and the AHU cannot restart until the alarm condition has been cleared.

Smoke detectors installed in the supply and return ducts will, on the detection of smoke, shut down the air handler supply fan via a hard-wired electrical interlock. Additional fire protection is provided by electrical smoke dampers, which close upon the sensing of high-temperature in the supply ductwork. In the case of either condition, an alarm will also be reported to the BAS.

Drawing Title: Sequence of Operations							
	REFERENCE DRAWING	NO	REVISION-LOCATION	ECN	DATE	BY	
	Sales Engineer / Project Manager / Application Engineer		DRAWN BY / DATE	APPROVED BY / DATE			
Project Title: AH-S13 Modification	Johnson Controls	Branch Information	CONTRACT NUMBER: 00110003				
			DRAWING NUMBER: 1.3				

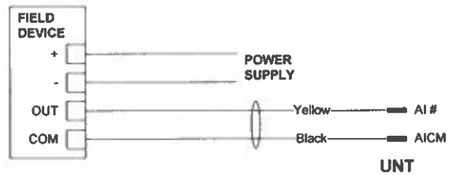
Electrician/Fitter		Point Information			Controller Information							Panel Information						Intermediate Device				Field Device					
Tag	Point Type	System Name	Object Name	Expanded ID	Controller Details	Trunk Type	Trunk Nbr	Trunk Addr.	Cable Destination Bay/Terminal	Module Type	Termination Out	Panel	Panel Location	Slot Number	Reference Drawing	Cable Number	Wiring /Tubing	Termination In	Device	Termination Out	Location	Wiring /Tubing	Termination In	Device	Location	Ref Detail Shape	Comment
		AH-S13			UNT 1144	N2	2	10				EN-1	Mech Room	0	M12												N2 Trunk
	AI-1	AH-S13	OA-T	Outdoor Air Temp	UNT 1144	N2	2	10	AI-1		AI1,AICM	EN-1	Mech Room	0	M12	1-10-AI-1						2/22	2-Wire	Analog Input (S/W Mapped)		UC108	
	AI-2	AH-S13	SA-P	Static Press	UNT 1144	N2	2	10	AI-2		AI2,AICM	EN-1	Mech Room	0	M12	1-10-AI-2						2/22	See wiring detail	Voltage Input (External Pwr)		UC101	
	AI-3	AH-S13	DA-T	Disch Air Temp	UNT 1144	N2	2	10	AI-3		AI3,AICM	EN-1	Mech Room	0	M12	1-10-AI-3						2/22	2-Wire	TE		UC131	
	AI-4	AH-S13	ZN-T	Zone Temp	UNT 1144	N2	2	10	AI-4		AI4,AICM	EN-1	Mech Room	0	M12	1-10-AI-4						2/22	2-Wire	Analog Input (S/W Mapped)		UC108	
	AI-5	AH-S13			UNT 1144	N2	2	10	AI-5			EN-1	Mech Room	0	M12	1-10-AI-5											
	AI-6	AH-S13	Zn-H	Zone Humidity	UNT 1144	N2	2	10	AI-6		AI6,AICM +15VDC	EN-1	Mech Room	0	M12	1-10-AI-6						3/22	OUT,COM,PWR	HE-63x0-HE		UC151	
	BI-1	AH-S13	SF-S	Supply Airflow	UNT 1144	N2	2	10	BI-1		BI1, BI SRC	EN-1	Mech Room	0	M12	1-10-BI-1						2/22	See wiring detail	Dry Contact		UC301	
	BI-2	AH-S13	OADmpr-S	OA Damper Status	UNT 1144	N2	2	10	BI-2		BI2, BI SRC	EN-1	Mech Room	0	M12	1-10-BI-2						2/22	See wiring detail	M-9216 EndSwitch		UC363	
	BI-3	AH-S13	LL-S	Freeze Stat	UNT 1144	N2	2	10	BI-3		BI3, BI SRC	EN-1	Mech Room	0	M12	1-10-BI-3						2/22	LINE, M1	A70 (NO)		UC302	
	BI-4	AH-S13	SMK-A	Smoke Alarm	UNT 1144	N2	2	10	BI-4		BI4, BI SRC	EN-1	Mech Room	0	M12	1-10-BI-4						2/22	See wiring detail	Dry Contact		UC301	
	BI-6	AH-S13	PAINT-EN	Paint Booth Enabled	UNT 1144	N2	2	10	BI-6		BI6, BI SRC	EN-1	Mech Room	0	M12	1-10-BI-6						2/22	See wiring detail	Dry Contact		UC301	
	BI-7	AH-S13			UNT 1144	N2	2	10	BI-7			EN-1	Mech Room	0	M12	1-10-BI-7											
	AO-1	AH-S13	PH-O	Preheat Valve	UNT 1144	N2	2	10	AO-1		AO1,AOCM / 24VAC	EN-1	Mech Room	0	M12	1-10-AO-1						2/22 / 2/18	5, 1/1, 2	M-9216 Tandem (Ext Source)		UC265	
	AO-2	AH-S13	CLG-O	Cooling Valve	UNT 1144	N2	2	10	AO-2		AO2,AOCM / 24VAC	EN-1	Mech Room	0	M12	1-10-AO-2						2/22 / 2/18	5, 1/1, 2	M-9216 Tandem (Ext Source)		UC265	
	AO-3	AH-S13	SF-O	Supply Fan Cntl	UNT 1144	N2	2	10	AO-3		AO3,AOCM	EN-1	Mech Room	0	M12	1-10-AO-3						2/22	AI#,AICM	0-10V (Output to Input)		UC203	
	AO-4	AH-S13			UNT 1144	N2	2	10	AO-4			EN-1	Mech Room	0	M12	1-10-AO-4											
	BO-1	AH-S13	OADPR-C	Outdoor Air Damper	UNT 1144	N2	2	10	BO-1		BO1(NO),24V Com	EN-1	Mech Room	0	M12	1-10-BO-1						2/22	3, 1	M-9216-AGx (On-Off)		UC573	
	BO-2	AH-S13	PAINT-C	Paint Booth Damper	UNT 1144	N2	2	10	BO-2		BO2(NO),24V Com	EN-1	Mech Room	0	M12	1-10-BO-2						2/18	See wiring detail	24VAC OUT		UC504	
	BO-3	AH-S13	SF-C	Supply Fan Command	UNT 1144	N2	2	10	BO-3		BO3(NO),24V Com	EN-1	Mech Room	0	M12	1-10-BO-3						2/18	See wiring detail	24VAC OUT		UC504	
	BO-4	AH-S13			UNT 1144	N2	2	10	BO-4			EN-1	Mech Room	0	M12	1-10-BO-4											

DETAIL UC108 ANALOG INPUT (Software Mapped)



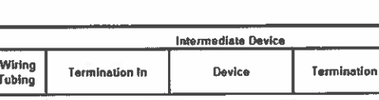
Set SW1 to OFF and SW2 to ON

DETAIL UC101 VOLTAGE INPUT - EXTERNAL SOURCE



Set SW1 to ON and SW2 to OFF

DETAIL UC108 ANALOG INPUT (Software Mapped)

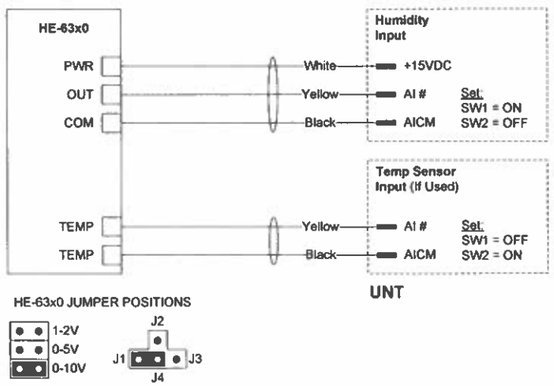


Set SW1 to OFF and SW2 to ON

DETAIL UC131 TEMPERATURE SENSOR INPUT

Set SW1 to OFF and SW2 to ON

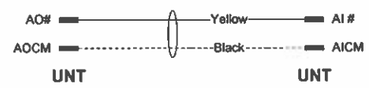
DETAIL UC151 HE-6300 SERIES HUMIDITY SENSOR



DETAIL UC203 ANALOG OUTPUT to ANALOG INPUT

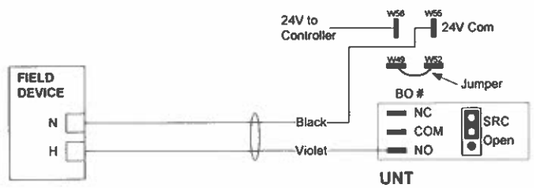
Note that the Analog Output Common and Analog Input Common are the same within a single controller.

If this is used between two controllers, ensure that the controllers have a common 24Vac connection.



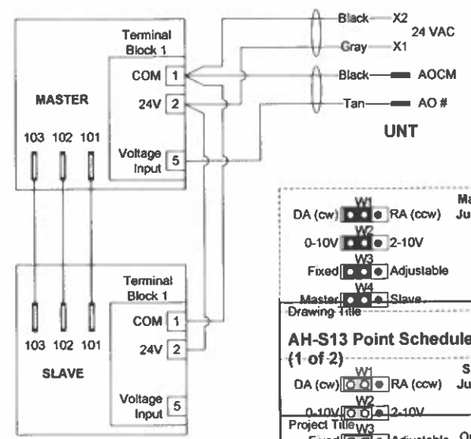
Set SW1 to ON and SW2 to OFF

DETAIL UC504 24 VAC BINARY OUTPUT



NOTE: 24V Sourced from Controller Power

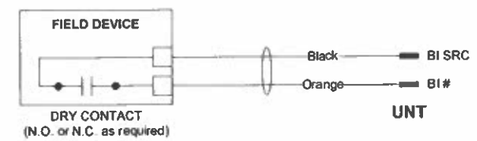
DETAIL UC265 0-10VDC OUTPUT to M-9216 (Tandem Actuator)



When connecting 2 actuators back to back on the same shaft, the coupler on one actuator must be set to spring return in the opposite direction from the other actuator.

To Reverse the Spring Return Rotation, reverse the orientation of the Blade Pin Coupler

DETAIL UC301 BINARY INPUT (DRY CONTACT)



Drawing Title

AH-S13 Point Schedule (1 of 2)

Project Title

AH-S13 Modification

REFERENCE DRAWING	NO	REVISION-LOCATION	ECN	DATE	BY
Sales Engineer	Project Manager	Application Engineer	DRAWN BY	DRAWN DATE	APPROVED BY / DATE

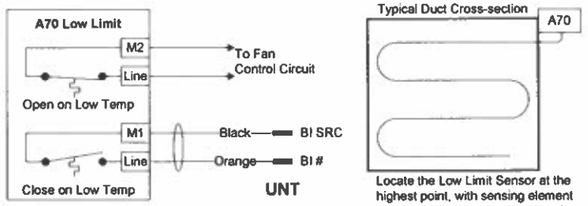
Branch Information

CONTRACT NUMBER: 00110003

DRAWING NUMBER: 1.4A

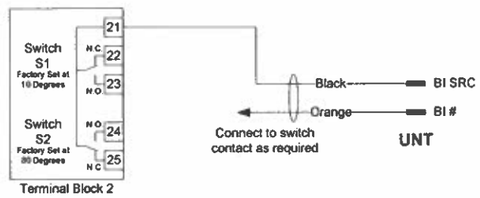
Johnson Controls

DETAIL UC302 N.O. BINARY INPUT - A70

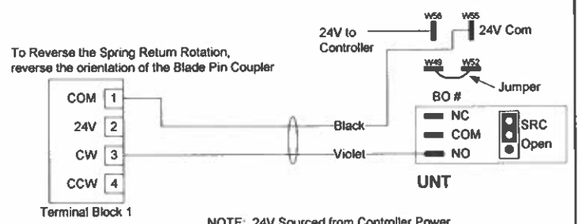


Locate the Low Limit Sensor at the highest point, with sensing element stretched continuously downward
Install 1 sensor / 25 sq.feet

DETAIL UC363 BINARY INPUT from M-9216



DETAIL UC573 ON-OFF CONTROL to M-9216-AGx



NOTE: 24V Sourced from Controller Power
Refer to UC505, UC506 for optional isolated output connections

Drawing Title
AH-S13 Point Schedule
(2 of 2)

REFERENCE DRAWING	NO	REVISION-LOCATION	ECN	DATE	BY

Sales Engineer | Project Manager | Application Engineer | DRAWN BY / DATE | APPROVED BY / DATE

Project Title
AH-S13 Modification

Johnson Controls

Branch Information

CONTRACT NUMBER
00110003

DRAWING NUMBER
1,4B

JOHNSON CONTROLS

Controls Group 507 E. Michigan Street
P.O. Box 423, Milwaukee, WI 53202
Code No. LIT-1900062

UNT1100 Series

Unitary Controller

UNT1100 Series Controller

Description

The Metasys® Unitary (UNT1100 Series) Controller is an addition to the popular UNT controller family. It is a versatile digital controller for packaged (rooftop) air handling units, unit ventilators, fan coils, heat pumps, and other terminal units. It can also be configured as a generic inputs device for basic point monitoring applications when used within a Metasys Network.

The UNT1100 Series has several features not available with the standard UNT product, including: additional inputs/outputs, low ambient temperature operation, up to four analog outputs (model dependent), relay binary outputs, and an option for removable screw terminations.

Use the UNT 1100 as a standalone controller, or as part of a Metasys Network through a Network Control Module (NCM) or N30 Supervisory Controller.

Features

- standalone control or network communication over N2 Bus
- built-in control program library
- expanded point capacity
- relay outputs
- removable screw termination options
- LED indicators
- low ambient temperature operation

To Order

Specify the code number from the following selection chart.

Selection Chart

Code Number	Termination Type [a]	Analog Inputs	Binary Inputs	Analog Outputs	Binary Outputs
AS-UNT1108-0	Spade Lug	6 RTD Temp. Elem. (NI, SI, or PT) 0-10 VDC Trans. 2K ohm Setpoint Potentiometers Voltage or resistive DIP switch selectable	6 6-Dry Contacts 24 VAC 10 mA minimum	0	8 24 VAC relays at 2 Amps each (10 mA minimum), 13 Amp Inrush Source Sinking or Isolated [b] Contact, Jumper Selectable
AS-UNT1126-0	Spade Lug	6 RTD Temp. Elem. (NI, SI, or PT) 0-10 VDC Trans. 2K ohm Setpoint Potentiometers Voltage or resistive DIP switch selectable	6 6-Dry Contacts 24 VAC 10 mA minimum	2 0-10 VDC @10 mA	6 24 VAC relays at 2 Amps each (10 mA minimum), 13 Amp Inrush Source Sinking or Isolated [b] Contact, Jumper Selectable
AS-UNT1144-0	Spade Lug	6 RTD Temp. Elem. (NI, SI, or PT) 0-10 VDC Trans. 2K ohm Setpoint Potentiometers Voltage or resistive DIP switch selectable	6 6-Dry Contacts 24 VAC 10 mA minimum	4 0-10 VDC @10 mA	4 24 VAC relays at 2 Amps each (10 mA minimum), 13 Amp Inrush Source Sinking or Isolated [b] Contact, Jumper Selectable

(a) Accommodates removable screw terminations that are available as separate kits (AP-TBK1002-0 and AP-TBK1003-0).

(b) Voltage-free

UNT1100 Series Unitary Controller (Continued)

Options

Application Options	Software Options	
Primary Equipment Types	Unit Vents:	ASHRAE Cycle 1 ASHRAE Cycle 2 ASHRAE Cycle 3 ASHRAE Cycle W
	Heat Pumps:	Water to Air Air to Air
	Packaged Rooftops	
	Fan Coils	
	Generic Point Multiplexer	
Primary Control Strategies	Room/Zone control	
Economizer Changeover Strategies	Dry bulb	
	Outside air enthalpy	
	Differential outside/return air temperature	
	Outside air and return air enthalpy comparison	
	Binary input from external economizer	
	-Supervisory network command	

Application Options	Software Options
Mixed Air Control Strategies	Proportional output to outdoor air/room damper actuators
	Binary output to economizer actuator
	Zone bus output to OA/RA damper actuator
Heating/Cooling Configuration	Modulated single coil
	Staged (2-stage max)
	Modulated common heating/cooling coil
	Reversing valve logic
	Incremental
Fan Start/Stop	Continuous Operation
	Cycled with call for heating/cooling
Lighting Control	On and off outputs to lighting relay in conjunction with OCC/Unocc mode
Unoccupied Control	Setup and setback, morning warmup and cooldown

Note: The UNT1100 Series controller is not intended for 3-wire or floating control, since this could adversely affect the service life of the relay outputs.

Binary outputs are not intended for low current analog applications.

Accessories (Order Separately)

Code Number	Description
AS-XFR100	Power Supply, 100 VA Transformer
EN-EWC15-0	Power Supply, 50 VA Transformer
AS-ZTU100-1	Zone Terminal
AS-ENC100-0	Enclosure Kit
EN-EWC10-0	Enclosure Kit
EN-EWC15-0	Enclosure Kit
AS-CBLPRO-2	Interface Converter for HVAC PRO Software
AS-CVTPROx00-0	Interface Converter for HVAC PRO Software
AS-TBKIT-0	Removable Screw Terminations, kit consists of five of each plug type
AP-TBK1002-0	Removable Screw Terminations, 2 position screw termination kit pkg/100
AP-TBK1003-0	Removable Screw Terminations, 3 position screw termination kit pkg/100
TE-6700 Series	Zone Sensors
AP-TMZ1600-0	Room Sensor with LCD Display
MM-CVT101-0	RS-485 to RS-232 Converter

Specifications

UNT1100 Series Unitary Controller	
Product Codes	Spade quick connects: AS-UNT1108-0 6AI, 6BI, 0AO, 8BO AS-UNT1126-0 6AI, 6BI, 2AO, 6BO AS-UNT1144-0 6AI, 6BI, 4AO, 4BO
Ambient Operating Conditions	-40 to 60° C (-40 to 140° F) 10 to 90% RH
Dimensions	165 x 163 x 56 mm (6.5 x 6.4 x 2.2 in)
Power Requirements	24 VAC, 50/60 Hz at 40 VA (per typical system)
N2 Bus	Isolated
Zone Bus	8-Pin Phone Jack or Terminal Block on Controller
Shipping Weight	0.64 kg (1.4 lbs)
Agency Compliance	CSA C22.2 No. 205, FCC Part 15, Subpart J, Class A, IEEE 446, IEEE 472, IEEE 518, IEEE 587 Category A, UL 916, UL 864 NEMA ICS 2, Part 2-230, VDE 0871 Class B
Supervisory Support	NCM or N31 Series or CPN

Code No. LIT-1900251
Issued December 4, 2007

VSD Series

Variable Speed Open Drives

Description

VSD Series variable speed open drives, powered by Eaton®/Cutler-Hammer® technology, are specifically engineered for Heating, Ventilating, and Air Conditioning (HVAC), pump, and fluid control applications. The power unit makes use of the most sophisticated semiconductor technology and a highly modular construction that can be flexibly adapted to customer needs.

The Input and Output (I/O) configuration is designed with modularity in mind. The I/O is comprised of option cards, each with its own input and output configuration. The controls module is designed to accept a total of five of these cards.

Features

- standard Quickstart Wizard on every drive ensures a quick and smooth start up
- compatibility with current and future Johnson Controls® network architecture
- standard Johnson Controls support includes ordering, estimating, and project management tools: Advanced Order Management System (AOMS), Advanced Installation Management (AIM) Tools — Catalog, PRESTO, STORE, and QuickLIT
- closed-loop control programmed with engineering units for specific HVAC applications: duct static, building static, pressure control, and temperature control
- run permissive damper control
- quick and easy non-HVAC specific standard application to get the drive up and running
- up to six user-defined skip frequencies
- user-selectable s-shaped acceleration/ deceleration curve
- selectable Analog Input (AI) Min/Max/ Averaging feature
- digital inputs can be defined for normally open or normally closed operation
- automatic fault display captures 10 drive operating parameters at time of default and stores 30 faults in the history
- 3% line reactors standard on drives from Frame 4 through Frame 9. For Frame 10 and greater, the line reactor is supplied loose.
- Electromagnetic Interference (EMI)/Radio Frequency Interference (RFI) filters standard up to Frame 9
- HAND/OFF/AUTO selector on keypad simplifies control
- additional I/O and communication cards provide plug-and-play functionality, N2/XT/ SA Bus, LON, BACnet® protocol, Siemens® protocol
- Copy/Paste function allows transfer of parameter settings between drives
- keypad can display up to three monitored parameters simultaneously
- standard TYPE 12 keypad on all drives
- I/O connections with simple quick connection terminals
- drive programming capability using auxilary 24 VDC power supply (VS-AUX24V)
- standard option board configuration includes an A9 I/O board and an A2 relay output board installed in Slots A and B
- plenum rated

VSD Series Variable Speed Open Drive

- predefined customer interlock shipped with every drive
- 2 Analog Outputs (AOs)
- 6 Digital Inputs (DIs)
- 1 Digital Output (DO)
- 2 Form C Relays

Repair Information

If the Variable Speed Open Drive fails to operate within its specifications, contact the nearest Johnson Controls representative.

Selection Chart

Code Number	V	S						0	A	—				
Base Product	VS = Variable Speed Drive prefix													
Horsepower (VT)[1]	001 = 1.0 hp to 250 = 250 hp[2]													
Voltage[3]	2 = 230 V 4 = 480 V 5 = 575 V													
Enclosure Rating	1 = TYPE 1 2 = TYPE 12													
Enclosure Style	0 = None (Open Drive)													
Revision #	A = Rev. 1													
Separator (—)														
Communications[4]	0 = None N = N2/XT/SA Bus Communication (N2 by default) L = LONWORKS® Network													
Option 1	00 = None													
Option 2	00 = None													

1. All horsepower ratings are Variable Torque (VT).
2. 1 to 100 hp at 230 V; 1.5 to 250 hp at 480 V; 3 to 200 hp at 575 V
3. Voltage Ratings: 230 V = 208 - 240 V; 480 V = 380-500 V; 575 V = 525-690 V
4. N2/XT/SA Bus Communications selectable on drive keypad

Johnson Controls

Variable Speed Open Drives (Continued)

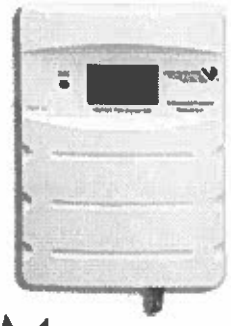
Technical Specifications

VSD Series Variable Speed Open Drives (Part 1 of 2)	
Input Voltage (V_{in})	10%/-15%
Input Frequency (f_{in})	50/60 Hz (variation up to 45-66 Hz)
Connection to Power	Once per minute or less (typical operation)
Current Withstand Rating	100 kAIC
Output Voltage	0 to V_{in}
Continuous Output Current	Ambient Temperature Maximum 40°C (104°F), Overload 1.1 x I_L (1 min./10 min.)
Overload Current	110%
Output Frequency	0 to 320 Hz
Frequency Resolution	0.01 Hz
Control Method	Frequency Control (V/f) Open Loop Sensorless Vector Control
Switching Frequency	Adjustable with Parameters 2.6.9 1 to 40 hp: 1 to 16 kHz; default 10 kHz 50 to 75 hp: 1 to 10 kHz; default 3.6 kHz
Frequency Reference	Analog Input: Resolution 0.1% (10 bit), accuracy +/-1% Panel Reference: Resolution 0.01 Hz
Field Weakening Point	30 to 320 Hz
Acceleration Time	0 to 3,000 s
Deceleration Time	0 to 3,000 s
Braking Torque	DC brake: 30% x T_n (without brake option)
Ambient Operating Temperature	-10 (no frost) to 40°C (14 to 104°F)
Storage Temperature	-40 to 70°C (-40 to 158°F)
Relative Humidity	0 to 95% RH, noncondensing, noncorrosive, no dripping water
Air Quality	Chemical vapors: IEC 721-3-3, unit in operation, Class 3C2; Mechanical particles: IEC 721-3-3, unit in operation, Class 3S2
Altitude	100% load capacity (no derating) up to 1,000 m (3,280 ft); 1% derating for each 100 m (328 ft) above1,000 m (3,280 ft); maximum 3,000 m (9,842 ft)
Vibration	EN 50178, EN 60068-2-6; 5 to 50 Hz, Displacement amplitude 1 mm (peak) at 3 to 15.8 Hz, Max. acceleration amplitude 1 G at 15.8 to 150 Hz
Shock	EN 50178, EN 6068-2-27 United Parcel Service® (UPS) Drop test (for applicable UPS weights) Storage and shipping: max. 15 G, 11 ms (in package)
Enclosure Class	TYPE 1/IP21 or TYPE 12/IP54

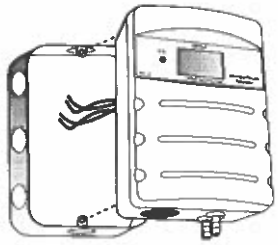
VSD Series Variable Speed Open Drives (Part 2 of 2)	
Product	IEC 61800-2
Safety	UL 508C; CSA C22.2 No. 14
EMC (at default settings)	Immunity: Fulfills all Electromagnetic Compatibility (EMC) immunity requirements; Emissions: EN 61800-3, LEVEL H
Air Quality Chemical Vapors	IEC721-3-3; unit in operation; class 3C2
Mechanical Particles	IEC721-3-3, unit in operation class 3S2
Analog Input Voltage	0 to 10 V, R = 200 ohms differential (-10 to 10 V joystick control) Resolution 0.1%; accuracy ±1%
Analog Input Current	0 (4) to 20 mA; R_i - 250 ohms differential
Digital Inputs (6)	Positive or negative logic; 18 to 24 VDC
Auxiliary Voltage	24 V ±15%, maximum 250 mA
Output Reference Voltage	10 V 3%, maximum load 10 mA
Analog Output	0 (4) to 20 mA; R_L max. 500 ohms; Resolution 10 bit; Accuracy ± 2%
Digital Outputs	Open collector output, 50 mA/48 V
Relay Outputs	2 programmable Form C relay outputs Switching capacity: 24 VDC/8 A, 250 VAC/8 A, 125 VDC/0.4 A
Overcurrent Protection	Trip limit 4.0 x I_H instantaneously
Overvoltage Protection	Yes
Undervoltage Protection	Yes
Earth Fault Protection	In case of earth fault in motor or motor cable, only the frequency converter is protected.
Input Phase Supervision	Trips if any of the input phases are missing.
Motor Phase Supervision	Trips if any of the output phases are missing.
Overtemperature Protection	Yes
Motor Overload Protection	Yes
Motor Stall Protection	Yes
Motor Underload Protection	Yes
Short Circuit Protection	Yes (of the 24 V and 10 V Reference Voltages)
Ratings	UL Listed File No. E244421; cUL Listed
Warranty	2 Years Standard Terms; 3 Years with Certified Startup
Reliability	500,000 hours Mean Time Between Failures (MTBF)
Line Voltage (VAC)	230 V (208-240 V) 480 V (380-500 V) 575 V (525-690 V)

PX Series *Differential Pressure Transducer–Dry Media*

Selectable Ranges...LCD Display... Automatic Zero...



LCD DISPLAY!



The digital PX Series differential pressure transducers utilize a highly accurate and stable sensor, which is microprocessor profiled for improved accuracy and reliability. The stability, accuracy and ease of use characteristics of the PX models make them the ideal product for differential pressure monitoring applications.

Designed to monitor duct and static pressure in commercial buildings and to provide exceptional job-site flexibility, all PX models feature four field-selectable range options allowing just two models to cover applications for 0-0.1" to 0-10" W.C. The directional mode jumper provides the means to configure the transducer in unidirectional or bidirectional mode for room and building static pressure applications.

All models feature a pushbutton and digital input terminal to zero the output. A microprocessor algorithm prevents accidental zero adjustment during normal operation.

Advanced pressure sensing technology

PX Series pressure transducers utilize an advanced ceramic capacitive sensing element which provides a highly stable linear output. Output offset errors due to changes in temperature, warm-up and long term drift are significantly reduced compared to conventional sensors.

Applications

- Static pressure in duct or room applications
- Variable air volume system
- Filter status monitoring

Exceptional accuracy and stability

- Improved tolerance to overpressure and vibration reduces field failures
- High accuracy digital sensor maintains calibration and reduces callbacks
- High reliability sensor technology for long-term maintenance-free operation

Lowest total installed cost

- Switch-selectable ranges reduce setup time and number of models to stock
- Microprocessor allows for a nine-point calibration increasing product accuracy and reliability
- Brass barb fittings prevent breakage and accomodate popular tubing sizes
- Built-in pickup tube simplifies installation and saves time (duct model)
- Circuit protection, prevents damage due to incorrect wiring

Low-differential room pressure sensor with LCD display

- Ideal for clean rooms, hospitals, fume hoods, computer rooms, and other very low differential pressure applications
- Monitors positive and negative pressure
- Field-adjustable ranges for maximum resolution
- Flush mount directly on wall or duct

ORDERING INFORMATION

	(Enclosure)	(Local Display)	(NIST)	(Range)	(US or EU)
PX	☐	☐	☐	☐	S
	D = Duct P = Panel	L = LCD Display X = No Display	N = NIST X = None	01 = 0-1" wc 02 = 0-10" wc	S = Standard

Example:

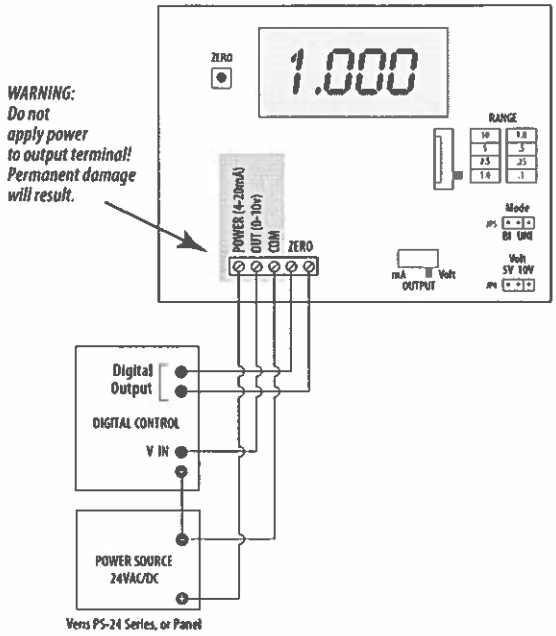
PX [D] [L] [X] [01] [S]

ACCESSORIES

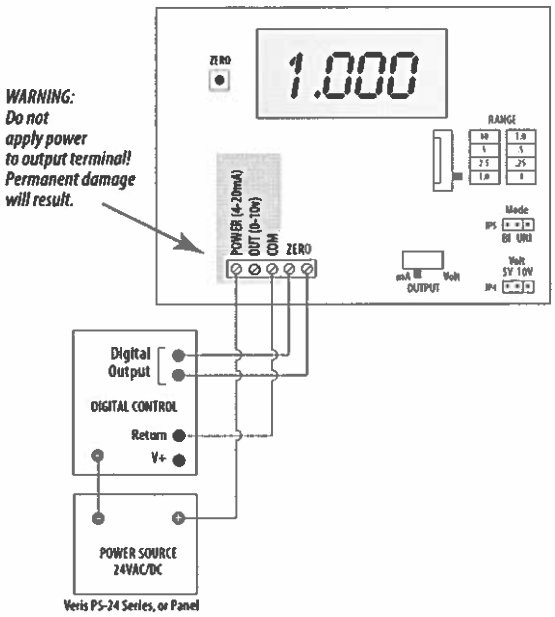
Room and duct static pickup tubes...
See page 206

WIRING DIAGRAMS

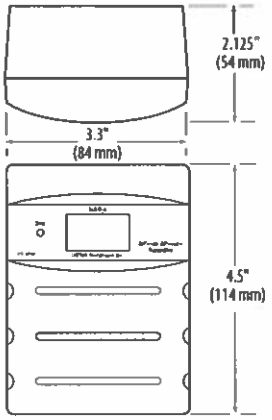
3-wire, 0-5V/0-10V



2-wire, 4-20mA



DIMENSIONAL DRAWINGS



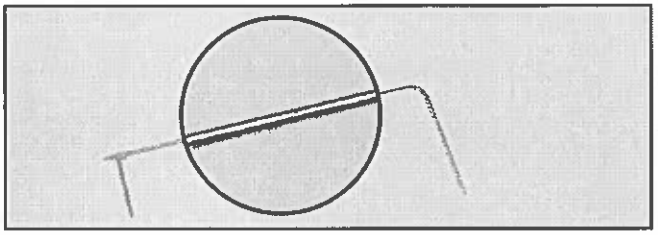
SPECIFICATIONS

Media Compatibility		Dry air or inert gas
Input Power		12-30VDC, or 24VAC nominal
Output		Field selectable: 2-wire, loop-powered 4-20mA, (clipped and capped), or 3-wire 0-5V/0-10V
Pressure Ranges:	01	Unidirectional: 0.1/0.25/0.5/1.0" W.C. F.S., jumper-selectable
		Bidirectional: ±0.1/±0.25/±0.5/±1.0" W.C. F.S., jumper-selectable
	02	Unidirectional: 1.0/2.5/5.0/10" W.C. F.S., jumper-selectable
		Bidirectional: ±1.0/±2.5/±5.0/±10" W.C. F.S., jumper-selectable
Mode		Unidirectional or bidirectional, jumper-selectable
Display (option)		Signed 3-1/2 digit LCD, indicates pressure in inches of water column
Proof Pressure		3 psid
Burst Pressure		5 psid
Accuracy		±1% F.S. Combined linearity and hysteresis
Temperature Effect		1" models: 0.05%/°C; 10" models: 0.01%/°C (Relative to 25°C) 0° to 50°C
Zero Drift (1-year)		1" models: 2.0% max.; 10" models: 0.5% max.
Zero Adjust		Pushbutton auto-zero and digital input (2-pos terminal block)
Operating Environment		0°- 60°C; 0 to 90% RH non-condensing
Fittings		Brass barb; 1/8" o.d.
Physical		High-impact ABS plastic

Series 160

Stainless Steel Pitot Tubes

ASME Design Meets AMCA and ASHRAE Codes



Standard Model 160 Pitot Tube

Ideal for use with our precision manometers and air velocity gages, Dwyer® Pitot Tubes are constructed from corrosion resistant stainless steel for a lifetime of service. ASME design meets AMCA and ASHRAE specifications for maximum accuracy over a wide variety of flow conditions. No correction factors required as ASHRAE tip design yields a calibration factor of 1. ASHRAE design needs no calibration! Permanent, stamped insertion depth graduations on sides of 160 series facilitate accurate positioning. Static pressure port is parallel to sensing tube allowing quick, easy alignment of tube with air flow. Low sensitivity to misalignment gives accurate reading even when tube is misaligned up to 15 degrees. Various standard sizes are available for use in ducts as small as 4" dia. or as large as 36 ft dia. A universal model fits user supplied 3/4" schedule 40 (standard) pipe in any length. Several convenient mounting options are available for permanent installations.

- No calibration needed
- Precisely located, burr-free static pressure holes
- Hemispherical tip design, best for accuracy if imperfectly aligned and nearly impossible to damage
- Long lasting 304 SS construction
- Silver soldered connections for leak-proof operation
- Coefficient of "1"
- 5/16" models rated to 1500°F
- Extended static connection helps guide tip within recommended 15° of air flow direction
- Inch graduations on sides of 160 series to quickly determine exact insertion depth
- Dwyer® Air Velocity Calculator, direct reading flow charts and instructions included
- Use 1/8" models in ducts as small as 4", 5/16" models in ducts 10" or larger
- Optional mounting gland or split flange make permanent installation fast and simple

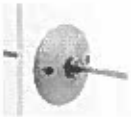
Series 160 is designed to meet:

- ASME "Fluid Meters" 6th Ed.
- ANSI/AMCA 210-99
- ANSI/ASHRAE 51-1999
- British Standard 1042

ACCESSORIES

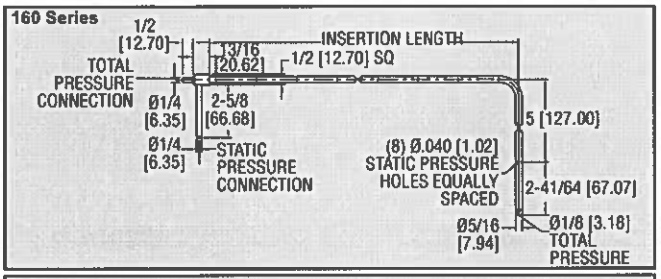
No. A-158 Split Flange Mounting can be added to any Dwyer® No. 160 Standard Pitot Tube. Cadmium plated steel. Gasket is pattern for mounting holes. Secure flange loosely to tube, adjust tube depth and tighten screws. Gasket of 1/16" Neoprene fits tightly around tube and against duct for leak-proof seal. Nuts, washers included.

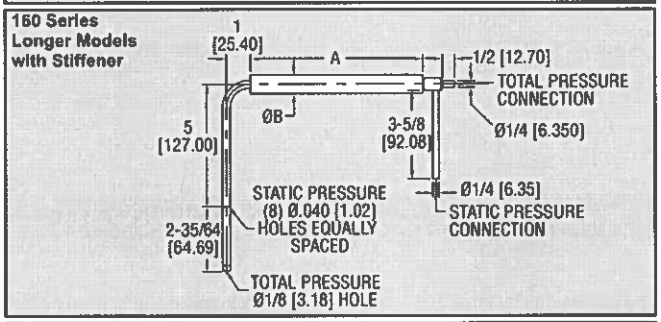
No. A-159 Mounting Gland — No. A-159 Mounting Gland — Versatile adapter slips on any Series 160, 5/16" standard Pitot tube made after Dec. 1990. Two-part stainless steel fitting slides over tube and provides permanent, secure mounting. Where duct interior is accessible, use the washers and jam nut supplied. For blind applications or in thicker materials, use model A-156 flange mounting plate. Once tube is adjusted to proper depth and angle, tighten smaller hex bushing to lock position. Graphite bushing inside assures leak-proof seal even at higher temperatures. TFE bushing also available. **Note:** For full insertion with this fitting, order next longer Pitot tube.

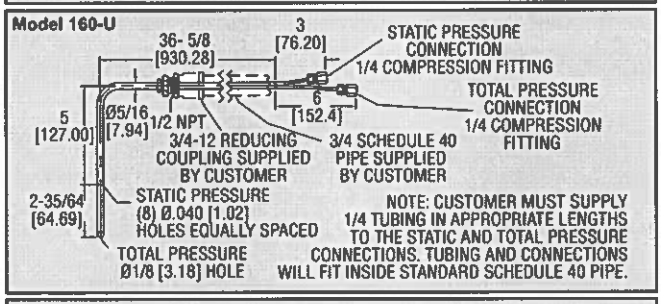


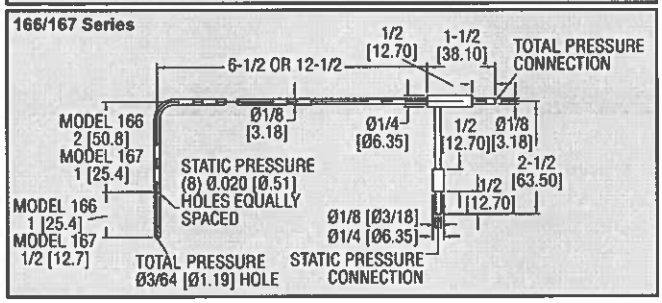
A-159 Mounting Gland is used for both duct mounting and flange mounting. To flange mount, the A-159 must be used with the A-156 flange mounting plate.

No. A-397 Step Drill. For fast, convenient installation of Pitot tubes in sheet metal ducts. No center punch needed; automatic de-burring. Drills six sizes from 3/16"-1/2" in 1/16" increments.









Standard 5/16" Diameter		Longer Length w/ Stiffener	
Model	**Insertion Length**	**Model**	**Insertion Length**
160-8	8-5/8"	160-96	96"
160-12	12-5/8"	160-216	216"
160-18	18-5/8"	**Pocket Size 1/8" Diameter**	
160-24	24-5/8"	**Model**	**Insertion Length**
160-36	36-5/8"	166-6	6"
160-48	48-5/8"	166-12	12"
160-60	60-5/8"	167-6	6"
		167-12	12"

ACCESSORIES & OPTIONS

A-156, Flange Mounting Plate 1/2" female NPT
A-158, Split Flange
A-159, Mounting Gland
A-397, Step Drill
1/8" male NPT compression fitting, mounting option for Series 166/167. Add -CF suffix (166-6-CF).

*Universal model for permanent installation and connection to metal tubing. Make any length Pitot tube with 3/4" schedule 40 pipe, 3/4" to 1/2" reducing bushing and 1/4" metal tubing.

0011-0002

Field Level Suites
FCU Control Upgrades

DRAWING NUMBER	DRAWING TITLE
TITLE	Title Page
PAGE 2	NAE Reference Drawing
PAGE 3	NAE Panel Detail Drawing
PAGE 4	Wireless Field Bus Riser (1 of 2)
PAGE 5	Wireless Field Bus Riser (2 of 2)
1.1	SUITE-1 Flow
1.2A	SUITE-1 Wiring Detail - Existing
1.2B	SUITE-1 Wiring Detail - New
1.3	SUITE-1 Sequence of Operations
1.4A	SUITE-1 Point Schedule (1 of 2)
1.5A	SUITE-1 Point Schedule (2 of 2)
2.1	SUITE-8A Flow
2.2	SUITE-8A Wiring Detail
2.3	SUITE-8A Sequence of Operations
2.4A	SUITE-8A Point Schedule (1 of 2)
2.4B	SUITE-8A Point Schedule (2 of 2)
3.1	SUITE-8B Flow
3.2	SUITE-8B Wiring Detail
3.3	SUITE-8B Sequence of Operations
3.4A	SUITE-8B Point Schedule (1 of 2)
3.4B	SUITE-8B Point Schedule (2 of 2)
4.1	EF & Exterior TV Control
RS-1	Room Schedule

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Creating a better climate for business.

- ■ Environmental Control System
- ■ Facility Management System
- ☐ Air and Water System Balancing
- ☐ Fire Management System
- ☐ Security System
- ☐ Lighting Services
- ☐ Instrumentation System Installation
- ☐ Building Operations Management
- ☐ Energy Conservation Control
- ☐ Training Programs
- ☐ Performance Contracting
- ☐ Planned Service Agreements

Air Conditioning
Heating
Diagnostic Services
Coil Cleaning
Refrigeration
Automatic Temperature Controls
Facility Management Systems
Fire Management
Security Management
Building Operations and Management
Water Treatment
Electrical Equipment
Emergency Generator / Lighting Equipment
Industrial Controls / Recording / Indication Equipment

PROJECT TITLE
MILLER PARK
FIELD LEVEL SUITES
FCU CONTROL UPGRADES

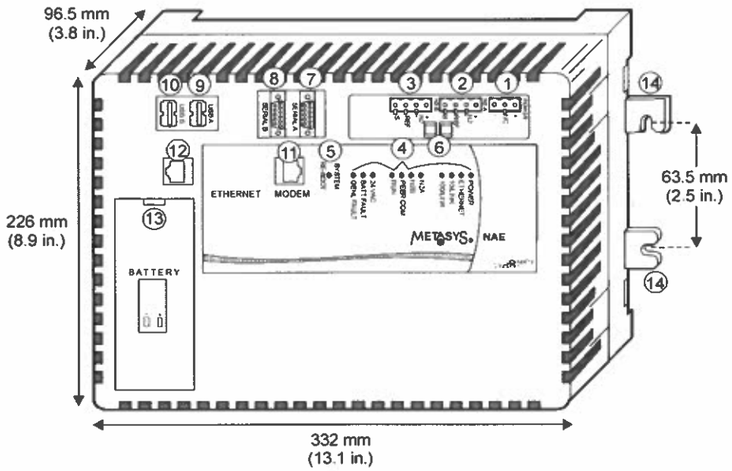
ARCHITECT	ENGINEER
, Phone:	, Phone:
MECHANICAL CONTRACTOR	ELECTRICAL CONTRACTOR
, Phone:	, Phone:

REFERENCE DRAWING	NO	REVISION LOCATION	ECR	DATE	BY

Johnson Controls

Branch Information
, Phone: Fax:

SALES ENGINEER	PROJECT MANAGER	APPLICATION ENGINEER	DATE	CONTRACT NUMBER
	KDP	KDP	3/2011	00110002



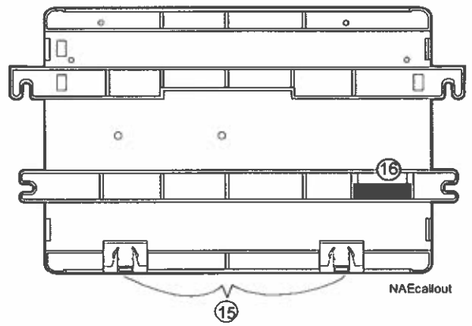
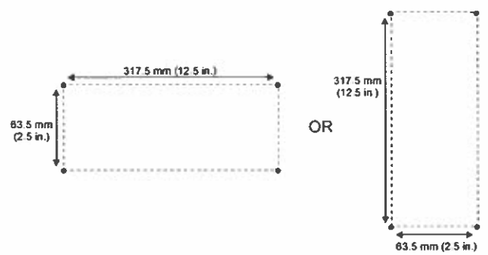
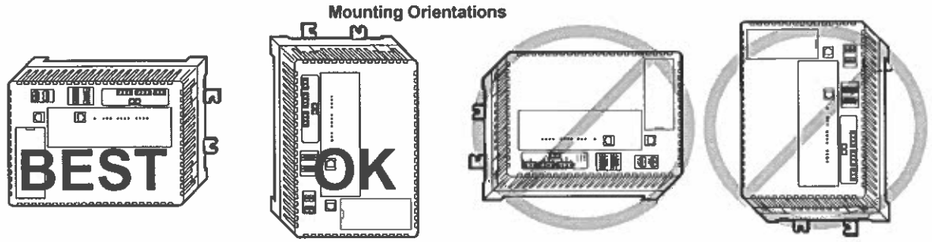


Table 1: NAE/NIE Callouts			
Callout	Description	Callout	Description
1	Power Termination	9	USB A connector
2	N2 A Bus termination	10	USB B connector
3	N2 B Bus termination	11	Modem RJ-11 connector
4	Light-Emitting Diodes (LEDs)	12	Ethernet RJ-45 connector
5	System Re-boot switch	13	Battery hatch
6	N2 End-of-Line (EOL) switches	14	Mounting feet (2 of 4)
7	Serial A RS-232 connector	15	DIN rail clips (2 of 2)
8	Serial B RS-232 connector	16	Battery Strap

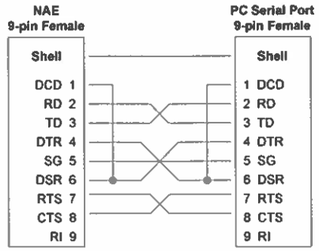


Mounting Hole Spacing

Mounting Orientations



PC Serial Ports (SER A, SER B)



USB Ports (USB A and USB B)

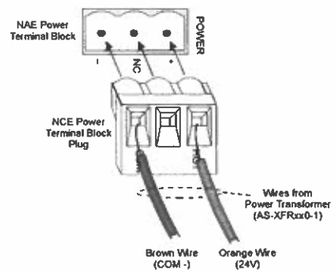
NAE USB Pinouts

+5 VDC	1
Data -	2
Data +	3
Ground	4

Ethernet Port

NAE Ethernet Pinouts

TD +	1
TD -	2
RD +	3
No Connection	4
No Connection	5
RD -	6
No Connection	7
No Connection	8



24VAC Power Connection

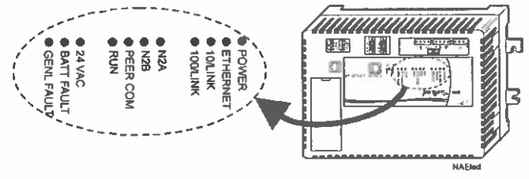
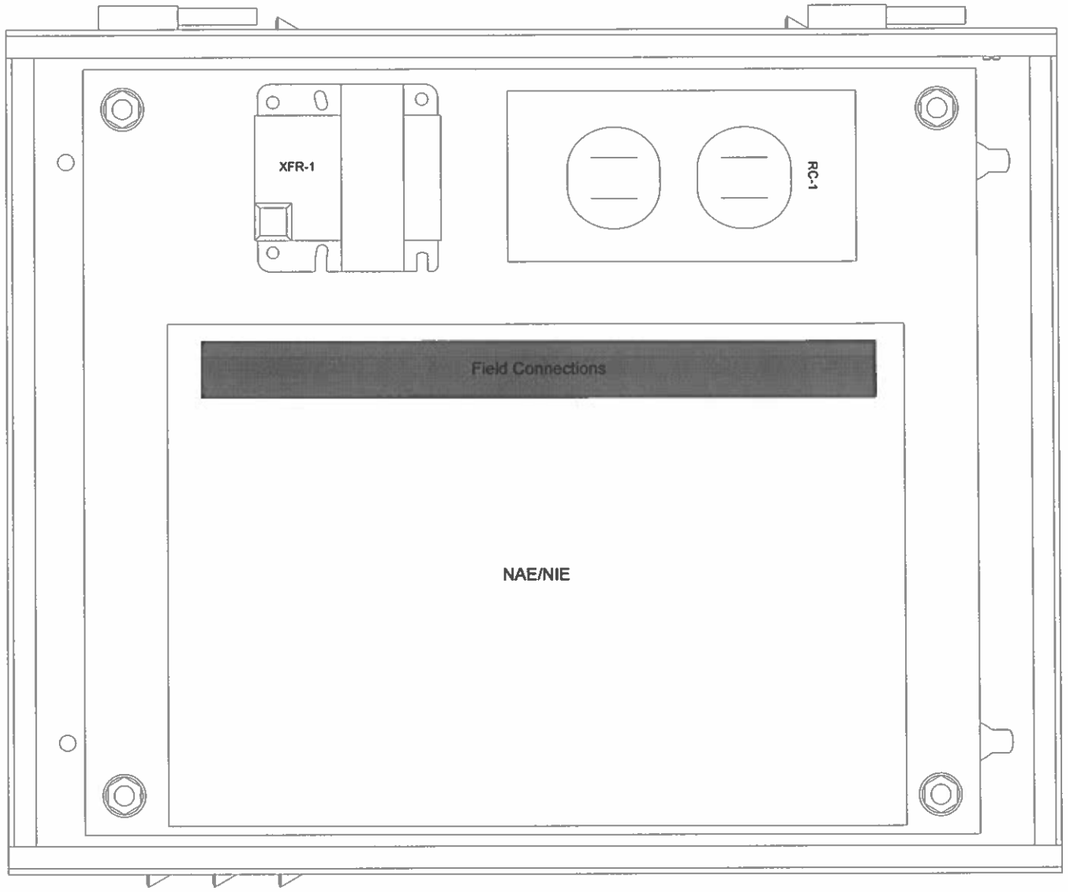


Table 4: NAE / NIE LEDs

LED	Normal	Descriptions / Other Conditions
POWER (GREEN)	On Steady	On Steady = Unit is getting power from either the battery or 24 VAC power. Also see the 24 VAC LED. Off Steady = Unit is shut down.
ETHERNET (GREEN)	Flicker	Flicker = Data is transferring on the Ethernet connection. Ethernet traffic is general traffic (may not be for the NAE / NIE). Off Steady = No Ethernet traffic, probably indicates a dead Ethernet network or bad Ethernet connection.
10/LINK (GREEN)	On Steady	On Steady = Ethernet connection is established at 10 Mb/sec.
100/LINK (GREEN)	On Steady	On Steady = Ethernet connection is established at 100 Mb/sec.
N2 A (GREEN) (NAE Only)	Flicker	Flicker = N2 A port is transmitting or receiving data. Flickers are generally in synch with data transmission, but should not be used to indicate specific transmission times. Off Steady = No traffic.
N2 B (GREEN) (NAE Only)	Flicker	Flicker = N2 B port is transmitting or receiving data. Flickers are generally in synch with data transmission, but should not be used to indicate specific transmission times. Off Steady = No traffic.
PEER COMM (GREEN)	Varies (see next column)	Flicker = Data traffic between NAE / NIE devices. For an NAE / NIE that is not a Site Director, this LED indicates regular heartbeat communications with the Site Director. For a Site Director NAE / NIE, flashes are more frequent and indicate heartbeat communications from all other NAE / NIE devices on the site.
Run	On Steady	On Steady = NAE / NIE software is running On 1 second, Off 1 second = NAE / NIE software is in startup mode. On 4 seconds, Off 1 second = NAE / NIE is in diagnostics mode. On 0.5 seconds, Off 0.5 seconds = NAE / NIE software is shutting down. Off Steady = Operating system is shutting down or software is not running.
24 VAC (GREEN)	On Steady	On Steady = 24 VAC power present. Off Steady = Loss of 24 VAC power. In the Off Steady condition, the NAE / NIE can be running on battery power. Also se the POWER LED.
BATT FAULT (RED)	Off Steady	On Steady = Battery fault. Replace the battery.
GENL FAULT (RED)	Off Steady	On Steady = General Fault. Fault conditions include excessive Central Processing Unit (CPU) flash, or memory use, or excessive CPU or Printed Wire Board (PWB) temperature. In normal operation, the GENL FAULT LED stays on steady for the first half of the startup sequence.

REVISION INFORMATION	Drawing Title: Visio NAE Reference Drawing								
NUMBER									
DATE: 02/02/12									
TIME: 01:35 PM		REFERENCE DRAWING	NO	REVISION-LOCATION		ECN	DATE	BY	
File Name: NAE Reference Drawing001 v8d	Project Title: Founders Suite Controls	Sales Engineer	Project Manager	Application Engineer	DRAWN BY / DATE	APPROVED BY / DATE	Branch Information	CONTRACT NUMBER: 0011-0002	
								DRAWING NUMBER: PAGE 2	

Johnson Controls

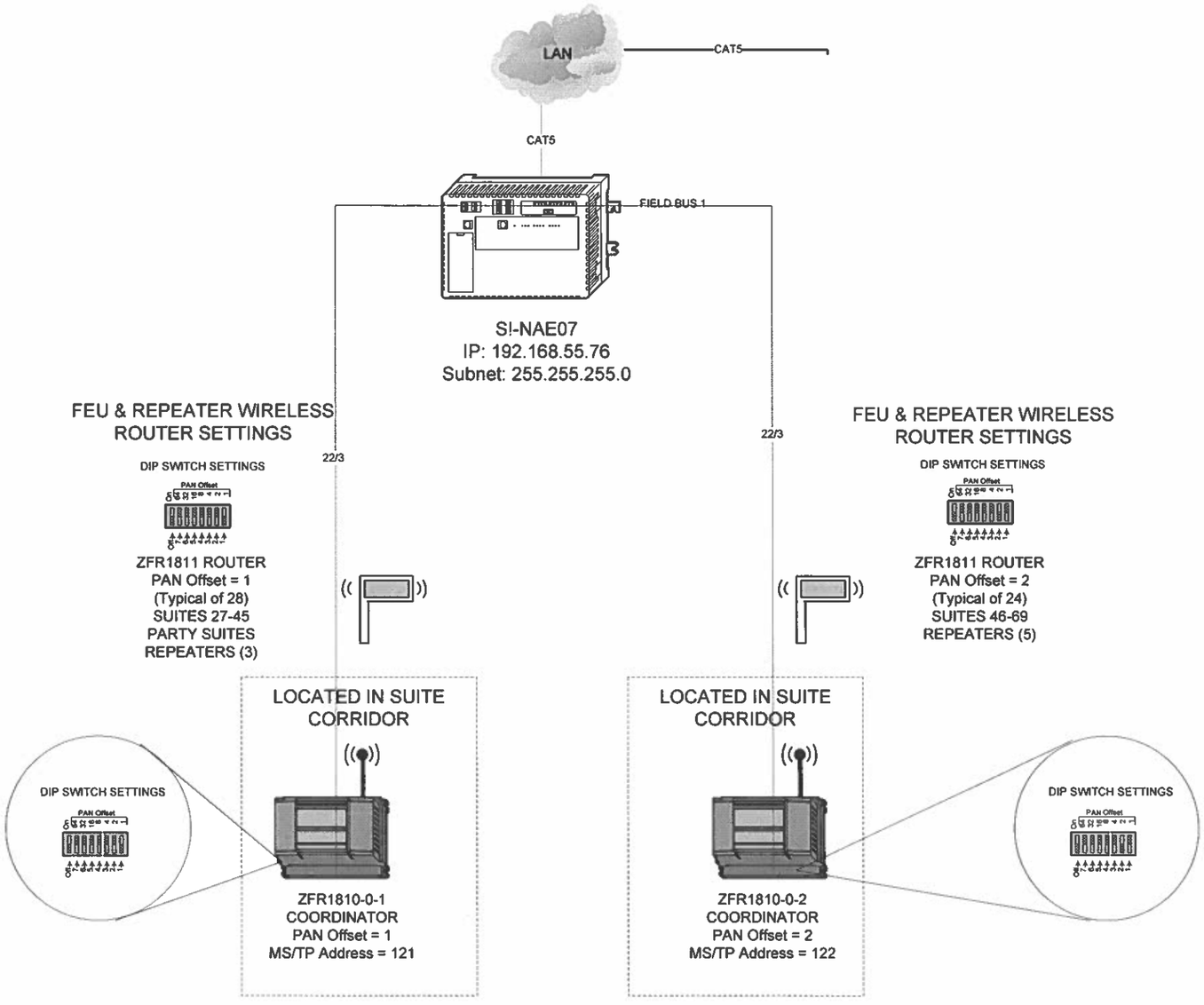


ENC-1

Drawing Title: Visio Panel Detail Drawing							
REFERENCE DRAWING		NO.	REVISION-LOCATION		ECN	DATE	BY
Sales Engineer	Project Manager	Application Engineer	DRAWN BY	DATE	APPROVED BY	DATE	
Project Title: Founders Suite Controls	Johnson Controls		Branch Information		CONTRACT NUMBER: 0011-0002		
					DRAWING NUMBER: PAGE 3		

BILL OF MATERIALS

Designation	Qty	Part Number	Description
S1-NAE07	1	MS-NAE5510-1	
ZFR1810 COORDINATOR	2	MS-ZFR1810-0	SUPERVISORY WIRELESS INTERFACE MODULE
ZFR1811 ROUTER	8	MS-ZFR1811-0	WIRELESS ZIGBEE FIELD BUS ROUTER
REPEATER	8	MS-ZFRRPT-0	ZFR REPEATER POWER SUPPLY



Drawing Title
Wireless Field Bus Riser (1 of 2)

REFERENCE DRAWING	NO	REVISION-LOCATION	ECN	DATE	BY

Sales Engineer	Project Manager	Application Engineer	DRAWN BY	DRAWN DATE	APPROVED BY	APPROVED DATE

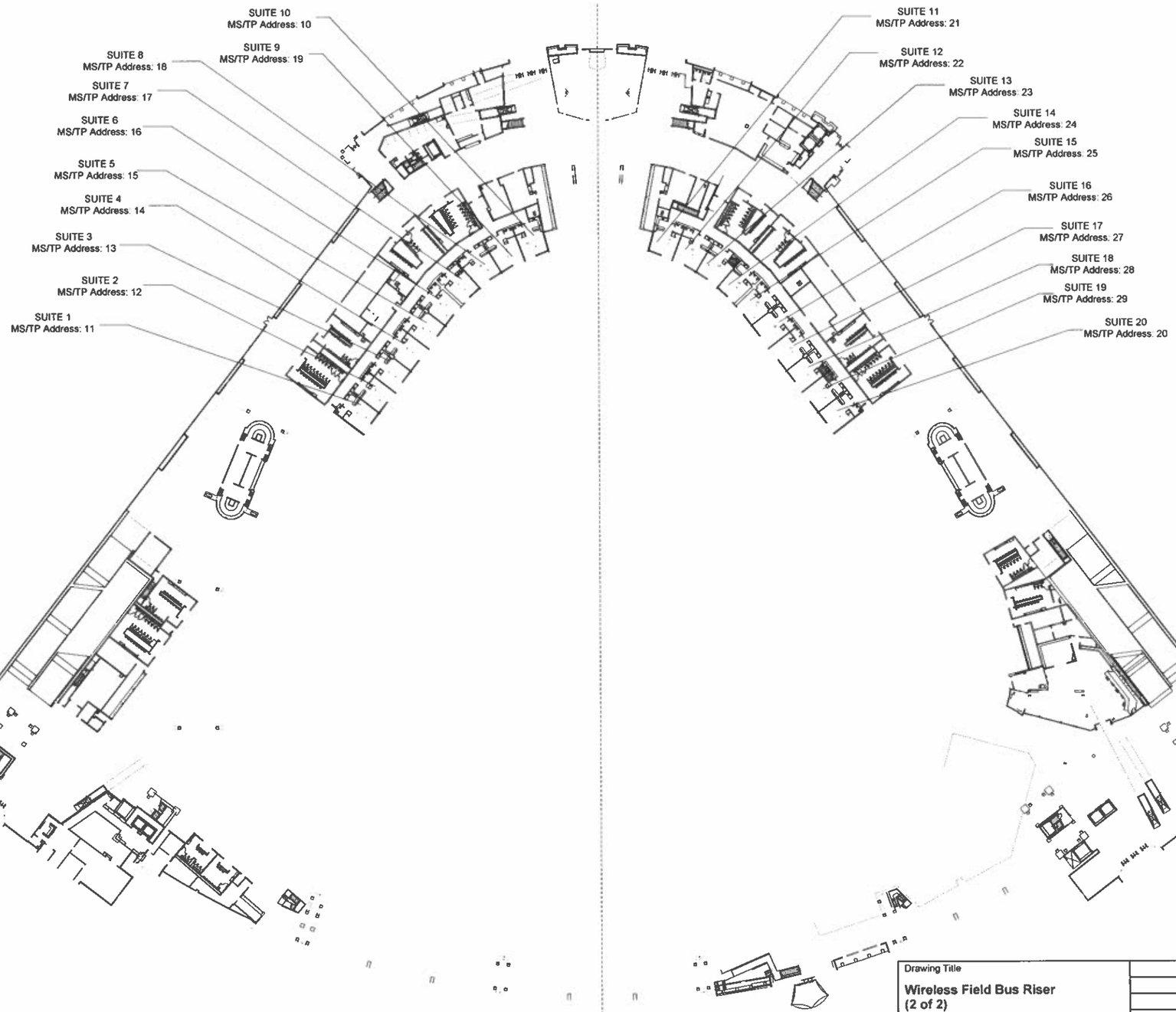
Project Title
Founders Suite Controls

Branch Information

Johnson Controls

CONTRACT NUMBER
0011-0002

DRAWING NUMBER
PAGE 4



Drawing Title
Wireless Field Bus Riser (2 of 2)

REFERENCE DRAWING	NO	REVISION-LOCATION	ECH	DATE	BY

Sales Engineer | Project Manager | Application Engineer | DRAWN BY / DATE | APPROVED BY / DATE

Project Title
Founders Suite Controls

Johnson Controls

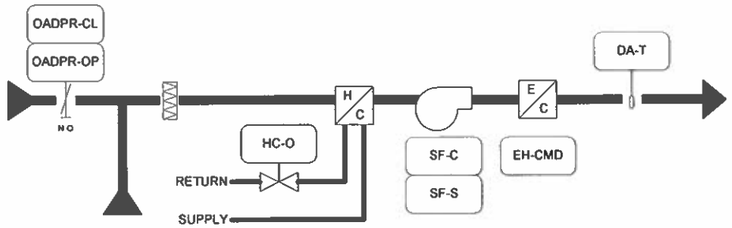
Branch Information

CONTRACT NUMBER
0011-0002

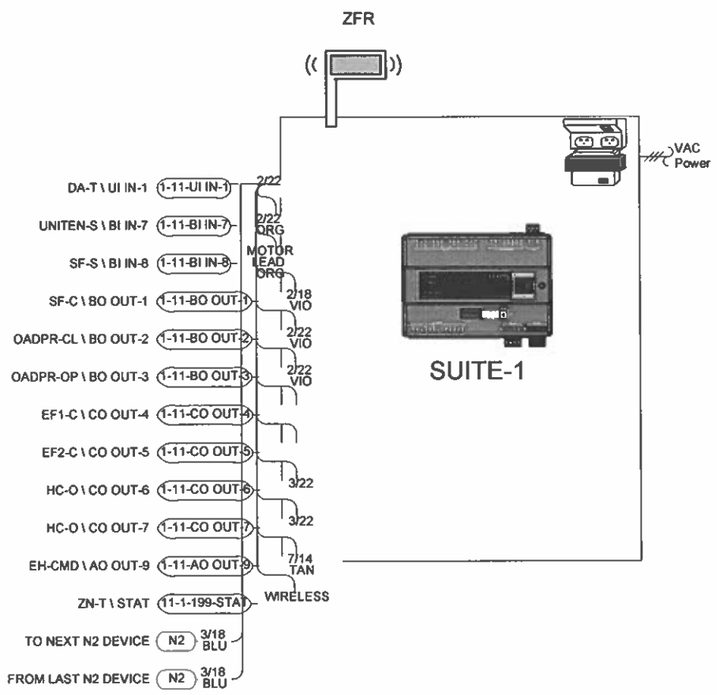
DRAWING NUMBER
PAGE 5

BILL OF MATERIALS

Designation	Qty	Part Number	Description
SUITE-1	18	MS-FEC2611-0	17PT FIELD EQUIP CONTRLR W/ 6UI, 2BI, 3BO
ZFR	18	MS-ZFR1811-0	WIRELESS FIELD BUS ROUTER FOR FEC VMA16
ZN-T	18	WRZ-TTR-0000	SENSR, WIRELSS, NO SETPNT ADJUSTMENT



ZN-T



Drawing Title

SUITE-1 Flow Panel Detail (Typical of 18)

REFERENCE DRAWING	NO.	REVISION-LOCATION	ECN	DATE	BY

Sales Engineer	Project Manager	Application Engineer	DRAWN BY	DRAWN DATE	APPROVED BY	APPROVED DATE

Project Title

Founders Suite Controls

Johnson Controls

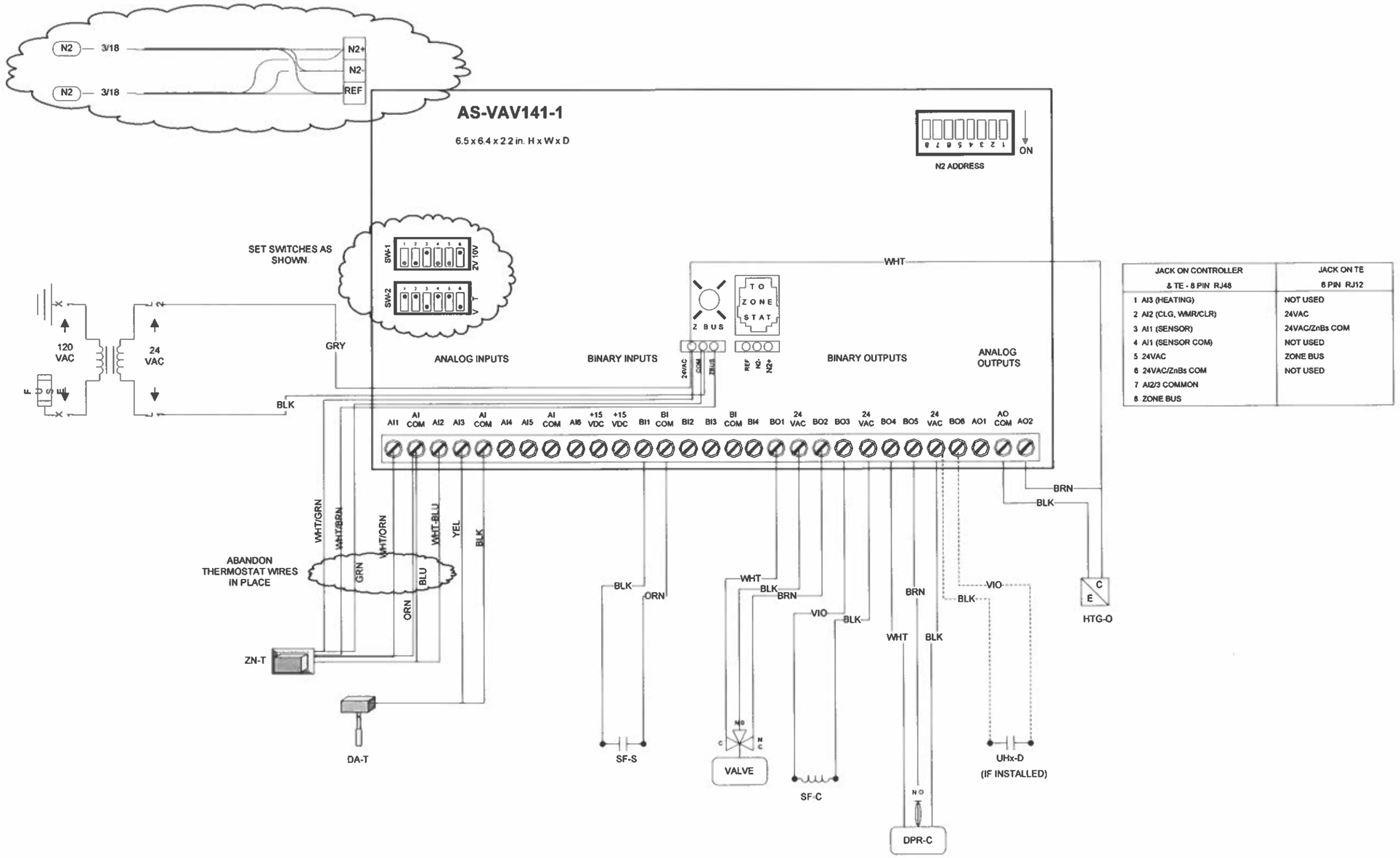
Branch Information

CONTRACT NUMBER

0011-0002

DRAWING NUMBER

1.1



JACK ON CONTROLLER & TE - 8 PIN RJ48	JACK ON TE 6 PIN RJ12
1 AI3 (HEATING)	NOT USED
2 AI2 (CLG, WMR/CLR)	24VAC
3 AI1 (SENSOR)	24VAC/ZnBs COM
4 AI1 (SENSOR COM)	NOT USED
5 24VAC	ZONE BUS
6 24VAC/ZnBs COM	NOT USED
7 AI2/3 COMMON	
8 ZONE BUS	

Drawing Title

SUITE-1 Wiring Details - Existing (Typical of 18) (1 of 2)

REFERENCE DRAWING	NO	REVISION-LOCATION	ECN	DATE	BY

Sales Engineer | Project Manager | Application Engineer | DRAWN BY / DATE | APPROVED BY / DATE

Project Title

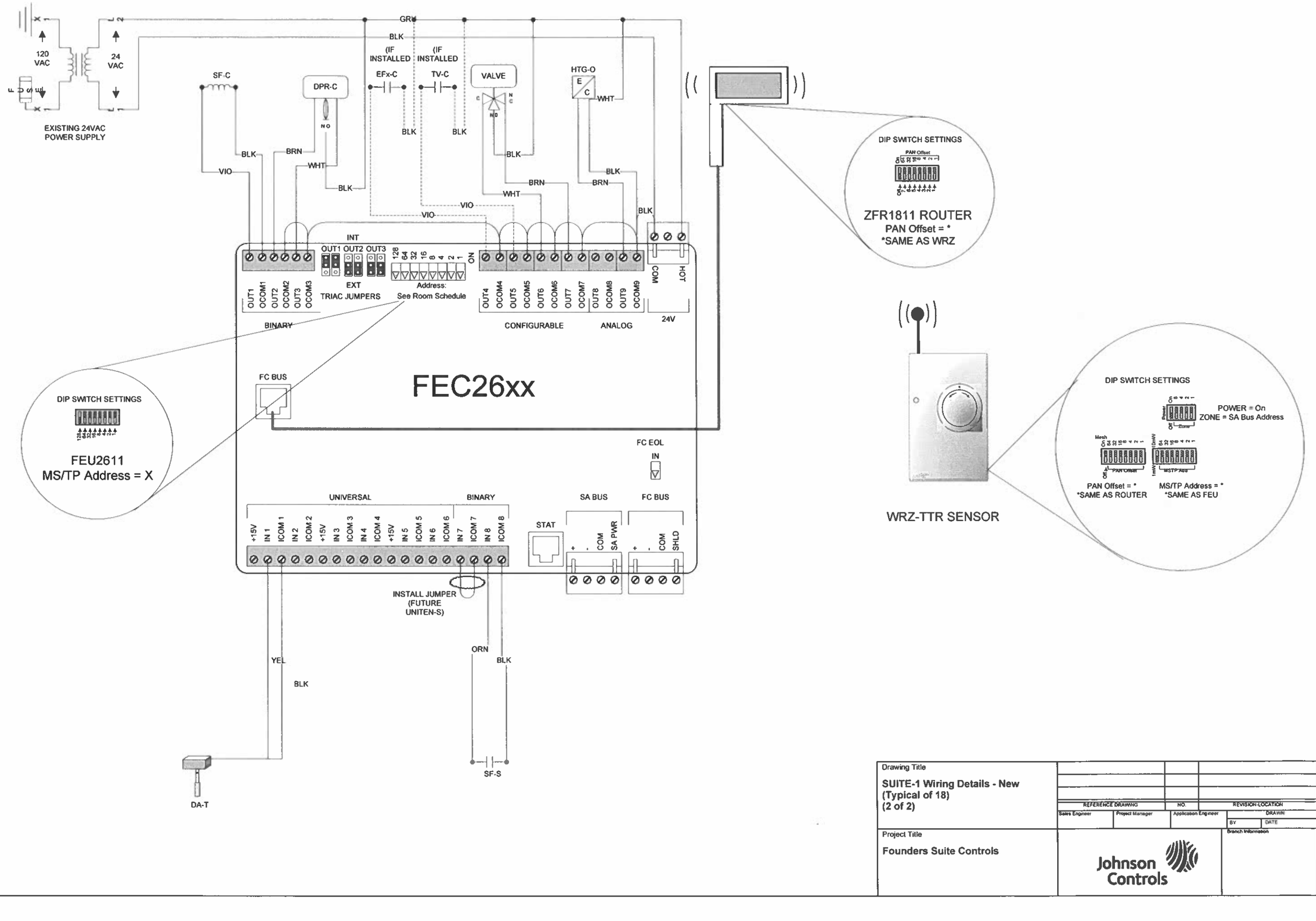
Founders Suite Controls

Branch Information

Johnson Controls

CONTRACT NUMBER **0011-0002**

DRAWING NUMBER **1.2A**



Drawing Title: SUITE-1 Wiring Details - New (Typical of 18) (2 of 2)						
	REFERENCE DRAWING	NO.	REVISION-LOCATION	ECN	DATE	BY
	Sales Engineer / Project Manager / Application Engineer		DRAWN BY DATE	APPROVED BY DATE		
Project Title: Founders Suite Controls	Johnson Controls	Branch Information	CONTRACT NUMBER: 0011-0002	DRAWING NUMBER: 1.2B		

SEQUENCE OF OPERATIONS

Upon a call for Occupied Mode, the outside air damper will move to the open position and the supply fan will be energized.

Operation of the fan coil heating/cooling valve is determined by the Summer-Winter Switchover point which is commanded through the BAS.

During Summer mode, chilled water is supplied to the coil, and the valve will modulate open to maintain the zone temperature setpoint. If heating is required, the two-stage electric duct heater will energize to maintain the electric heating zone temperature setpoint.

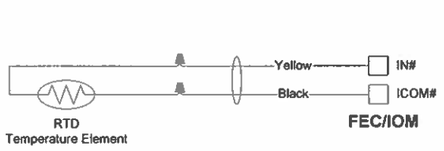
During Winter mode, hot water is supplied to the coil, and the valve will modulate open to maintain the zone temperature setpoint.

During the Unoccupied Mode, the supply fan and heating/cooling valve will operate intermittently to maintain a minimum space temperature of 45° F, and a maximum space temperature of 85° F.

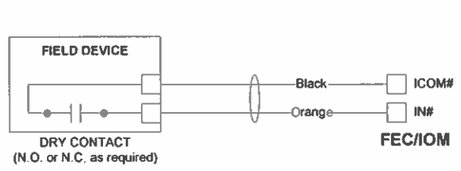
Drawing Title: Sequence of Operations							
	REFERENCE DRAWING	NO	REVISION-LOCATION	ECN	DATE	BY	
	Sales Engineer / Project Manager / Application Engineer	DRAWN BY / DATE	APPROVED BY / DATE				
Project Title: Founders Suite Controls	Johnson Controls	Branch Information	CONTRACT NUMBER: 0011-0002				
			DRAWING NUMBER: 1.3				

Electrician/Fitter	Point Information			Controller Information							Panel Information					Intermediate Device				Field Device					
Tag	Point Type	System Name	Object Name	Expanded ID	Controller Details	Trunk Type	Trunk Nbr	Trunk Addr.	Cable Destination Bay/Terminal	Module Type	Termination Out	Panel	Panel Location	Slot Number	Reference Drawing	Cable Number	Wiring /Tubing	Termination In	Device	Termination Out	Location	Wiring /Tubing	Termination In	Device	Location	Ref Detail Shape	Comment
		SUITE-1			FEC 26xx							EN-1	Mech Room		M12											Power to Controller
		SUITE-1			FEC 26xx	MS/TP	1	11				EN-1	Mech Room	0	M12											BacNet FC Bus
	UI IN-1	SUITE-1	OA-T	Discharge Air Temperature	FEC 26xx	MS/TP	1	11	UI IN-1		IN1, ICOM1	EN-1	Mech Room	0	M12	1-11-UI IN-1						2/22	2-Wire	TE		F131	
	UI IN-2	SUITE-1			FEC 26xx	MS/TP	1	11	UI IN-2			EN-1	Mech Room	0	M12	1-11-UI IN-2											
	UI IN-3	SUITE-1			FEC 26xx	MS/TP	1	11	UI IN-3			EN-1	Mech Room	0	M12	1-11-UI IN-3											
	UI IN-4	SUITE-1			FEC 26xx	MS/TP	1	11	UI IN-4			EN-1	Mech Room	0	M12	1-11-UI IN-4											
	UI IN-5	SUITE-1			FEC 26xx	MS/TP	1	11	UI IN-5			EN-1	Mech Room	0	M12	1-11-UI IN-5											
	UI IN-6	SUITE-1			FEC 26xx	MS/TP	1	11	UI IN-6			EN-1	Mech Room	0	M12	1-11-UI IN-6											
	BI IN-7	SUITE-1	UNITEN-S	Unit Enable Toggle Switch	FEC 26xx	MS/TP	1	11	BI IN-7		IN7, ICOM7	EN-1	Mech Room	0	M12	1-11-BI IN-7						2/22	See wiring detail	Dry Contact		F301	
	BI IN-8	SUITE-1	SF-S	Supply Fan Status	FEC 26xx	MS/TP	1	11	BI IN-8		IN8, ICOM8	EN-1	Mech Room	0	M12	1-11-BI IN-8	2/22	OUT, COM	Current Relay	Motor Lead		Motor Lead	See wiring detail	Motor Status (Contact)		F301	
	BO OUT-1	SUITE-1	SF-C	Supply Fan Command	FEC 26xx	MS/TP	1	11	BO OUT-1		OUT1, OCOM1	EN-1	Mech Room	0	M12	1-11-BO OUT-1						2/18	See wiring detail	24VAC OUT (Sw Low, INT Source)		F701	
	BO OUT-2	SUITE-1	OADPR-CL	Outdoor Air Damper Comman	FEC 26xx	MS/TP	1	11	BO OUT-2		OUT-a,OUT-b,24V COM	EN-1	Mech Room	0	M12	1-11-BO OUT-2						3/22	ORG, RED, BLK	M910x-AGx-2S (Incr) (Sw Hi, EXT Sou		F559	
	BO OUT-3	SUITE-1	OADPR-OP	Outdoor Air Damper Comman	FEC 26xx	MS/TP	1	11	BO OUT-3		OUT-a,OUT-b,24V COM	EN-1	Mech Room	0	M12	1-11-BO OUT-3						3/22	ORG, RED, BLK	M910x-AGx-2S (Incr) (Sw Hi, EXT Sou		F559	
	CO OUT-4	SUITE-1	EFx-C	Exhaust Fan Command	FEC 26xx	MS/TP	1	11	CO OUT-4		OUT4, 24V COM	EN-1	Mech Room	0	M12	1-11-CO OUT2/22		COIL (Wh/Yel,Wh/Blue)	RIB Relay	COM, NO (Yel, Org)		2/14	See wiring detail	Control Panel (NO) (Sw Hi, EXT Sourc		F902	
	CO OUT-5	SUITE-1	TV-C	Ext Suite TV Command	FEC 26xx	MS/TP	1	11	CO OUT-5		OUT5, 24V COM	EN-1	Mech Room	0	M12	1-11-CO OUT2/22		COIL (Wh/Yel,Wh/Blue)	RIB Relay	COM, NO (Yel, Org)		2/14	See wiring detail	Control Panel (NO) (Sw Hi, EXT Sourc		F902	
	CO OUT-6	SUITE-1	HC-O	Heating/Cooling Output	FEC 26xx	MS/TP	1	11	CO OUT-6		OUT-a,OUT-b,24V COM	EN-1	Mech Room	0	M12	1-11-CO OUT-6						3/22	3, 2, 1	VA-7200 (Incr) (Sw Hi, EXT Source)		F981	
	CO OUT-7	SUITE-1	HC-O	Heating/Cooling Output	FEC 26xx	MS/TP	1	11	CO OUT-7		OUT-a,OUT-b,24V COM	EN-1	Mech Room	0	M12	1-11-CO OUT-7						3/22	3, 2, 1	VA-7200 (Incr) (Sw Hi, EXT Source)		F981	
	AO OUT-8	SUITE-1			FEC 26xx	MS/TP	1	11	AO OUT-8			EN-1	Mech Room	0	M12	1-11-AO OUT-8											
	AO OUT-9	SUITE-1	EH-CMD	Sideloop Output	FEC 26xx	MS/TP	1	11	AO OUT-9		OUT9, OCOM9,24V HOT	EN-1	Mech Room	0	M12	1-11-AO OUT-9		SIG IN, COM, 24V	Sequencer	See Detail		7/14	See wiring detail	Heating Sequencer (Vdc)		F1059	
		SUITE-1			NET STAT							EN-1	Mech Room		M12											BacNet SA Bus
		SUITE-1			NET STAT	SA Bus	1	199				EN-1	Mech Room	0	M12											
	STAT	SUITE-1	ZN-T	Zone Temperature	NET STAT	SA Bus	1	199	STAT		Wireless	EN-1	Mech Room	0	M12	11-1-199-STAT						Wireless		WRZ-TTx0000 (ZONE Add Switch=1)		flS107	

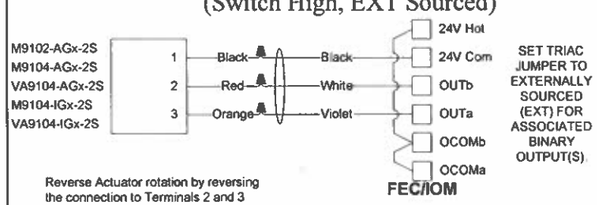
DETAIL F131 TEMPERATURE SENSOR INPUT



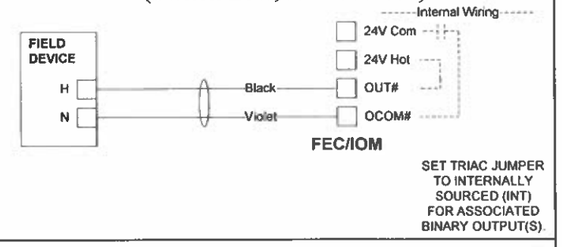
DETAIL F301 BINARY INPUT (DRY CONTACT)



DETAIL F559 INCREMENTAL CONTROL to M910x-AGx-2S, M9104-IGx-2S (Switch High, EXT Sourced)

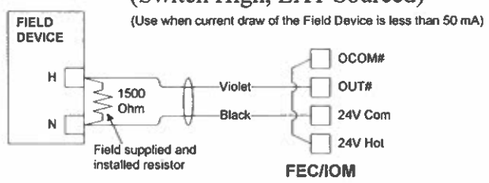


DETAIL F701 24 VAC BINARY OUTPUT (Switch Low, INT Sourced)

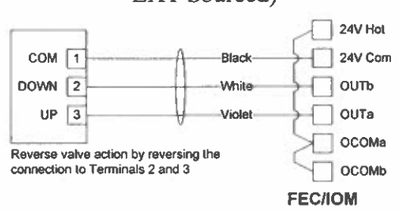


DETAIL F902 24 VAC TRIAC OUTPUT to LOW CURRENT DRAW DEVICE (Switch High, EXT Sourced)

(Use when current draw of the Field Device is less than 50 mA)



DETAIL F981 INCREMENTAL CONTROL to VA-7150 / VA-7200 (Switch High, EXT Sourced)



Drawing Title
SUITE-1 Point Schedule (1 of 2)

Project Title
Founders Suite Controls

REFERENCE DRAWING	NO	REVISION-LOCATION	ECN	DATE	BY
Sales Engineer / Project Manager / Application Engineer		DRAWN BY / DATE	APPROVED BY / DATE		

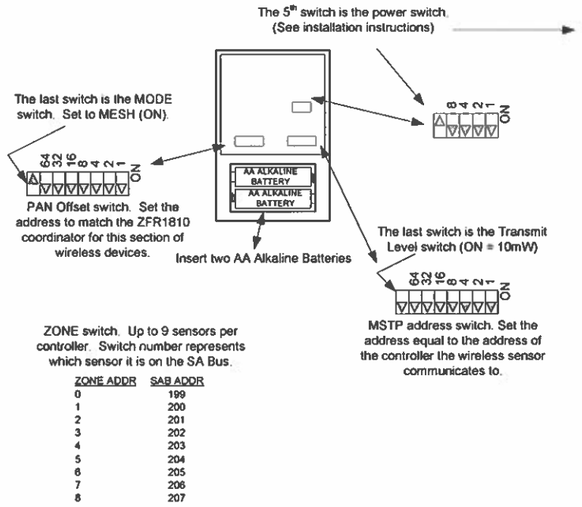
Branch Information

Johnson Controls

CONTRACT NUMBER: 0011-0002

DRAWING NUMBER: 1.4A

DETAIL NS107 WRZ-TTx0000 Wireless Zone Sensor



ZONE switch. Up to 9 sensors per controller. Switch number represents which sensor it is on the SA Bus.

ZONE ADDR	SAB ADDR
0	199
1	200
2	201
3	202
4	203
5	204
6	205
7	206
8	207

WRZ-TTx0000 Installation Instructions

Step 1 – Set the Power Switch to OFF.

Step 2 – Set the MODE switch to MESH (ON).

Step 3 – Set the PAN Offset switch to match the ZFR1810 Coordinator, and ZFR1811 Router for the controller (See MSTP Riser Details)

Step 4 – Set the ZONE switch. (See System Point Schedule for switch address.)

Step 5 – Set the MSTP Address switch to match the address of the controller. (See Room Schedule or Point Schedule for switch address)

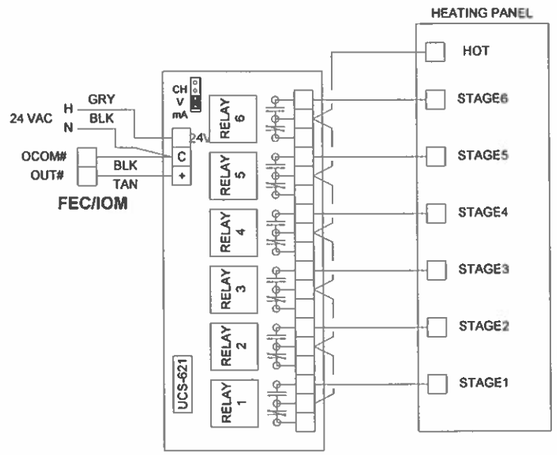
Step 6 – Set the Transmit Level switch to 10mW (ON).

Step 7 – Install two AA Alkaline Batteries.

Step 8 – Set the Power Switch to ON.

Step 9 – Mount Sensor in accordance of the installation instruction that come with the sensor

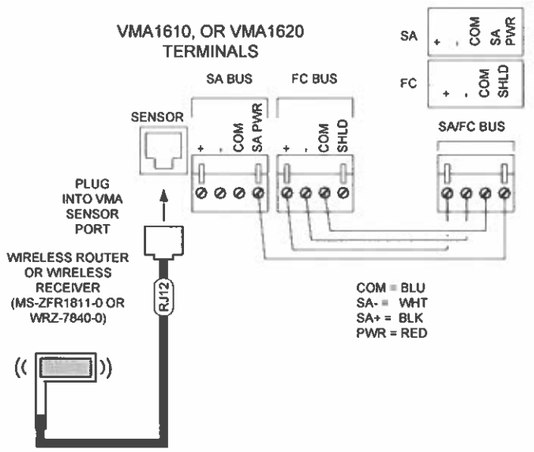
DETAIL F1059 Staged Heating Wiring Detail to Sequencer



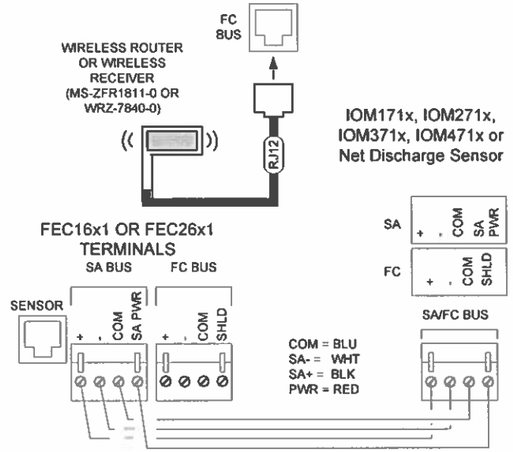
ZFR1811 Routers, WRZ-7840 Receivers and SA Bus wiring when wireless. Select correct controller for system.

VMA1610, OR VMA1620

IOM171x, IOM271x, IOM371x, IOM471x or Net Discharge Sensor



FEC16x1 AND FEC26x1



Drawing Title
SUITE-1 Point Schedule (2 of 2)

REFERENCE DRAWING	NO.	REVISION-LOCATION	ECN	DATE	BY

Sales Engineer | Project Manager | Application Engineer | DRAWN BY / DATE | APPROVED BY / DATE

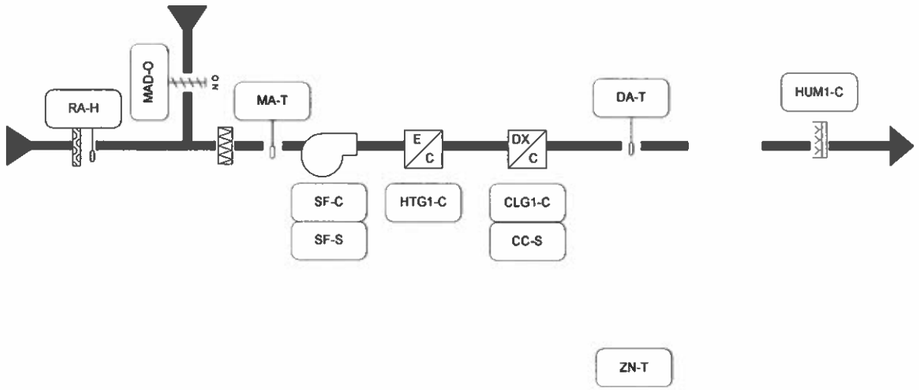
Project Title
Founders Suite Controls

Branch Information

Johnson Controls

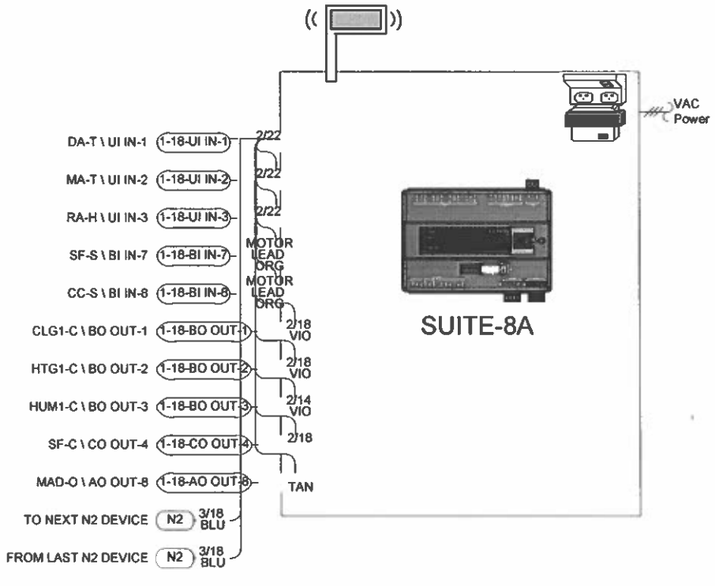
CONTRACT NUMBER
0011-0002

DRAWING NUMBER
1.4B



BILL OF MATERIALS

Designation	Qty	Part Number	Description
SUITE-8A	1	MS-FEC2611-0	17PT FIELD EQUIP CONTRLR W/ 6UI, 2BI, 3BO
ZFR	1	MS-ZFR1811-0	WIRELESS FIELD BUS ROUTER FOR FEC VMA16
ZN-T	1	WRZ-TTR0000-0	SENSR, WIRELSS, NO SETPNT ADJUSTMENT
RA-H	1	HC-6703-6N00P	HUMIDITY CONTRLR DUCT MT
MA-T, DA-T	2	TE-6311P-1	TEMP SENSOR, 1000 OHM, NI - 6" FOR DUCT MTG
MAD-O	1	M9208-GGA-3	70 IN-LB SPRING RETURN ACT PROP
SF-C, HTG1-C, CLG1-C	3	LY2N-AC24	RELAY, PLUGIN, DPDT
	3	PTF08A-E	RELAY SOCKET, DPDT
SF-S, CC-S	2	H909	CURR SWITCH, SPLIT, 2.5-135A, NO, 0.2A@120V



Drawing Title

SUITE-8A Flow Panel Detail

REFERENCE DRAWING	NO	REVISION-LOCATION	ECN	DATE	BY

Sales Engineer	Project Manager	Application Engineer	DRAWN BY	DRAWN DATE	APPROVED BY	APPROVED DATE

Project Title

Founders Suite Controls

Johnson Controls

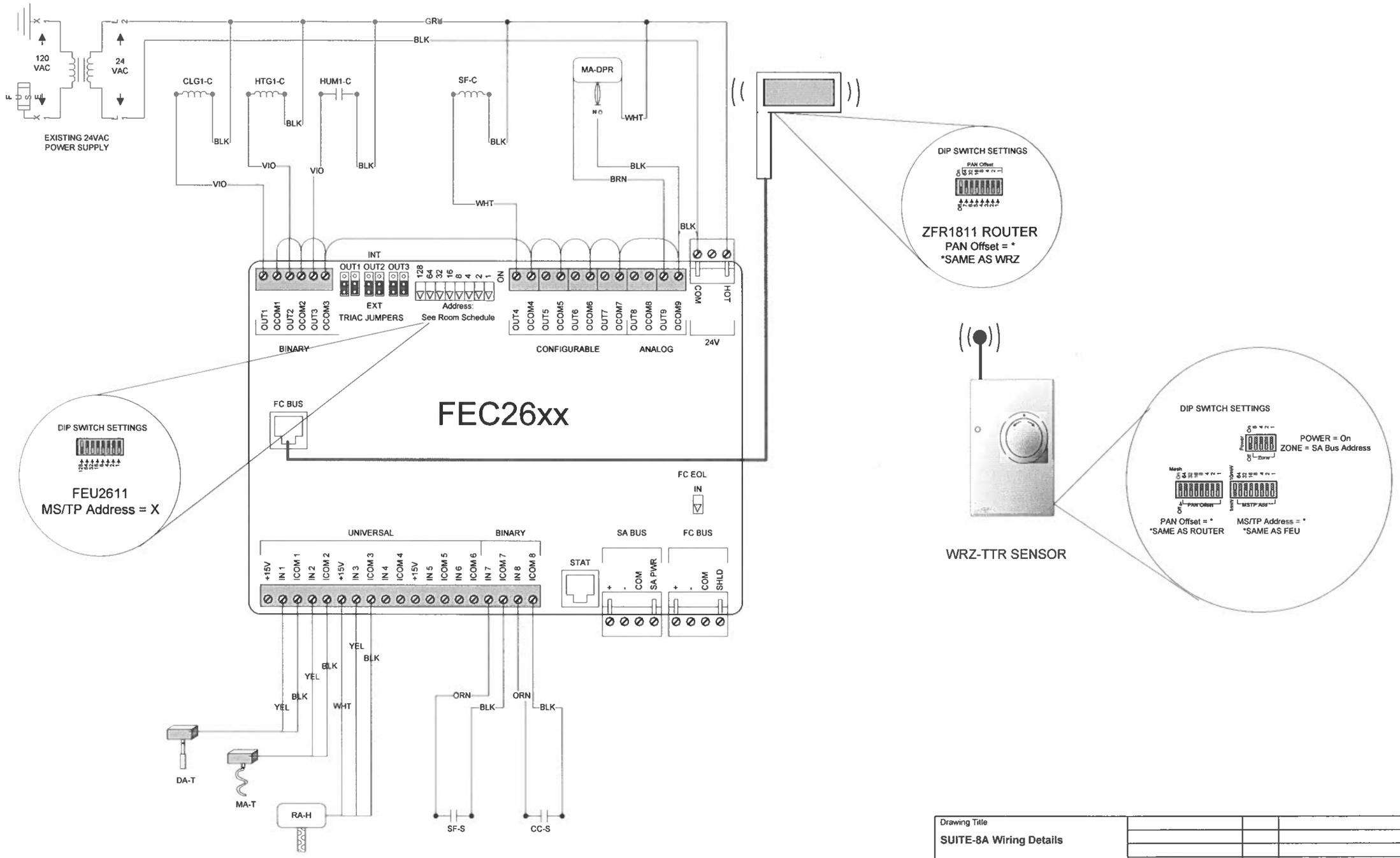
Branch Information

CONTRACT NUMBER

0011-0002

DRAWING NUMBER

2.1



Drawing Title: SUITE-8A Wiring Details						
REFERENCE DRAWING	NO	REVISION LOCATION		ECN	DATE	BY
Sales Engineer / Project Manager		Application Engineer	DRAWN BY / DATE		APPROVED BY / DATE	
Project Title: Founders Suite Controls	Johnson Controls	Branch Information	CONTRACT NUMBER: 0011-0002			
			DRAWING NUMBER: 2.2			

SEQUENCE OF OPERATIONS

Upon a call for Occupied Mode, the economizer damper will move to its minimum position and the supply fan will be energized.

Heating and cooling is staged in sequence to prevent simultaneous heating and cooling, and to maintain zone temperature setpoint.

Upon a call for cooling, and the outside air dry bulb temperature is less than dry bulb switchover setpoint, the economizer dampers will be positioned for maximum free cooling using outside air to meet the cooling demand. Once the outside air dry bulb temperature is greater than the dry bulb switchover setpoint, the economizer damper will move to its minimum position, and mechanical cooling will stage on and off to maintain the desired zone temperature setpoint.

Upon a call for heating, the economizer damper will move to its minimum position, and the electric heating will stage on and off to maintain the desired zone temperature setpoint.

Dehumidification Mode: When operating in cooling, consideration of the dehumidification setpoint is taken into account. Mechanical cooling will stage on to sub-cool the supply air, and reheat with the electric heating coil as necessary to maintain zone temperature setpoint.

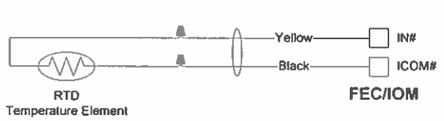
Humidification Mode: When operating in both the heating and cooling modes, return air is monitored for relative humidity. A single stage humidification unit will stage on and off as required to maintain return air humidity setpoint.

During the Unoccupied Mode, the supply fan and heating and cooling stages will operate intermittently to maintain a minimum space temperature of 60° F, and a maximum space temperature of 82° F

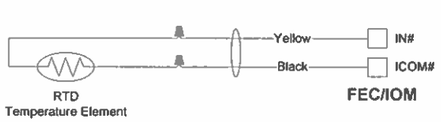
Drawing Title: **Sequence of Operations**							
	REFERENCE DRAWING	NO	REVISION-LOCATION	ECN	DATE	BY	
	Sales Engineer / Project Manager / Application Engineer		DRAWN BY / DATE	APPROVED BY / DATE			
Project Title: **Founders Suite Controls**	Johnson Controls		Branch Information	CONTRACT NUMBER: **0011-0002**			
				DRAWING NUMBER: **2.3**			

Electrician/Fitter	Point Information				Controller Information							Panel Information						Intermediate Device				Field Device					
Tag	Point Type	System Name	Object Name	Expanded ID	Controller Details	Trunk Type	Trunk Nbr	Trunk Addr.	Cable Destination Bay/Terminal	Module Type	Termination Out	Panel	Panel Location	Slot Number	Reference Drawing	Cable Number	Wiring /Tubing	Termination In	Device	Termination Out	Location	Wiring /Tubing	Termination In	Device	Location	Ref Detail Shape	Comment
		SUITE-8A			FEC 26xx	MS/TP	1	18				EN-1	Mech Room	0	M12												BacNet FC Bus
	UI IN-1	SUITE-8A	DA-T	Discharge Air Temperature	FEC 26xx	MS/TP	1	18	UI IN-1		IN1, ICOM1	EN-1	Mech Room	0	M12	1-18-UI IN-1						2/22	2-Wire	TE		F131	
	UI IN-2	SUITE-8A	MA-T	Mixed Air Temperature	FEC 26xx	MS/TP	1	18	UI IN-2		IN2, ICOM2	EN-1	Mech Room	0	M12	1-18-UI IN-2						2/22	2-Wire	TE		F131	
	UI IN-3	SUITE-8A	RA-H	Return Air Humidity	FEC 26xx	MS/TP	1	18	UI IN-3		IN3, ICOM3	EN-1	Mech Room	0	M12	1-18-UI IN-3						2/22	TEMP, TEMP	HE-63X0-TE		F151	
	UI IN-4	SUITE-8A			FEC 26xx	MS/TP	1	18	UI IN-4			EN-1	Mech Room	0	M12	1-18-UI IN-4											
	UI IN-5	SUITE-8A			FEC 26xx	MS/TP	1	18	UI IN-5			EN-1	Mech Room	0	M12	1-18-UI IN-5											
	UI IN-6	SUITE-8A			FEC 26xx	MS/TP	1	18	UI IN-6			EN-1	Mech Room	0	M12	1-18-UI IN-6											
	BI IN-7	SUITE-8A	SF-S	Supply Fan Status	FEC 26xx	MS/TP	1	18	BI IN-7		IN7, ICOM7	EN-1	Mech Room	0	M12	1-18-BI IN-7	2/22	OUT, COM	Current Relay	Motor Lead		Motor Lead	See wiring detail	Motor Status (Contact)		F301	
	BI IN-8	SUITE-8A	CC-S	Cooling Coil Status	FEC 26xx	MS/TP	1	18	BI IN-8		IN8, ICOM8	EN-1	Mech Room	0	M12	1-18-BI IN-8	2/22	OUT, COM	Current Relay	Motor Lead		Motor Lead	See wiring detail	Motor Status (Contact)		F301	
	BO OUT-1	SUITE-8A	CLG1-C	Cooling Stage 1 Command	FEC 26xx	MS/TP	1	18	BO OUT-1		OUT1, 24V COM	EN-1	Mech Room	0	M12	1-18-BO OUT-1						2/18	See wiring detail	24VAC OUT (Sw Hi, EXT Source)		F501	
	BO OUT-2	SUITE-8A	HTG1-C	Heating Stage 1 Command	FEC 26xx	MS/TP	1	18	BO OUT-2		OUT2, 24V COM	EN-1	Mech Room	0	M12	1-18-BO OUT-2						2/18	See wiring detail	24VAC OUT (Sw Hi, EXT Source)		F501	
	BO OUT-3	SUITE-8A	HUM1-C	Humidifier Stage 1 Command	FEC 26xx	MS/TP	1	18	BO OUT-3		OUT3, 24V COM	EN-1	Mech Room	0	M12	1-18-BO OUT2/22		COIL-, COIL+	Relay	COM, NO		2/14	See wiring detail	Humidifier (Packaged) (Sw Hi, EXT Sc	F1054		
	CO OUT-4	SUITE-8A	SF-C	Supply Fan Command	FEC 26xx	MS/TP	1	18	CO OUT-4		OUT4, 24V COM	EN-1	Mech Room	0	M12	1-18-CO OUT-4						2/18	See wiring detail	24VAC OUT (Sw Hi, EXT Source)		F901	
	CO OUT-5	SUITE-8A			FEC 26xx	MS/TP	1	18	CO OUT-5			EN-1	Mech Room	0	M12	1-18-CO OUT-5											
	CO OUT-6	SUITE-8A			FEC 26xx	MS/TP	1	18	CO OUT-6			EN-1	Mech Room	0	M12	1-18-CO OUT-6											
	CO OUT-7	SUITE-8A			FEC 26xx	MS/TP	1	18	CO OUT-7			EN-1	Mech Room	0	M12	1-18-CO OUT-7											
	AO OUT-8	SUITE-8A	MAD-O	Mixed Air Damper Output	FEC 26xx	MS/TP	1	18	AO OUT-8			EN-1	Mech Room	0	M12	1-18-AO OUT-8											
	AO OUT-9	SUITE-8A			FEC 26xx	MS/TP	1	18	AO OUT-9		OUT9, OCOM9 24VAC, (	EN-1	Mech Room	0	M12	1-18-AO OUT-9						2/22 / 2/18	GRY, BLK/BLK, RED	M9208-GGx-x (Vdc) (Ext Source)		F269	
		SUITE-8A			NET STAT							EN-1	Mech Room		M12												
		SUITE-8A			NET STAT	SA Bus	1	199				EN-1	Mech Room	0	M12												BacNet SA Bus
	STAT	SUITE-8A			NET STAT	SA Bus	1	199	STAT		Wireless	EN-1	Mech Room	0	M12	18-1-199-STAT						Wireless		WRZ-TTx0000 (ZONE Add Switch=1)		NS107	

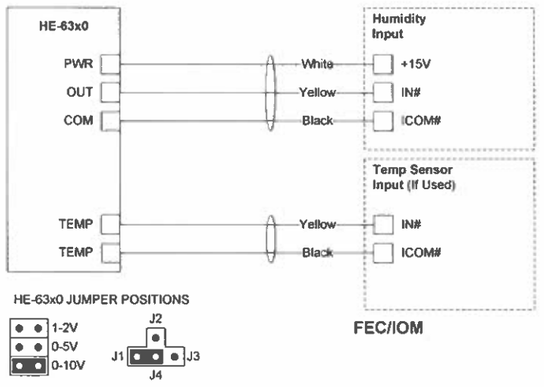
DETAIL F131 TEMPERATURE SENSOR INPUT



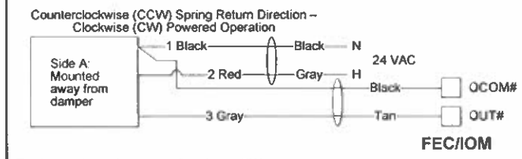
DETAIL F131 TEMPERATURE SENSOR INPUT



DETAIL F151 HE-6300 SERIES HUMIDITY SENSOR

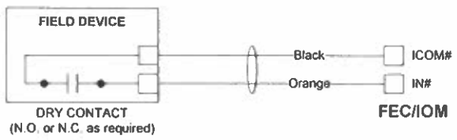


DETAIL F269 0 (2)-10VDC OUTPUT to M9206-GGx-2S and M9208-GGx-x

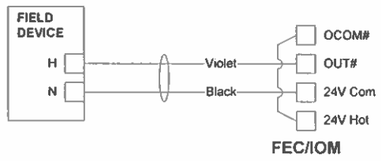


To change the spring return direction to CW, mount the actuator to the damper shaft so that Side B of the actuator is away from the damper. With power applied, the actuator now drives CCW from the 0° position, and spring returns CW.

DETAIL F301 BINARY INPUT (DRY CONTACT)

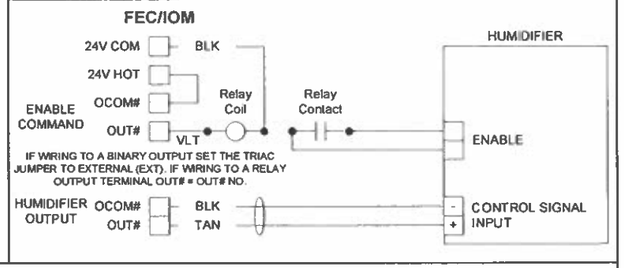


DETAIL F501 24 VAC BINARY OUTPUT (Switch High, EXT Sourced)

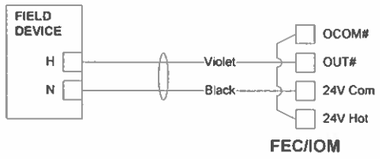


SET TRIAC JUMPER TO EXTERNALLY SOURCED (EXT) FOR ASSOCIATED BINARY OUTPUT(S).

DETAIL F1054 Packaged Humidifier Wiring



DETAIL F901 24 VAC TRIAC OUTPUT (Switch High, EXT Sourced)



Drawing Title
SUITE-8A Point Schedule (1 of 2)

REFERENCE DRAWING	NO	REVISION-LOCATION	ECN	DATE	BY

Sales Engineer	Project Manager	Application Engineer	DRAWN BY	DRAWN DATE	APPROVED BY	APPROVED DATE

Project Title
Founders Suite Controls

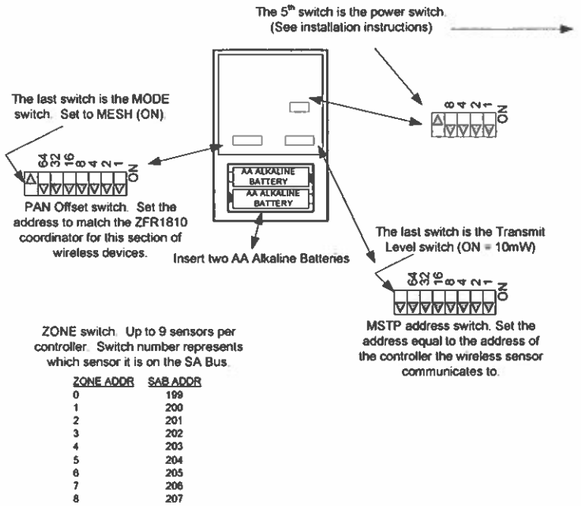
Branch Information

Johnson Controls

CONTRACT NUMBER
0011-0002

DRAWING NUMBER
2.4A

DETAIL NS107 WRZ-TTx0000 Wireless Zone Sensor



ZONE ADDR	SAB ADDR
0	199
1	200
2	201
3	202
4	203
5	204
6	205
7	206
8	207

WRZ-TTx0000 Installation Instructions

Step 1 – Set the Power Switch to OFF.

Step 2 – Set the MODE switch to MESH (ON).

Step 3 – Set the PAN Offset switch to match the ZFR1810 Coordinator, and ZFR1811 Router for the controller (See MSTP Riser Details)

Step 4 – Set the ZONE switch. (See System Point Schedule for switch address.)

Step 5 – Set the MSTP Address switch to match the address of the controller. (See Room Schedule or Point Schedule for switch address)

Step 6 – Set the Transmit Level switch to 10mW (ON).

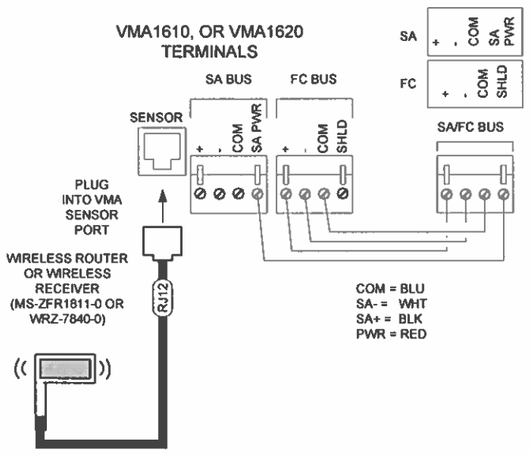
Step 7 – Install two AA Alkaline Batteries.

Step 8 – Set the Power Switch to ON.

Step 9 – Mount Sensor in accordance of the installation instruction that come with the sensor

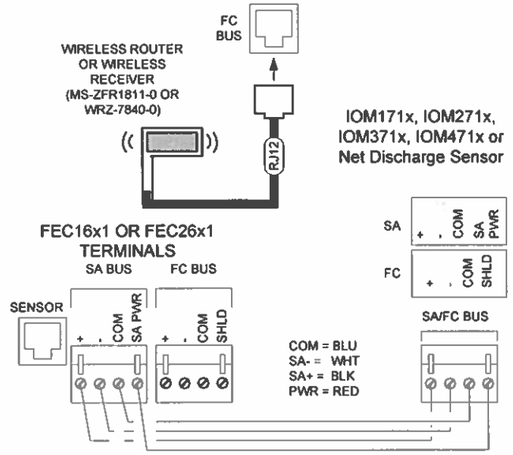
ZFR1811 Routers, WRZ-7840 Receivers and SA Bus wiring when wireless. Select correct controller for system.

VMA1610, OR VMA1620



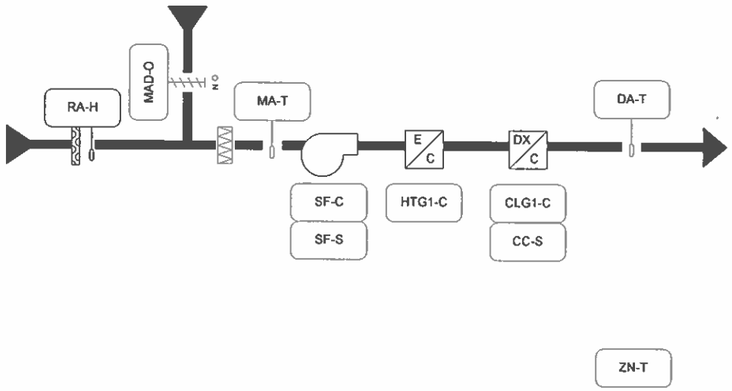
IOM171x, IOM271x, IOM371x, IOM471x or Net Discharge Sensor

FEC16x1 AND FEC26x1



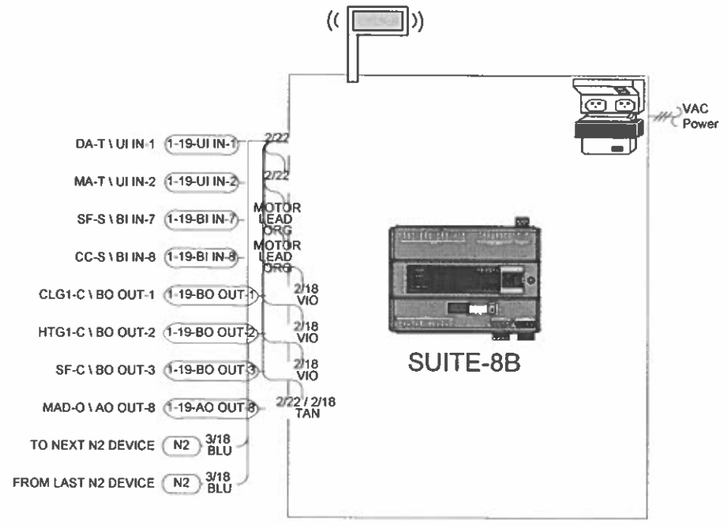
IOM171x, IOM271x, IOM371x, IOM471x or Net Discharge Sensor

Drawing Title: SUITE-8A Point Schedule (2 of 2)						
	REFERENCE DRAWING	NO.	REVISION LOCATION	ECN	DATE	BY
	Sales Engineer / Project Manager / Application Engineer		DRAWN BY / DATE	APPROVED BY / DATE		
Project Title: Founders Suite Controls	Johnson Controls	Branch Information	CONTRACT NUMBER: 0011-0002	DRAWING NUMBER: 2.4B		



BILL OF MATERIALS

Designation	Qty	Part Number	Description
SUITE-8A	1	MS-FEC2611-0	17PT FIELD EQUIP CONTRLR W/ 6UI, 2BI, 3BO
ZFR	1	MS-ZFR1811-0	WIRELESS FIELD BUS ROUTER FOR FEC VMA16
ZN-T	1	WRZ-TTR0000-0	SENSR, WIRELSS, NO SETPNT ADJUSTMENT
RA-H	1	HC-6703-6N00P	HUMIDITY CONTRLR DUCT MT
MA-T, DA-T	2	TE-6311P-1	TEMP SENSOR, 1000 OHM, NI - 6" FOR DUCT MTG
MAD-O	1	M9208-GGA-3	70 IN-LB SPRING RETURN ACT PROP
SF-C, HTG1-C, CLG1-C	3	LY2N-AC24	RELAY, PLUGIN, DPDT
	3	PTF08A-E	RELAY SOCKET, DPDT
SF-S, CC-S	2	H909	CURR SWITCH, SPLIT, 2.5-135A, NO, 0.2A@120V



Drawing Title

SUITE-8B Flow Panel Detail

REFERENCE DRAWING	NO	REVISION LOCATION	ECN	DATE	BY

Sales Engineer	Project Manager	Application Engineer	DRAWN BY	DRAWN DATE	APPROVED BY	APPROVED DATE

Project Title

Founders Suite Controls

Branch Information

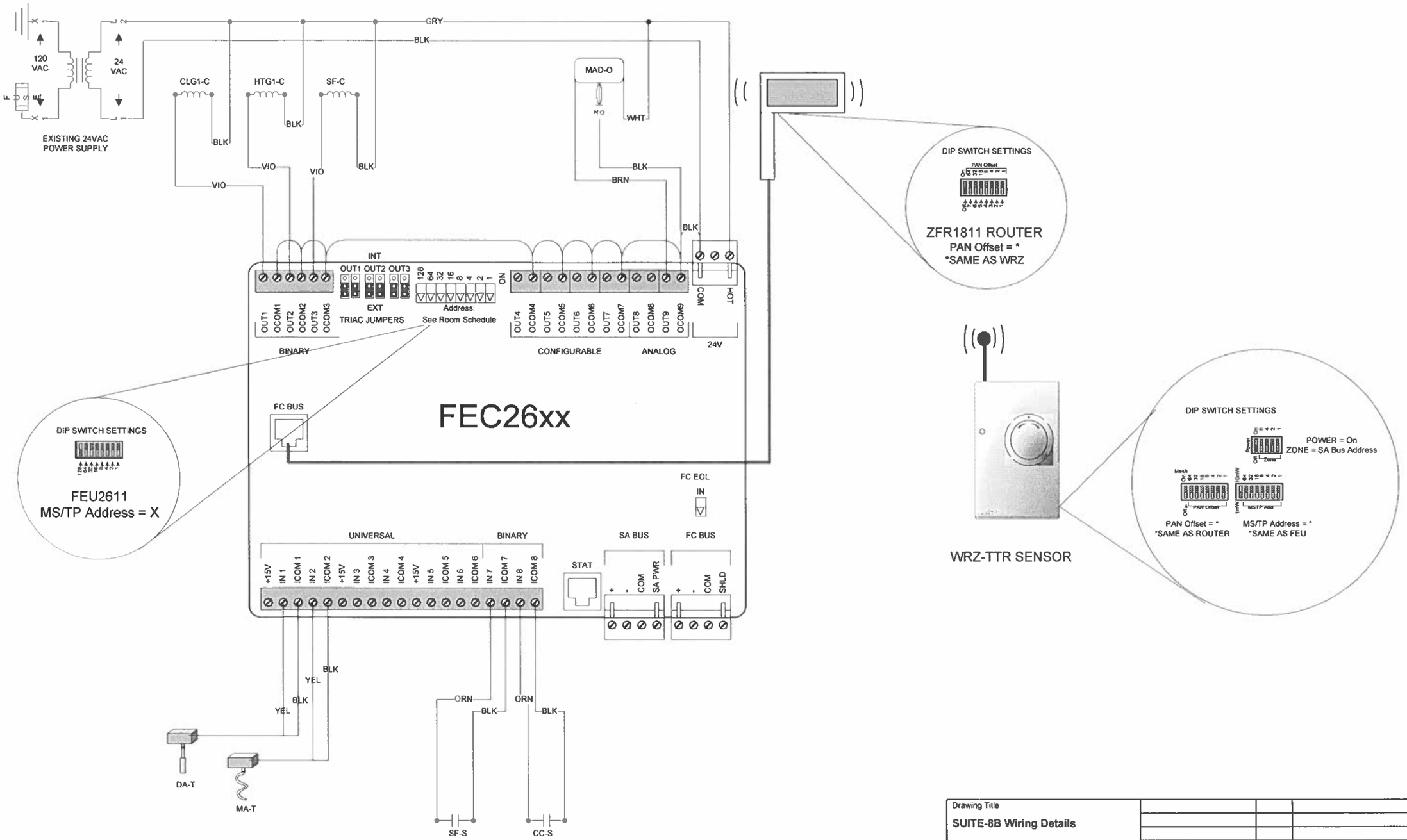
Johnson Controls

CONTRACT NUMBER

0011-0002

DRAWING NUMBER

3.1



Drawing Title: SUITE-8B Wiring Details							
	REFERENCE DRAWING	NO	REVISION-LOCATION		ECN	DATE	BY
	Sales Engineer / Project Manager / Application Engineer		DRAWN BY / DATE	APPROVED BY / DATE			
Project Title: Founders Suite Controls	Johnson Controls	Branch Information	CONTRACT NUMBER: 0011-0002	DRAWING NUMBER: 3.2			

SEQUENCE OF OPERATIONS

Upon a call for Occupied Mode, the economizer damper will move to its minimum position and the supply fan will be energized.

Heating and cooling is staged in sequence to prevent simultaneous heating and cooling, and to maintain zone temperature setpoint.

Upon a call for cooling, and the outside air dry bulb temperature is less than dry bulb switchover setpoint, the economizer dampers will be positioned for maximum free cooling using outside air to meet the cooling demand. Once the outside air dry bulb temperature is greater than the dry bulb switchover setpoint, the economizer damper will move to its minimum position, and mechanical cooling will stage on and off to maintain the desired zone temperature setpoint.

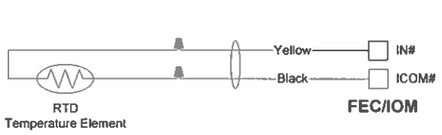
Upon a call for heating, the economizer damper will move to its minimum position, and the electric heating will stage on and off to maintain the desired zone temperature setpoint.

During the Unoccupied Mode, the supply fan and heating and cooling stages will operate intermittently to maintain a minimum space temperature of 60° F, and a maximum space temperature of 82° F

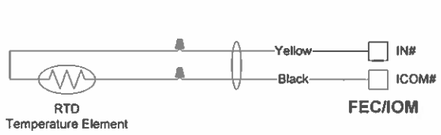
Drawing Title **Sequence of Operations**								
	REFERENCE DRAWING		NO	REVISION-LOCATION		ECN	DATE	BY
	Sales Engineer	Project Manager	Application Engineer	DRAWN		APPROVED		
				BY	DATE	BY	DATE	
Project Title **Founders Suite Controls**	Johnson Controls			Branch Information		CONTRACT NUMBER **0011-0002**		
						DRAWING NUMBER **3.3**		

Electrician/Fitter	Point Information				Controller Information							Panel Information						Intermediate Device				Field Device					
Tag	Point Type	System Name	Object Name	Expanded ID	Controller Details	Trunk Type	Trunk Nbr	Trunk Addr.	Cable Destination Bay/Terminal	Module Type	Termination Out	Panel	Panel Location	Slot Number	Reference Drawing	Cable Number	Wiring /Tubing	Termination In	Device	Termination Out	Location	Wiring /Tubing	Termination In	Device	Location	Ref Detail Shape	Comment
		SUITE-8B			FEC 26xx							EN-1	Mech Room		M12												
		SUITE-8B			FEC 26xx	MS/TP	1	19				EN-1	Mech Room		0 M12												Power to Controller BacNet FC Bus
	UI IN-1	SUITE-8B	DA-T	Discharge Air Temperature	FEC 26xx	MS/TP	1	19	UI IN-1		UI1, ICOM1	EN-1	Mech Room		0 M12	1-19-UI IN-1						2/22	2-Wire	TE		F131	
	UI IN-2	SUITE-8B	MA-T	Mixed Air Temperature	FEC 26xx	MS/TP	1	19	UI IN-2		UI2, ICOM2	EN-1	Mech Room		0 M12	1-19-UI IN-2						2/22	2-Wire	TE		F131	
	UI IN-3	SUITE-8B			FEC 26xx	MS/TP	1	19	UI IN-3			EN-1	Mech Room		0 M12	1-19-UI IN-3											
	UI IN-4	SUITE-8B			FEC 26xx	MS/TP	1	19	UI IN-4			EN-1	Mech Room		0 M12	1-19-UI IN-4											
	UI IN-5	SUITE-8B			FEC 26xx	MS/TP	1	19	UI IN-5			EN-1	Mech Room		0 M12	1-19-UI IN-5											
	UI IN-6	SUITE-8B			FEC 26xx	MS/TP	1	19	UI IN-6			EN-1	Mech Room		0 M12	1-19-UI IN-6											
	BI IN-7	SUITE-8B	SF-S	Supply Fan Status	FEC 26xx	MS/TP	1	19	BI IN-7		UI7, ICOM7	EN-1	Mech Room		0 M12	1-19-BI IN-7	2/22	OUT, COM	Current Relay	Motor Lead		Motor Lead	See wiring detail	Motor Status (Contact)		F301	
	BI IN-8	SUITE-8B	CC-S	Cooling Coil Status	FEC 26xx	MS/TP	1	19	BI IN-8		UI8, ICOM8	EN-1	Mech Room		0 M12	1-19-BI IN-8	2/22	OUT, COM	Current Relay	Motor Lead		Motor Lead	See wiring detail	Motor Status (Contact)		F301	
	BO OUT-1	SUITE-8B	CLG1-C	Cooling Stage 1 Command	FEC 26xx	MS/TP	1	19	BO OUT-1		OUT1, 24V COM	EN-1	Mech Room		0 M12	1-19-BO OUT-1						2/18	See wiring detail	24VAC OUT (Sw Hi, EXT Source)		F501	
	BO OUT-2	SUITE-8B	HTG1-C	Heating Stage 1 Command	FEC 26xx	MS/TP	1	19	BO OUT-2		OUT2, 24V COM	EN-1	Mech Room		0 M12	1-19-BO OUT-2						2/18	See wiring detail	24VAC OUT (Sw Hi, EXT Source)		F501	
	BO OUT-3	SUITE-8B	SF-C	Supply Fan Command	FEC 26xx	MS/TP	1	19	BO OUT-3		OUT3, 24V COM	EN-1	Mech Room		0 M12	1-19-BO OUT-3						2/18	See wiring detail	24VAC OUT (Sw Hi, EXT Source)		F501	
	CO OUT-4	SUITE-8B			FEC 26xx	MS/TP	1	19	CO OUT-4			EN-1	Mech Room		0 M12	1-19-CO OUT-4											
	CO OUT-5	SUITE-8B			FEC 26xx	MS/TP	1	19	CO OUT-5			EN-1	Mech Room		0 M12	1-19-CO OUT-5											
	CO OUT-6	SUITE-8B			FEC 26xx	MS/TP	1	19	CO OUT-6			EN-1	Mech Room		0 M12	1-19-CO OUT-6											
	CO OUT-7	SUITE-8B			FEC 26xx	MS/TP	1	19	CO OUT-7			EN-1	Mech Room		0 M12	1-19-CO OUT-7											
	AO OUT-8	SUITE-8B	MAD-O	Mixed Air Damper Output	FEC 26xx	MS/TP	1	19	AO OUT-8		OUT8, OCOM8 24VAC, (	EN-1	Mech Room		0 M12	1-19-AO OUT-8						2/22 / 2/18	GRY, BLK/BLK, RED	M9208-GGx-x (Vdc) (Ext Source)		F269	
	AO OUT-9	SUITE-8B			FEC 26xx	MS/TP	1	19	AO OUT-9			EN-1	Mech Room		0 M12	1-19-AO OUT-9											
		SUITE-8B			NET STAT							EN-1	Mech Room		M12												
		SUITE-8B			NET STAT	SA Bus	1	199				EN-1	Mech Room		0 M12												BacNet SA Bus
	STAT	SUITE-8B			NET STAT	SA Bus	1	199	STAT		Wireless	EN-1	Mech Room		0 M12	19-1-199-STAT						Wireless		WRZ-TTx0000 (ZONE Add Switch=1)		NS107	

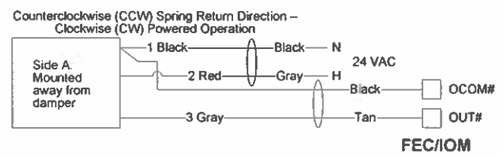
DETAIL F131 TEMPERATURE SENSOR INPUT



DETAIL F131 TEMPERATURE SENSOR INPUT

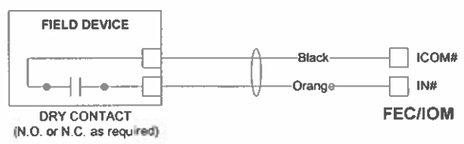


DETAIL F269 0 (2)-10VDC OUTPUT to M9206-GGx-2S and M9208-GGx-x

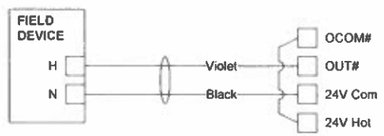


To change the spring return direction to CW, mount the actuator to the damper shaft so that Side B of the actuator is away from the damper. With power applied, the actuator now drives CCW from the 0° position, and spring returns CW.

DETAIL F301 BINARY INPUT (DRY CONTACT)



DETAIL F501 24 VAC BINARY OUTPUT (Switch High, EXT Sourced)



SET TRIAC JUMPER TO EXTERNALLY SOURCED (EXT) FOR ASSOCIATED BINARY OUTPUT(S).

Drawing Title
SUITE-8B Point Schedule (1 of 2)

REFERENCE DRAWING	NO	REVISION-LOCATION	ECN	DATE	BY

Sales Engineer | Project Manager | Application Engineer | DRAWN BY / DATE | APPROVED BY / DATE

Project Title
Founders Suite Controls

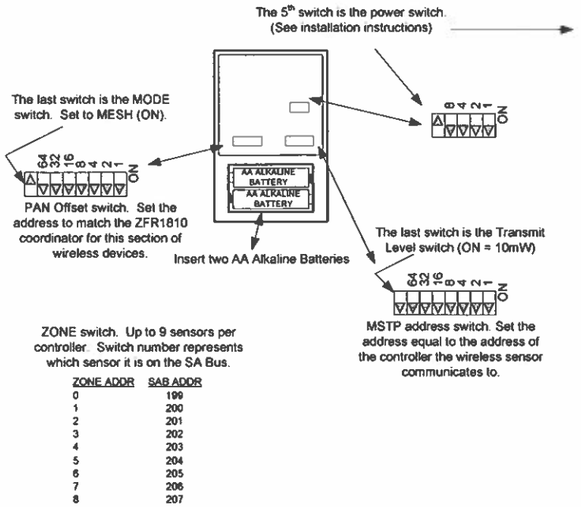
Johnson Controls

Branch Information

CONTRACT NUMBER
0011-0002

DRAWING NUMBER
3.4A

DETAIL NS107 WRZ-TTx0000 Wireless Zone Sensor



ZONE ADDR	SAB ADDR
0	199
1	200
2	201
3	202
4	203
5	204
6	205
7	206
8	207

WRZ-TTx0000 Installation Instructions

Step 1 – Set the Power Switch to OFF.

Step 2 – Set the MODE switch to MESH (ON).

Step 3 – Set the PAN Offset switch to match the ZFR1810 Coordinator, and ZFR1811 Router for the controller (See MSTP Riser Details)

Step 4 – Set the ZONE switch. (See System Point Schedule for switch address.)

Step 5 – Set the MSTP Address switch to match the address of the controller. (See Room Schedule or Point Schedule for switch address)

Step 6 – Set the Transmit Level switch to 10mW (ON).

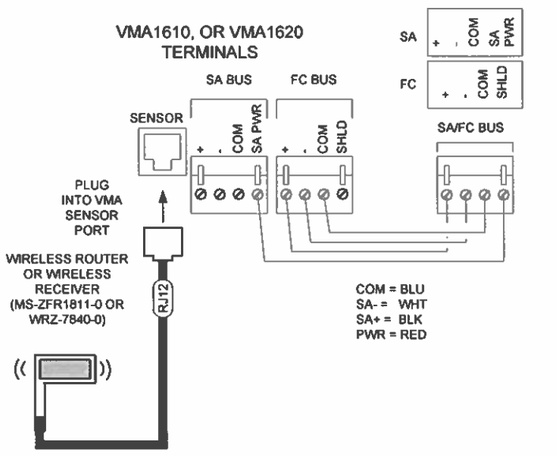
Step 7 – Install two AA Alkaline Batteries.

Step 8 – Set the Power Switch to ON.

Step 9 – Mount Sensor in accordance of the installation instruction that come with the sensor

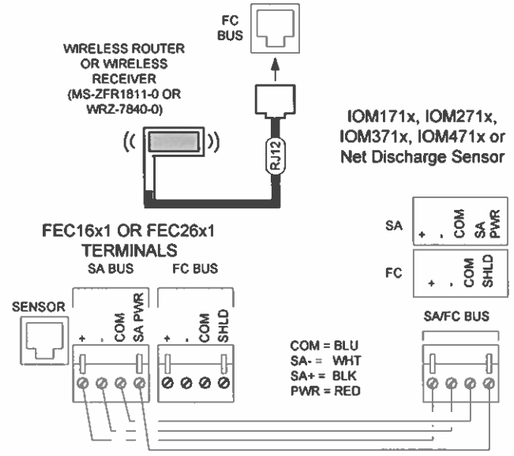
ZFR1811 Routers, WRZ-7840 Receivers and SA Bus wiring when wireless. Select correct controller for system.

VMA1610, OR VMA1620



IOM171x, IOM271x, IOM371x, IOM471x or Net Discharge Sensor

FEC16x1 AND FEC26x1



IOM171x, IOM271x, IOM371x, IOM471x or Net Discharge Sensor

Drawing Title
SUITE-8B Point Schedule (2 of 2)

REFERENCE DRAWING	NO	REVISION-LOCATION	ECN	DATE	BY

Sales Engineer | Project Manager | Application Engineer | DRAWN BY DATE | APPROVED BY DATE

Project Title
Founders Suite Controls

Branch Information

Johnson Controls

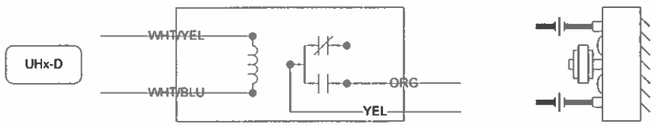
CONTRACT NUMBER **0011-0002**

DRAWING NUMBER **3.4B**

BILL OF MATERIALS

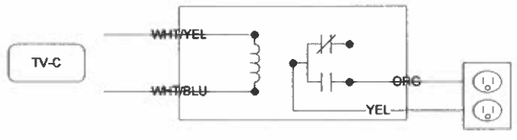
Designation	Qty	Part Number	Description
EFFx-C	2	RIBU1C	SPDT, 10A, HC=10-30VAC/DCD, W/LED
TV-C	12		
UHx-D	1		

ELECTRIC UNIT HEATER
TYPICAL OF 1



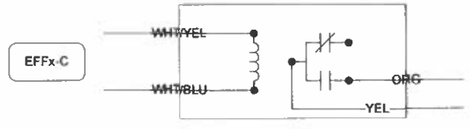
Hardware	I/O	Object Name	Description
24	CO-4	UH2413-D	Unit Heater Disable

SUITE TV COMMAND
TYPICAL OF 12



Hardware	I/O	Object Name	Description
10	CO-5	TV-C	Suite 9 and 10 TV Command
11	CO-5	TV-C	Suite 1and 2 TV Command
13	CO-5	TV-C	Suite 3 TV Command
14	CO-5	TV-C	Suite 4 and 5 TV Command
16	CO-5	TV-C	Suite 6 TV Command
17	CO-5	TV-C	Suite 7 and 8 TV Command
20	CO-5	TV-C	Suite 20 TV Command
21	CO-5	TV-C	Suite 11 and 12 TV Command
24	CO-5	TV-C	Suite 13 and 14 TV Command
25	CO-5	TV-C	Suite 15 TV Command
26	CO-5	TV-C	Suite 16 and 17 TV Command
29	CO-5	TV-C	Suite 18 and 19 TV Command

EXHAUST FAN
TYPICAL OF 2



Hardware	I/O	Object Name	Description
23	CO-4	EFF03-C	Toilet Exhaust Fan Command
30	CO-4	EFF02-C	Toilet Exhaust Fan Command

Drawing Title
Exhaust Fan & Exterior TV Control

REFERENCE DRAWING	NO	REVISION-LOCATION	ECN	DATE	BY

Sales Engineer | Project Manager | Application Engineer | DRAWN BY / DATE | APPROVED BY / DATE

Project Title
Founders Suite Controls

Branch Information

Johnson Controls

CONTRACT NUMBER
0011-0002

DRAWING NUMBER
4.1

Contract Name
Contract Number

Room Schedule

Box Location								Controller Information							Box Information										
	Room							Controller Required						Sensor			Box Config Required						Required (N2)		
Bldg./Flr.	No.	Name	System Name	Mech. Dwg.	System Serving this Box	Box Mfgr.	Mfgr Box Type	JCI Ctrl Dwg No.	Controller Part No.	NC/ NAE Addr	Trunk ID	Device Addr	PAN Offset	CSModel or Template	Code No.	Box Heat	Supplemental Heat	Config File Name	Inlet Size (Inches)	Inlet Area (Sq. Ft.)	K Factor	Clg Min Flow	Clg Max Flow	VMA Box Config	Comments	Generate Flag
Field Level Sect 6	2605	Suite 1	FC-F01	M2.26		Trane		1.1	MS-FEC2611-0	S1-NAE07	1	11	1	SuiteFCU	WRZ-TTR-0000										
Field Level Sect 6	2604	Suite 2	FC-F02	M2.26		Trane		1.1	MS-FEC2611-0	S1-NAE07	1	12	1	SuiteFCU	WRZ-TTR-0000										
Field Level Sect 6	2603	Suite 3	FC-F03	M2.26		Trane		1.1	MS-FEC2611-0	S1-NAE07	1	13	1	SuiteFCU	WRZ-TTR-0000										
Field Level Sect 6	2602	Suite 4	FC-F04	M2.26		Trane		1.1	MS-FEC2611-0	S1-NAE07	1	14	1	SuiteFCU	WRZ-TTR-0000										
Field Level Sect 6	2601	Suite 5	FC-F05	M2.26		Trane		1.1	MS-FEC2611-0	S1-NAE07	1	15	1	SuiteFCU	WRZ-TTR-0000										
Field Level Sect 5	2507	Suite 6	FC-F06	M2.25		Trane		1.1	MS-FEC2611-0	S1-NAE07	1	16	1	SuiteFCU	WRZ-TTR-0000										
Field Level Sect 5	2506	Suite 7	FC-F07	M2.25		Trane		1.1	MS-FEC2611-0	S1-NAE07	1	17	1	SuiteFCU	WRZ-TTR-0000										
Field Level Sect 5	2504	Suite 8	FC-F08	M2.25		York		2.1	MS-FEC2611-0	S1-NAE07	1	18	1	SuiteFCU	WRZ-TTR-0000										
Field Level Sect 5	2504	Suite 8	FC-F09	M2.25		York		3.1	MS-FEC2611-0	S1-NAE07	1	19	1	SuiteFCU	WRZ-TTR-0000										
Field Level Sect 5	2503	Suite 10	FC-F10	M2.25		Trane		1.1	MS-FEC2611-0	S1-NAE07	1	10	1	SuiteFCU	WRZ-TTR-0000										
Field Level Sect 4	2406	Suite 11	FC-F11	M2.24		Trane		1.1	MS-FEC2611-0	S1-NAE07	1	21	2	SuiteFCU	WRZ-TTR-0000										
Field Level Sect 4	2405	Suite 12	FC-F12	M2.24		Trane		1.1	MS-FEC2611-0	S1-NAE07	1	22	2	SuiteFCU	WRZ-TTR-0000										
Field Level Sect 4	2404	Suite 13	FC-F13	M2.24		Trane		1.1	MS-FEC2611-0	S1-NAE07	1	23	2	SuiteFCU	WRZ-TTR-0000										
Field Level Sect 4	2403	Suite 14	FC-F14	M2.24		Trane		1.1	MS-FEC2611-0	S1-NAE07	1	24	2	SuiteFCU	WRZ-TTR-0000										
Field Level Sect 4	2402	Suite 15	FC-F15	M2.24		Trane		1.1	MS-FEC2611-0	S1-NAE07	1	25	2	SuiteFCU	WRZ-TTR-0000										
Field Level Sect 4	2416	Suite 16	FC-F16	M2.23		Trane		1.1	MS-FEC2611-0	S1-NAE07	1	26	2	SuiteFCU	WRZ-TTR-0000										
Field Level Sect 2	2205	Suite 17	FC-F17	M2.23		Trane		1.1	MS-FEC2611-0	S1-NAE07	1	27	2	SuiteFCU	WRZ-TTR-0000										
Field Level Sect 2	2204	Suite 18	FC-F18	M2.23		Trane		1.1	MS-FEC2611-0	S1-NAE07	1	28	2	SuiteFCU	WRZ-TTR-0000										
Field Level Sect 2	2203	Suite 19	FC-F19	M2.23		Trane		1.1	MS-FEC2611-0	S1-NAE07	1	29	2	SuiteFCU	WRZ-TTR-0000										
Field Level Sect 3	2302	Suite 20	FC-F20	M2.22		Trane		1.1	MS-FEC2611-0	S1-NAE07	1	20	2	SuiteFCU	WRZ-TTR-0000										

MS-NAE35xx-x, MS-NAE45xx-x, MS-NAE55xx-x, NAE8500-0

Network Automation Engine

Description

Network Automation Engines (NAEs) enable Internet Protocol (IP) connectivity and Web-based access to Metasys® Building Management Systems (BMSs).

NAEs leverage standard building management communication technologies, including BACnet® protocol, LONWORKS® network, and N2 Bus protocol to monitor and supervise a wide variety of HVAC, lighting, security, and fire safety equipment.

NAEs provide comprehensive equipment monitoring and control, scheduling, alarm and event management, energy management, data exchange, data trending, and data storage.

NAEs feature an embedded Site Management Portal user interface, support multiple concurrent Web browser sessions with password and permission access control, and provide the protection of industry standard Information Technology (IT) security.

NAE55 models support a comprehensive set of supervisory features and functions for large facilities and technically advanced buildings and complexes.

The NAE35/NAE45 models enable cost-effective NAE connectivity and control in smaller facilities, and can increase distribution of control in larger facilities.

The NAE85 is a high-capacity NAE that allows integration of large BACnet IP systems and can take the place of multiple NAEs.

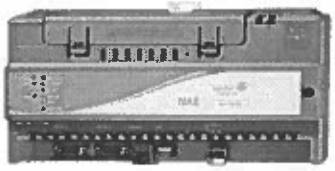
Refer to the *Network Automation Engine Product Bulletin (LIT-1201160)* for important product application information.

Features

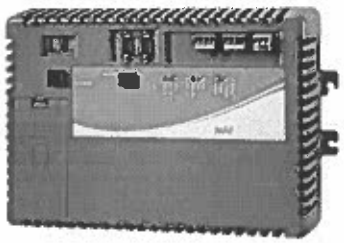
- communication using commonly accepted IT standards, including Web services, at the automation and enterprise level
- Web-based user interface
- Site Director function
- user interface and online system configuration software embedded in NAE
- supervision of field controller networks including N2 Bus, LONWORKS network, BACnet Master-Slave/Token-Passing (MS/TP), and BACnet IP devices
- multiple connection options for data access

Repair Information

If the NAE fails to operate within its specifications, refer to the *Network Automation Engine Product Bulletin (LIT-1201160)* for a list of repair parts available.



NAE35/NAE45



NAE55

NAE85

Selection Charts

NAE35

Product Code Number[1]	Description
MS-NAE35xx-x (Base Features of Each NAE35)	NAE35 Network Automation Engines: Requires a 24 VAC power supply. Each model includes one RS-232-C serial port, one USB serial port, one Ethernet port, and an MS-BAT1020-0 Data Protection Battery.
MS-NAE3510-2	Supports one N2 Bus or BACnet MS/TP (RS-485) trunk; includes an additional RS-232-C serial port for optional external modem; supports a maximum of 50 devices on the N2 Bus or BACnet MS/TP trunk.
MS-NAE3510-2U	Supports one BACnet MS/TP (RS-485) trunk; includes an additional RS-232-C serial port for optional external modem; supports a maximum of 50 devices on the BACnet MS/TP trunk. Note: This model is UL Listed, File S4977, UUKL 864 - 9th Edition Smoke Control Equipment.
MS-NAE3511-2	Supports one N2 Bus or BACnet MS/TP (RS-485) trunk; includes an internal modem; supports a maximum of 50 devices on the N2 Bus or BACnet MS/TP trunk.
MS-NAE3514-2	Supports one N2 Bus or BACnet MS/TP (RS-485) trunk; limited to Basic Access support; includes an additional RS-232-C serial port for optional external modem; supports a maximum of 50 devices on the N2 Bus or BACnet MS/TP trunk.
MS-NAE3515-2	Supports one N2 Bus or BACnet MS/TP (RS-485) trunk; limited to Basic Access support; includes an internal modem; supports a maximum of 50 devices on the N2 Bus or BACnet MS/TP trunk.
MS-NAE3520-2	Supports one LONWORKS trunk; includes an additional RS-232-C serial port for optional external modem. Supports a maximum of 64 devices on the LONWORKS port.
MS-NAE3521-2	Supports one LONWORKS trunk; includes an internal modem. Supports a maximum of 64 devices on the LONWORKS port.
MS-NAE3524-2	Supports one LONWORKS trunk, limited to Basic Access support; and includes an additional RS-232-C serial port for optional external modem. Supports a maximum of 64 devices on the LONWORKS trunks.
MS-NAE3525-2	Supports one LONWORKS trunk; limited to Basic Access support; and includes an internal modem. Supports a maximum of 64 devices on the LONWORKS trunks.

1. Some models are also available in a Buy American version (add a G after the code number). For repair parts, add -702 after the code number.

Network Automation Engine (Continued)

NAE45

Product Code Number[1]	Description
MS-NAE45xx-x (Base features of each NAE45)	NAE45 Network Automation Engines: Requires a 24 VAC power supply. Each model includes one RS-232-C serial port, one USB serial port, one Ethernet port, and an MS-BAT1020-0 Data Protection Battery.
MS-NAE4510-2	Supports one N2 Bus or BACnet MS/TP (RS-485) trunk; includes an additional RS-232-C serial port for optional external modem; supports a maximum of 100 devices on the N2 Bus or BACnet MS/TP trunk.
MS-NAE4510-2U	Supports one BACnet MS/TP (RS-485) trunk; includes an additional RS-232-C serial port for optional external modem; supports a maximum of 100 devices on the BACnet MS/TP trunk. Note: This model is UL Listed, File S4977, UUKL 864 - 9th Edition, Smoke Control Equipment.
MS-NAE4511-2	Supports one N2 Bus or BACnet MS/TP (RS-485) trunk; includes an internal modem; supports a maximum of 100 devices on the N2 Bus or BACnet MS/TP trunk.
MS-NAE4520-2	Supports one LONWORKS trunk, includes an additional RS-232-C serial port for optional external modem; supports a maximum of 127 devices on the LONWORKS port.
MS-NAE4521-2	Supports one LONWORKS trunk, includes an internal modem; supports a maximum of 127 devices on the LONWORKS port.

1. Some models are also available in a Buy American version (add a G after the code number). For repair parts, add -702 after the code number.

NAE55

Product Code Number[1]	Description
MS-NAE55xx-x (Base Features of Each NAE55)	NAE55 Network Automation Engines: Requires a 24 VAC power supply. Each model includes two RS-232-C serial ports, two USB serial ports, two RS-485 ports, one Ethernet port, and one MS-BAT1010-0 Data Protection Battery.
MS-NAE5510-1	Supports two N2 Bus or two BACnet MS/TP (RS-485) trunks (or one N2 Bus and one BACnet MS/TP trunk); supports a maximum of 100 devices on each N2 Bus or BACnet MS/TP trunk.
MS-NAE5510-1U	Supports two BACnet MS/TP (RS-485) trunks, which support a maximum of 100 devices on each BACnet MS/TP trunk. Note: This model is UL Listed, File S4977, UUKL 864 - 9th Edition Smoke Control Equipment.
MS-NAE5510-2	Supports two N2 Bus or two BACnet MS/TP (RS-485) trunks (or one N2 Bus and one BACnet MS/TP trunk); supports a maximum of 100 devices on each N2 Bus or BACnet MS/TP trunk.
MS-NAE5511-1	Supports two N2 Bus or two BACnet MS/TP (RS-485) trunks (or one N2 Bus and one BACnet MS/TP trunk); supports a maximum of 100 devices on each N2 Bus or BACnet MS/TP trunk: includes an internal modem.
MS-NAE5511-2	Supports two N2 Bus or two BACnet MS/TP (RS-485) trunks (or one N2 Bus and one BACnet MS/TP trunk); supports a maximum of 100 devices on each N2 Bus or BACnet MS/TP trunk: includes an internal modem.
MS-NAE5520-1	Supports a LONWORKS trunk, and two N2 Bus or two BACnet MS/TP (RS-485) trunks (or one N2 Bus and one BACnet MS/TP trunk). Supports a maximum of 255 devices on the LONWORKS trunk and a maximum of 100 devices on each N2 Bus or BACnet MS/TP trunk.
MS-NAE5520-2	Supports a LONWORKS trunk, and two N2 Bus or two BACnet MS/TP (RS-485) trunks (or one N2 Bus and one BACnet MS/TP trunk). Supports a maximum of 255 devices on the LONWORKS trunk and a maximum of 100 devices on each N2 Bus or BACnet MS/TP trunk.
MS-NAE5521-1	Supports a LONWORKS trunk, and two N2 Bus or two BACnet MS/TP (RS-485) trunks (or one N2 Bus and one BACnet MS/TP trunk); includes an internal modem. Supports a maximum of 255 devices on the LONWORKS trunk and a maximum of 100 devices on each N2 Bus or BACnet MS/TP trunk.
MS-NAE5521-2	Supports a LONWORKS trunk, and two N2 Bus or two BACnet MS/TP (RS-485) trunks (or one N2 Bus and one BACnet MS/TP trunk); includes an internal modem. Supports a maximum of 255 devices on the LONWORKS trunk and a maximum of 100 devices on each N2 Bus or BACnet MS/TP trunk.

1. Some models are also available in a Buy American version (add a G after the code number). For the European version, add an E after the code number. For repair parts, replace -701 after the -1 code numbers.

NAE85

Product Code Number	Description
MS-NIE8500-0	Rack-mount server, preloaded with NxE8500 software, support for up to 10,000 objects. Note: The NAE85 rack-mount servers ship as MS-NIE8500-0 rack-mount servers. Use the ChangeModel utility in the NxE85 Metasys software to change an NIE85 to an NAE85.
MS-NxE85SW-0[1]	New NxE85 software only; for new installations/projects
MS-NxE85SW-6[1]	Upgrade NxE85 software only; for existing NxE85 engines

1. Standard NxE85 packages supports 10,000 objects; an expansion upgrade is available to support an additional 15,000 objects.

Accessories

Product Code Number (Part 1 of 2)	Description
MS-BAT1010-0	Replacement data protection battery for NAE55 and NIE55. Rechargeable gel cell battery: 12 V, 1.2 Ah, with a typical life of 3 to 5 years at 21°C (70°F)
MS-BAT1020-0	Replacement data protection battery for NAE35, NAE45, and NCE25. Rechargeable NiMH battery: 3.6 V 500 mAh, with a typical life of 5 to 7 years at 21°C (70°F)
MS-15KUPG-0	15,000 object expansion upgrade for NxE85 (only one expansion per NxE85)

Network Automation Engine (Continued)

Product Code Number (Part 2 of 2)	Description
MS-MULTENGSW-6	Contains ToggleTunnel utility for converting an NAE55/NIE55 to an NAE55 model with the N2 Tunneling features enabled. Not for use with MS-NAE5510-1U
MS-RAP-0	Ready Access Portal Server provides a user interface that is a natural, complementary extension of the Metasys Site Management Portal user interface. Note: Ready Access Portal is provided with ADS/ADX software, therefore this option is not necessary for sites with an ADS/ADX.
MS-EXPORT-0	Export Utility extracts historical trend, alarm, and audit data from the system and presents the historical data in a variety of formats. Note: Export Utility is provided with ADS/ADX software, therefore this option is not necessary for sites with an ADS/ADX.
AS-XFR100-1	Power transformer (Class 2, 24 VAC, 92 VA maximum output), with enclosure
AS-XFR010-1	Power transformer (Class 2, 24 VAC, 92 VA maximum output), no enclosure
SC450RM1U (OEM Part No.)	Recommended Uninterruptable Power Supply (UPS) for NxE85 Models: American Power Conversion (APC®) Smart-UPS SC 450VA, 280 W 120 VAC input/output with NEMA 5-15R output connections

Technical Specifications

NAE35 and NAE45	
Power Requirement	Dedicated nominal 24 VAC, Class 2 power supply (North America), Safety Extra- Low Voltage (SELV) power supply (Europe), at 50/60 Hz (20 VAC minimum to 30 VAC maximum)
Power Consumption	25 VA maximum
Ambient Operating Conditions	0–50°C (32–122°F); 10–90% RH, 30°C (86°F) maximum dew point
Ambient Storage Conditions	-40–70°C (-40–158°F); 5–95% RH, 30°C (86°F) maximum dew point
Data Protection	Supports data protection on power failure. Rechargeable NiMH battery: 3.6 VDC 500 mAh, with a typical life of 5 to 7 years at 21°C (70°F); Product Code Number: MS-BAT1020-0
Processor	192 MHz Renesas™ SH4 7760 RISC processor
Memory	128 MB Flash nonvolatile memory for operating system, configuration data, and operations data storage and backup 128 MB Synchronous Dynamic Random Access Memory (DRAM) for operations data dynamic memory
Operating System	Microsoft® Windows® CE embedded
Network and Serial Interfaces	One Ethernet port; connects at 10 or 100 Mbps; 8-pin RJ-45 connector One optically isolated RS-485 port; 9.6k, 19.2k, 38.4k, or 76.8k baud (depending on protocol); with a pluggable and keyed 4-position terminal block (FC Bus available on NAE351x and NAE451x models only) One LONWORKS port; FTT10 78 Kbps; pluggable, keyed 3-position terminal block (LONWORKS port available on NAE352x-x and NAE452x models only) One RS-232-C serial port with standard 9-pin sub-D connector that supports standard baud rates. A second serial port, on models without an internal modem, that supports an optional, user-supplied external modem. One USB serial port with standard USB connector that supports an optional, user-supplied external modem. Option: One telephone port for internal modem; up to 56 Kbps; 6-pin modular connector (NAE models with an optional internal modem have one RS-232-C serial port only.)
Housing	Plastic housing material: ABS + polycarbonate UL94-5VB Protection: IP20 (IEC 60529)
Mounting	On flat surface with screws on three mounting clips or a single 35 mm DIN rail
Dimensions (Height x Width x Depth)	131 x 270 x 62 mm (5-3/16 x 10-5/8 x 2-1/2 in.) Minimum space for mounting NAE35 and NAE45: 210 x 350 x 110 mm (8-3/16 x 13-13/16 x 4.-5/16 in.)
Shipping Weight	1.2 kg (2.7 lb)
Compliance CE	**United States:** UL Listed, File E107041, CCN PAZX, UL 916, Energy Management Equipment UL Listed, FIle S4977, UUKL 864 - 9th Edition, Smoke Control Equipment (MS-NAE3510-2U and MS-NAE4510-2U models only); FCC Compliant to CFR47, Part 15, Subpart B, Class A
	Canada: UL Listed, File E107041, CCN PAZX7, CAN/CSA C22.2 No. 205, Signal Equipment Industry Canada Compliant, ICES-003
	Europe: CE Mark – Johnson Controls, Inc., declares that this product is in compliance with the essential requirements and other relevant provisions of the EMC Directive 2004/108/EC.
	Australia and New Zealand: C-Tick Mark, Australia/NZ Emissions Compliant
	BACnet International: BACnet Testing Laboratories™ (BTL) 135-2004 Listed BACnet Building Controller (B-BC)

NAE55xx-1U	
Power Requirement	Dedicated nominal 24 VAC, Class 2 power supply (North America), Safety Extra-Low Voltage (SELV) power supply (Europe), at 50/60 Hz (20 VAC minimum to 30 VAC maximum)
Power Consumption	50 VA maximum
Ambient Operating Conditions	0–50°C (32–122°F); 10–90% RH, 30°C (86°F) maximum dew point
Ambient Storage Conditions	-40–70°C (-40–158°F); 5–95% RH, 30°C (86°F) maximum dew point
Data Protection Battery	Supports data protection on power failure. Rechargeable gel cell battery: 12 V, 1.2 Ah, with a typical life of 3 to 5 years at 21°C (70°F); Product Code Number: MS-BAT1010-0
Clock Battery	Maintains real-time clock through a power failure. Onboard cell; typical life 10 years at 21°C (70°F)

Network Automation Engine (Continued)

NAE55xx-1U (Continued)	
Processor	400 MHz Pentium® class Geode® GX533 processor for MS-NAE55xx-1 models
Memory	512 MB Flash nonvolatile memory for operating system, configuration data, and operations data storage and backup for MS-NAE55xx-1 models. 256 MB Synchronous Dynamic Random Access Memory (DRAM) for operations data dynamic memory for all models
Operating System	Microsoft Windows XP® embedded
Network and Serial Interfaces	One Ethernet port; connects at 10 or 100 Mbps; 8-pin RJ-45 connector Two optically isolated RS-485 ports; 9.6k, 19.2k, 38.4k, or 76.8k baud; pluggable and keyed 4-position terminal blocks Two RS-232-C serial ports, with standard 9-pin sub-D connectors, that support all standard baud rates Two USB serial ports, standard USB connectors support an optional, user-supplied external modem Options: One telephone port for internal modem; up to 56 Kbps; 6-pin modular connector One LONWORKS port; FTT10 78 Kbps; pluggable, keyed 3-position terminal block (LONWORKS port available on NAE552x-xxx models only)
Housing	Plastic housing with internal metal shield Plastic material: ABS + polycarbonate UL94-5VB Protection: IP20 (IEC 60529)
Mounting	On flat surface with screws on four mounting feet or on dual DIN rail
Dimensions (Height x Width x Depth)	226 x 332 x 96.5 mm (8-7/8 x 13-1/8 x 3-13/16 in.) including mounting feet Minimum space for mounting: 303 x 408 x 148 mm (12 x 16-1/8 x 5-13/16 in.)
Shipping Weight	2.9 kg (6.4 lb)
Compliance	**United States:** UL Listed, File E107041, CCN PAZX, UL 916, Energy Management Equipment UL Listed, File S4977, UUKL 864 - 9th Edition, Smoke Control Equipment (MS-NAE5510-1U models only) FCC Compliant to CFR47, Part 15, Subpart B, Class A
	Canada: UL Listed, File E107041, CCN PAZX7, CAN/CSA C22.2 No. 205, Signal Equipment Industry Canada Compliant, ICES-003
CE	**Europe:** CE Mark – Johnson Controls, Inc., declares that this product is in compliance with the essential requirements and other relevant provisions of the EMC Directive 2004/108/EC.
	Australia and New Zealand: C-Tick Mark, Australia/NZ Emissions Compliant
	BACnet International: BACnet Testing Laboratories™ (BTL) 135-2004 Listed BACnet Building Controller (B-BC)

NAE55xx-2	
Power Requirement	Dedicated nominal 24 VAC, Class 2 power supply (North America), Safety Extra-Low Voltage (SELV) power supply (Europe), at 50/60 Hz (20 VAC minimum to 30 VAC maximum)
Power Consumption	50 VA maximum
Ambient Operating Conditions	0–50°C (32–122°F); 10–90% RH, 30°C (86°F) maximum dew point
Ambient Storage Conditions	-40–70°C (-40–158°F); 5–95% RH, 30°C (86°F) maximum dew point
Data Protection Battery	Supports data protection on power failure. Rechargeable gel cell battery: 12 V, 1.2 Ah, with a typical life of 3 to 5 years at 21°C (70°F); Product Code Number: MS-BAT1010-0
Clock Battery	Maintains real-time clock through a power failure. Onboard cell; typical life 10 years at 21°C (70°F)
Processor	1.6 GHz Intel® Atom™ processor
Memory	4 GB Flash nonvolatile memory for operating system, configuration data, and operations data storage and backup 1 GB Synchronous Dynamic Random Access Memory (DRAM) for operations data dynamic memory for all models
Operating System	Microsoft® Windows® Embedded Standard (WES) 2009
Network and Serial Interfaces	One Ethernet port; connects at 10 Mbps, 100 Mbps, or 1 Gbps; 8-pin RJ-45 connector Two optically isolated RS-485 ports; 9.6k, 19.2k, 38.4k, or 76.8k baud; pluggable and keyed 4 position terminal blocks Two RS-232-C serial ports, with standard 9-pin sub-D connectors, that support all standard baud rates Two USB serial ports; standard USB connectors support an optional, user-supplied external modem Options: One telephone port for internal modem; up to 56 Kbps; 6-pin modular connector One LONWORKS port; FTT10 78 Kbps; pluggable, keyed 3-position terminal block (LONWORKS port available on NAE552x-x models only)
Housing	Plastic housing with internal metal shield Plastic material: ABS + polycarbonate; Protection: IP20 (IEC 60529)
Mounting	On flat surface with screws on four mounting feet or on dual DIN rail
Dimensions (Height x Width x Depth)	226 x 332 x 96.5 mm (8-7/8 x 13-1/8 x 3-13/16 in.) including mounting feet Minimum space for mounting: 303 x 408 x 148 mm (12 x 16-1/8 x 5-13/16 in.)
Shipping Weight	2.9 kg (6.4 lb)
Compliance	**United States:** UL Listed, File E107041, CCN PAZX, UL 916, Energy Management Equipment FCC Compliant to CFR47, Part 15, Subpart B, Class A
	Canada: UL Listed, File E107041, CCN PAZX7, CAN/CSA C22.2 No. 205, Signal Equipment Industry Canada Compliant, ICES-003
CE	**Europe:** CE Mark – Johnson Controls, Inc., declares that this product is in compliance with the essential requirements and other relevant provisions of the EMC Directive 2004/108/EC.
	Australia and New Zealand: C-Tick Mark, Australia/NZ Emissions Compliant
	BACnet International: BACnet Testing Laboratories™ (BTL) 135-2004 Listed BACnet Building Controller (B-BC)

Network Automation Engine (Continued)

NAE85	
Computer Type	Dell® PowerEdge® R410
Power Requirement	100–240 VAC 50/60 Hz
Power Supply	480 W
Ambient Operating Conditions	10–35°C (50–95°F); 20–80% RH, noncondensing (twmax=29C)
Ambient Storage Conditions	-40–65°C (-40–149°F); 5–95% RH, noncondensing (twmax=38C)
Data Protection	Recommended Uninterruptable Power Supply (UPS): American Power Conversion (APC®) Smart-UPS SC 450 VA, 280 W, 120 VAC input/output, NEMA 5-15R output connections, OEM Part No. SC450RM1U
Processor	Intel® Xeon® E5506, 2.13 GHz, 4 MB Cache
Memory	2 GB DDR2, 1066 MHz, 2 x 1 GB, Single Ranked UDIMMs for 1 Processor
Hard Disk	2 x 160 GB 7.2K RPM Serial Advanced Technology Attachment (SATA), 8.9 cm (3-1/2 in.) Cabled 3 Gbps, RAID 1 configuration with add-in SAS6/iR (SATA/SAS Controller)
Internal Optical Drive	DVD ROM, SATA
Operating System	Microsoft Windows Web Server 2008 R2 Operating System (64-bit)
AntiVirus Software	Symantec® AntiVirus Corporate Edition Version 11
Network and Serial Interfaces	2 RJ45 1-Gbps Ethernet ports, Port 2 is disabled 2 video ports; 1 front, 1 back 1 9-pin Serial port 4 USB ports (2 front, 2 back)
Dimensions (Height x Width x Depth)	4.3 x 43.4 x 62.7 cm (1-11/16 x 17-1/8 x 24-11/16 in.)
Mounting	Mount in an EIA-310D compatible server cabinet
Shipping Weight	15.9 kg (35 lb)
Compliance	Europe: CE Mark (Record Holder: www.dell.com/regulatory_compliance) BACnet International: BACnet Testing Laboratories™ (BTL) 135-2004 Listed BACnet Building Controller (B-BC)

NAE85 Software System Requirements for Installation/Upgrade		
Product Code	MS-NxE85SW-0	NxE85 software for 10,000 objects (new projects only software)
Recommended Computer Platform	Intel® Xeon® E5506, 2.13 GHz, 4 MB Cache 2 x 160 GB 7.2K RPM Serial Advanced Technology Attachment (SATA), 8.9 cm (3.5 in.) Cabled 3 Gbps, RAID 1 configuration with add-in SAS6/iR (SATA/SAS Controller) DVD ROM, SATA	
Memory	1 GB RAM minimum	
Hard Disk	160 GB minimum	
Supported Operating Systems and Software	**Microsoft® Windows® Web Server 2008 R2 OS (64-bit)** IIS Version 7.5, Microsoft .NET Framework Version 3.5.1 **Microsoft Windows Web Server 2008 OS with SP1 (32-bit)** IIS Version 7.0, Microsoft .NET Framework Version 3.5 with SP1 **Microsoft Windows 2003 Web Edition OS[1] with SP2 (32-bit)** IIS Version 6.0, Microsoft .NET Framework Version 3.5 with SP1	
Network Communication	Network Interface Single 1 Gbps Ethernet network interface card connects at 10 Mbps, 100 Mbps or 1Gbps; (100 Mbps or better recommended)	
Data Protection	Recommended Uninterruptible Power Supply (UPS): American Power Conversion (APC®) Smart-UPS SC 450VA, 280 W, 120 VAC input/output, NEMA 5-15R output connections, OEM Part No. SC450RM1U	
Compliance	BACnet International: BACnet Testing Laboratories™ (BTL) 135-2004 Listed BACnet Building Controller	

1. We support the 32-bit version only. We do not support the 64-bit version.

Code No. LIT-1900346
Issued October 4, 2010

Field Equipment Controller (FEC) Series

Description

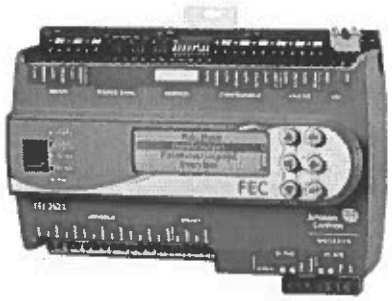
The FEC is a programmable digital controller that communicates via BACnet® Master-Slave/Token Passing (MS/TP) protocol. The FEC models include the 10-point FEC16 and the 17-point FEC26. FEC models include a 32-bit microprocessor, intuitive design, and are available with an optional built-in Liquid Crystal Display (LCD) screen local User Interface (UI).

A full range of FEC models combined with the Input/Output Module (IOM) models can be applied to a wide variety of building applications ranging from simple fan coil or heat pump control to advanced central plant management.

Refer to the *Metasys® System Field Equipment Controllers and Related Products Product Bulletin (LIT-12011042)* for important product application information.

Features

- Patented proportional adaptive control (P-Adaptive) and Pattern Recognition Adaptive Control (PRAC) technologies — provide continuous loop tuning.
- User-friendly graphic theme and clear push-button identification — facilitate easy controller use.
- Writable flash memory — allows you to download standard or customized applications from the Controller Configuration Tool (CCT) software.
- Large product family — provides a wide range of point mix to meet application requirements and allows for the addition of one or more IOMs and/or Network Sensors to provide even more application capacity.
- Network Automation Engine (NAE) and Network Control Engine (NCE) Automatic Discovery ability — allows for easy controller integration.
- Local UI display option (integral display or stand-alone display) — provides enhanced local monitoring.
- BACnet MS/TP communication — provides open system compatibility.
- 32-bit microprocessor — ensures optimum performance and meets industry specifications.
- Wireless capabilities via ZFR1800 Series Wireless Field Bus System enable wireless mesh connectivity between FECs to WRZ Series Wireless Room Temperature Sensors, and to NAE/NCE devices — facilitate easy initial location and relocation.
- Universal and configurable inputs and outputs — support multiple signal options and increase controller application flexibility.



FEC26 Controller

Repair Information

If the Field Equipment Controller fails to operate within its specifications, replace the unit. For a replacement FEC, contact the nearest Johnson Controls® representative.

Selection Charts

FEC Series Point Type Counts per Model

Point Types	Signals Accepted	FEC16	FEC26
Universal Input (UI)	Analog Input, Voltage Mode, 0–10 VDC Analog Input, Current Mode, 4–20 mA[1] Analog Input, Resistive Mode, 0–2k ohm, RTD (1k NI [Johnson Controls], 1k PT, A99B SI), NTC (10k Type L, 2.252k Type 2) Binary Input, Dry Contact Maintained Mode	2	6
Binary Input (BI)	Dry Contact Maintained Mode Pulse Counter/Accumulator Mode (High Speed), 100 Hz	1	2
Analog Output (AO)	Analog Output, Voltage Mode, 0–10 VDC Analog Output, Current Mode, 4–20 mA	0	2
Binary Output (BO)	24 VAC Triac	3	3
Configurable Output (CO)	Analog Output, Voltage Mode, 0–10 VDC Binary Output Mode, 24 VAC Triac	4	4

1. Analog Input, Current Mode is set by hardware for the FEC26, and as software for the FEC16.

Field Equipment Controller (FEC) Series (Continued)

Ordering Information

Product Code Number	Description
MS-FEC1611-0	10-Point Field Equipment Controller with 2 UI, 1 BI, 3 BO, and 4 CO; 24 VAC; SA Bus; Mounting Base
MS-FEC1621-0	10-Point Field Equipment Controller with 2 UI, 1 BI, 3 BO, and 4 CO; 24 VAC; SA Bus; Mounting Base; Integral Display
MS-FEC2611-0	17-Point Field Equipment Controller with 6 UI, 2 BI, 3 BO, 2 AO, and 4 CO; 24 VAC; SA Bus; Mounting Base
MS-FEC2621-0	17-Point Field Equipment Controller with 6 UI, 2 BI, 3 BO, 2 AO and 4 CO; 24 VAC; SA Bus; Integral Display; Mounting Base

Ordering Information for UL Listed, File S4977, UUKL 864 - 9th Edition, Smoke Control Equipment

Product Code Number[1]	Description
MS-FEU1610-0U	10-Point Field Equipment Controller with 2 UI, 1 BI, 3 BO, and 4 CO; 24 VAC; SA Bus; (includes Mounting Base and Cover)
MS-FEU1620-0U	10-Point Field Equipment Controller with 2 UI, 1 BI, 3 BO, and 4 CO; 24 VAC; SA Bus; Mounting Base; Integral Display
MS-FEU2610-0U	17-Point Field Equipment Controller with 6 UI, 2 BI, 3 BO, 2 AO, and 4 CO; 24 VAC; SA Bus; Mounting Base
MS-FEU2620-0U	17-Point Field Equipment Controller with 6 UI, 2 BI, 3 BO, 2 AO, and 4 CO; 24 VAC; SA Bus; Mounting Base; Integral Display

1. These devices are UL Listed, File S4977, UUKL 864 - 9th Edition, Smoke Control Equipment.

Accessories (Order Separately)

Product Code Number	Description
Y64T15-0	Transformer, 120/208/240 VAC Primary to 24 VAC Secondary, 92 VA, Foot Mount, 30 in. Primary Leads and 30 in. Secondary Leads, Class 2
Y65A13-0	Transformer, 120 VAC Primary to 24 VAC Secondary, 40 VA, Foot Mount (Y65AS), 8 in. Primary Leads and 30 in. Secondary Leads, Class 2
Y65T42-0	Transformer, 120/208/240 VAC Primary to 24 VAC Secondary, 40 VA, Hub Mount (Y65SP+), 8 in. Primary Leads and Secondary Screw Terminals, Class 2
Y65T31-0	Transformer, 120/208/240 VAC Primary to 24 VAC Secondary, 40 VA, Foot Mount (Y65AR+), 8 in. Primary Leads and Secondary Screw Terminals, Class 2
AP-TBK4SA-0	Replacement MS/TP SA Bus Terminal, 4-Position Connector, Brown, Bulk Pack
AP-TBK4FC-0	Replacement MS/TP FC Bus Terminal, 4-Position Connector, Blue, Bulk Pack
AP-TBK3PW-0	Replacement Power Terminal, 3-Position Connector, Gray, Bulk Pack
MS-BTCVT-1	Wireless Commissioning Converter, with Bluetooth® technology
MS-BTCVTCBL-700	Cable replacement Set for the MS-BTCVT-1 or the NS-ATV7003-0; includes one 5 ft (1.5 m) retractable cable.
MS-DIS1710-0	Local Controller Display for FEC1611 and FEC2611 models
MS-ZFR1810-0	Wireless Field Bus Coordinator, 10 mW Transmission Power. Functions with NAE35xx, NAE45xx, NAE55xx, and NCE25xx models.
MS-ZFR1811-0	Wireless Field Bus Router, 10 mW Transmission Power. Functions with Metasys BACnet FECs, VMA1600s, and WRZ-TTx Series Wireless Mesh Room Temperature Sensors.
MS-ZFRCBL-0	Wire Harness for use with ZFR1811 Router. Allows ZFR1811 Router to function with FEC1620; and with FEC1610, VMA1610, or VMA1620 controllers in conjunction with NS Series Sensors, Wireless Commissioning Converter, or DIS1710 Local Controller Display.

Field Equipment Controller (FEC) Series (Continued)

Technical Specifications

FEC Series	
Product Code Numbers	MS-FEC1611-0 – Field Equipment Controller MS-FEC2611-0 – Field Equipment Controller MS-FEC1621-0 – Field Equipment Controller with Display and Push Button User Interface MS-FEC2621-0 – Field Equipment Controller with Display and Push Button User Interface
Supply Voltage	24 VAC (nominal, 20 VAC minimum/30 VAC maximum), 50/60 Hz, power supply Class 2 (North America), Safety Extra-Low Voltage (SELV) (Europe)
Power Consumption	14 VA maximum for FEC1611 and FEC2611 (no integral display) 20 VA maximum for FEC1621 and FEC2621 (with integral display) Note: VA ratings do not include any power supplied to the peripheral devices connected to Binary Outputs (BOs) or Configurable Outputs (COs), which can consume up to 12 VA for each BO or CO; for a possible total consumption of an additional 84 VA (maximum).
Ambient Conditions	**Operating:** 0 to 50°C (32 to 122°F); 10 to 90% RH noncondensing **Storage:** -40 to 80°C (-40 to 176°F); 5 to 95% RH noncondensing
Controller Addressing	DIP switch set; valid field controller device addresses 4–127 (Device addresses 0–3 and 128–255 are reserved and not valid field controller addresses.)
Communications Bus	BACnet® MS/TP, RS-485: 3-wire FC Bus between the supervisory controller and field controllers 4-wire SA Bus between field controller, network sensors, and other sensor/actuator devices, includes a lead to source 15 VDC supply power (from field controller) to bus devices.[1]
Processor	H8SX/166xR Renesas® microcontroller
Memory	1 MB Flash Memory and 512 KB Random Access Memory (RAM)
Input and Output Capabilities	**FEC16 Models:** 2 - Universal Inputs: Defined as 0–10 VDC, 4–20 mA, 0–600k ohm, or Binary Dry Contact 1 - Binary Inputs: Defined as Dry Contact Maintained or Pulse Counter/Accumulator Mode 3 - Binary Outputs: Defined as 24 VAC Triac (selectable internal or external source power) 4 - Configurable Outputs: Defined as 0–10 VDC or 24 VAC Triac BO **FEC26 Models:** 6 - Universal Inputs: Defined as 0–10 VDC, 4–20 mA, 0–600k ohm, or Binary Dry Contact 2 - Binary Inputs: Defined as Dry Contact Maintained or Pulse Counter/Accumulator Mode 3 - Binary Outputs: Defined as 24 VAC Triac (selectable internal or external source power) 4 - Configurable Outputs: Defined as 0–10 VDC or 24 VAC Triac BO 2 - Analog Outputs: Defined as 0–10 VDC or 4–20 mA
Analog Input/Analog Output Resolution and Accuracy	Analog Input: 16-bit resolution Analog Output: 16-bit resolution and ±200 mV in 0–10 VDC applications
Terminations	Input/Output: Fixed Screw Terminal Blocks FC Bus, SA Bus, and Supply Power: 3-Wire and 4-Wire Pluggable Screw Terminal Blocks FC Bus and SA Bus: RJ-12 6-Pin Modular Jacks
Mounting	Horizontal on single 35 mm DIN rail mount (preferred), or screw mount on flat surface with three integral mounting clips on controller
Housing	Enclosure material: ABS and plycarbonate UL94 5VB; Self-extinguishing, Plenum-rated Protection Class: IP20 (IEC529)
Dimensions (Height x Width x Depth)	**FEC16 Models:** 150 x 164 x 53 mm (5-7/8 x 6-7/16 x 2-1/8 in.) including terminals and mounting clips **FEC26 Models:** 150 x 190 x 53 mm (5-7/8 x 7-1/2 x 2-1/8 in.) including terminals and mounting clips Note: Mounting space for FEC16 and FEC26 Models requires an additional 50 mm (2 in.) space on top, bottom, and front face of controller for easy cover removal, ventilation, and wire terminations.
Weight	**FEC16 Models:** 0.4 kg (0.9 lb) **FEC26 Models:** 0.5 kg (1.1 lb)
Compliance CE	**United States:** UL Listed, File E107041, CCN PAZX, UL 916, Energy Management Equipment; FCC Compliant to CFR47, Part 15, Subpart B, Class A
	Canada: UL Listed, File E107041, CCN PAZX7, CAN/CSA C22.2 No. 205, Signal Equipment Industry Canada Compliant, ICES-003
	Europe: CE Mark – Johnson Controls, Inc., declares that the FEC Series Field Equipment Controllers are in compliance with the essential requirements and other relevant provisions of the EMC Directive 2004/108/EC. Note: For **FEC26 Models**, Conducted RF Immunity within EN 61000-6-2 meets performance criteria B.
	Australia and New Zealand: C-Tick Mark, Australia/NZ Emissions Compliant
	BACnet International: BACnet Testing Laboratories™ (BTL) 135-2004 Listed BACnet Application Specific Controller (B-ASC)

1. For more information, refer to the *MS/TP Communications Bus Technical Bulletin (LIT-12011034)*.

Code No. LIT-1900562
Issued May 13, 2011

M9208-GGx-x, M9208-AGx-x, M9208-Bxx-3

M9208-xxx-x Series Electric Spring Return Actuators

Description

The M9208-xxx-x Series Electric Spring Return Actuators provide control of dampers in Heating, Ventilating, and Air Conditioning (HVAC) systems. All actuators in this series provide 70 lb·in (8 N·m) rated torque.
A mechanical spring return system provides rated torque with and without power applied to the actuator. The series includes the following control options:

- On/Off, 24 V, 120 VAC, 230 VAC power
- On/Off and Floating Point, 24 V power
- Proportional, 24 V power, for 0(2) to 10 VDC or 0(4) to 20 mA Control Signal

These actuators are configured for direct mounting and do not require a damper linkage. Actuators can be mounted directly to a damper shaft from 5/16 to 5/8 in. (8 to 16 mm) diameter with a universal clamp. For shafts up to 3/4 in. (19 mm) diameter use the accessory Large Shaft Coupler Kit M9208-600. An accessory crankarm and remote mounting kit are available for applications where the actuator cannot be direct-coupled to the damper shaft. Optional line voltage auxiliary switches indicate an end-stop position or perform switching functions within the selected rotation range.

Refer to the *M9208-xxx-x Series Electric Spring Return Actuators Product Bulletin (LIT-12011480)* for important product application information.

Features

- 70 lb·in. (8 N·m) rated torque
- direct-coupled design
- reversible mounting
- electronic stall detection
- double-insulated construction
- microprocessor-controlled brushless DC motor (-AGx and -GGx types)
- external mode selection switch (-AGx and -GGx types)
- locking manual override with auto release and crank storage
- integral cables with colored and numbered conductors
- integral connectors for 3/8 in. (10 mm) Flexible Metal Conduit (FMC)
- optional integrated auxiliary switches
- UL, CE, and C-Tick compliance
- manufactured under International Standards Organization (ISO) 9001 quality control standards
- 5-year warranty

M9208-xxx-x Series Electric Spring Return Actuator

Repair Information

If the M9208-xxx-x Series Electric Spring Return Actuator fails to operate within its specifications, replace the unit. For a replacement M9208-xxx-x actuator, contact the nearest Johnson Controls® representative.

Accessories and Replacement Parts (Order Separately)

Code Number	Description
DMPR-KC003[1]	7 in. (178 mm) Blade Pin Extension (without bracket) for Johnson Controls Direct-Mount Damper Applications (quantity 1)
M9000-200	Commissioning Tool that provides a control signal to drive 24 V On/Off, Floating, Proportional, and/or Resistive Electric Actuators (quantity 1)
M9000-321	Weathershield Kit for Damper Application of M9203 and M9208 Series Electric Spring Return Actuators (quantity 1)
M9000-400	Jackshaft Linkage Kit. Open-ended design enables clamping onto a jackshaft without requiring access to the ends of the jackshaft. (quantity 1)
M9000-560	Ball Valve Linkage Kit for applying M9203 and M9208 Series Electric Spring Return Actuators to VG1000 Series Valves (quantity 1)
M9000-604	Replacement Anti-Rotation Bracket Kit for M9208, M9210, and M9220 Series Electric Spring Return Actuators (quantity 1)
M9000-606	Position Indicator for Damper Applications of M9203 and M9208 Series Actuators (quantity 5)
M9200-100	Threaded Conduit Adapter, 1/2 NPSM, for M9210(20) and M(VA)9208 Series Actuators (quantity 5)
M9208-100	Remote Mounting Kit, including Mounting Bracket, M9208-150 Crankarm, Ball Joint, and mounting fasteners (quantity 1)
M9208-150	Crankarm Adapter Kit (quantity 1)
M9208-600	Large Shaft Coupler Kit (with Locking Clip) for Mounting M9208 Series Electric Spring Return Actuators on dampers with round shafts from 1/2 to 3/4 in. (12 to 19 mm) or square shafts from 3/8 to 9/16 in. (10 to 14 mm) (quantity 1)
M9208-601	Replacement Standard Coupler Kit (with Locking Clip) for mounting M9208 Series Electric Spring Return Actuators on dampers with round shafts from 5/16 to 5/8 in. (8 to 16 mm) or square shafts from 1/4 to 1/2 in. (6 to 12 mm) (quantity 1)
M9208-602	Replacement Locking Clips for M9208 Series Electric Spring Return Actuators (quantity 5)
M9208-603	Adjustable Stop Kit for M9208 Series Electric Spring Return Actuators (quantity 1)
M9208-604	Replacement Manual Override Cranks for M9208 Series Electric Spring Return Actuators with long crank radius: 2.83 in. (72 mm) (quantity 5)
M9208-605	Replacement Manual Override Cranks for M9208 Series Electric Spring Return Actuators with short crank radius: 1.83 in. (46.5 mm) (quantity 5)

1. Furnished with the damper and may be ordered separately.

M9208-xxx-x Series Electric Spring Return Actuators (Continued)

Selection Chart

Code Number	Rotation Time	For 90°	Power Requirements				Power Consumption			Input Signal			Position Feedback	Auxiliary Switches	Electrical Connection		
	Power On (Running)	Power Off (Spring Return)	24 VAC +/- 25%, VDC +20%/-10%	24 VAC +/- 20%, VDC +20%/-10%	120 VAC +/- 10%	230 VAC +/- 10%	VA Rating, Transformer Sizing	VA: Running (Holding)	Amperage: Running (Holding)	On/Off	Floating Point	0(2) to 10 VDC 0(4) to 20 mA (with 500 ohm Resistor)	0(2) to 10 VDC	2 Single-Pole, Double-Throw (SPDT), 5.0 A (2.9 A Inductive) at 240 V	48 in. (1.2 m) 18 AWG Appliance Cable	120 in. (3.05 m) 19 AWG Plenum Cable	Integral 3/8 in. (10 mm) FMC Connectors
M9208-AGA-2	150	17 to 25[1]		x			8	7.9 (5.5)	-	x	x					x	x
M9208-AGA-3	150	17 to 25[1]		x			8	7.9 (5.5)	-	x	x				x		x
M9208-AGC-3	150	17 to 25[1]		x			8	7.9 (5.5)	-	x	x			x	x		x
M9208-BGA-3	55 to 71	13 to 26[2]	x				7	6.1 (1.2)	-	x					x		x
M9208-BGC-3	55 to 71	13 to 26[2]	x				7	6.1 (1.2)	-	x				x	x		x
M9208-BAA-3	55 to 71	13 to 26[2]			x		-	-	.05 (.03)	x					x		x
M9208-BAC-3	55 to 71	13 to 26[2]			x		-	-	.05 (.03)	x				x	x		x
M9208-BDA-3	55 to 71	13 to 26[2]				x	-	-	.04 (.03)	x					x		x
M9208-BDC-3	55 to 71	13 to 26[2]				x	-	-	.04 (.03)	x				x	x		x
M9208-GGA-2	150	17 to 25[1]		x			8	7.9 (5.5)	-			x	x			x	x
M9208-GGA-3	150	17 to 25[1]		x			8	7.9 (5.5)	-			x	x		x		x
M9208-GGC-3	150	17 to 25[1]		x			8	7.9 (5.5)	-			x	x	x	x		x

1. 22 seconds nominal at room temperature and rated load, 94 seconds maximum at rated load and -40°F (-40°C)
2. 21 seconds nominal at room temperature and rated load, 39 seconds maximum at rated load and -4°F (-20°C), 108 seconds maximum at 53 lb·in. (6 N·m) and -40°F (-40°C)

M9208-xxx-x Series Electric Spring Return Actuators (Continued)

Technical Specifications

M9208-GGx-x Series Proportional Electric Spring Return Actuator (Part 1 of 2)		
Power Requirements	**-GGx Models**	AC 24 V (AC 19.2 V to 28.8 V) at 50/60 Hz: Class 2 (North America) or Safety Extra-Low Voltage (SELV) (Europe), 7.9 VA Running, 5.5 VA Holding Position DC 24 V (DC 21.6 V to 28.8 V): Class 2 (North America) or SELV (Europe), 3.5 W Running, 1.9 W Holding Position Minimum Transformer Size: 8 VA per Actuator
Input Signal / Adjustments	**-GGx Models**	Factory Set at DC 0 to 10 V, CW Rotation with Signal Increase; Selectable DC 0 (2) to 10 V or 0 (4) to 20 mA with Field-Furnished 500 ohm 0.25 W Minimum Resistor; Switch Selectable Direct or Reverse Action with Signal Increase
Control Input Impedance	**-GGx Models**	Voltage Input: 100,000 ohm Current Input: 500 ohm with Field Furnished 500 ohm Resistor
Feedback Signal	**-GGx Models**	DC 0 (2) to 10 V for Desired Rotation Range up to 95° Corresponds to Rotation Limits, 0.5 mA at 10 V Maximum
Auxiliary Switch Rating	**-xxC Models**	Two Single-Pole, Double-Throw (SPDT), Double-Insulated Switches with Gold over Silver Contacts: AC 24 V, 50 VA Pilot Duty AC 120 V, 5.8 A Resistive, 1/4 hp, 275 VA Pilot Duty AC 240 V, 5.0 A Resistive, 1/4 hp, 275 VA Pilot Duty
Spring Return		Direction Is Selectable with Mounting Position of Actuator: Actuator Face Labeled A Is Away from Damper or Valve: CCW Spring Return Actuator Face Labeled B Is Away from Damper or Valve: CW Spring Return
Rated Torque	**Power On (Running)**	70 lb·in. (8 N·m) All Operating Temperatures
	Power Off (Spring Returning)	70 lb·in. (8 N·m) All Operating Temperatures
Rotation Range		Maximum Full Stroke: 95° Adjustable Stop: 35° to 95° Maximum Position
Rotation Time for 90 Degrees of Travel	**Power On (Running)**	150 Seconds Constant for 0 to 70 lb·in (8 N·m) Load, at all Operating Conditions
	Power Off (Spring Returning)	17 to 25 Seconds for 0 to 70 lb·in. (8 N·m) Load, at Room Temperature 22 Seconds Nominal at Full Rated Load 94 Seconds Maximum with 70 lb·in. (8 N·m) Load, at -40°F (-40°C)
Life Cycles		60,000 Full Stroke Cycles with 70 lb·in. (8 N·m) Load 1,500,000 Repositions with 70 lb·in. (8 N·m) Load
Audible Noise Rating	**Power On (Running)**	<35 dBA at 70 lb·in. (8 N·m) Load, at a Distance of 39-13/32 in. (1 m)
	Power On (Holding)	<20 dBA at a Distance of 39-13/32 in. (1 m)
	Power Off (Spring Returning)	<52 dBA at 70 lb·in. (8 N·m) Load, at a Distance of 39-13/32 in. (1 m)
Electrical Connections	**Models: GGx-3**	48 in. (1.2 m) UL 758 Type AWM Halogen Free Cable with 18 AWG (0.85 mm²) Conductors and .25 in. (6 mm) Ferrule Ends
	Models: GGA-2	120 in. (3.05 m) UL 444 Type CMP Plenum Rated Cable with 19 AWG (0.75 mm²) Conductors and .25 in. (6 mm) Ferrule Ends
	Auxiliary Switches (-xxC Models)	48 in. (1.2 m) UL 758 Type AWM Halogen Free Cable with 18 AWG (0.85 mm²) Conductors and .25 in. (6 mm) Ferrule Ends
Conduit Connections		Integral Connectors for 3/8 in. (10 mm) Flexible Metal Conduit
Mechanical Connections	**Round Shafts**	Range of Sizes: 5/16 to 5/8 in. (8 to 16 mm)
	Square Shafts	Range of Sizes: 1/4 to 1/2 in. (6 to 12 mm)
Enclosure Rating		NEMA 2 (IP54) for all Mounting Directions
Ambient Conditions	**Standard Operating**	-40 to 140°F (-40 to 60°C); 90% RH Maximum, Noncondensing
	Storage	-40 to 185°F (-40 to 85°C); 95% RH Maximum, Noncondensing
Dimensions		6.33 x 3.90 x 2.26 in. (160.7 x 99 x 57.5 mm)

M9208-xxx-x Series Electric Spring Return Actuators (Continued)

M9208-GGx-x Series Proportional Electric Spring Return Actuator (Part 2 of 2)		
Compliance	United States	UL Listed, CCN XAPX, File E27734; to UL 60730-1A: 2003-08, Ed. 3.1, Automatic Electrical Controls for Household and Similar Use; and UL 60730-2-14: 2002-02, Ed. 1, Part 2, Particular Requirements for Electric Actuators. (Models: All)
	Canada	UL Listed, CCN XAPX7, File E27734; to UL 60730-1:02-CAN/CSA: July 2002, 3rd Ed., Automatic Electrical Controls for Household and Similar Use; and CSA C22.2 No. 24-93 Temperature Indicating and Regulating Equipment (Models: All).
CE	Europe	CE Mark – Johnson Controls, Inc., declares that this product is in compliance with the essential requirements and other relevant provisions of the EMC Directive 2004/108/EC and Low Voltage Directive 2006/95/EC.
	Australia and New Zealand	C-Tick Mark, Australia/NZ Emissions Compliant (Models: All)
Shipping Weight		Models: -GGA: 3.43 lb (1.6 kg) Models: -GGC: 3.8 lb (1.7 kg)

M9208-AGx-x Series On/Off and Floating Point Control Electric Spring Return Actuator (Part 1 of 2)		
Power Requirements	-AGx Models	AC 24 V (AC 19.2 V to 28.8 V) at 50/60 Hz: Class 2 (North America) or Safety Extra-Low Voltage (SELV) (Europe), 7.9 VA Running, 5.5 VA Holding Position DC 24 V (DC 21.6 V to 28.8 V): Class 2 (North America) or SELV (Europe), 3.5 W Running, 1.9 W Holding Position Minimum Transformer Size: 8 VA per Actuator
Input Signal	-AGx Models	AC 19.2 to 28.8 V at 50/60 Hz or DC 24 V +20%/-10%, Class 2 (North America) or SELV (Europe) Minimum Pulse Width: 500 msec
Control Input Impedance	-AGx Models	3,000 ohm Control Inputs
Auxiliary Switch Rating	-xxC Models	Two SPDT, Double-Insulated Switches with Gold over Silver Contacts: AC 24 V, 50 VA Pilot Duty AC 120 V, 5.8 A Resistive, 1/4 hp, 275 VA Pilot Duty AC 240 V, 5.0 A Resistive, 1/4 hp, 275 VA Pilot Duty
Spring Return		Direction Is Selectable with Mounting Position of Actuator: Actuator Face Labeled A Is Away from Damper or Valve: CCW Spring Return Actuator Face Labeled B Is Away from Damper or Valve: CW Spring Return
Rated Torque	Power On (Running)	70 lb·in. (8 N·m) All Operating Temperatures
	Power Off (Spring Returning)	70 lb·in. (8 N·m) All Operating Temperatures
Rotation Range		Maximum Full Stroke: 95° Adjustable Stop: 35 to 95° Maximum Position
Rotation Time for 90 Degrees of Travel	Power On (Running)	150 Seconds Constant for 0 to 70 lb·in. (8·N m) Load, at all Operating Conditions
	Power Off (Spring Returning)	17 to 25 Seconds for 0 to 70 lb·in. (8 N·m) Load, at Room Temperature 22 Seconds Nominal at Full Rated Load 94 Seconds Maximum with 70 lb·in. (8 N·m) Load, at -40°F (-40°C)
Life Cycles		60,000 Full Stroke Cycles with 70 lb·in. (8 N·m) Load 1,500,000 Repositions with 70 lb·in. (8 N·m) Load
Audible Noise Rating	Power On (Running)	<35 dBA at 70 lb·in. (8 N·m) Load, at a Distance of 39-13/32 in. (1 m)
	Power On (Holding)	<20 dBA at a Distance of 39-13/32 in. (1 m)
	Power Off (Spring Returning)	<52 dBA at 70 lb·in. (8 N·m) Load, at a Distance of 39-13/32 in. (1 m)
Electrical Connections	Models: AGx-3	48 in. (1.2 m) UL 758 Type AWM Halogen Free Cable with 18 AWG (0.85 mm²) Conductors and .25 in. (6 mm) Ferrule Ends
	Models: AGA-2	120 in. (3.05 m) UL 444 Type CMP Plenum Rated Cable with 19 AWG (0.75 mm²) Conductors and .25 in. (6 mm) Ferrule Ends
	Auxiliary Switches (-xxC Models)	48 in. (1.2 m) UL 758 Type AWM Halogen Free Cable with 18 AWG (0.85 mm²) Conductors and .25 in. (6 mm) Ferrule Ends
Conduit Connections		Integral Connectors for 3/8 in. (10 mm) Flexible Metal Conduit
Mechanical Connections	Round Shafts	Range of Sizes: 5/16 to 5/8 in. (8 to 16 mm)
	Square Shafts	Range of Sizes: 1/4 to 1/2 in. (6 to 12 mm)
Enclosure Rating		NEMA 2 (IP54) for all Mounting Directions

M9208-xxx-x Series Electric Spring Return Actuators (Continued)

M9208-AGx-x Series On/Off and Floating Point Control Electric Spring Return Actuator (Part 2 of 2)		
Ambient Conditions	Standard Operating	-40 to 140°F (-40 to 60°C); 90% RH Maximum, Noncondensing
	Storage	-40 to 185°F (-40 to 85°C); 95% RH Maximum, Noncondensing
Dimensions		6.33 x 3.90 x 2.26 in. (160.7 x 99 x 57.5 mm)
Compliance	United States	UL Listed, CCN XAPX, File E27734; to UL 60730-1A: 2003-08, Ed. 3.1, Automatic Electrical Controls for Household and Similar Use; and UL 60730-2-14: 2002-02, Ed. 1, Part 2, Particular Requirements for Electric Actuators. (Models: All)
	Canada	UL Listed, CCN XAPX7, File E27734; to UL 60730-1:02-CAN/CSA: July 2002, 3rd Ed., Automatic Electrical Controls for Household and Similar Use; and CSA C22.2 No. 24-93 Temperature Indicating and Regulating Equipment (Models: All).
CE	Europe	CE Mark – Johnson Controls, Inc., declares that this product is in compliance with the essential requirements and other relevant provisions of the EMC Directive 2004/108/EC and Low Voltage Directive 2006/95/EC.
	Australia and New Zealand	C-Tick Mark, Australia/NZ Emissions Compliant (Models: All)
Shipping Weight		Models: -AGA: 3.43 lb (1.6 kg) Models: -AGC: 3.8 lb (1.7 kg)

M9208-Bxx-3 Series On/Off Electric Spring Return Actuators (Part 1 of 2)		
Power Requirements	-BGx Models	AC 24 V (AC 18 V to 30 V) at 50/60 Hz: Class 2 (North America) or Safety Extra-Low Voltage (SELV) (Europe), 6.1 VA Running, 1.2 VA Holding Position DC 24 V (DC 21.6 V to 28.8 V): Class 2 (North America) or SELV (Europe), 3.5 W Running, 0.5 W Holding Position Minimum Transformer Size: 7 VA per Actuator
	-BAx Models	AC 120 V (AC 102 V to 132 V) at 60 Hz: 0.05 A Running, 0.03 A Holding Position
	-BDx Models	AC 230 V (AC 198 V to 264 V) at 50/60 Hz: 0.04 A Running, 0.03 A Holding Position
Auxiliary Switch Rating	-xxC Models	Two SPDT, Double-Insulated Switches with Gold over Silver Contacts: AC 24 V, 50 VA Pilot Duty AC 120 V, 5.8 A Resistive, 1/4 hp, 275 VA Pilot Duty AC 240 V, 5.0 A Resistive, 1/4 hp, 275 VA Pilot Duty
Spring Return		Direction is Selectable with Mounting Position of Actuator: Actuator Side A is Away from Damper or Valve: CCW Spring Return Actuator Side B is Away from Damper or Valve: CW Spring Return
Rated Torque	Power On (Running)	70 lb·in. (8 N·m) All Operating Temperatures
	Power Off (Spring Returning)	70 lb·in. (8 N·m) at Standard Operating Temperatures 53 lb·in. (6 N·m) at Extended Operating Temperatures
Rotation Range		Maximum Full Stroke: 95° Adjustable Stop: 35 to 95°, Maximum Position
Rotation Time for 90 Degrees of Travel	Power On (Running)	55 to 71 Seconds for 0 to 70 lb·in. (8 N·m) Load, at All Operating Conditions 60 Seconds Nominal at Full Rated Load (0.25 rpm)
	Power Off (Spring Returning)	13 to 26 Seconds for 0 to 70 lb·in. (8 N·m) Load, at Room Temperature 21 Seconds Nominal at Full Rated Load 39 Seconds Maximum with 70 lb·in. (8 N·m) Load at -4°F (-20°C) 108 Seconds Maximum with 53 lb·in. (6 N·m) Load at -40°F (-40°C)
Life Cycles		60,000 Full-Stroke Cycles with 70 lb·in. (8 N·m) Load
Audible Noise Rating	Power On (Running)	<47 dBA at 70 lb·in. (8 N·m) Load, at a Distance of 39-13/32 in. (1 m)
	Power On (Holding)	<20 dBA at a Distance of 39-13/32 in. (1 m)
	Power Off (Spring Returning)	<52 dBA at 70 lb·in. (8 N·m) Load, at a Distance of 39-13/32 in. (1 m)
Electrical Connections	Actuator (All Models)	48 in. (1.2 m) UL 758 Type AWM Halogen-Free Cable with 18 AWG (0.85 mm²) Conductors and .25 in. (6 mm) Ferrule Ends
	Auxiliary Switches (-xxC Models)	48 in. (1.2 m) UL 758 Type AWM Halogen-Free Cable with 18 AWG (0.85 mm²) Conductors and .25 in. (6 mm) Ferrule Ends
Conduit Connections		Integral Connectors for 3/8 in. (10 mm) Flexible Metal Conduit

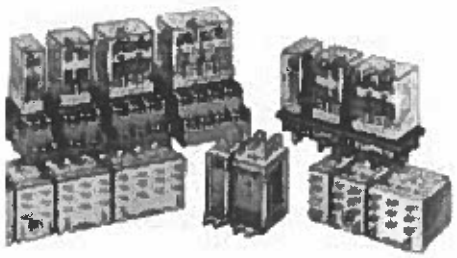
M9208-xxx-x Series Electric Spring Return Actuators (Continued)

M9208-Bxx-3 Series On/Off Electric Spring Return Actuators (Part 2 of 2)		
Mechanical Connections	**Round Shafts**	Range of Sizes: 5/16 to 5/8 in. (8 to 16 mm)
	Square Shafts	Range of Sizes: 1/4 to 1/2 in. (6 to 12 mm)
Ambient Conditions	**Extended Operating**	-40 to -4°F (-40 to -20°C); 90% RH Maximum, Noncondensing
	Storage	-40 to 185°F (-40 to 85°C); 95% RH Maximum, Noncondensing
Dimensions		6.33 x 3.90 x 2.26 in. (160.7 x 99 x 57.5 mm)
Compliance	**United States**	UL Listed, CCN XAPX, File E27734; to UL 60730-1A: 2003-08, Ed. 3.1, Automatic Electrical Controls for Household and Similar Use; and UL 60730-2-14: 2002-02, Ed. 1, Part 2, Particular Requirements for Electric Actuators. (Models: All)
	Canada	UL Listed, CCN XAPX7, File E27734; to UL 60730-1:02-CAN/CSA: July 2002, 3rd Ed., Automatic Electrical Controls for Household and Similar Use; and CSA C22.2 No. 24-93 Temperature Indicating and Regulating Equipment (Models: All).
CE	**Europe**	CE Mark – Johnson Controls, Inc., declares that this product is in compliance with the essential requirements and other relevant provisions of the EMC Directive 2004/108/EC and Low Voltage Directive 2006/95/EC.
	Australia and New Zealand	C-Tick Mark, Australia/NZ Emissions Compliant (Models: All)
Shipping Weight		Models: -BGC: 3.75 lb (1.7 kg) Models: -BAC and -BDC: 4.15 lb (1.9 kg)

RH Series — General Purpose Midget Relays

Key features of the RH series include:

- **Compact midget size saves space**
- **High switching capacity (10A)**
- **Choice of blade or PCB style terminals**
- **Relay options include indicator light, check button, and top mounting bracket**
- **DIN rail, surface, panel, and PCB type sockets available for a wide range of mounting applications**



UL Recognized
Files No. E67770
E59804
E64245

CSA Certified
File No.LR35144

TÜV PRODUCT SERVICE File No. BL951113332319

CE

D

Specifications

Contact Material	Silver cadmium oxide
Contact Resistance	50mΩ maximum (initial value)
Minimum Applicable Load	24V DC/30mA, 5V DC/100mA (reference value)
Operating Time	SPDT (RH1), DPDT (RH2): 20ms maximum 3PDT (RH3), 4PDT (RH4): 25ms maximum
Release Time	SPDT (RH1), DPDT (RH2): 20ms maximum 3PDT (RH3), 4PDT (RH4): 25ms maximum
Power Consumption	**SPDT** (RH1): DC: 0.8W AC: 1.1VA (50Hz), 1VA (60Hz) **DPDT** (RH2): DC: 0.9W AC: 1.4VA (50Hz), 1.2VA (60Hz) **3PDT** (RH3): DC: 1.5W AC: 2VA (50Hz), 1.7VA (60Hz) **4PDT** (RH4): DC: 1.5W AC: 2.5VA (50Hz), 2VA (60Hz)
Insulation Resistance	100MΩ min (measured with a 500V DC megger)
Dielectric Strength	**SPDT** (RH1) Between live and dead parts: 2,000V AC, 1 minute; Between contact circuit and operating coil: 2,000V AC, 1 minute; Between contacts of the same pole: 1,000V AC, 1 minute
	DPDT (RH2), **3PDT** (RH3), **4PDT** (RH4) Between live and dead parts: 2,000V AC, 1 minute; Between contact circuit and operating coil: 2,000V AC, 1 minute; Between contact circuits: 2,000V AC, 1 minute; Between contacts of the same pole: 1,000V AC, 1 minute
Frequency Response	1,800 operations/hour
Temperature Rise	Coil: 85°C maximum Contact: 65°C maximum
Vibration Resistance	0 to 6G (55Hz maximum)
Shock Resistance	SPDT/DPDT: 200N (approximately 20G) 3PDT/4PDT: 100N (approximately 10G)
Life Expectancy	Electrical: over 500,000 operations at 120V AC, 10A; (over 200,000 operations at 120V AC, 10A for SPDT [RH1], 3PDT [RH3], 4PDT [RH4]) Mechanical: 50,000,000 operations
Operating Temperature	–30 to +70°C
Weight	SPDT: 24g, DPDT: 37g (approximately) 3PDT: 50g, 4PDT: 74g (approximately)

See page D-29 for dimensions.

Operational Characteristics

Maximum Continuous Applied Voltage (AC/DC) at 20°C	110% of the rated voltage
Minimum Operating Voltage (AC/DC) at 20°C	80% of the rated voltage
Drop-Out Voltage (AC)	30% or more of the rated voltage
Drop-Out Voltage (DC)	10% or more of the rated voltage

Ordering Information

Order standard voltages for fastest delivery. Allow extra delivery time for non-standard voltages.

Basic Part No.	Coil Voltage:
RH2B-U	AC110-120V

Part Numbers

Part Numbers: RH Series with Options

Termination	Contact Configuration	Basic Part No.	Indicator Light	Check Button	Indicator Light and Check Button	Top Bracket
B (blade)	SPDT	RH1B-U	RH1B-L*	—	—	RH1B-UT
	DPDT	RH2B-U	RH2B-UL	RH2B-UC	RH2B-ULC	RH2B-UT
	3PDT	RH3B-U	RH3B-UL	RH3B-UC	RH3B-ULC	RH3B-UT
	4PDT	RH4B-U	RH4B-UL	RH4B-UC	RH4B-ULC	RH4B-UT
V2 (PCB 0.078" [2mm] wide)	SPDT	RH1V2-U	RH1V2-L*	—	—	—
	DPDT	RH2V2-U	RH2V2-UL	RH2V2-UC	RH2V2-ULC	—
	3PDT	RH3V2-U	RH3V2-UL	RH3V2-UC	RH3V2-ULC	—
	4PDT	RH4V2-U	RH4V2-UL	RH4V2-UC	RH4V2-ULC	—

*1. * RH1B(V2)-L is* **not** *UL recognized.*
2. For Coil and Contact Ratings, see the next page.

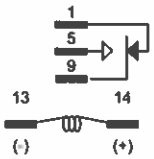
D

Part Numbers: Sockets

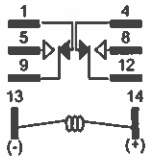
Relay	Standard DIN Rail Mount	Finger-Safe DIN Rail Mount	Surface Mount	Panel Mount	PCB Mount	Spring (optional)
RH1B	SH1B-05	SH1B-05C	—	SH1B-51	SH1B-62	SY2S-02F1 SFA-101 SFA-202 SY4S-51F1 SFA-301 SFA-302
RH2B	SH2B-05	SH2B-05C	SH2B-02	SH2B-51	SH2B-62	SY4S-02F1 SFA-101 SFA-202 SY4S-51F1
RH3B	SH3B-05	SH3B-05C	—	SH3B-51	SH3B-62	SH3B-05F1 SFA-101, -202 SY4S-51F1
RH4B	SH4B-05	SH4B-05C		SH4B-51	SH4B-62	SH4B-02F1 SFA-101, -202 SY4S-51F1

3. See Section F for details on sockets. All DIN rail mount sockets shown above can be mounted using DIN rail BNDN1000.

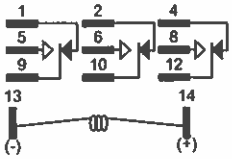
Internal Circuit



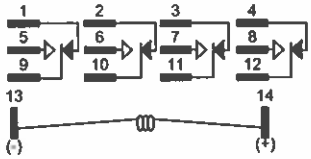
RH1



RH2



RH3



RH4

Ratings

Coil Ratings

Rated Voltage		Rated Current ±15% at 20°C								Coil Resistance ±15% at 20°C			
		60Hz				50Hz							
		SPDT		DPDT		3PDT		4PDT		SPDT	DPDT	3PDT	4PDT
AC	6V	150mA	200mA	280mA	330mA	170mA	238mA	330mA	387mA	18.8Ω	9.4Ω	6.0Ω	5.4Ω
	12V	75mA	100mA	140mA	165mA	86mA	118mA	165mA	196mA	76.8Ω	39.3Ω	25.3Ω	21.2Ω
	24V	37mA	50mA	70mA	83mA	42mA	59.7mA	81mA	98mA	300Ω	153Ω	103Ω	84.5Ω
	120V*	7.5mA	11mA	14.2mA	16.5mA	8.6mA	12.9mA	16.4mA	19.5mA	7,680Ω	4,170Ω	27,70Ω	22,20Ω
	240V†	3.2mA	5.5mA	7.1mA	8.3mA	3.7mA	6.5mA	8.2mA	9.8mA	3,1200Ω	15,210Ω	12,100Ω	91,20Ω
		SPDT		DPDT		3PDT		4PDT		SPDT	DPDT	3PDT	4PDT
DC	6V	128mA		150mA		240mA		250mA		47Ω	40Ω	25Ω	24Ω
	12V	64mA		75mA		120mA		125mA		188Ω	160Ω	100Ω	96Ω
	24V	32mA		36.9mA		60mA		62mA		750Ω	650Ω	400Ω	388Ω
	48V	18mA		18.5mA		30mA		31mA		2,660Ω	2,600Ω	1,600Ω	15,50Ω
	110V‡	8mA		9.1mA		12.8mA		15mA		13,800Ω	12,100Ω	8,600Ω	7,340Ω

** For RH2 relays = 110/120V AC.*
† For RH2 relays = 220/240V AC.
‡ For RH2 relays = 100/110V DC.

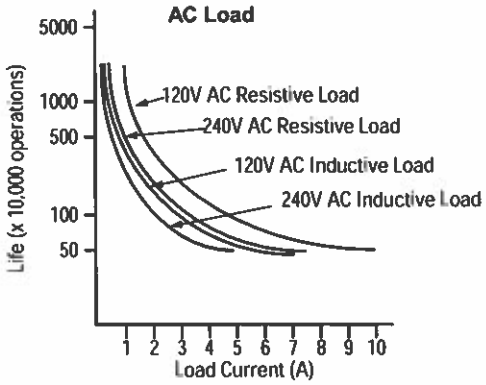
D

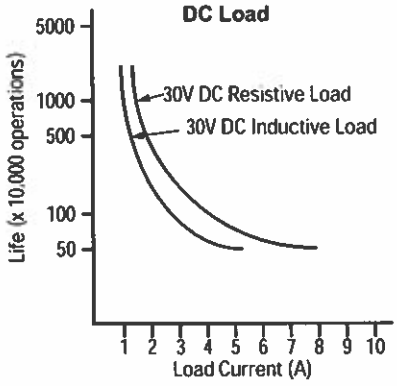
Contact Ratings

		Resistive				Inductive				Motor Load	
Voltage	Rating	SPDT	DPDT	3PDT	4PDT	SPDT	DPDT	3PDT	4PDT	SPDT	DPDT
28V DC	UL	10A	10A	10A	10A	7.5A	—	—	7.5A	—	—
30V DC	UL	10A	10A	10A	—	7A	7A	—	—	—	—
	CSA				10A		7.5A			—	—
	Nominal							7.5A	7.5A	—	—
110V DC	Nominal	0.5A	0.5A	0.5A	0.5A	0.3A	0.3A	0.3A	0.3A	—	—
120V AC	UL	10A	10A	10A	10A	7.5A	—	—	7.5A	1/6	1/6
	CSA						7.5A			—	—
	Nominal					7A		7.5A			
240V AC	UL	10A	10A	—	7.5A	7A	7A	*	5A	1/3	1/3
	CSA							7A		—	—
	Nominal	7A	7.5A	7.5A	4.5A	5A	5A	5A			

*1. * 6.5A/pole, 20A total.*
2. Inductive load cos ø = 0.3, L/R = 7ms.

Electrical Life Curves

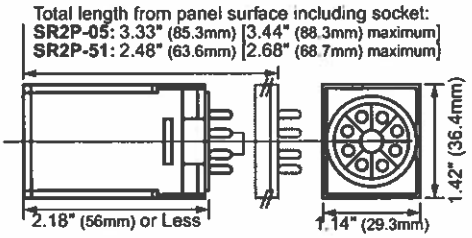




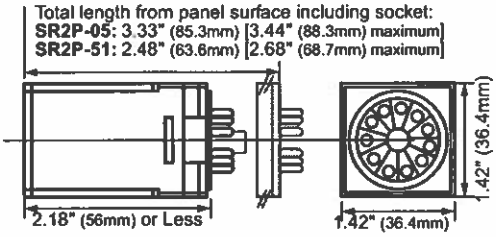
General Purpose and Latching Relay Dimensions

RR Series

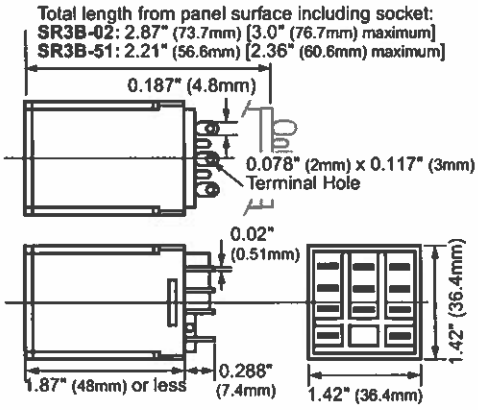
8-Pin
RR2P



11-Pin
RR3PA

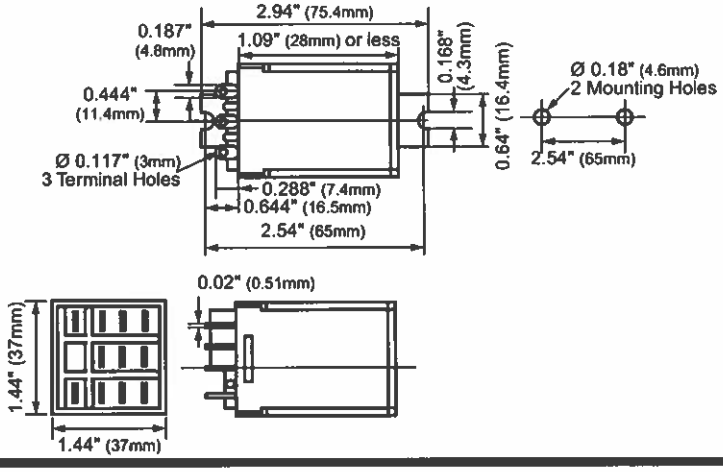


Blade
RR1BA, RR2BA, RR3B



Note: Dimensions in [ ] include hold-down spring.

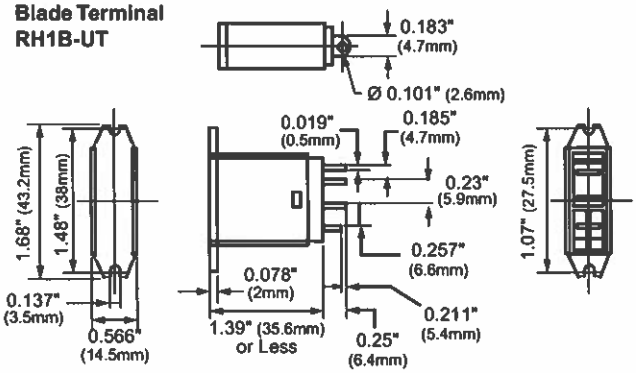
Side Flange
RR1BA-US, RR2BA-US, RR3B-US



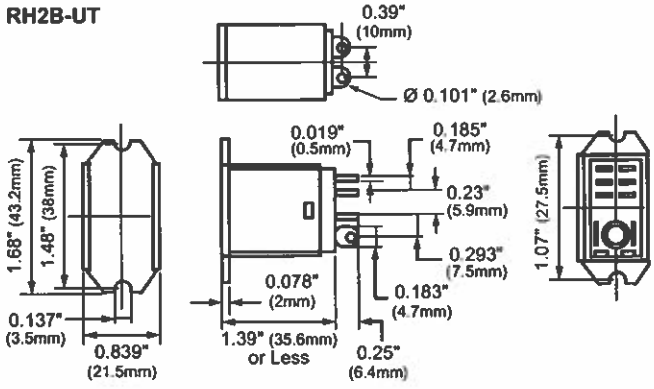
D

RH Series

Top Bracket Mounting
Blade Terminal
RH1B-UT

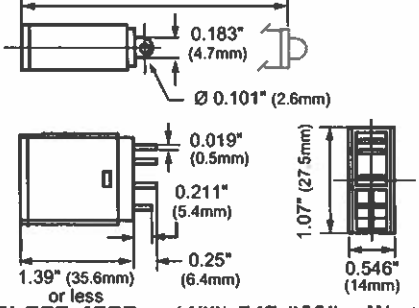


RH2B-UT



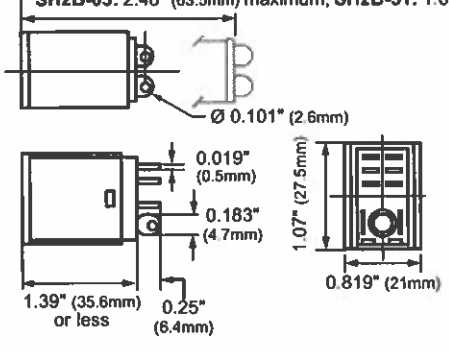
Plug-in
Blade Terminal
RH1B

Total length from panel surface including socket:
SH1B-05: 2.40" (61.5mm) maximum; **SH1B-51:** 1.54" (39mm) maximum
Total length from panel surface including hold-down spring:
SH1B-05: 2.48" (63.5mm) maximum; **SH1B-51:** 1.62" (41.6mm) maximum



RH2B

Total length from panel surface including socket:
SH2B-05: 2.40" (61.5mm) maximum; **SH2B-51:** 1.54" (39.6mm)
Total length from panel surface including hold-down spring:
SH2B-05: 2.48" (63.5mm) maximum; **SH2B-51:** 1.62" (41.6mm)

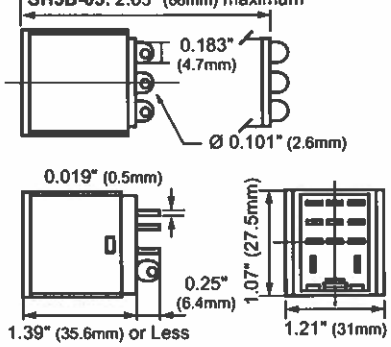


Dimensions, continued

RH Series, continued

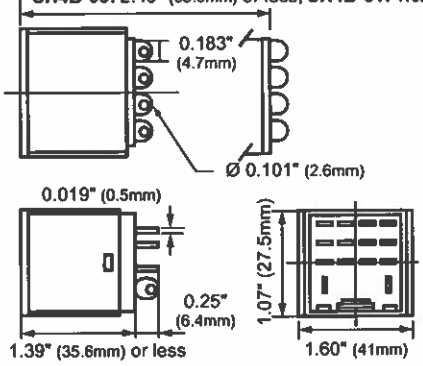
Plug-in
Blade Terminal
RH3B

Total length from panel surface including socket:
SH3B-05: 2.57" (66mm) maximum
Total length from panel surface including hold-down spring:
SH3B-05: 2.65" (68mm) maximum



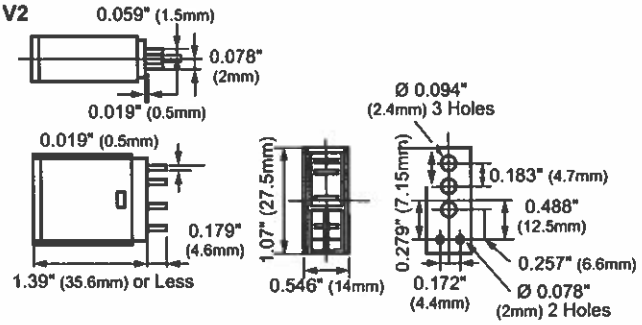
RH4B

Total length from panel surface including socket:
SH4B-05: 2.40" (61.5mm) or less; **SH4B-51:** 1.54" (39.6mm)
Total length from panel surface including hold-down spring:
SH4B-05: 2.48" (63.5mm) or less; **SH4B-51:** 1.62" (41.6mm)

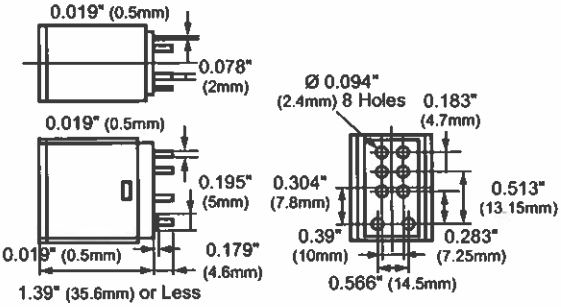


D

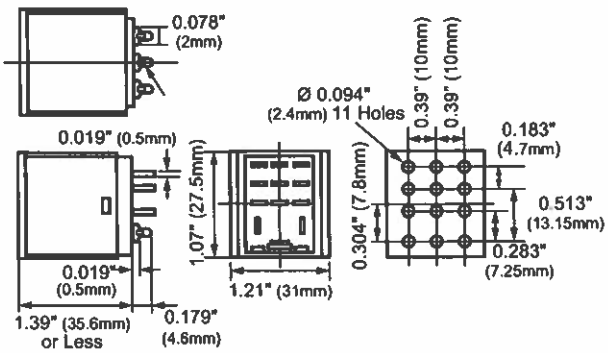
PCB Terminal
RH1V2



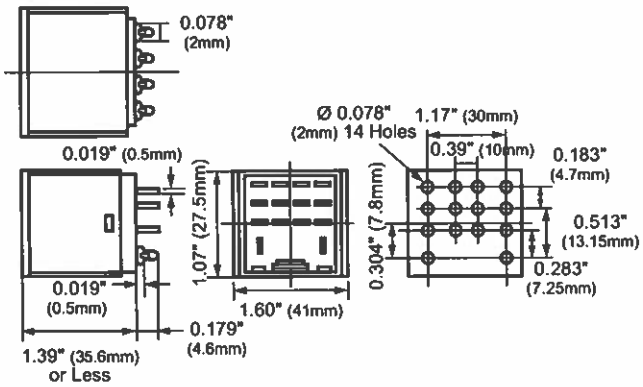
RH2V2

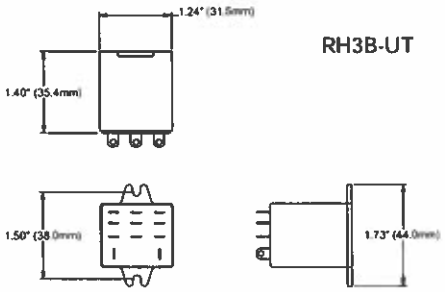


RH3V2

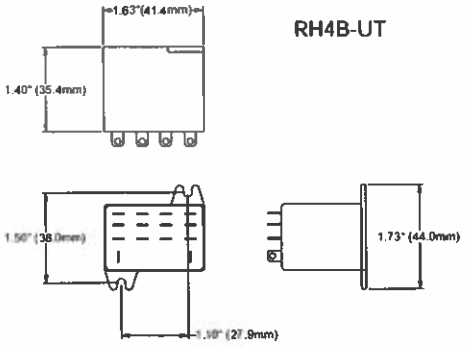


RH4V2





RH3B-UT



RH4B-UT

Selection Guides, continued

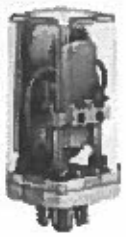
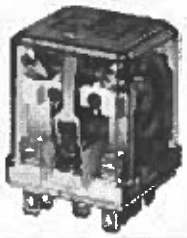
General Purpose Relays

	RR Series	RH Series	RM Series	RY Series
Appearance				
Page	D-8	D-11	D-14	D-17
Features	• Highly reliable • Large capacity • 8-pin, 11-pin, or 11-blade plug-in base • 1 to 3 pole switching • AC or DC coils	• Compact midget size • Highly reliable • Large capacity • AC or DC coils • 1 to 4 pole switching	• Compact miniature size • Highly reliable • AC or DC coils	• Compact ice-cube size • 2- or 4-pole switching • Bifurcated contacts for dry circuit switching
Options	Indicator light Check button Side flange	Indicator light Check button Top mount	Indicator light Check button Top mount	Indicator light Check button Top mount
Contact Configuration	1, 2, 3 Form C	1, 2, 3, 4 Form C	2 Form C	2, 4 Form C
Contact Rating (resistive)	10A, 30V DC 10A, 120V, 240V AC 1/3HP, 240V AC 1/4HP, 120V AC	10A, 30V DC 10A, 120V, 240V AC 1/3HP, 240V AC 1/6HP, 120V AC	5A, 30V DC 5A, 120V AC, 240V AC	DPDT: 3A, 30V DC; 3A, 120V AC, 240V AC 4PDT: 5A, 30V DC; 5A, 120V AC, 240V AC
Contact Material	Silver	Silver-cadmium oxide	Silver	Silver, gold-plated
Minimum Electrical Life	500,000 operations (10A, 120V AC)	500,000 operations (10A, 120V AC)	500,000 operations (5A, 240V AC)	200,000 operations (DPDT: 3A, 120V AC) (4PDT: 5A, 120V AC)
Minimum Mechanical Life	10,000,000 operations	50,000,000 operations	50,000,000 operations	50,000,000 operations
Dielectric Strength (between contact and coil)	2,000V AC, 1 minute	2,000V AC, 1 minute	2,000V AC, 1 minute	2,000V AC, 1 minute (4-pole version)
Coil Voltage	6, 12, 24, 48, 110V DC	6, 12, 24, 48, 110V DC	6, 12, 24, 48, 110V DC	6, 12, 24, 48, 110V DC
	6, 12, 24, 120, 240V AC	6, 12, 24, 120, 240V AC	6, 12, 24, 120, 240V AC	6, 12, 24, 120, 240V AC
Power Consumption (approximately)	2.5VA/1.5W	SPDT: 1VA/0.8W 2PDT: 1.2VA/0.9W 3PDT: 1.7VA/1.5W 4PDT: 2VA/1.5W	1.4VA/0.9W	DPDT: 1.0VA/0.8W 4PDT: 1.2VA/0.9W
Termination	Pin/Blade	Blade/PCB	Blade/PCB	Blade/PCB
Sockets	SR2P SR3P SR3B	SH1B SH2B SH3B SH4B	SY4S	SY2S SY4S
Approvals	UL Recognized Files No. E67770 E59804 E64245 CSA Certified File No.LR35144 TÜV PRODUCT SERVICE * File No. BL951113332319 CE *		UL Recognized Files No. E59804 E64245 CSA Certified File No.LR35144 TÜV PRODUCT SERVICE * File No. BL951113332319 CE *	

** CE marking and TUV ratings do not apply to RR blade style relays.*

Selection Guides, continued

General Purpose Latching Relays

	RR2KP Series	RH2L Series	RY2KS Series	RY2L Series
Appearance				
Page	D-20	D-22	D-24	D-26
Features	• Magnetic dual coil • Self-maintaining without power • Separate set and reset coils • AC or DC coils	• Midget size latch relay • 10A capacity • Dual coil • Power saving pulse input • Indicator shows set-reset condition • AC or DC coils	• Magnetic dual coil • Self-maintaining without power • Separate set and reset coil • AC or DC coils	• Miniature size latch relay • 3A capacity • Dual coil • Power saving pulse input • Mechanical indicator to show set/reset condition • AC or DC coils
Options	Check button	—	Check button	—
Contact Configuration	2 Form C	2 Form C	2 Form C	2 Form C
Contact Rating (resistive)	10A, 30V DC 10A, 120V AC	10A, 30V DC 7.5A, 240V AC 10A, 120V AC	3A, 30V DC 3A, 120V AC	3A, 30V DC 3A, 120V AC 3A, 240V AC
Contact Material	Silver	Silver-cadmium oxide	Silver, gold-plated	Silver, gold-flashed
Minimum Electrical Life	500,000 operations	200,000 operations	200,000 operations	200,000 operations
Minimum Mechanical Life	5,000,000 operations	10,000,000 operations	5,000,000 operations	10,000,000 operations
Dielectric Strength (between contact and coil)	1,500V AC, 1 minute	2,000V AC, 1 minute	1,500V AC, 1 minute	1,500V AC, 1 minute
Coil Voltage	6, 12, 24, 110V DC 6, 12, 24, 120, 240V AC	6, 12, 24V DC 6, 12, 24, 120V AC	6, 12, 24, 110V DC 6, 12, 24, 120, 240V AC	6, 12, 24V DC 6, 12, 24, 120V AC
Power Consumption	AC: 2.2VA DC: 1.5W	1.2VA/2W (set) 0.5VA/0.9W (reset)	AC: 1.5VA DC: 1.2W	0.7VA/1.2W (set) 0.35VA/0.6W (reset)
Termination	Pin	Blade/PCB	Blade	Blade/PCB
Sockets	SR3P	SH3B	SY4S	SY4S
Approvals	UL Recognized Files No. E67770 E55996		CSA Certified File No.LR35144	

Sockets (for reference only)

Panel Mount

SH1B-51

SH3B-51

SY2S-61

SY4S-51

For more socket information, see Section F.

Selection Guides, continued

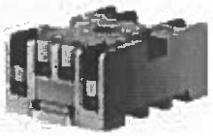
Solid State Relays

		RSS Series	RA Series	RB Series
Appearance				
Page		D-35	D-39	D-42
Isolation Method		Phototransistor coupler	Phototransistor coupler	Phototransistor coupler
Zero-Voltage Switching		Yes	Yes	Yes
Input Rating	Voltage Range	DC: 4 – 32V AC: 90 – 280V	3 – 28V DC	3 – 28V DC
	Impedance	1500Ω (DC) 40K, +10% (AC)	1.2kΩ (approximately)	1.5kΩ (approximately)
Output Rating	Maximum Load Current	10, 25, 50, 75, and 90A	1.2A	1.5A, 2A
	Voltage Range	48 – 660V AC	70 – 250V AC	5 – 60V DC
	Drop-Out Voltage	1.5V, maximum	0.8V DC, minimum	0.8V DC, minimum
Mounting Style		Panel mount	Blade/Plug-in, Pin/Plug-in, PC mount	
Sockets		—	SR2P-... SH1B-...	SR2P-... SH1B-... SH2B-...
Approvals		CE UL Recognized Files No. E59804 CSA Certified File No.LR38595-94M	—	

Sockets (for reference only)

DIN Rail Mount


SR2P-05


SR3P-05C (finger-safe)


SH2B-05

DIN Rail


BNDN-1000

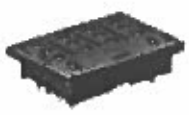
PC Mount


SH1B-62


SY2S-05


SY4S-05


SH-05C (finger-safe)


SH4B-62

Hold-Down Springs/Clips


SR2B-02F1


SH4B-02F1

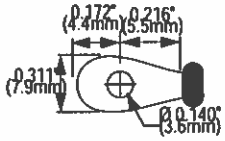

SFA-202

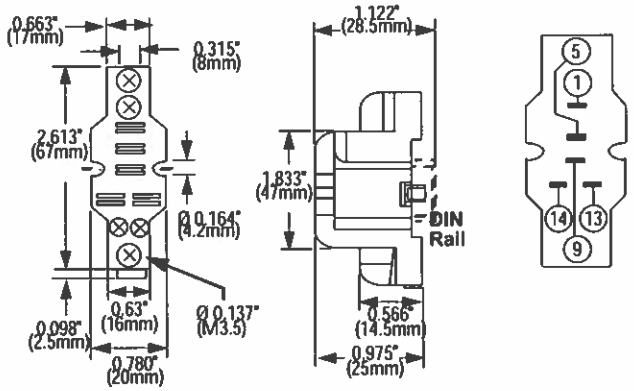

SFA-301

For more details on sockets, see Section F.

SH Series: DIN Rail Snap-Mount Sockets

SH1B Sockets

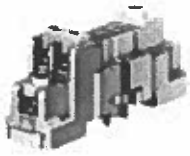


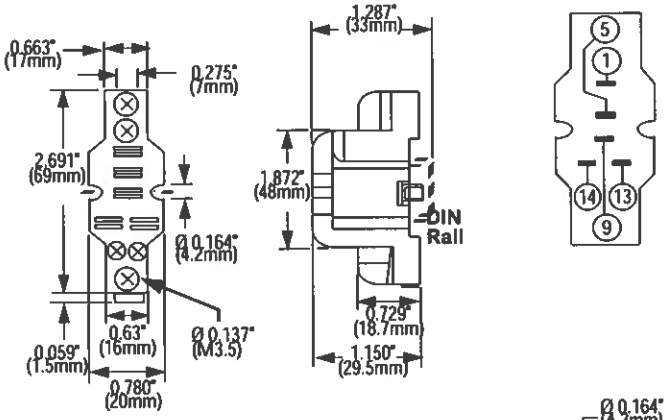


SH1B-05

Style	5-blade, snap-mount/surface mount
Terminal	(Coil) M3 screws/(contact) M3.5 screws with captive wire clamp
Wire Size	Maximum up to 2–#12AWG
Electrical Rating	250V, 10A
Compatible Relay	RH1B, RAHB, RBHB
Hold-Down Spring	SY2S-02F1
Hold-Down Clip	SFA-101, SFA-202

F



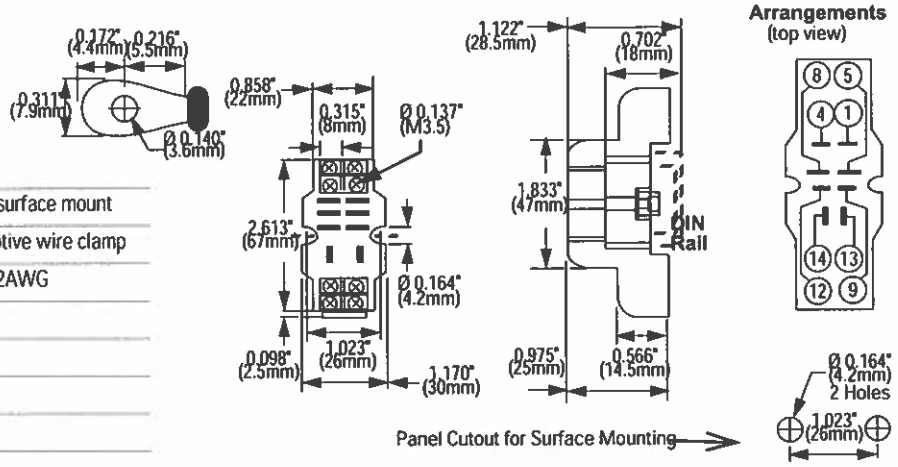


SH1B-05C Fingersafe

Style	5-blade, snap-mount/surface mount
Terminal	(Coil) M3 screws/(contact) M3.5 screws with captive wire clamp, fingersafe
Wire Size	Maximum up to 2–#12AWG
Electrical Rating	250V, 10A
Compatible Relay	RH1B, RAHB, RBHB
Hold-Down Spring	SY2S-02F1
Hold-Down Clip	SFA-101, SFA-202

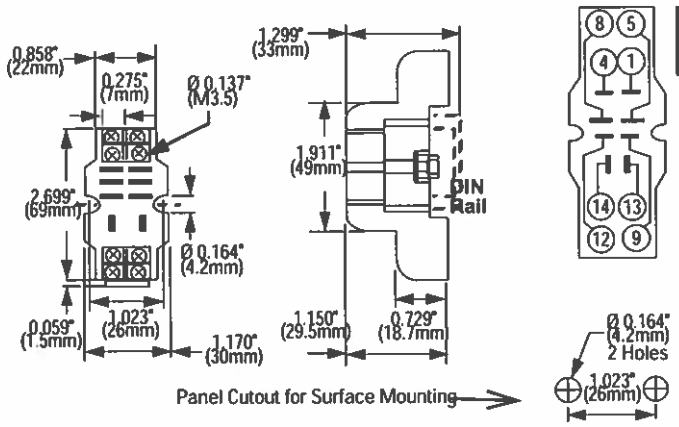
1. For socket mounting accessories, see page F-22.
2. For hold-down clip/spring selections, see page F-4.

SH2B Sockets



SH2B-05

Style	8-blade, snap-mount/surface mount
Terminal	M3.5 screws with captive wire clamp
Wire Size	Maximum up to 2–#12AWG
Electrical Rating	300V, 10A
Compatible Relay	RH2B, RAMB, RBMB
Hold-Down Spring	SY4S-02F1
Hold-Down Clip	SFA-101, SFA-202



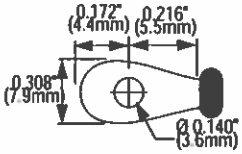
SH2B-05C Fingersafe

Style	8-blade, snap-mount/surface mount
Terminal	M3.5 screws with captive wire clamp, fingersafe
Wire Size	Maximum up to 2–#12AWG
Electrical Rating	300V, 10A
Compatible Relay	RH2B, RAMB, RBMB
Hold-Down Spring	SY4S-02F1
Hold-Down Clip	SFA-101, SFA-202

F

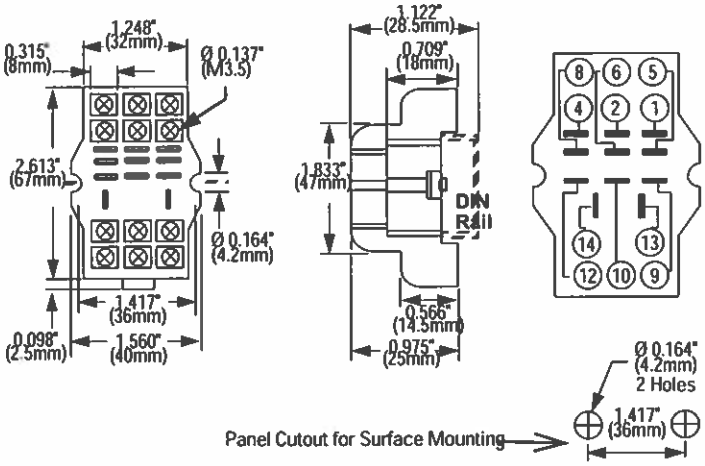
1. For socket mounting accessories, see page F-22.
2. For hold-down clip/spring selections, see page F-4.

SH3B Sockets

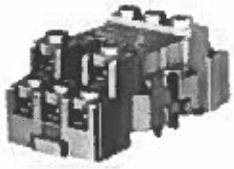


SH3B-05

Style	11-blade, snap-mount/surface mount
Terminal	M3.5 screws with captive wire clamp
Wire Size	Maximum up to 2–#12AWG
Electrical Rating	300V, 10A
Compatible Relay	RH3B, *RH2LB (*latching relay)
Hold-Down Spring	SH3B-05F1
Hold-Down Clip	SFA-101, SFA-202

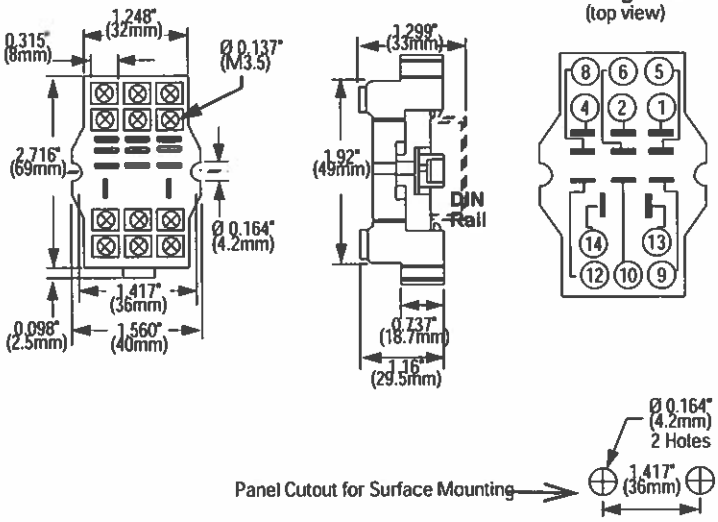


F



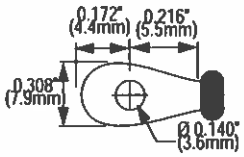
SH3B-05C Fingersafe

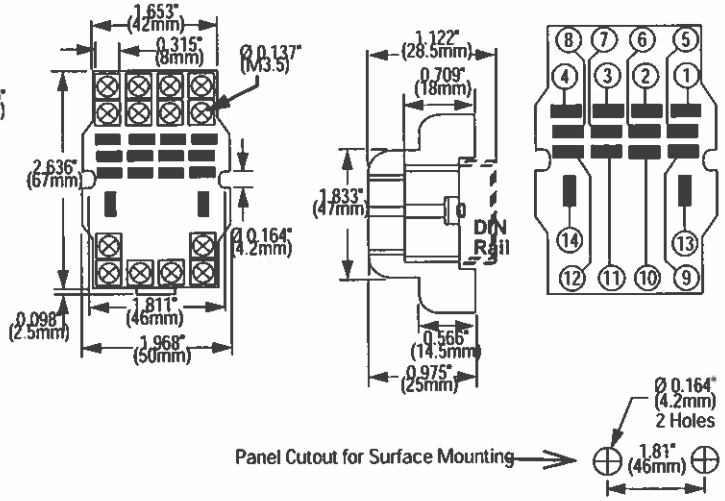
Style	11-blade, snap-mount/surface mount
Terminal	M3.5 screws with captive wire clamp, fingersafe
Wire Size	Maximum up to 2–#12AWG
Electrical Rating	300V, 10A
Compatible Relay	RH3B, *RH2LB (*latching relay)
Hold-Down Spring	SH3B-05F1
Hold-Down Clip	SFA-101, SFA-202



1. For socket mounting accessories, see page F-22.
2. For hold-down clip/spring selections, see page F-4.

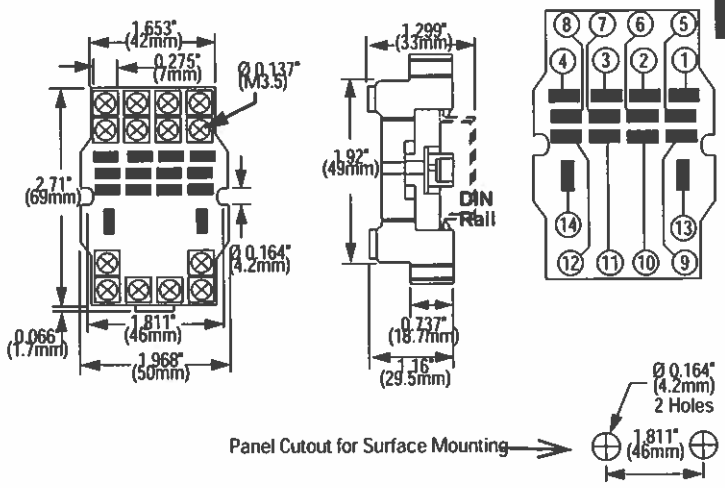
SH4B Sockets





SH4B-05

Style	14-blade, snap-mount/surface mount
Terminal	M3 5 screws with captive wire clamp
Wire Size	Maximum up to 2–#12AWG
Electrical Rating	300V, 10A
Compatible Relay	RH4B
Hold-Down Spring	SH4B-02F1
Hold-Down Clip	SFA-101, SFA-202



SH4B-05C Fingersafe

Style	14-blade, snap-mount/surface mount
Terminal	M3.5 screws with captive wire clamp, fingersafe
Wire Size	Maximum up to 2–#12AWG
Electrical Rating	300V, 10A
Compatible Relay	RH4B
Hold-Down Spring	SH4B-02F1
Hold-Down Clip	SFA-101, SFA-202

1. For socket mounting accessories, see page F-22.
2. For hold-down clip/spring selections, see page F-4.

Accessories

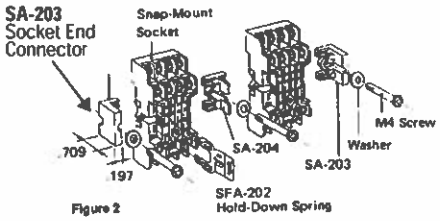
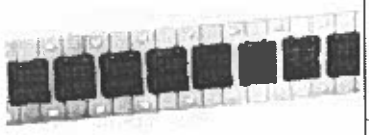


Figure 2

Description	Appearance	Use with	Part No.	Remarks
Aluminum DIN Rail (1 meter length)		All DIN rail sockets	BNDN1000	IDEC offers a low-profile DIN rail (BNDN-1000). The BNDN-1000 is designed to accommodate snap-mount sockets and surface mount sockets. Made of durable extruded aluminum, the BNDN-1000 measures 0.413" in height and 1.37" (35mm) in width (DIN standard). Standard length is 39" (1,000mm).
DIN Rail End Stop		BNDN1000 DIN rail	BNL5	9.1 mm wide.
Surface Mount End Connector		SY2S, SY4S, SR3B, SH1B, SH2B, SH3B, SH4B	SA-203	For use on ends of socket groupings when surface mounting.
			SA-204	For use between adjoining sockets when surface mounting.
Surface Mount Connector		SY2S, SY4S, SR3B, SH1B, SH2B, SH3B, SH4B	SA-405	For use between adjoining sockets when surface mounting.
DIN Rail Spacer		All DIN rail sockets	SA-406	
Steel Mounting Plates (for panel mount sockets)		SY4S-51, SH2B-51	SA-402	11.42" length with 10 holes.
		SY4S-51, SH2B-51	SA-403	23.33" length with 21 holes.
Relay Holders		RH2B, RM2S, RY4S, RY42S, RY2LS, RAMB, RBMB	RH-01	For diagram, see next page.
		RY2S, RAHB,RBHB, RH1B	RH-03	
Replacement Hold-Down Spring Anchor (horseshoe clip)		All DIN rail sockets	Y778-011	For use with hold-down springs (bale wire types). or DIN rail mount sockets. 2 pieces included with each socket.

F

Instructions

Mounting Snap-Mount Sockets

Figure 1

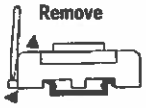


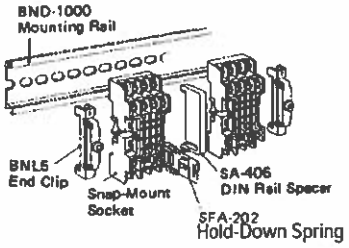
Figure 2

Snap-mount sockets are designed to mount on the BNDN-1000 mounting rail. The built-in mounting clip eliminates mounting hardware and reduces mounting time by 80%.

To mount see Figure 1. Place the end of the socket (end opposite of mounting clip against the outer edge of the rail). Press the socket down firmly until the clip snaps onto the mounting rail. To remove see Figure 2. Pull out the mounting clip with a screwdriver, and lift the socket.

For spacing between adjoining sockets, use the SA-406 DIN rail spacer. Spacers are 0.195" wide. Spacing can be adjusted according to the number of spacers added. Spacers snap on and off easily like snap-mount sockets.

To prevent side-to-side movement, use a BNL-5 end clip at **each** end of every socket row.



Mounting Relay Holders

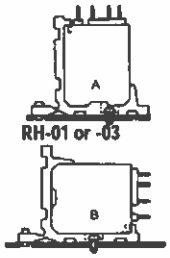


Figure 1

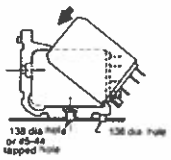


Figure 2

Mount directly onto panel boards in two alternate positions: A and B (see Figure 1).

To mount the relay into the holder, hook the bottom edge of the relay case (coil terminal side) onto the relay holder (see Figure 2).

Push down until the relay snaps into place.

F

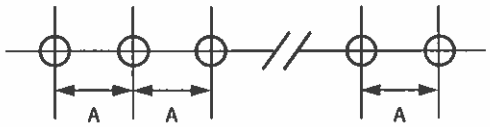
Dimensions

Surface Mount Sockets (SH2B-02)

IDEC surface mount sockets (SH2B-02) are also designed to mount individually or collectively on a flat surface without the use of a DIN rail. Use the mounting screw between adjoining sockets and at the outer ends of the row of sockets.

Dimension Table

Socket Part No.	Dimension A
SH2B-02	1.14"



1. Drawing is not to scale.

Snap-Mount Sockets

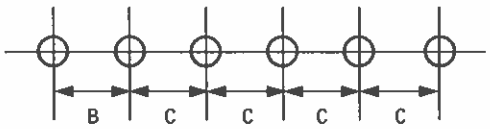
F

Snap-mount sockets are designed to mount individually or collectively without using a rail. Use a SA-405 connector or SA-204 connector between adjoining sockets (see Figures 1 and 2). Use the SA-203 end connector at the outer ends of each socket row when using the SA-204 connector (see Figure 2).

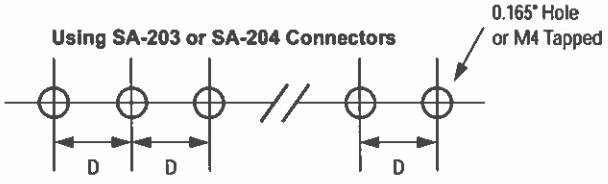
Dimension Table

Socket Part No.	Dim. B	Dim. C	Dim. D
SY2S-05, SY2S-05C	0.669"	0.826"	0.866"
SY4S-05, SY4S-05C	1.024"	1.181"	1.220"
SR3B-05	1.496"	1.693"	1.732"
SH1B-05, SH1B-05C	0.630"	0.787"	0.827"
SH2B-05, SH2B-05C	1.024"	1.181"	1.220"
SH3B-05, SH3B-05C	1.417"	1.575"	1.614"
SH4B-05, SH4B-05C	1.811"	1.969"	2.008"

Using an SA-406 Connector



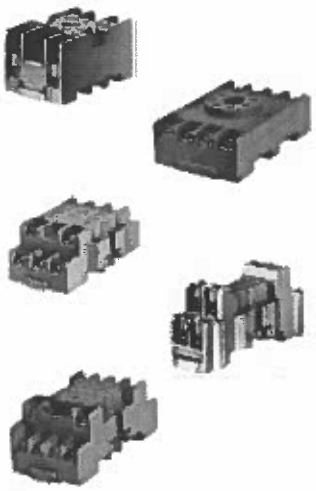
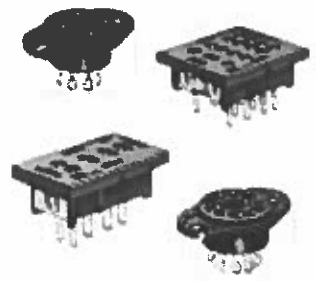
Using SA-203 or SA-204 Connectors



2. Drawings are not to scale.

Relay Socket Selection Guide

Relay Sockets

Mounting	Series	Page	Part No.	No. of Poles	Receptacle	Terminal	Compatible IDEC Relay and Timer
DIN Rail Snap-Mount 	SR	F-5	SR2P-05 SR2P-05C SR2P-06	2	8-Pin	M3.5 Screw	RR2P, RAPP, RBPP, GT5P, RTE-P1, GT3 (8-pin)
			SR3P-05 SR3P-05C SR3P-06	3	11-Pin		RR3PA, RR2KP, RTE-P2 GT3 (11-pin)
			SR3B-05	3	11-Blade		RR1BA, RR2BA, RR3B, RTE-B
	SH	F-8	SH1B-05 SH1B-05C	1	5-Blade	M3.5 Screw Coil Terminal: M3	RH1B, RAHB, RBHB
			SH2B-05 SH2B-05C	2	8-Blade	M3.5 Screw	RH2B, RAMB, RBMB
			SH3B-05 SH3B-05C	3	11-Blade		RH3B, RH2LB
			SH4B-05 SH4B-05C	4	14-Blade		RH4B
	SY	F-12	SY2S-05 SY2S-05C	2	8-Blade	M3 Screw	RY2S, RY22S
			SY4S-05 SY4S-05C	4	14-Blade		RY4S, RY42S, RY2KS, RY2LS, RM2S, GT5Y
Panel Mount 	SR	F-14	SR2P-51	2	8-Pin	Solder	RR2P, RAPP, RBPP, GT5P, RTE-P1, GT3 (8-pin)
			SR3P-51	3	11-Pin		RR3PA, RR2KP, RTE-P2, GT3 (11-pin)
			SR3B-51	3	11-Blade		RR1BA, RR2BA, RR3B
	SH	F-15	SH1B-51	1	5-Blade		RH1B, RAHB, RBHB
			SH2B-51	2	8-Blade		RH2B, RAMB, RBMB
			SH3B-51	3	11-Blade		RH3B, RH2LB
			SH4B-51	4	14-Blade		RH4B
	SY	F-17	SY2S-51	2	8-Blade		RY2S, RY22S
			SY4S-51	4	14-Blade		RY4S, RY42S, RY2KS, RY2LS, RM2S, GT5Y
Surface Mount 	SH	F-18	SH2B-02	2	8-Blade	M3.5 Screw	RH2B, RAMB, RBMB
PCB Mount 	SH	F3-19	SH1B-62	1	5-Blade	PC Board	RH1B, RAHB, RBHB
			SH2B-62	2	8-Blade		RH2B, RAMB, RBMB
			SH3B-62	3	11-Blade		RH3B, RH2LB
			SH4B-62	4	14-Blade		RH4B
	SY	F3-20	SY2S-61	2	8-Blade		RY2S, RY22S
			SY4S-61	4	14-Blade		RY4S, RY42S, RY2KS, RY2LS, RM2S, GT5Y
			SY4S-62	4	14-Blade		RY4S, RY42S, RY2KS, RY2LS, RM2S, GT5Y

For relay mounting accessories, see page F-22.

F

Specifications		
	Rated Insulation Voltage	300V; except SH1B and SY4S-62: 250V
	Rated Current	SR/SH: 10A, SY: 7A (SH1B coil terminal 7A)
	Insulation Resistance	100MΩ minimum
	Dielectric Strength	2,000V AC, 1 minute
	Material Grade	UL94V-0

UL Recognized
File No. E62437

CSA Certified
File No.LR35144

TÜV PRODUCT SERVICE
File No. BL950813332307 *

CE *

1. * *Applicable to DIN rail sockets only.*

Relay Socket Part Numbering Guide

Relay socket part numbers are composed of 5 part number codes. When ordering a relay socket, select one code from each category.
Example: SR2P-05C

SR	2	P	—	05	C
① Socket Series	② No. of Poles	③ Termination		④ Mounting Style	⑤ Fingersafe Option

F

Part Numbers: Relay Sockets

	Description	Part Number Code	Remarks
① Socket Series	SR	SR	For use with RR series relays
	SH	SH	For use with RH series relays
	SY	SY	For use with RY series relays
② No. of Poles	1-pole	1	SH series
	2-pole	2	SR, SH, and SY series
	3-pole	3	SR, and SH series
	4-pole	4	SH series
③ Termination	Tubular pin	P	SR series
	Blade	B	SH series
	Solder/blade	S	SY series
④ Mounting Styles	DIN rail snap-mount	05	To decide between configuration 05 and 06, see pictures and schematics beginning on page F-5
		06	Model 05 is available as 05C with a fingersafe option; see ⑤ below
	Panel mount	51	
	PC board mount	61	
		62	
⑤ Fingersafe Option	With finger-protection terminals	C	Available only on SR, SH, and SY series snap-mount sockets
	Without finger-protection terminals	Leave blank	

2. *For hold-down springs and clips for DIN rail snap-mount, panel mount, and PC board mount, see page F-4.*
3. *For socket accessories, see page F-22.*

Hold-Down Springs and Clips Selection Guide

DIN Rail Snap-Mount Sockets

Socket Part No.	Applicable Relays, Timer	Hold-Down Spring	Hold-Down Clip
SR2P-05 SR2P-05C	RR2P, RAPP, RBPP	SR2B-02F1	SFA-203
	RTE-P1, GT3, GT5P	—	SFA-203
SR2P-06	RR2P, RAPP, RBPP	SR2B-02F1	SFA-202
	GT3 (8-pin), RTE-P1, GT5P	—	SFA-202
SR3P-05 SR3P-05C	RR3PA	SR3B-02F1	SFA-203
	RR2KP	SR3P-06F3	SFA-203
	RTE-P2, GT3 (11-pin)	—	SFA-203
SR3P-06	RR3PA	SR3B-02F1	SFA-202
	RR2KP	SR3P-06F3	SFA-202
	RTE-P2, GT3 (11-pin)	—	SFA-202
SR3B-05	RR1BA, RR2BA, RR3B, RTE-B	SR3B-02F1	SFA-202
SH1B-05 SH1B-05C	RH1B, RAHB, RBHB	SY2S-02F1	SFA-101 SFA-202
SH2B-05 SH2B-05C	RH2B, RAMB, RBMB	SY4S-02F1	SFA-101 SFA-202
SH3B-05 SH3B-05C	RH3B, RH2LB	SH3B-05F1	SFA-101 SFA-202
SH4B-05 SH4B-05C	RH4B	SH4B-02F1	SFA-101 SFA-202
SY2S-05 SY2S-05C	RY2S, RY22S	SY2S-02F1	SFA-101 SFA-202
SY4S-05 SY4S-05C	RY4S, RY42S, RY2LS, RM2S	SY4S-51F1	SFA-101 SFA-202
	RY2KS, GT5Y	(SY4S-51F3)	SFA-202

Panel and PC Board Mount Sockets

Socket Part No.	Applicable Relays, Timer	Hold-Down Spring	Hold-Down Clip
SR2P-51	RR2P, RAPP, RBPP	SR3P-01F1	—
	GT3 (8-pin), RTE-P1	—	SFA-402
SR3P-51	RR3PA	SR3P-01F1	—
	RR2KP	SR3P-51F3	
	GT3 (11-pin), RTE-P2	—	SFA-402
SR3B-51	RR1BA, RR2BA, RR3B, RTE-B	SR3B-02F1	—
SH1B-51 SH1B-62	RH1B, RAHB, RBHB	SY4S-51F1	SFA-301 SFA-302
SH2B-51	RH2B, RAMB, RBMB	SY4S-51F1 (SY4S-02F1)	SFA-301 SFA-302
SH2B-62	RH2B, RAMB, RBMB	SY4S-51F1 (SY4S-02F1)	—
SH3B-51 SH3B-62	RH3B, RH2LB	SY4S-51F1 (SY4S-02F1)	SFA-301 SFA-302
SH4B-51 SH4B-62	RH4B	SY4S-51F1 SY4S-02F1)	SFA-301 SFA-302
SY2S-51 SY2S-61	RY2S, RY22S	SY4S-51F1	SFA-301 SFA-302
SY4S-51 SY4S-61	RY4S, RY42S, RY2LS	SY4S-51F1 (SY4S-02F1)	SFA-301 SFA-302
	RY2KS	SY4S-51F1 (SY4S-02F3)	SFA-302
	GT5Y	—	SFA-302
SY4S-62 *	RY4S, RY42S, RY2LS, RM2S	SY4S-51F1 (SY4S-02F1)	—
	RY2KS	SY4S-51F1 (SY4S-02F3)	—

** Does not accept hold down clips*

1. *When mounting relays with a check button onto panel mount or PC board mount sockets, use the hold-down spring shown in parenthesis. Hold-down springs for relays with check buttons are not available for SR2P-51.*
2. *For close mounting of panel mount or PC mount sockets, use hold-down clips rather than hold-down springs.*


SFA-101


SFA-202


SFA-302


SFA-402


SR3P-01F1


SY4S-51F1

Functional Devices, Inc.
310 South Union Street
Russiaville, IN 46979
www.functionaldevices.com

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Sales: (800) 888-5538
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RIBU1C

Enclosed Relay 10 Amp SPDT with 10-30 Vac/dc/120 Vac Coil

Functional Devices, Inc. A600D 2006

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CE

MADE IN USA

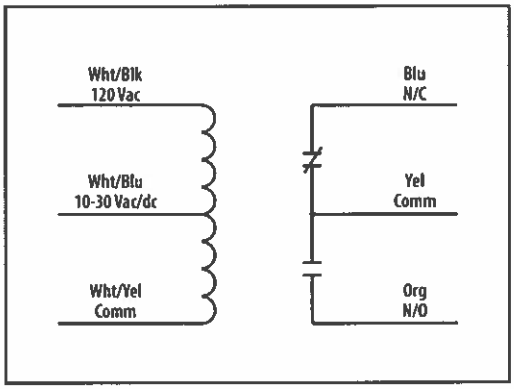
 # Relays & Contact Type: One (1) SPDT Continuous Duty Coil
Expected Relay Life: 10 million cycles minimum mechanical
Operating Temperature: -30 to 140° F
Operate Time: 20mS
Relay Status: LED On = Activated
Dimensions: 1.70" x 2.80" x 1.50" with .50" NPT nipple
Wires: 16", 600V Rated
Approvals: UL Listed, UL916, UL864, UL924, C-UL California State Fire Marshal, CE
Housing Rating: Plenum, NEMA 1
Gold Flash: Yes
Override Switch: No

Contact Ratings:
10 Amp Resistive @ 120-277 Vac
10 Amp Resistive @ 28 Vdc
480 VA Pilot Duty @ 240-277 Vac
480 VA Ballast @ 277 Vac
600 Watt Tungsten @ 120 Vac N/O
240 Watt Tungsten @ 120 Vac N/C
1/3 HP for N/O @ 120-240 Vac
1/6 HP for N/C @ 120-240 Vac
1/4 HP for N/O @ 277 Vac
1/8 HP for N/C @ 277 Vac

Coil Current:

30 mA @ 10 Vac	12 mA @ 10 Vdc
32 mA @ 12 Vac	14 mA @ 12 Vdc
42 mA @ 24 Vac	16 mA @ 24 Vdc
50 mA @ 30 Vac	18 mA @ 30 Vdc
25 mA @ 120 Vac	

Coil Voltage Input:
10-30 Vac/dc ; 120 Vac ; 50-60 Hz
Drop Out = 2.1 Vac / 2.8 Vdc
Pull In = 9 Vac / 10 Vdc



RIBU1C-RD
» Red housing

RIBU1C-N4
» NEMA 4X housing

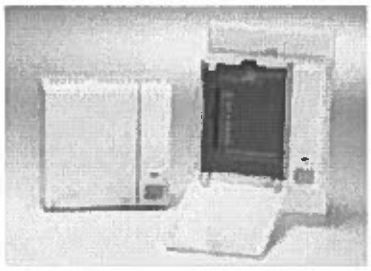
NOTES

JOHNSON CONTROLS

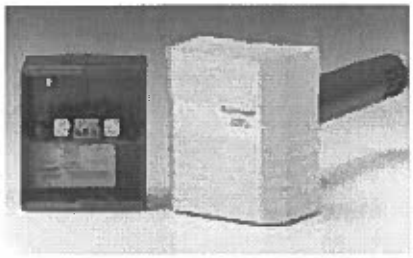
Controls Group 507 E. Michigan Street
P.O. Box 423, Milwaukee, WI 53202
Code No. LIT-1900058

HC-67x3 Series

TRUERH™ Humidity Controllers



HC-6703-4N00W Wall Mount Humidity Controller



HC-6703-6N00P Duct Probe Humidity Controller

Description

The TRUERH™ Series HC-67x3 Humidity Controllers come in both wall and duct mount packages. These attractively styled controllers offer ease of installation and application flexibility. The patented All-Polymer™ humidity sensor construction improves resistance to chemical corrosion. The HC-67x3 functions as a proportional humidity controller.

The output is jumper-selectable Reverse Acting (RA) or Direct Acting (DA), along with an adjustable setpoint and proportional band.

Features

- TRUERH™ Technology features patented improvements in circuitry and calibration techniques
- All-Polymer humidity sensor with patented sensing element provides accurate and reliable humidity sensing with the patented sensing element
- jumper-selectable RA or DA output, 0 to 10 or 6 to 9 VDC, maximizes control and application flexibility
- RH Adjustable Setpoint Range and Proportional Band allows local setpoint adjustment and provides application versatility
- all-plastic material for the duct probe improves thermal performance and complies with Underwriters Laboratories.® Inc (UL) flammability ratings for plenum use

To Order

Specify the code number from the selection chart. Refer to the Accessories table for accessories and replacement parts available for the wall mount humidity controller. (There are none for the duct probe model.)

Selection Chart

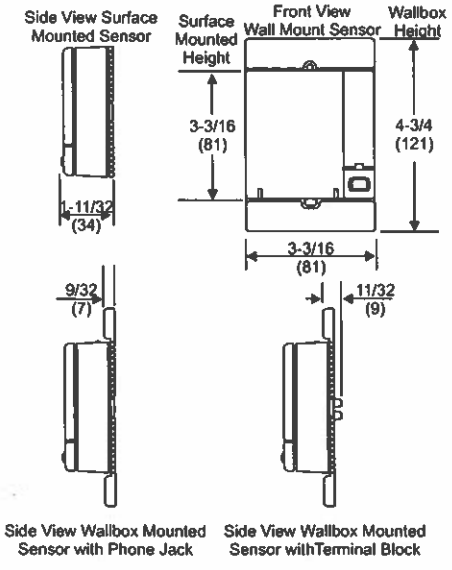
Code Number	Description
HC-6703-4N00W	Wall Mount Humidity Controller
HC-6703-6N00P	Duct Probe Humidity Controller

Accessories

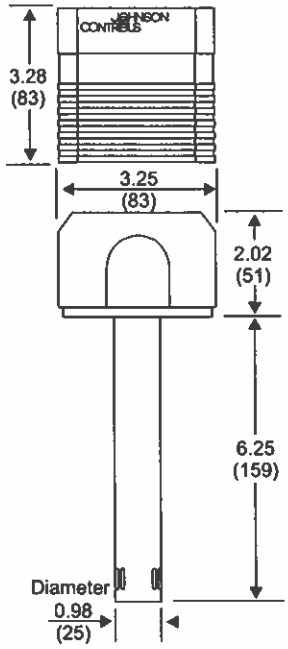
Code Number	Description
ACC-DWCLIP-0	Drywall Clip Mounting Kit (10 per bag)
ACC-INSL-0 [a]	Foam Pad Kit for Wallbox Mounting (10 per package)
ACC-INSL-1 [a]	Foam Pad Kit for Surface Mounting (10 per package)
GRD10A-608	Plastic Guard with Baseplate and Mounting Ring
T-4000-119	Allen-Head Adjustment Tool (30 per bag)
TE-67MB-600	Mounting Base Kit
TE-67D0-601 [b]	Door Replacement Kit with Johnson Controls logo
TE-67D0-602 [b]	Door Replacement Kit without logo

(a) These foam pads help prevent drafts from entering the unit through the wall, and make installation easier when mounting on an uneven surface.

(b) Contains 10 original and 10 new style doors.



Wall Mount Humidity Controller Dimensions, in. (mm)



Duct Probe Humidity Controller Dimensions, in. (mm)

HC-67x3 Series TRUERH™ Humidity Controllers (Continued)

Specifications

HC-67x3 Series TRUERH™ Humidity Controllers		
Power Requirements		14 to 30 VDC at 10 mA or 20 to 30 VAC, 50/60 Hz at 15 mA with no load, Class 2
Control Action		Jumper selectable, direct or reverse (factory set for reverse acting)
Output Range		Jumper selectable, 0 to 10 VDC (factory set) or 6 to 9 VDC; 5k ohm minimum load impedance
Sensor Characteristics	Element Material	All-Polymer
	Sensing Range	0 to 100% RH, noncondensing
User Adjustments	Setpoint	Adjustable from 20 to 80% RH
	Proportional Band	Adjustable from 2 to 20% RH
Temperature Coefficient		-0.1 to 0.05% RH/°C at 5°C (41°F) to -0.07 to -0.21% RH/°C at 65°C (149°F)
Electrical Connections		3-position screw terminal block
Ambient Operating Conditions		32 to 122°F (0 to 50°C); 0 to 100% RH, noncondensing; 85°F (29°C) maximum dew point
Survival Operating Conditions		-22 to 140°F (-30 to 60°C); 0 to 100% RH, noncondensing; 85°F (29°C) maximum dew point
Ambient Storage Conditions		-40 to 176°F (-40 to 80°C); 0 to 100% RH, noncondensing; 85°F (29°C) maximum dew point
Materials	Wall Mount	White PC/ABS plastic enclosure mounting base for surface or standard U.S. wallbox mounting, including hardware
	Duct Probe	Light gray plastic cover with dark gray housing and probe
Dimensions	Wall Mount (H x W x D)	3.20 x 3.20 x 1.34 in. (81 x 81 x 34 mm)
	Duct Probe (H x W x D)	3.28 x 3.25 x 8.27 in. (83 x 83 x 210 mm)
	Probe (L x D)	6.25 x 0.98 in. (159 x 25 mm)
Agency Compliance	Duct Probe Material	94-5V flammability rated per UL 94

Code No. LIT-1900217
Issued May 6, 2011

TE-6300 Series Temperature Sensors

Description

The TE-6300 Temperature Sensor line provides economical solutions for a wide variety of temperature sensing needs, including wall-mount, outdoor-air, duct, strap-mount, well-insertion, duct-averaging, and Variable Air Volume (VAV) flange-mount duct-probe applications. The TE-6300 line offers both a metal and a plastic enclosure for the most popular models.

Sensors are available in the following types:

- 1k ohm thin-film nickel
- 1k ohm nickel averaging
- 1k ohm thin-film platinum
- 100 ohm platinum equivalent averaging
- 1k ohm platinum equivalent averaging
- 2.2k (2,252) ohm thermistor
- 10k ohm thermistor, Johnson Controls® Type II

Each sensor is packaged with the necessary mounting accessories to maximize ordering and installation ease and reduce both commissioning time and cost.

Refer to the *TE-6300 Temperature Sensors Product Bulletin (LIT-216320)* for important product application information.

Features

- full line of versatile sensors — supports all your temperature sensing needs from a single supplier: wall mount, outdoor air, duct probe, duct averaging, strap-mount, well insertion, and flange mount duct probe
- single assembly ordering — simplifies ordering; provides a complete assembly in one box
- models featuring an integral NPT Adaptor — increase sensor connection strength, which eliminates the need for a special adaptor
- models with a stainless steel sensor probe — protect the sensor while increasing corrosion resistance
- metal enclosure (TE-63xxM Models only) — meets plenum requirements
- models featuring a retainer for the sensor holder — allow you to lock the sensor holder into the conduit box
- brushed stainless steel mounting plate — offers a durable, aesthetically-pleasing design
- low profile flush mount design — provides a tamper-proof installation ideally suited for schools, sporting complexes, retailers, prisons, and more

All TE-6300 series sensors are two-wire, passive, resistance output devices.

TE-63xxA Models

The TE-63xxA (adjustable length) models:

- provide a thermoplastic mounting flange and gland nut to adjust the length of the probe
- include two hex-head self-drilling screws for mounting
- come equipped with a 10 ft (3 m) plenum-rated cable with 1/4 in. (6.35 mm) female insulated quick-connect terminations on leads

TE-63xxF Models

The TE-63xxF (flush mount) models:

- provide a low profile when installed in an electrical box
- feature thermally isolated sensor from the wall with a foam pad
- offer a rugged stainless steel cover
- provide 22 AWG lead wires with low voltage installation

TE-63xxM Models

The TE-63xxM (metal enclosure) models:

- come with a corrosion-protected steel enclosure with a 0.88 in. (22 mm) hole for a 1/2 in. (12.7 mm) conduit fitting
- include two hex-head self-drilling screws for mounting the duct and duct averaging models
- offer (well models only) either a direct mount or 1/2-14 NPT threaded well sensor holder for mounting in TE-6300W Series thermal wells (Order the thermal well separately.)
- provide optional well sensor holders (order separately) to mount duct models in thermal wells.
- meet UL 1995 plenum use requirements
- offer optional accessory kit (order separately) to replace plastic hole plug and wiring bushing to meet International Mechanical Code (IMC) requirements

TE-63xxP Models

The TE-63xxP (plastic enclosure) models:

- provide a thermoplastic conduit box with 1/2-14 NPT female thread for connecting to conduit
- provide aluminum mounting plate and 1/2-14 NPT threaded hub mounting options for the duct and duct averaging models
- use the 1/2-14 NPT female thread to mount the Outdoor Air models directly to ridged conduit
- provide optional sensor holders (order separately) to mount duct models in thermal wells
- offer an optional accessory metal cover kit (order separately) to replace the plastic cover to meet UL 1995 plenum use requirements

TE-6300 Series Temperature Sensors

- include a replaceable sensing probe on duct probe, outdoor air, and well insertion models

TE-63x4P Wall Mount Models

The TE-63x4P (plastic enclosure) models:

- come with a white thermoplastic ventilated cover with a brushed aluminum face plate and a steel mounting plate for surface mounting
- include faceplates for both horizontal and vertical mounting
- offer an accessory mounting kit for mounting to a standard electrical box
- offer optional covers

TE-63xS Models

The TE-63xS (Strap-Mount) models:

- provide a 1/4 in. (6.35 mm) diameter stainless steel probe without an enclosure
- include three cable ties for mounting to pipe up to 2-5/8 in. (67 mm) diameter
- come equipped with a 10 ft (3 m) plenum rated cable
- meet UL 1995 plenum use requirements
- offer an accessory mounting kit for mounting to a pipe up to 11 in. (280 mm) diameter

TE-63xxV Models

The TE-63xxV (VAV flange mount) models:

- provide a stainless steel mounting flange with two hex-head self-drilling mounting screws
- come equipped with a 10 ft (3 m) plenum rated cable with 1/4 in. (6.35 mm) female insulated quick-connect terminations on leads
- meet UL 1995 plenum use requirements

Repair Information

If the TE-6300 Series Temperature Sensor fails to operate within its specifications, refer to the *TE-6300 Series Temperature Sensors Product Bulletin (LIT-216320)* for a list of repair parts available.

TE-6300 Series Temperature Sensors (Continued)

Selection Charts

Sensor	Mounting Style	Probe Length in. (mm)	Product Code Number
Nickel (1k ohm)	Adjustable[1]	8 ft (203)	TE-6311A-1
		8 ft (2.4 m)	TE-6315M-1
			TE-6315V-2[1]
		17 ft (5.2 m)	TE-6316M-1
			TE-6316V-2[1]
	Duct	4 (102)	TE-631GM-1
		8 (203)	TE-6311M-1
			TE-6311P-1
		18 (457)	TE-631JM-1
	Flange	4 (102)	TE-631GV-2
		8 (203)	TE-6311V-2
	Flush	N/A	TE-6310F-1
	Outdoor Air	3 (76)	TE-6313P-1
	Strap-Mount	3 (76)	TE-631S-1
	Wall[2]	N/A	TE-6314P-1
	Well	6 (152)	TE-631AM-2
		8 (203)	TE-6312M-1
Platinum (1k ohm)	Adjustable	8 (203)	TE-6351-A
	Duct	4 (102)	TE-635GM-1
		8 (203)	TE-6351M-1
			TE-6351P-1
		18 (457)	TE-635JM-1
	Flange	4 (102)	TE-635GV-2
		8 (203)	TE-6351V-2
	Flush	N/A	TE-6350F-1
	Strap-Mount	3 (76)	TE-635S-1
	Outdoor Air	3 (76)	TE-6353P-1
	Wall[2]	N/A	TE-6324P-1
	Well	6 (152)	TE-635AM-2
		8 (203)	TE-6352M-1
Platinum Equivalent	1k ohm Averaging[1]	10 ft (3 m)	TE-6327P-1
		20 ft (6.1 m)	TE-6328P-1
	100 ohm Averaging[1]	10 ft (3 m)	TE-6337P-1
		20 ft (6.1 m)	TE-6338P-1
Thermistor (2.2k ohm)	Adjustable	8 (203)	TE-6341A-1
	Duct	8 (203)	TE-6341P-1
	Flange	4 (102)	TE-634GV-2
		8 (203)	TE-6341V-2
	Outdoor Air	3 (76)	TE-6343P-1
	Wall[2]	N/A	TE-6344P-1
	Well	8 (203)	TE-6342M-1
		6 (152)	TE-634AM-2
Thermistor (10k ohm) Type II	Adjustable	8 (203)	TE-6361A-1
	Duct	4 (102)	TE-636GM-1
		8 (203)	TE-6361M-1
			TE-6361P-1
		18 (457)	TE-636JM-1
	Flange	4 (102)	TE-636GV-2
		8 (203)	TE-6361V-2
	Flush	N/A	TE-6360F-1
	Outdoor Air	3 (76)	TE-6363P-1
	Strap-Mount	3 (76)	TE-636S-1
	Well	6 (152)	TE-636AM-2
		8 (203)	TE-6362M-1

1. Two TE-6001-8 Element Holders come with the platinum equivalent averaging sensors. Order separately to use with a nickel averaging sensor.
2. Order the TE-1800-9600 Mounting Hardware separately to mount the wall unit to a wallbox.

Optional Accessories

Product Code Number	Description
F-1000-182	Thermal Conductive Grease for element wells (8 oz.)
T-4000-xxxx	Wall Mount Cover
T-4000-119	Allen Head Tool for Wall Mount Cover Screws (order in multiples of 30)
TE-1800-9600	Mounting Hardware for mounting the wall mount unit to a wall box
TE-6001-8	Element Holder for mounting an averaging sensor (order in multiples of 10)
TE-6001-13	Metal Cover and Gasket Kit (5 per package)
TE-6300-101	12 in. (305 mm) (1k ohm) Nickel Probe (cut to an appropriate length)[1]
TE-6300-105	12 in. (305 mm) (1k ohm) Platinum Class A Probe (cut to an appropriate length)[1]
TE-6300-103	1/2-14 NPT Plastic Sensor Holder without retainer (order in multiples of 10)
TE-6300-104	12 in. (305 mm) (2.2k ohm) Thermistor Probe (cut to an appropriate length)[1]
TE-6300-613	IMC Kit, Metal Knockout Plug, Metal Clamp Connector (order in multiples of 10)
TE-6300-614	Cable Tie Mounting Kit, 0.50 to 2.625 in. (12.7 to 66.7 mm) Bundle Diameter (10 per package)
TE-6300-615	Cable Tie Mounting Kit, 11 in. (280 mm) Max Bundle Diameter
TE-6300-616	8 in. (203 mm) 1k ohm Platinum Class A Probe
TE-6300-617	3 in. (76 mm) 1k ohm Platinum Class A Probe
TQ-6000-1	4 to 20 mA Output Transmitter for use with the 100 ohm platinum sensor
TE-6300W-102	6 in. (152 mm) Stainless Steel Well (direct mount)
TE-6300W-101	6 in. (152 mm) Brass Well (direct mount with thermal grease included)
TE-6300W-110	8 in. (203 mm) Stainless Steel Well

1. Cut 12 in. probes to a minimum of 3 in. (76 mm).

TE-6300 Series Temperature Sensors (Continued)

T-4000 Covers Available for the Wall Mount TE-63x4P Series

Product Code Number	Horizontal Johnson Controls Logo	Vertical Johnson Controls Logo	Thermometer, with °F/°C Scale	Faceplate/Cover Color
T-4000-2138[1]	—	—	—	Brushed Aluminum/Beige
T-4000-2139	X	—	—	
T-4000-2140	X	—	X	
T-4000-2144	—	X	—	
T-4000-2639	X	—	—	Brown and Gold/Beige
T-4000-2640	X	—	X	
T-4000-2644	—	X	—	
T-4000-3139	X	—	—	Brushed Aluminum/White
T-4000-3140	X	—	X	
T-4000-3144	—	X	—	

1. Without Johnson Controls logo

Technical Specifications

TE-6300 Series Temperature Sensors (Part 1 of 2)		
Sensor Reference Resistance	1k ohm Nickel	1k ohms at 70°F (21°C)
	1k ohm Nickel Averaging	
	1k ohm Platinum	1k ohms at 32°F (0°C)
	100 ohm Platinum Averaging	100 ohms at 32°F (0°C)
	1k ohm Platinum Averaging	1k ohms at 32°F (0°C)
	2.2k ohm Thermistor	2,252 ohms at 77°F (25°C)
	10k ohm Thermistor	10.0k ohms at 77°F (25°C)
Sensor Accuracy	1k ohm Nickel	±0.34F° at 70°F (±0.19C° at 21°C)
	1k ohm Nickel Averaging	±3.4F° at 70°F (±1.9C° at 21°C)
	1k ohm Platinum Class A	±0.35F° at 70°F (±0.19C° at 21°C), DIN Class A
	1k ohm Platinum Class B	±0.73F° at 70°F (±0.41C° at 21°C), DIN Class B
	100 ohm Platinum Averaging	±1.0F°at 70°F (± 0.58C° at 21°C)
	1k ohm Platinum Averaging	
	2.2k ohm Thermistor	±0.36F° (±0.2C°) in the range: 32 to 158°F (0 to 70°C)
	10k ohm Thermistor	±0.9F° (±0.5C°) in the range: 32 to 158°F (0 to 70°C)
Sensor Temperature Coefficient	1k ohm Nickel	Approximately 3 ohms/F° (5.4 ohms/C°)
	1k ohm Nickel Averaging	
	1k ohm Platinum	Approximately 2 ohms/F° (3.9 ohms/C°) 3850 ppm/K
	100 ohm Platinum Averaging	Approximately 0.2 ohms/F° (0.39 ohms/C°)
	1k ohm Platinum Averaging	Approximately 2 ohms/F° (3.9 ohms/C°)
	2.2k ohm Thermistor	Nonlinear, Negative Temperature Coefficient (NTC)
	10k ohm Thermistor	Nonlinear NTC, Johnson Controls Type II
Electrical Connection	TE-63xxM	22 AWG (0.6 mm diameter) x 6 in. (152 mm) long
	TE-63xxP	
	TE-63xxF-1	22 AWG (0.6 mm diameter) x 12 ft (3 m) braided-copper wires, low voltage insulation, half-stripped ends
	TE-63xxP Nickel Averaging	18 AWG (1.0 mm diameter) x 6 in. (152 mm) long
	TE-63xS	22 AWG (0.6 mm diameter) x 10 ft (3 m) long plenum-rated cable
	TE-63xxA, TE-63xxV	22 AWG (0.6 mm diameter) x 10 ft (3 m) long plenum-rated cable with 0.25 in. (6.35 mm) female quick-connect terminals

TE-6300 Series Temperature Sensors (Continued)

TE-6300 Series Temperature Sensors (Part 2 of 2)		
Materials	**Probes**	Nickel Averaging: 0.094 in. (2.4 mm) Outside Diameter (O.D.) copper tubing Nickel Averaging Adaptor: 0.25 in. (6.35 mm) O.D. Brass Platinum Averaging Probe: 0.19 in. (4.8 mm) Aluminum tubing All others (except Averaging): 0.25 in. (6.35 mm) O.D. Stainless Steel
	TE-63xxA	Mounting Adapter Plate and Gland: Thermoplastic
	TE-63xxF-1	Flush Mount: Stainless Steel
	TE-63xxM	Enclosure: Corrosion-Protected Steel Well Sensor Holder: 0.875 in. (22.2 mm) Hex Brass
	TE-63xxP	Conduit box and Shield: Rigid Thermoplastic Mounting Plate: Aluminum Sensor Holder: Rigid Thermoplastic Wall Mount Base Plate: Corrosion-Protected Steel Wall Mount Cover: Rigid Thermoplastic (White) Wall Mount Face Plate: Brushed Aluminum
	TE-63xxV	Mounting Flange: Stainless Steel
Operating Conditions	**TE-63xxA**	-50 to 140°F (-46 to 60°C)
	TE-63xxF	32 to 104°F (0 to 40°C)
	TE-63xxM	-50 to 220°F (-46 to 104°C)
	TE-63xxP	Enclosure: -50 to 122°F (-46 to 50°C) Sensor Probe: -50 to 220°F (-46 to 104°C)
	TE-63xS	Sensor Probe: -50 to 220°F (-46 to 104°C) Wire Harness: -50 to 122°F (-46 to 50°C)
	TE-63xxV	
Shipping Weight	**TE-63xxA**	0.2 lb (0.09 kg)
	TE-63xxF	0.25 lb (113.4 kg)
	TE-63xxM	Duct Averaging: 0.9 lb (0.41 kg) Duct Mount: 0.4 lb (0.18 kg) Well Insertion: 0.5 lb (0.23 kg)
	TE-63xxP	Duct Averaging: 0.5 lb (0.23 kg) Duct Mount: 0.4 lb (0.18 kg) Outdoor Air: 0.5 lb (0.23 kg) Wall Mount: 0.2 lb (0.09 kg) Well Insertion: 0.35 lb (0.16 kg)
	TE-63xS	Strap-Mount: 0.2 lb (0.09 kg)
	TE-63xxV	Duct Averaging: 0.7 lb (0.32 kg) Duct Mount: 0.2 lb (0.09 kg)
Dimensions (H x W x D)	**TE-63xxA**	2.17 in. (55 mm) diameter plus 4 or 8 in. (102 or 203 m) element
	TE-63xxF	Flush Mount: 4.50 x 2.75 in. (114.3 x 69.85 mm)
	TE-63xxM	Duct Averaging: 1.87 x 1.87 x 1.80 in. (47.5 x 47.5 x 45.8 mm) plus 8 or 17 ft (2.4 or 5.2 m) element Duct Mount: 1.87 x 1.87 x 1.80 in. (47.5 x 47.5 x 45.8 mm) plus 4, 8, or 18 in. (102, 203, or 457 mm) element Well Insertion: 1.87 x 1.87 x 1.80 in. (47.5 x 47.5 x 45.8 mm) plus 6 or 8 in. (152 or 203 mm) element
	TE-63xxP	Duct Averaging: 5.97 x 1.38 x 2.75 in. (152 x 35 x 70 mm) plus 8, 10, 17, or 20 ft (2.4, 3.0, 5.2, or 6.1 m) element Duct Mount: 5.97 x 1.38 x 2.75 in. (152 x 35 x 70 mm) plus 6 or 8 in. (152 or 203 mm) probe Outdoor Air: 5.97 x 3.47 x 4.46 in. (152 x 88 x 113 mm) Wall Mount: 2.09 x 3.12 x 1.80 in. (53 x 79 x 46 mm) Well Insertion: 5.97 x 1.38 x 2.75 in. (152 x 35 x 70 mm) plus 6 or 8 in. (152 or 203 mm) probe
	TE-63xS	Strap-Mount: 0.25 in. (6.35 mm) diameter x 3.00 in. (76 mm.) long
	TE-63xxV	Duct Averaging: 2.25 x 1.50 in. (57 x 38 mm) plus 8 or 17 ft (2.4 or 5.2 m) element Duct Mount: 2.25 x 1.50 in. (57 x 38 mm) plus 4 or 8 in. (102 or 203 m) element

Code No. LIT-1900509
Issued September 2, 2011

ZFR1800 Series

Wireless Field Bus System

Description

The ZFR1800 Series Wireless Field Bus System uses ZigBee™ technology to provide a new wireless platform for Metasys® Field Equipment Controllers (FEC), Input/Output Module (IOM), or Variable Air Volume (VAV) Modular Assembly 1600 Series (VMA16) field controllers using BACnet® protocol.

One ZFR1811 router is required per field controller. This pairing of a router and an FEC, IOM or VMA16 field controller is a Wireless Enabled Field Controller (WEFC).

A ZFR1800 Series system consists of:

- up to eight ZFR1810 Wireless Field Bus Coordinators per field bus
- up to 35 Wireless Enabled Field Controllers (WEFCs) per coordinator
- up to 100 WEFCs per field bus, depending on the network engine (32 with NCE, 50 with NAE35)
- up to nine WRZ Sensors per FEC or VMA16 field controller
- additional ZFR1811 Wireless Field Bus Routers connected to MS-ZFRRPT-0 Repeater accessories, as required, acting as repeaters.

Note: Repeaters extend the wireless transmission distance of the BACnet data communications, fill in any gaps within the wireless mesh network, and provide multiple wireless data transmission pathways. Together, these components create a wireless mesh network that allows the exchange of data between the collection of devices within the ZFR1800 Series System's wireless network and wired BACnet Master-Slave/Token-Passing (MS/TP) devices.

The wireless mesh network enhances reliability by providing redundant transmission paths for the data through other routers in the mesh network. The result is a resilient, self-healing network.

Refer to the *ZFR1800 Series Wireless Field Bus System Product Bulletin (LIT-12011336)* for important product application information.

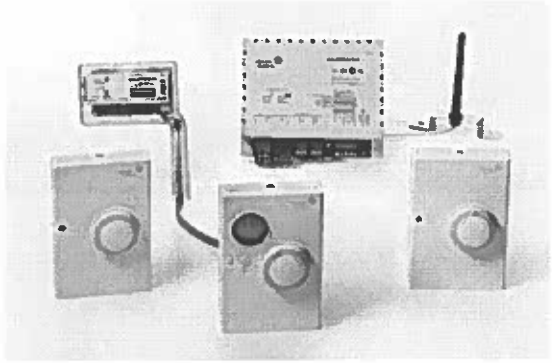
Features

- wireless communications for a Metasys system
- wireless mesh network
- improved application mobility and flexibility
- support of up to nine wireless room temperature sensors per wirelessly enabled field controller
- multiple diagnostic Light-Emitting Diodes (LEDs)
- compact, easy-to-install, and versatile ZFR1811 routers
- stylish, lightweight wireless room temperature sensors with optional LCD screen, occupancy override button, and optional setpoint adjustment

Applications

The wireless Metasys products within a Metasys system are ideal for any location where it is cost-prohibitive, difficult, or aesthetically unappealing to hardwire between Metasys products. Examples of these locations include the following:

- hospitals, office buildings, university campuses, educational facilities, correctional facilities, and other commercial structures with brick or solid concrete walls and/or ceilings that impede hard-wired applications
- office buildings, retail stores, and other commercial real estate where tenant turnover is frequent and temporary walls and ceilings are common
- museums, historical buildings, atriums, and other sites where building aesthetics and historical preservation are important



ZFR1811 Routers (top left), ZFR1810 Coordinator (top center), and WRZ Series Sensors (bottom)

- stadiums, arenas, gymnasiums, convention centers, airports, zoos, and other locations with large, open spaces
- buildings with marble, granite, glass, mirrored, wood veneer, or other decorative surfaces that present challenges to hard-wiring
- buildings with asbestos or other hazardous materials that must not be disturbed
- buildings with occupants sensitive to disruptions to business
- regions with high labor costs

The ZFR1800 Series System is approved by national compliance agencies for use only in the United States and Canada. See *Technical Specifications*.

Locations or applications that prohibit cellular telephones or Wireless Fidelity (WiFi) systems are unsuitable for the wireless Metasys products:

- operating rooms or radiation therapy rooms
- validated environments
- UL 864 applications
- Department of Defense applications requiring Diacap certification (for example, military bases and military hospitals)

Do not use the wireless Metasys products in applications that cannot tolerate intermittent interference or where:

- critical control features would affect life safety or result in large monetary loss, including secondary (backup) life-safety applications
- data centers, production lines, or critical areas would be shut down
- loss of critical control would result from loss of data from humidity or temperature sensor communications
- operation of exhaust fans or Air Handling Units (AHUs) would impair a purge or pressurization mode
- missing data would invalidate reporting required by the customer
- security points are monitored

Repair Information

If a ZFR1800 Series Wireless Field Bus System component fails to operate within its specifications, replace the unit. For a replacement ZFR1800 Series System component, contact the nearest Johnson Controls® representative.

Wireless Field Bus System (Continued)

Selection Charts

ZFR1800 Series Wireless Field Bus System Components

Product Code Number	Product Description
MS-ZFR1810-0	Wireless Field Bus Coordinator, 10 mW Transmission Power; functions with NAE35, NAE45, NAE55, and NCE25 Models
MS-ZFR1811-0	Wireless Field Bus Router, 10 mW Transmission Power; functions with Metasys BACnet FECs, IOMs, VMA16s, and WRZ Series Wireless Room Temperature Sensors
WRZ-THB0000-0	Wireless Temperature/Humidity Sensor with Display, Warmer/Cooler (+/-) Setpoint Adjustment or Setpoint Adjustment Scale: 13 to 29°C/55 to 85°F, F/C Button, Relative Humidity (RH) Button and Occupancy Button, 10 mW Transmission Power
WRZ-THN0000-0	Wireless Temperature/Humidity Sensor, Occupancy Button, No Temperature adjustment and No LCD temperature/humidity display, 10 mW Transmission Power
WRZ-THP0000-0	Wireless Temperature/Humidity Sensor, Warmer/Cooler (+/-) Setpoint Adjustment and Occupancy Button, No LCD temperature/humidity display, 10 mW Transmission Power
WRZ-TTB0000-0	Wireless Temperature Sensor with Display and F/C Button, 10 mW Transmission Power
WRZ-TTD0000-0	Wireless Temperature Sensor with Display, F/C Button and Fan Speed Control, 10 mW Transmission Power
WRZ-TTP0000-0	Wireless Room Temperature Sensor, Warmer/Cooler (+/-) Setpoint Adjustment, 10 mW Transmission Power
WRZ-TTR0000-0	Wireless Room Temperature Sensor, No Setpoint Adjustment, 10 mW Transmission Power
WRZ-TTS0000-0	Wireless Room Temperature Sensor, Setpoint Adjustment Scale: 13 to 29°C/55 to 85°F, 10 mW Transmission Power

WRZ Sensor Model Comparison

Sensor Model	Temperature	3% Humidity	Display	F/C Button	Fan Control	Occupancy Override	Setpoint Adjustment Dial[1]
WRZ-THB0000-0	x	x	x	x		x	Both
WRZ-THN0000-0	x	x				x	
WRZ-THP0000-0	x	x				x	W/C
WRZ-TTB0000-0	x		x	x		x	Both
WRZ-TTD0000-0	x		x	x	x	x	Both
WRZ-TTP0000-0	x					x	ABSOL
WRZ-TTR0000-0	x					x	
WRZ-TTS0000-0	x					x	ABSOL

1. Either Absolute Scale (ABSOL), Warmer/Cooler (W/C) or Both (BOTH).

Related Field Controllers

Product Code Number	Product Description[1]
MS-FEC1611-0	10-Point Field Equipment Controller with 2 UI, 1 BI, 3 BO, 4 CO, 24 VAC, and SA Bus, with Mounting Base
MS-FEC1621-0	Field Equipment Controller Cover with 2 UI, 1 BI, 3 BO, 4 CO, 24 VAC, and SA Bus with LCD Screen, with Mounting Base
MS-FEC2611-0	17-Point Field Equipment Controller with 6 UI, 2 BI, 3 BO, 2 AO, 4 CO, 24 VAC, and SA Bus with Mounting Base
MS-FEC2621-0	17-Point Field Equipment Controller with 6 UI, 2 BI, 3 BO, 2 AO, 4 CO, 24 VAC, and SA Bus with Mounting Base with LCD Screen
MS-IOM1711-0	4-Point IOM with 4 BI, FC Bus, and SA Bus Support
MS-IOM2711-0	6-Point IOM with 2 UI, 2 UO, 2 BO, FC Bus, and SA Bus Support
MS-IOM3711-0	12-Point IOM with 4 UI, 4 UO, 4 BO, FC Bus, and SA Bus Support
MS-IOM4711-0	17-Point IOM with 6 UI, 2 BI, 3 BO, 2 AO, 4 CO, 24 VAC, and SA Bus with Mounting Base
MS-VMA1610-0	Integrated VAV Controller/Actuator/Pressure Sensor (Cooling Only), FC Bus, and SA Bus
MS-VMA1620-0	Integrated VAV Controller/Actuator/Pressure Sensor (with Reheat and Fan Control), FC Bus, and SA Bus

1. Universal Input (UI), Binary Input (BI), Binary Output (BO), Analog Output (AO), Configurable Output (CO), Sensor Actuator (SA)

Accessories

Product Code Number	Product Description (Part 1 of 2)
MS-ZFRRPT-0	Optional Repeater Accessory for use with ZFR1811 Router as a repeater. Includes 20-28 VAC or 16-30 VDC input power, 12 VDC output power supply (regulated at 500 mA maximum, 6 VA), and 4 x 4 in. electrical box with cover.
MS-ZFRCBL-0	Wire Harness for use with ZFR1811 Router. Allows ZFR1811 Router to function with FEC1620; and with FEC1610, VMA1610, or VMA1620 controllers in conjunction with NS Series Sensors, Wireless Commissioning Converter, or DIS1710 Local Controller Display.
IA OEM-DAUB1 2400	Universal Serial Bus (USB) Dongle with ZigBee Driver provides a wireless connection through the Controller Configuration Tool (CCT) to allow wireless commissioning of the wirelessly enabled FEC and VMA1600 field controllers. Also allows use of the ZFR Checkout Tool (ZCT) in CCT. (Purchase through Johnson Controls eCounterline. Obtain the necessary price and description information from the Johnson Controls *Computer Price List*, which is available on the Johnson Controls Portal intranet site by Information Technology Acquisition Services [ITAS]).
WRZ-SST-100	Optional Wireless Sensing System Tool to be used with a WRZ-TTx Series Sensor to indicate wireless signal strength between potential locations of ZFR1800 System devices.

Wireless Field Bus System (Continued)

Product Code Number	Product Description (Part 2 of 2)
MS-BTCVT-1	Wireless Commissioning Converter, with Bluetooth® technology
MS-DIS1710-0	Local Controller Display for FEC1610 and FEC2610 models
TP-2420	Transformer, Wall Plug Mount, 120 VAC to 24 VAC, 20 VA, Class 2
Y65T31-0[1]	Transformer, 120/208/240 VAC to 24 VAC, 40 VA, Class 2, Foot Mount, 20 cm (8 in.) Primary Leads and Secondary Screw Terminals
T-4000-119	1.6 mm (1/16 in.) Allen-Head Adjustment Tool (30 per Bag) for Accessing and Securing WRZ-TTx Series Wireless Room Temperature Sensors
1.5 VDC, AA Alkaline Battery	Replacement Battery for WRZ-TTx Series Wireless Room Temperature Sensors (Purchase Locally.)

1. Additional Y60 Series Transformers are available from Johnson Controls.

Technical Specifications

ZFR1810 Wireless Field Bus Coordinator	
Product Code Number	MS-ZFR1810-0
Power Supply Input	**One of the following:** 24 VAC +10%/-15%, 50/60 Hz, Class 2. Transformer allowance should be 2.5 VA maximum, 2 VA typical. Provided through the three-position 24 V~ screw terminal pluggable block. 15 VDC, 180 mA (7 to 18 VDC, 185 mA maximum current draw) on the FC Bus provided through the FC/SA BUS IN RJ-12 jack from the FC Bus Jack on a Field Controller or NxE supervisory engine.
Power Supply Output	15 VDC; Provided through the FC/SA BUS, FC/SA BUS OUT RJ-12 jack for external devices.
Addressing	DIP Switches, Field Adjustable
Wireless Band	Direct-Sequence Spread-Spectrum, 2.4 GHz ISM Bands
Transmission Power	10 mW Maximum
Transmission Range	76.2 m (250 ft) Maximum Line-of-Sight 15 m (50 ft) Recommended
Ambient Conditions	**Operating:** 0 to 50°C (32 to 122°F), 5 to 95% RH, Noncondensing **Storage:** -20 to 70°C (-4 to 158°F), 5 to 90% RH, Noncondensing
Materials	White Plastic Housing with Plenum rating per UL1995 UL94-5VB Flammability Rating
Terminations	Two spade terminals with three-position screw terminal pluggable block for 24 VAC power supply input. Four spade terminals with four-position screw terminal pluggable block for RS-485 communications. RJ-12 IN jack for 15 VDC power supply and communications connection from an NxE or FEC FC Bus jack. RJ-12 OUT jack supplies 15 VDC and communications to BTCVT Wireless Commissioning Converter.
Dimensions	146 x 122 x 52 mm (5.8 x 4.8 x 2.1 in.)
Mounting Hardware	Four No. 6 Trade Size Sheet Metal Screws
Shipping Weights	0.45 kg (1.0 lb)
Compliance CE	**United States:** Intended for Connection to an NEC Class 2 Power Source; UL 916 Energy Management Plenum rated per UL1995 UL94-5VB Flammability Rating FCC Compliant to CFR47, Part 15, Subpart B, Class A Transmission Complies with FCC Part 15.247 Regulations for Low Power Unlicensed Transmitters Transmitter FCC Identification: TFB-MATRIXL **Canada:** CAN/CSA C22.2 No. 205, Signal Equipment Industry Canada (IC) Compliant to Canadian ICES-003, Class B Limits Industry Canada IC: 5969A-MATRIXL **Europe:** CE Mark – Johnson Controls, Inc., declares that this product is in compliance with the essential requirements and other relevant provisions of the R&TTE Directive 1999/05/EC and the EMC Directive 2004/108/EC. **Australia and New Zealand:** C-Tick Mark, Australia/NZ Emissions Compliant

ZFR1811 Wireless Field Bus Routers (Part 1 of 2)	
Product Code Number	MS-ZFR1811-0
Supply Voltage	8 to 18 VDC, 15 VDC nominal, Provided from the FC/SA BUS RJ-12 jack on the FEC or VMA1600
Current Consumption	90 mA maximum
Addressing	DIP Switches, Field Adjustable
Wireless Band	Direct-Sequence Spread-Spectrum, 2.4 GHz ISM Bands
Transmission Power	10 mW Maximum
Transmission Range	76.2 m (250 ft) Maximum Indoor Line-of-Sight 15 m (50 ft) Recommended

Wireless Field Bus System (Continued)

ZFR1811 Wireless Field Bus Routers (Part 2 of 2)	
Ambient Conditions	**Operating:** 0 to 50°C (32 to 122°F), 5 to 95% RH, Noncondensing **Storage:** -20 to 70°C (-4 to 158°F), 5 to 90% RH, Noncondensing
Materials	Translucent Plastic Housing with Plenum rating per UL1995 UL94-5VB Flammability Rating
Terminations	RJ-12 plug for connection to FEC or VMA1600 FC/SA Bus jack
Dimensions	136 x 100 x 18 mm (5-3/8 x 3-15/16 x 3/4 in.)
Mounting Hardware	1/2 in. trade size Electrical Mechanical Tubing (EMT) connector
Shipping Weights	0.095 kg (0.21 lb)
Compliance CE	**United States:** Intended for Connection to an NEC Class 2 Power Source; UL 916 Energy Management Plenum rated per UL1995 UL94-5VB Flammability Rating FCC Compliant to CFR47, Part 15, Subpart B, Class A Transmission Complies with FCC Part 15.247 Regulations for Low Power Unlicensed Transmitters Transmitter FCC Identification: TFB-MATRIXL **Canada:** CAN/CSA C22.2 No. 205, Signal Equipment Industry Canada (IC) Compliant to Canadian ICES-003, Class B Limits Industry Canada IC: 5969A-MATRIXL **Europe:** CE Mark – Johnson Controls, Inc., declares that this product is in compliance with the essential requirements and other relevant provisions of the R&TTE Directive 1999/05/EC and the EMC Directive 2004/108/EC. **Australia and New Zealand:** C-Tick Mark, Australia/NZ Emissions Compliant

WRZ Series Wireless Room Sensors (Part 1 of 2)	
Product Codes	**WRZ-THB0000-0:** Temperature/Humidity Sensor with Display, Warmer/Cooler (+/-) Setpoint Adjustment or Setpoint Adjustment Scale: 13 to 29°C/55 to 85°F, F/C Button, RH Button and Occupancy Button **WRZ-THN0000-0:** Temperature/Humidity Sensor with Occupancy Button **WRZ-THP0000-0:** Temperature/Humidity Sensor with Warmer/Cooler (+/-) Setpoint Adjustment and Occupancy Button **WRZ-TTB0000-0:** Temperature Sensor with Display and F/C Button **WRZ-TTD0000-0:** Temperature Sensor with Display, F/C Button and Fan Speed Control **WRZ-TTP0000-0:** Temperature Sensor with Warmer/Cooler (+/-) Setpoint Adjustment **WRZ-TTR0000-0:** Temperature Sensor with No Setpoint Adjustment **WRZ-TTS0000-0:** Temperature Sensor with Setpoint Adjustment Scale: 13 to 29°C (55 to 85°F)
Power Requirements	3 VDC Supplied by Two 1.5 VDC AA Alkaline Batteries (Included with Sensor); Typical Battery Life: 48 Months (36 Months Minimum)
Addressing	DIP Switches, Field Adjustable. MS/TP Address, Network Number, and Zone Address
Ambient Conditions	**Operating:** 0 to 50°C (32 to 122°F), 5 to 95% RH, Noncondensing **Storage:** -40 to 71°C (-40 to 160°F), 5 to 95% RH, Noncondensing
Wireless Band	Direct-Sequence Spread-Spectrum, 2.4 GHz ISM Band
Transmission Power	10 mW Maximum
Transmission Range	30 m (100 ft) Maximum Indoor Line-of-Sight; 15 m (50 ft) Recommended
Transmissions	Every 60 Seconds (±20 Seconds)
Temperature System Accuracy	0.6C°/1.0F° Over the Range of 13 to 29°C (55 to 85°F); 0.9C°/1.5F° Over a Range of 0 to 13°C (32 to 55°F) and 29 to 43°C (85 to 110°F)
Temperature Sensor Type	Internal 10k ohm Negative Temperature Coefficient (NTC) Thermistor
Humidity Calibrated Range	10% to 90% RH at 23°C (73°F)
Humidity Accuracy	±3% RH across the Range of 20% to 80% RH, ±6% RH across the Range of 10% to 20% RH and 80% to 90% RH; within the Temperature Range of 13 to 29°C (55 to 85°F)
Materials	NEMA 1 White Plastic Housing
Mounting	Screw Mount or Double-Sided Adhesive Foam Tape Mount; Double-Sided Adhesive Foam Tape Included
Dimensions	120 x 80 x 38 mm (4.7 x 3.1 x 1.5 in.)
Shipping Weight	0.14 kg (0.3 lb)

Wireless Field Bus System (Continued)

WRZ Series Wireless Room Sensors (Part 2 of 2)	
Compliance CE	**United States:** Transmission Complies with FCC Part 15.247 Regulations for Low Power Unlicensed Transmitters Transmitter FCC Identification: TFB-MATRIXL **Canada:** Industry Canada IC: 5969A-MATRIXL **Europe:** CE Mark – Johnson Controls, Inc., declares that this product is in compliance with the essential requirements and other relevant provisions of the R&TTE Directive 1999/05/EC and the EMC Directive 2004/108/EC. **Australia and New Zealand:** C-Tick Mark, Australia/NZ Emissions Compliant

Code No. LIT-1900668
Issued September 14, 2011

WRZ Series Wireless Room Sensors

Description

The WRZ Series Wireless Room Sensors are designed to sense room/zone temperature and transmit wireless temperature control data. Some models also sense and transmit relative humidity.

In a ZFR1800 Series Wireless Field Bus System application, the sensors communicate with FEC16 Series, FEC26 Series, and VMA16 Series Controllers by means of the ZFR1811 Router.

In wired field bus applications, the sensors communicate with a WRZ-7850 Wireless Receiver. The WRZ-7850 Receiver transfers data to the controller by means of the Sensor Actuator (SA) communication bus. In a typical application, one WRZ Series Sensor reports to one WRZ-7850 Receiver, but up to five WRZ Series Sensors can be associated with a single WRZ-7850 Receiver for multi-sensor averaging or high/low temperature selection.

WRZ Series sensor models are available with or without a Liquid Crystal Display (LCD). Depending on the sensor model, the WRZ Series Sensor can transmit sensed temperature, setpoint temperature, sensed humidity, occupancy status, and low battery conditions to an associated router or receiver. The WRZ Series Sensors are designed for indoor, intra-building applications only.

The WRZ Sensors use direct-sequence, spread-spectrum RF technology, and operate on the 2.4 GHz Industrial, Scientific, and Medical (ISM) band. The receiver meets the IEEE 802.15.4 standard for low power, low duty cycle RF transmitting systems.

Refer to the *WRZ Series Wireless Room Sensors Product Bulletin (LIT-12011653)* for important product application information.

Features

- Wireless RF Design
- Integral Wireless Signal Strength Testing Built into the Sensor
- Easy Installation and Relocation
- Easily-Applicable Data Types
- Simple, Field Adjustable DIP Switches
- Optional, Battery-Powered WRZ-SST-110 Wireless System Survey Tool

WRZ Wireless Room Sensors

- High Resistance to RF Interference from Other Radio Devices or RF Noise Sources
- User Selectable Default Display for Humidity Models
- Display Models
- Three Temperature Setpoint Range Options

Repair Information

If the WRZ Wireless Room Sensor fails to operate within its specifications, replace the unit. For a replacement sensor, contact the nearest Johnson Controls® representative.

Selection

Selection

Product Code Number	Product Description
WRZ-THB0000-0	Wireless Room Temperature and Humidity Sensor with Display, Warmer/Cooler (+/-) Setpoint Adjustment or Setpoint Adjustment Scale: 55 to 85°F (13 to 27°C), F/C Button, Relative Humidity (RH) Button, and Manual Occupancy Override Button
WRZ-THN0000-0	Wireless Room Temperature and Humidity Sensor with Battery Level/Signal Strength LED and Manual Occupancy Override Button
WRZ-THP0000-0	Wireless Room Temperature and Humidity Sensor with Warmer/Cooler (+/-) Setpoint Adjustment and Manual Occupancy Override Button
WRZ-TTB0000-0	Wireless Room Temperature Sensor with Display, F/C Button, and Manual Occupancy Override Button
WRZ-TTD0000-0	Wireless Room Temperature Sensor with Display, F/C Button, Fan Speed Control, and Manual Occupancy Override Button
WRZ-TTP0000-0	Wireless Room Temperature Sensor with Warmer/Cooler (+/-) Setpoint Adjustment, Battery Level/Signal Strength LED, and Manual Occupancy Override Button
WRZ-TTR0000-0	Wireless Room Temperature Sensor with Battery Level/Signal Strength LED, Manual Occupancy Override Button, and No Setpoint Adjustment
WRZ-TTS0000-0	Wireless Room Temperature Sensor with Setpoint Adjustment Scale: 55 to 80°F (13 to 27°C), Battery Level/Signal Strength LED, and Manual Occupancy Override Button
WRZ-SST-110	Wireless System Survey Tool

WRZ Sensor Model Comparison

Sensor Model	Temperature	3% Humidity	Display	F/C Button	Fan Control	Occupancy Override	Setpoint Adjustment Dial[1]
WRZ-THB0000-0	x	x	x	x		x	CONFIG
WRZ-THN0000-0	x	x				x	NO DIAL
WRZ-THP0000-0	x	x				x	W/C
WRZ-TTB0000-0	x		x	x		x	CONFIG
WRZ-TTD0000-0	x		x	x	x	x	CONFIG
WRZ-TTP0000-0	x					x	W/C
WRZ-TTR0000-0	x					x	NO DIAL
WRZ-TTS0000-0	x					x	SCALED

1. Warmer/Cooler temperature offset (W/C), Single-value in 13 to 29°C (55 to 85°F) range (SCALED), CONFIG - system-configured (available on display models only)

WRZ Series Wireless Room Sensors (Continued)

Technical Specifications

WRZ Series Wireless Room Sensors	
Product Codes	WRZ-THB0000-0: Temperature/Humidity Sensor with Display, Warmer/Cooler (+/-) Setpoint Adjustment or Setpoint Adjustment Scale: 13 to 29°C/55 to 85°F, F/C Button, RH Button and Occupancy Button WRZ-THN0000-0: Temperature/Humidity Sensor with Occupancy Button WRZ-THP0000-0: Temperature/Humidity Sensor with Warmer/Cooler (+/-) Setpoint Adjustment and Occupancy Button WRZ-TTB0000-0: Temperature Sensor with Display and F/C Button WRZ-TTD0000-0: Temperature Sensor with Display, F/C Button and Fan Speed Control **WRZ-TTP0000-0:** Temperature Sensor with Warmer/Cooler (+/-) Setpoint Adjustment **WRZ-TTR0000-0:** Temperature Sensor with No Setpoint Adjustment **WRZ-TTS0000-0:** Temperature Sensor with Setpoint Adjustment Scale: 13 to 29°C (55 to 85°F)
Power Requirements	3 VDC Supplied by Two 1.5 VDC AA Alkaline Batteries (Included with Sensor); Typical Battery Life: 48 Months (36 Months Minimum)
Addressing	DIP Switches, Field Adjustable. MS/TP Address, PAN Number, and Zone Address
Ambient Conditions	**Operating:** 0 to 50°C (32 to 122°F), 5 to 95% RH, Noncondensing **Storage:** -40 to 71°C (-40 to 160°F), 5 to 95% RH, Noncondensing
Wireless Band	Direct-Sequence Spread-Spectrum, 2.4 GHz ISM Band
Transmission Power	10 mW Maximum
Transmission Range	30 m (100 ft) Maximum Line-of-Sight; 15 m (50 ft) Recommended
Transmissions	**Temperature:** Every 60 Seconds (±20 Seconds) **Humidity:** Every 3 minutes, or 1 minute intervals if temperature or humidity changes
Temperature System Accuracy	0.6C°/1.0F° Over the Range of 13 to 29°C (55 to 85°F); 0.9C°/1.5F° Over a Range of 0 to 13°C (32 to 55°F) and 29 to 43°C (85 to 110°F)
Temperature Sensor Type	Internal 10k ohm Negative Temperature Coefficient (NTC) Thermistor
Humidity Calibrated Range	10% to 90% RH at 23°C (73°F)
Humidity Accuracy	±3% RH across the Range of 20% to 80% RH, ±6% RH across the Range of 10% to 20% RH and 80% to 90% RH; within the Temperature Range of 13 to 29°C (55 to 85°F)
Materials	NEMA 1 White Plastic Housing
Mounting	Screw Mount or Double-Sided Adhesive Foam Tape Mount; Double-Sided Adhesive Foam Tape Included
Dimensions	120 x 80 x 38 mm (4.7 x 3.1 x 1.5 in.)
Shipping Weight	0.14 kg (0.3 lb)
Compliance CE	**United States:** Transmission Complies with FCC Part 15.247 Regulations for Low Power Unlicensed Transmitters Transmitter FCC Identification: TFB-MATRIXL **Canada:** Industry Canada IC: 5969A-MATRIXL **Europe:** CE Mark – Johnson Controls, Inc., declares that this product is in compliance with the essential requirements and other relevant provisions of the R&TTE Directive 1999/05/EC. **Australia and New Zealand:** C-Tick Mark, Australia/NZ Emissions Compliant

0011-0001
Scoreboard Control Rm Remodel

DRAWING NUMBER	DRAWING TITLE
TITLE	Title Page
PAGE 2	Panel Detail Drawing
PAGE 3	N2 Bus Riser
1.1	UNT-46 Panel Detail
1.2A	VMA-46 Wiring Detail - Existing
1.2B	UNT-46 Wiring Detail - New
1.3	UNT-46 Point Schedule
2.1	UNT-47 Panel Detail
2.2	UNT-47 Wiring Detail
2.3	UNT-47 Point Schedule

Johnson Controls

Creating a better climate for business.

- [x] Environmental Control System
- [x] Facility Management System
- [ ] Air and Water System Balancing
- [ ] Fire Management System
- [ ] Security System
- [ ] Lighting Services
- [ ] Instrumentation System Installation
- [ ] Building Operations Management
- [ ] Energy Conservation Control
- [ ] Training Programs
- [ ] Performance Contracting
- [ ] Planned Service Agreements

Air Conditioning
Heating
Diagnostic Services
Coil Cleaning
Refrigeration
Automatic Temperature Controls
Facility Management Systems
Fire Management
Security Management
Building Operations and Management
Water Treatment
Electrical Equipment
Emergency Generator / Lighting Equipment
Industrial Controls / Recording / Indication Equipment

PROJECT TITLE
MILLER PARK
SCOREBOARD CONTROL RM
REMODEL

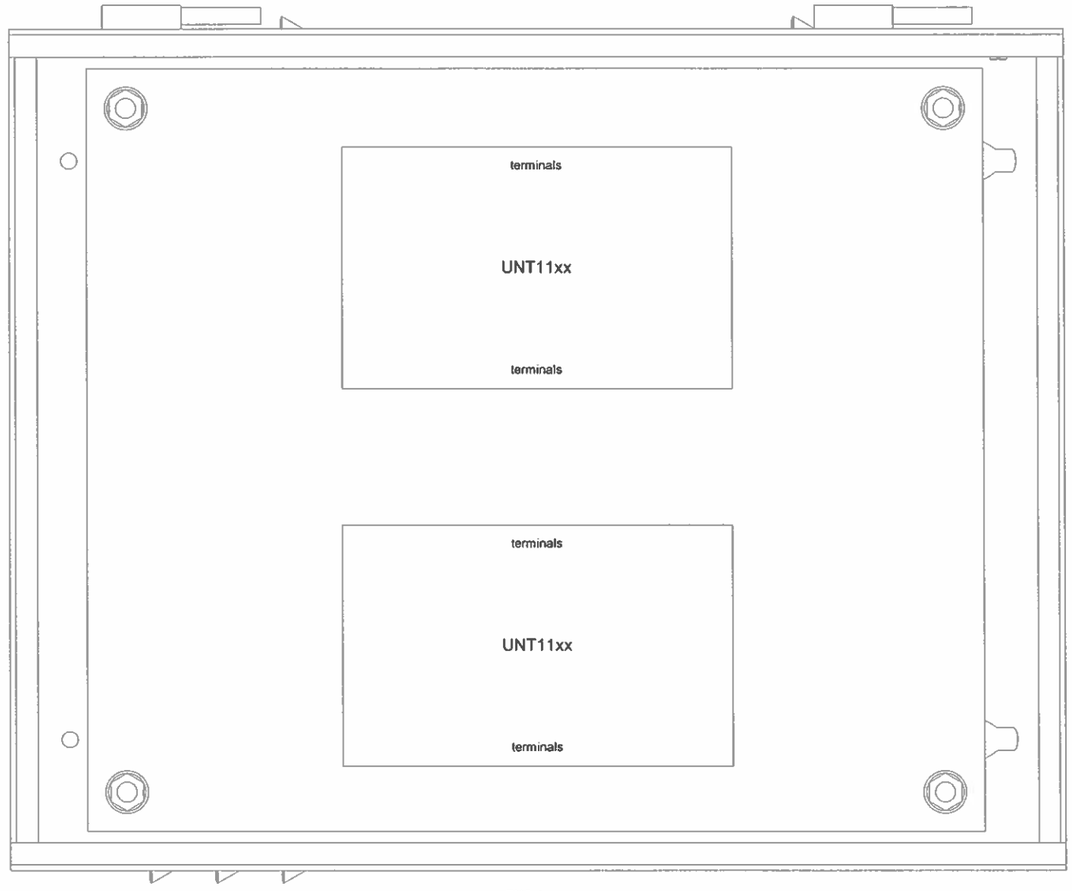
ARCHITECT	ENGINEER
, Phone:	, Phone:
MECHANICAL CONTRACTOR	ELECTRICAL CONTRACTOR
, Phone:	, Phone:

REFERENCE DRAWING	NO	REVISION-LOCATION	ECN	DATE	BY

Johnson Controls

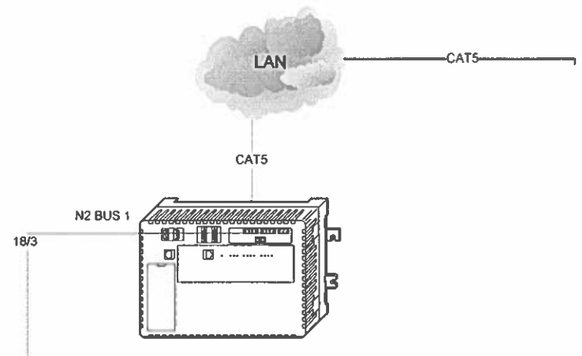
Branch Information
, Phone: Fax:

SALES ENGINEER	PROJECT MANAGER	APPLICATION ENGINEER	DATE	CONTRACT NUMBER
	KDP	KDP	2/2010	0010-0001



ENC-1

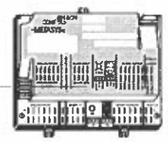
Drawing Title: Visio Panel Detail Drawing							
	REFERENCE DRAWING	NO	REVISION-LOCATION		ECN	DATE	BY
	Sales Engineer / Project Manager	Application Engineer	DRAWN BY / DATE		APPROVED BY / DATE		
Project Title: Scoreboard Control Rm	Johnson Controls		Branch Information		CONTRACT NUMBER: 0011-0001		
					DRAWING NUMBER: PAGE 2		



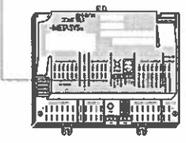
S!-NAE04
IP: 192.168.55.73
Subnet: 255.255.255.0

FROM UNT-128

LOCATED IN LOGE MDF



UNT-46



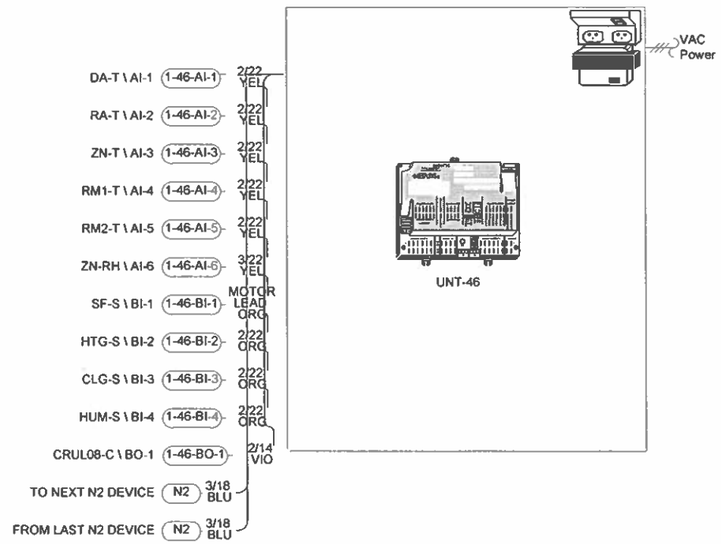
UNT-47

Drawing Title: N2 Bus Riser							
	REFERENCE DRAWING	NO.	REVISION LOCATION		ECN	DATE	BY
	Sales Engineer / Project Manager	Application Engineer	DRAWN BY / DATE	APPROVED BY / DATE			
Project Title: Scoreboard Control Rm	Johnson Controls	Branch Information	CONTRACT NUMBER: 0011-0001	DRAWING NUMBER: PAGE 3			

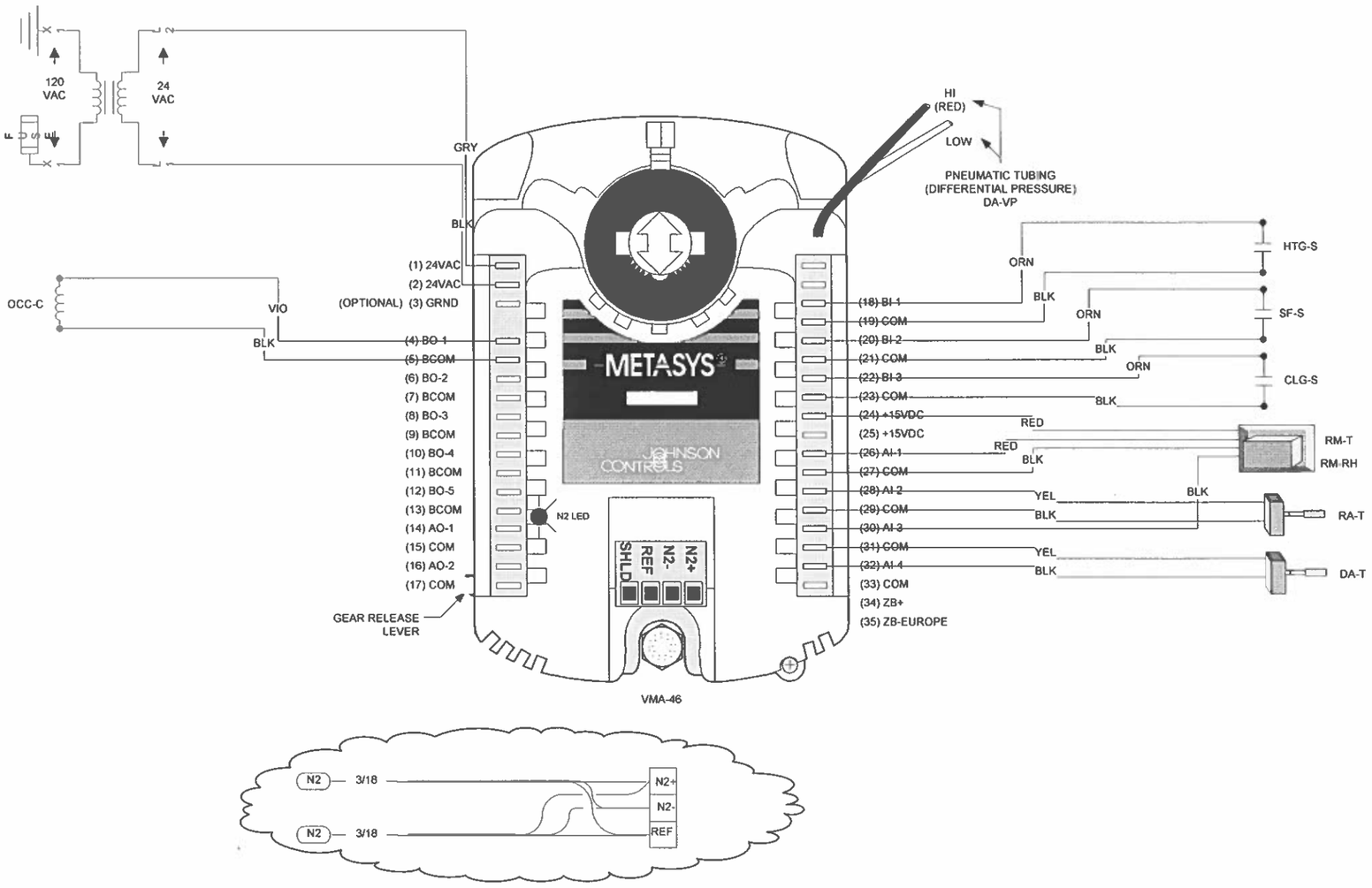
BILL OF MATERIALS

Designation	Qty	Part Number	Description
UNT-46	1	AS-UNT141-1	UNITARY CONTROLLER SCREW TERMINAL VER

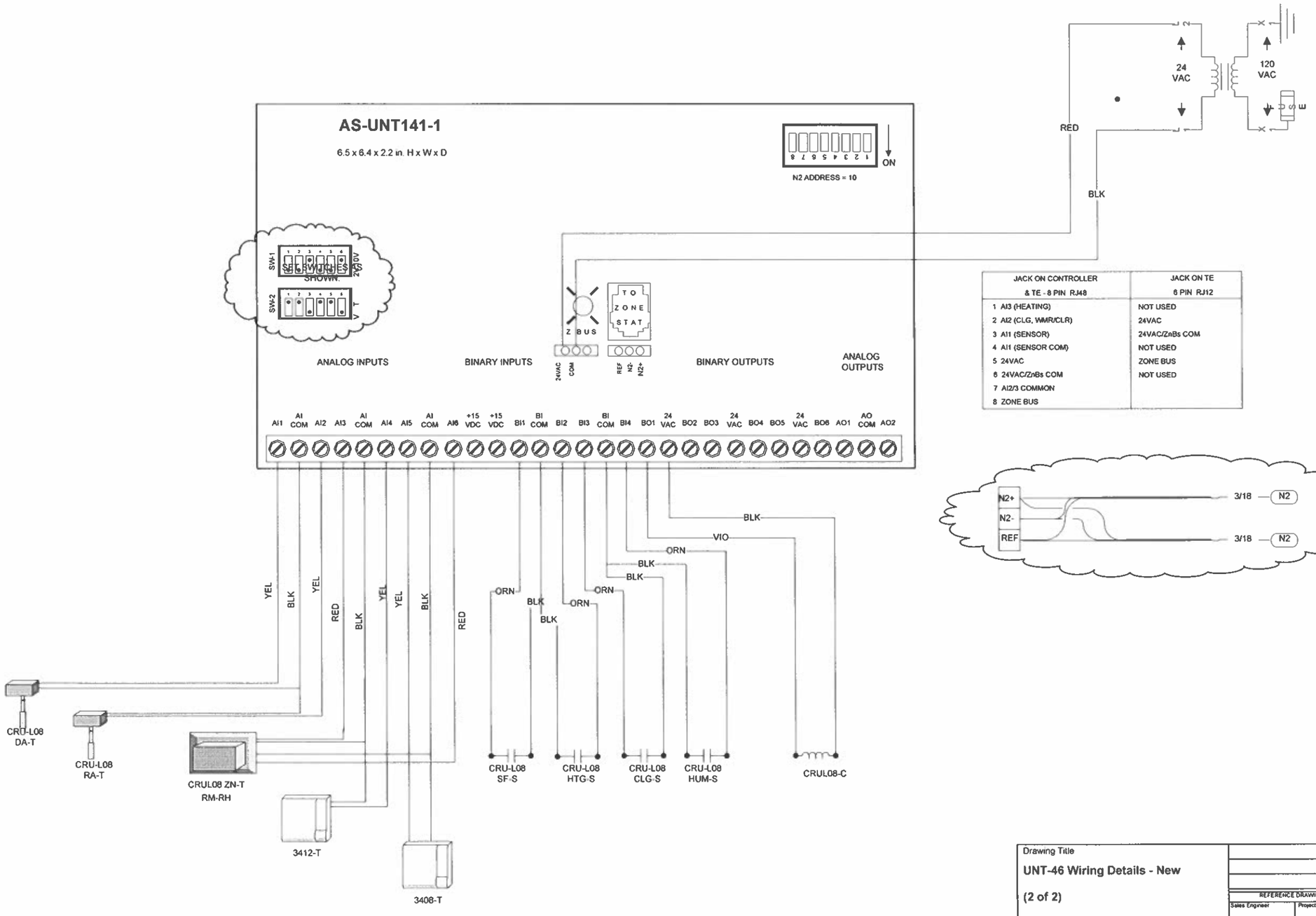
ALL OTHER FIELD DEVICES/SENSORS EXISTING



Drawing Title: UNT-46 Panel Detail							
REFERENCE DRAWING		NO	REVISION-LOCATION		ECN	DATE	BY
Sales Engineer	Project Manager	Application Engineer	DRAWN BY	DATE	APPROVED BY	DATE	
Project Title: Scoreboard Control Rm	Johnson Controls		Branch Information		CONTRACT NUMBER: 0011-0001		
					DRAWING NUMBER: 1.1		



Drawing Title: **VMA-46 Wiring Details - Existing (1 of 2)**							
	REFERENCE DRAWING	NO.	REVISION LOCATION		ECN	DATE	BY
	Sales Engineer / Project Manager / Application Engineer		DRAWN BY / DATE	APPROVED BY / DATE			
Project Title: **Scoreboard Control Rm**	Johnson Controls		Branch Information		CONTRACT NUMBER: **0011-0001**		
					DRAWING NUMBER: **1.2A**		



REFERENCE DRAWING	NO	REVISION-LOCATION		ECN	DATE	BY
Sales Engineer	Project Manager	Application Engineer	DRAWN		APPROVED	
			BY	DATE	BY	DATE

Drawing Title

UNT-46 Wiring Details - New

(2 of 2)

Project Title

Scoreboard Control Rm

Johnson Controls

Branch Information

CONTRACT NUMBER

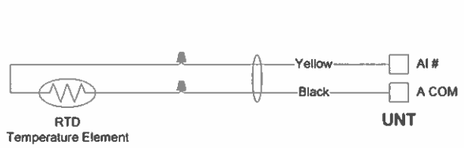
0011-0001

DRAWING NUMBER

1.2B

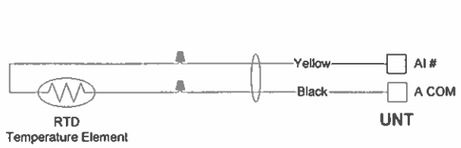
Electrician/Fitter	Point Information			Controller Information							Panel Information					Intermediate Device					Field Device					
Tag	Point Type	System Name	Object Name	Expanded ID	Controller Details	Trunk Type	Trunk Nbr	Trunk Addr.	Cable Destination Bay/Terminal	Module Type	Termination Out	Panel	Panel Location	Slot Number	Reference Drawing	Cable Number	Wiring /Tubing	Termination In	Device	Termination Out	Location	Wiring /Tubing	Termination In	Device	Location	Ref Detail Shape	Comment
		UNT-46			UNT 141							EN-1	Mech Room		M12												Power to Controller
		UNT-46			UNT 141	N2	1	46				EN-1	Mech Room	0	M12												N2 Trunk
	AI-1	UNT-46	DA-T	CRUL08 DA-T	UNT 141	N2	1	46	AI1,A COM		AI1,A COM	EN-1	Mech Room	0	M12	1-46-AI-1						2/22	2-Wire	TE		UT131	
	AI-2	UNT-46	RA-T	CRUL08 RA-T	UNT 141	N2	1	46	AI2,A COM		AI2,A COM	EN-1	Mech Room	0	M12	1-46-AI-2						2/22	2-Wire	TE		UT131	
	AI-3	UNT-46	ZN-T	CRUL08 ZN-T	UNT 141	N2	1	46	AI3,A COM		AI3,A COM	EN-1	Mech Room	0	M12	1-46-AI-3						2/22	2-Wire	TE		UT131	
	AI-4	UNT-46	RM1-T	Rm 3412-T	UNT 141	N2	1	46	AI4,A COM		AI4,A COM	EN-1	Mech Room	0	M12	1-46-AI-4						2/22	2-Wire	TE		UT131	
	AI-5	UNT-46	RM2-T	Rm 3408-T	UNT 141	N2	1	46	AI5,A COM		AI5,A COM	EN-1	Mech Room	0	M12	1-46-AI-5						2/22	2-Wire	TE		UT131	
	AI-6	UNT-46	ZN-RH	CRUL08 ZN-RH	UNT 141	N2	1	46	AI6,A COM,+15VDC		AI6,A COM,+15VDC	EN-1	Mech Room	0	M12	1-46-AI-6						3/22	OUT,COM,PWR	HE-63x0-HE		UT151	
	BI-1	UNT-46	SF-S	CRUL08 SF-S	UNT 141	N2	1	46	BI1,24VAC		BI1,24VAC	EN-1	Mech Room	0	M12	1-46-BI-1	2/22	OUT, COM	Current Relay	Motor Lead		Motor Lead	See wiring detail	Motor Status		UT301	
	BI-2	UNT-46	HTG-S	CRUL08 HTG-S	UNT 141	N2	1	46	BI2,24VAC		BI2,24VAC	EN-1	Mech Room	0	M12	1-46-BI-2						2/22	See wiring detail	Dry Contact		UT301	
	BI-3	UNT-46	CLG-S	CRUL08 CLG-S	UNT 141	N2	1	46	BI3,24VAC		BI3,24VAC	EN-1	Mech Room	0	M12	1-46-BI-3						2/22	See wiring detail	Dry Contact		UT301	
	BI-4	UNT-46	HUM-S	CRUL08 HUM-S	UNT 141	N2	1	46	BI4,24VAC		BI4,24VAC	EN-1	Mech Room	0	M12	1-46-BI-4						2/22	See wiring detail	Dry Contact		UT301	
	BO-1	UNT-46	CRUL08-C	CRUL08 Command	UNT 141	N2	1	46	BO1,RTN		BO1,RTN	EN-1	Mech Room	0	M12	1-46-BO-1	2/22	COIL (Wh/Yel,Wh/Blue)	RIB Relay	COM, NO (Yel, Org)		2/14	See wiring detail	Control Panel (NO) (Sw Hi)		UT502	
	BO-2	UNT-46			UNT 141	N2	1	46	BO-2			EN-1	Mech Room	0	M12	1-46-BO-2											
	BO-3	UNT-46			UNT 141	N2	1	46	BO-3			EN-1	Mech Room	0	M12	1-46-BO-3											
	BO-4	UNT-46			UNT 141	N2	1	46	BO-4			EN-1	Mech Room	0	M12	1-46-BO-4											
	BO-5	UNT-46			UNT 141	N2	1	46	BO-5			EN-1	Mech Room	0	M12	1-46-BO-5											
	BO-6	UNT-46			UNT 141	N2	1	46	BO-6			EN-1	Mech Room	0	M12	1-46-BO-6											
	AO-1	UNT-46			UNT 141	N2	1	46	AO-1			EN-1	Mech Room	0	M12	1-46-AO-1											
	AO-2	UNT-46			UNT 141	N2	1	46	AO-2			EN-1	Mech Room	0	M12	1-46-AO-2											

DETAIL UT131 TEMPERATURE SENSOR INPUT



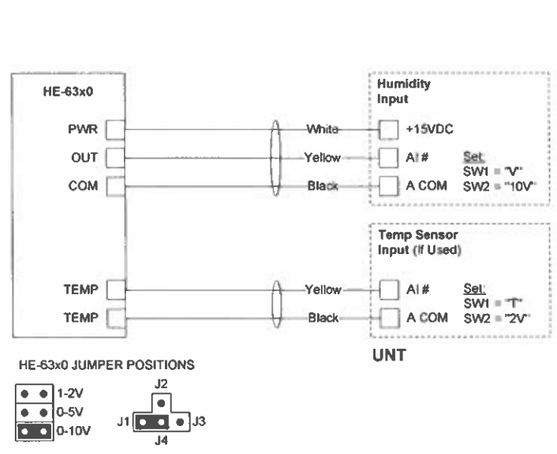
Set SW1 to Position "T"
and SW2 to Position "2V"

DETAIL UT131 TEMPERATURE SENSOR INPUT

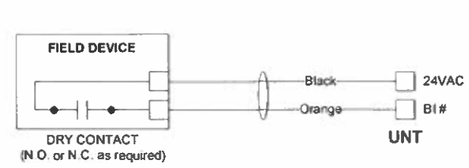


Set SW1 to Position "T"
and SW2 to Position "2V"

DETAIL UT151 HE-6300 SERIES HUMIDITY SENSOR

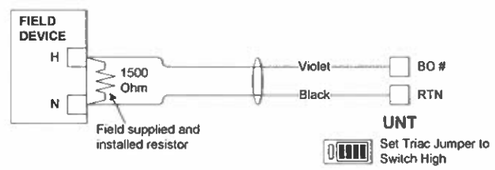


DETAIL UT301 BINARY INPUT (DRY CONTACT)



DETAIL UT502 24 VAC BINARY OUTPUT to LOW CURRENT DRAW DEVICE (Switch High)

(Use when current draw of the Field Device is less than 50 mA)



Drawing Title
UNT-46 Point Schedule

REFERENCE DRAWING	NO	REVISION-LOCATION	ECN	DATE	BY

Sales Engineer	Project Manager	Application Engineer	DRAWN BY	DRAWN DATE	APPROVED BY	APPROVED DATE

Project Title
Scoreboard Control Rm

Branch Information

Johnson Controls

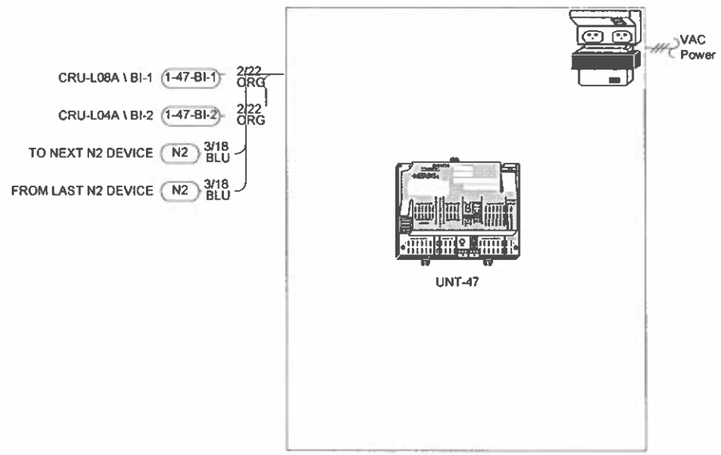
CONTRACT NUMBER
0011-0001

DRAWING NUMBER
1.3

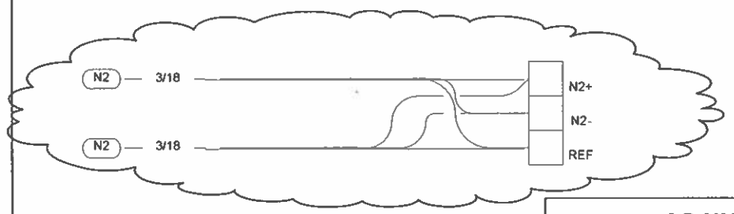
BILL OF MATERIALS

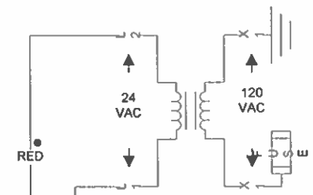
Designation	Qty	Part Number	Description
UNT-47	1	AS-UNT111-1	UNTIARY CONTROLLER W/ 6BO's 4BI's

ALL OTHER FIELD DEVICES/SENSORS EXISTING



Drawing Title: UNT-47 Panel Detail						
REFERENCE DRAWING	NO	REVISION LOCATION		ECN	DATE	BY
Sales Engineer / Project Manager / Application Engineer		DRAWN BY / DATE	APPROVED BY / DATE			
Project Title: Scoreboard Control Rm	Johnson Controls	Branch Information		CONTRACT NUMBER: 0011-0001		
				DRAWING NUMBER: 2.1		



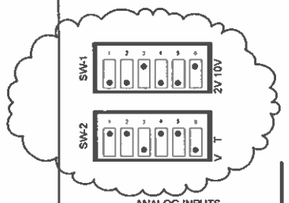


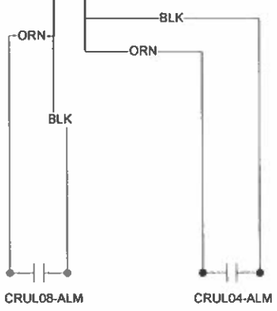
AS-UNT111-1

6.5 x 6.4 x 2.2 in. H x W x D

N2 ADDRESS

SET SWITCHES AS SHOWN.





ZONE THERMOSTAT
ZN-T, ZNT-SP

JACK ON CONTROLLER & TE - 8 PIN RJ48	JACK ON TE 6 PIN RJ12
1 AI3 (HEATING)	NOT USED
2 AI2 (CLG, WMR/CLR)	24VAC
3 AI1 (SENSOR)	24VAC/ZnBs COM
4 AI1 (SENSOR COM)	NOT USED
5 24VAC	ZONE BUS
6 24VAC/ZnBs COM	NOT USED
7 AI2/3 COMMON	
8 ZONE BUS	

Drawing Title
UNT-47 Wiring Details

(2 of 2)

REFERENCE DRAWING	NO	REVISION-LOCATION	ECN	DATE	BY

Sales Engineer	Project Manager	Application Engineer	DRAWN BY	DRAWN DATE	APPROVED BY	APPROVED DATE

Project Title
Scoreboard Control Rm

Johnson Controls

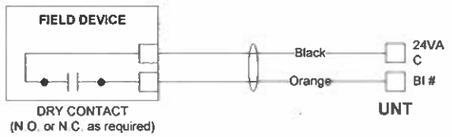
Branch Information

CONTRACT NUMBER
0011-0001

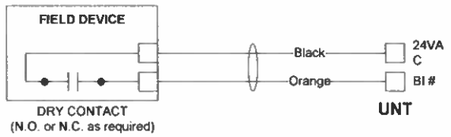
DRAWING NUMBER
2.2

Electrician/Fitter	Point Information				Controller Information							Panel Information						Intermediate Device			Field Device					
Tag	Point Type	System Name	Object Name	Expanded ID	Controller Details	Trunk Type	Trunk Nbr	Trunk Addr.	Cable Destination Bay/Terminal	Module Type	Termination Out	Panel	Panel Location	Slot Number	Reference Drawing	Cable Number	Wiring /Tubing	Termination In	Device	Termination Out	Location	Wiring /Tubing	Termination In	Device	Location	Ref Detail Shape	Comment
		UNT-47			UNT 111							EN-1	Mech Room		M12												
		UNT-47			UNT 111	N2	1	47				EN-1	Mech Room	0	M12												Power to Controller N2 Trunk
	AI-1	UNT-47			UNT 111	N2	1	47	AI-1			EN-1	Mech Room	0	M12	1-47-AI-1											
	AI-2	UNT-47			UNT 111	N2	1	47	AI-2			EN-1	Mech Room	0	M12	1-47-AI-2											
	AI-3	UNT-47			UNT 111	N2	1	47	AI-3			EN-1	Mech Room	0	M12	1-47-AI-3											
	AI-4	UNT-47			UNT 111	N2	1	47	AI-4			EN-1	Mech Room	0	M12	1-47-AI-4											
	AI-5	UNT-47			UNT 111	N2	1	47	AI-5			EN-1	Mech Room	0	M12	1-47-AI-5											
	AI-6	UNT-47			UNT 111	N2	1	47	AI-6			EN-1	Mech Room	0	M12	1-47-AI-6											
	BI-1	UNT-47	CRU-L08A	CRU-L08 Alarm	UNT 111	N2	1	47	BI-1		BI1 24VAC	EN-1	Mech Room	0	M12	1-47-BI-1						2/22	See wiring detail	Dry Contact		U301	
	BI-2	UNT-47	CRU-L04A	CRU-L04 Alarm	UNT 111	N2	1	47	BI-2		BI2 24VAC	EN-1	Mech Room	0	M12	1-47-BI-2						2/22	See wiring detail	Dry Contact		U301	
	BI-3	UNT-47			UNT 111	N2	1	47	BI-3			EN-1	Mech Room	0	M12	1-47-BI-3											
	BI-4	UNT-47			UNT 111	N2	1	47	BI-4			EN-1	Mech Room	0	M12	1-47-BI-4											
	BO-1	UNT-47			UNT 111	N2	1	47	BO-1			EN-1	Mech Room	0	M12	1-47-BO-1											
	BO-2	UNT-47			UNT 111	N2	1	47	BO-2			EN-1	Mech Room	0	M12	1-47-BO-2											
	BO-3	UNT-47			UNT 111	N2	1	47	BO-3			EN-1	Mech Room	0	M12	1-47-BO-3											
	BO-4	UNT-47			UNT 111	N2	1	47	BO-4			EN-1	Mech Room	0	M12	1-47-BO-4											
	BO-5	UNT-47			UNT 111	N2	1	47	BO-5			EN-1	Mech Room	0	M12	1-47-BO-5											
	BO-6	UNT-47			UNT 111	N2	1	47	BO-6			EN-1	Mech Room	0	M12	1-47-BO-6											
	AO-1	UNT-47			UNT 111	N2	1	47	AO-1			EN-1	Mech Room	0	M12	1-47-AO-1											
	AO-2	UNT-47			UNT 111	N2	1	47	AO-2			EN-1	Mech Room	0	M12	1-47-AO-2											

DETAIL U301 BINARY INPUT (DRY CONTACT)



DETAIL U301 BINARY INPUT (DRY CONTACT)



Drawing Title
UNT-47 Point Schedule

REFERENCE DRAWING	NO	REVISION-LOCATION	ECN	DATE	BY

Sales Engineer | Project Manager | Application Engineer | DRAWN BY DATE | APPROVED BY DATE

Project Title
Scoreboard Control Rm

Branch Information

Johnson Controls

CONTRACT NUMBER
0011-0001

DRAWING NUMBER
2.3

-METASYS®

Unitary Controller (UNT)

The Metasys® Unitary (UNT) Controller is an electronic device for digital control of packaged air handling units, unit ventilators, fan coils, heat pumps, and other terminal units serving a single zone or room. It can also be configured as a generic input/output device for basic point monitoring applications when used within a Metasys Network.

You can easily configure point inputs and outputs and software features to control a wide variety of HVAC equipment applications. You may use the UNT as a standalone controller or connected to the Metasys Network through a Network Control Module (NCM) or Companion™.

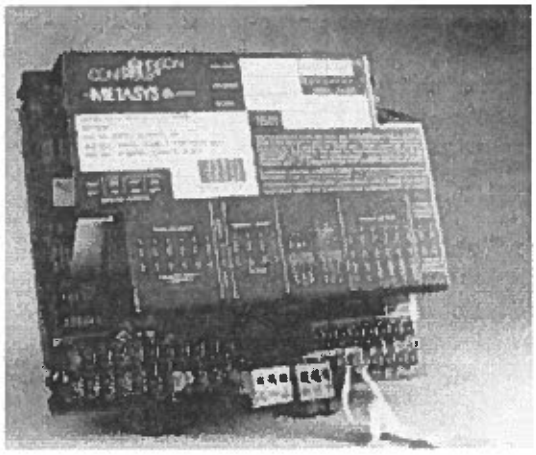


Figure 1: Unitary Controller

Features and Benefits

❑ **Standalone Control**	System reliability
❑ **Network Communications over N2 Bus**	Facility-wide control efficiencies and cost effective sensor sharing
❑ **Built-in Control Program Library**	No programming
❑ **Isolated N2 Circuitry**	More reliable operation
❑ **Removable N2 and 24 VAC Power Plugs**	Allows disconnection of an individual controller without disrupting other controller connections
❑ **Screw Terminals for I/O Connections Available in Some Models**	"Quick Connect" lugs and crimping tool not required
❑ **Available Pre-mounted in Single High EWC Enclosure with 50 VA Transformer**	Easy to mount on any wall Lockable, ready to go

Code No. LIT-635065

Flexible Hardware Packaging

The Unitary Controller is available in different hardware sets to suit environmental and application needs. A list of the controller hardware that is the same is listed below. Following that is a table describing the hardware differences.

Table 1: Unitary Controller Hardware Characteristics--*Similarities*

6 Analog Inputs	RTD temperature elements (1000 ohm nickel, platinum, or silicon) Adjustable 0 to 2K ohm setpoint potentiometers 0 to 5 VDC, 1 to 5 VDC or 0 to 10 VDC transmitters
4 Binary Inputs	(4) 24 VAC input only (24 VAC provided) (1) Momentary pushbutton from zone sensor for temporary occupancy mode (BI 5) BI 4 may be used as an accumulator input for frequencies less than 2 Hz.
Zone Bus (See Table 2 below.)	Removable screw terminal block, LED Indication, 8-pin phone jack on controller
24 VAC Power in Termination	Removable screw terminal block
N2 Bus	Removable screw terminal block, electronically isolated circuitry

Table 2: Unitary Controller Hardware Characteristics--*Differences*

	UNT110-1	**UNT111-1**	**UNT120-1**	**UNT121-1**	**UNT140-1**	**UNT141-1**
Operating Temperature Rating	32 to 140°F (0 to 60°C)	32 to 140°F (0 to 60°C)	-40 to 140°F (-40 to 60°C)	-40 to 140°F (-40 to 60°C)	32 to 140°F (0 to 60°C)	32 to 140°F (0 to 60°C)
Analog Outputs: **0 to 10 VDC @ 10 mA**	None	2	None	2	None	2
Binary Outputs: **24 VAC Triacs @ 0.5 amps or 0.8 amps if total power is limited** **Low or High side common selectable**	8	6	8	6	8	6
Zone Bus (See Table 1 above.)					Additional 6-pin Phone Jack	Additional 6-pin Phone Jack
I/O Terminations	Quick Connects (Spade Lugs)	Quick Connects (Spade Lugs)	Quick Connects (Spade Lugs)	Quick Connects (Spade Lugs)	Fixed Screw Terminal Block	Fixed Screw Terminal Block
Available pre-mounted in EWC10 with 24 VAC 50 VA transformer	UNT110-101	UNT111-101			UNT140-101	UNT141-101

Flexible Hardware Packaging

The Unitary Controller can be configured to match most applications found in today's fast evolving marketplace. The UNT is available in two different versions, differing in their output point configuration. Each of these two versions are available in models with "Quick Connects" (spade lugs) or screw terminations for input/output points. The versions with "Quick Connects" are also available in low temperature models for rooftop applications. This allows you to economically select a controller to match the needed application.

Controller Enclosure Options

The controller mounts easily to any surface using either direct mount or a controller enclosure. The common packaging for the UNT Controller is in the ENC100 or EWC10. The UNT120/121 Controller must be installed in the BZ-1000-7 enclosure unless it is mounted within the enclosed low voltage electrical compartment of the mechanical unit being controlled.

The UNT controller can be purchased pre-mounted in an EWC10 enclosure, including a 50 VA transformer (-101 suffix).

Easy Monitoring and Diagnostics with the Zone Terminal (AS-ZTU100-1)

The Zone Terminal (ZT) is a person/controller interface developed as an easy-to-use controller adjustment and indication device. The ZT is designed for the user who needs a straightforward method to monitor and adjust setpoints in an HVAC zone. The ZT plugs into the TE-6400 Metastat™ or TE-6100-11 or -12 Zone Sensor to communicate with the UNT Controller.

Convenient Configuration Setup

The UNT Controller doesn't need to be programmed in the traditional sense. Instead, the control algorithms and input/output point assignments are configured with the use of the HVAC PRO for Windows™ software tool.

The HVAC PRO for Windows runs on a laptop computer plugged directly into the UNT Controller, or into a jack at the room sensor or M100C Series Motor Actuator. The jack is connected back to the UNT Controller over a 3-wire cable called a Zone Bus. Programs loaded into the UNT Controller are saved in nonvolatile E^2PROM memory, so there is no need to reload software after a loss of power.

A second option allows you to load the configuration from the laptop via the N2 Bus. This option speeds up the initial loading and commissioning process by allowing you to load multiple controllers from one location.

Programming a UNT Controller is a simple matter of responding to a series of "yes-no" and multiple choice questions, and specifying setpoints and other parameters. No previous software programming experience is required.

The UNT Controller has a library of proven control sequences and proportional-integral algorithms that are automatically configured into a total system sequence-of-operation in response to your answers to the questions. Once configured, the UNT Controller's operating parameters, such as setpoints and tuning parameters may be changed from any Metasys operator device.

Metasys Network Configuration

As powerful as the UNT Controller is by itself, your facility benefits even more when UNT Controllers are part of a larger Metasys Network. Each UNT Controller can connect to the Metasys N2 Bus (Figure 2). Either a Network Control Unit or Companion system can be programmed to provide added energy management and supervisory control capabilities, including optimal start, demand limiting, load rolling, runtime totalization, and more.

Metasys Dynamic Data Access™ networking software, available from the Network Control Unit, makes all information from each UNT Controller available throughout the facility. Dynamic Data Access also makes sensor values, operating status, and any other parameter in the UNT Controller available to operators anywhere in your facility.

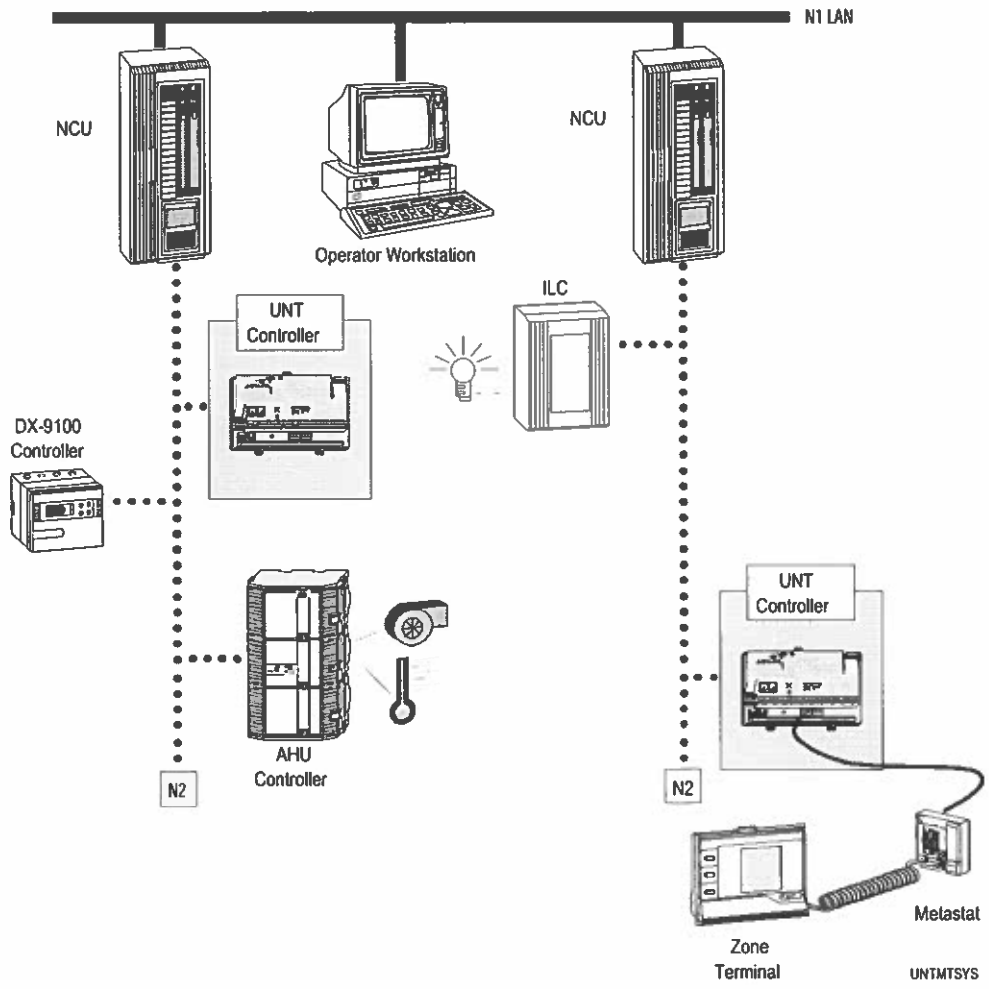


Figure 2: UNT Controller in Metasys Network

Metasys Companion Configuration

Metasys Companion connects to the UNT Controller over an independent N2 Bus (Figure 3). User access is through the Companion System, which implements built-in energy management programs throughout the devices on the bus.

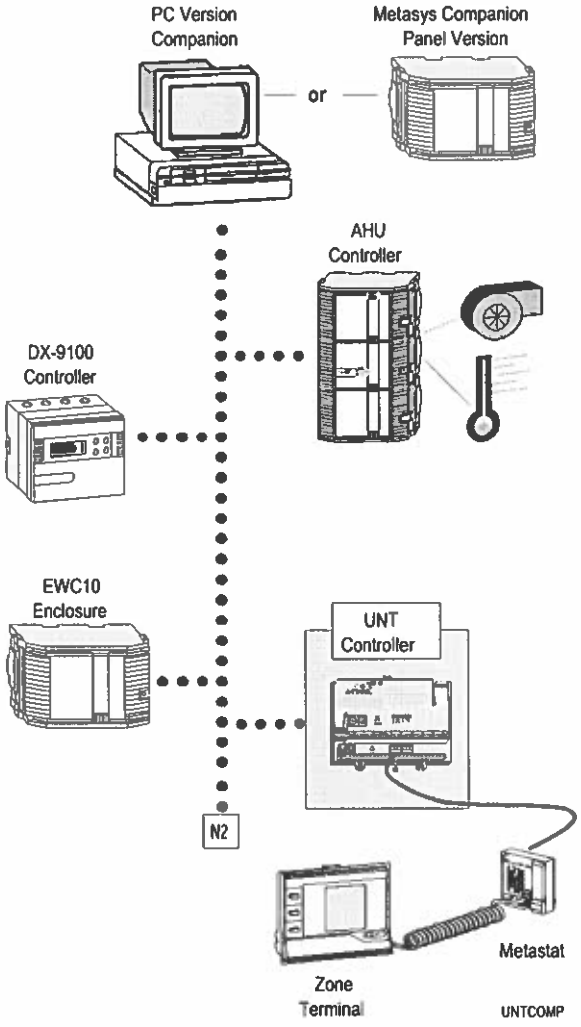


Figure 3: UNT Controller in Companion System

Application Flexibility

The UNT11n and UNT12n Series with "Quick Connects" are packaged for convenient factory mounting by original equipment manufacturers or for field installations where "Quick Connects" are preferred. The new UNT14n is packaged to accommodate field installations using screw terminations. In addition, points unused in the control scheme can be used in supervisory monitoring and control or standalone applications by the Metasys Network.

The UNT Controller offers a variety of zone sensor connection options that let you select the features you--and your occupants--need. The simplest and most economical option is a solid-state sensing element wired directly to the controller. When this option is chosen, all setpoint adjustments are made using the Operator Workstation or Network Terminal on the Metasys Network, or from the Zone Terminal or Companion system.

A second option provides the occupants in the zone the ability to adjust the setpoint to their preference, within a restricted range established by you. The user setpoint can be overridden by you at any time using the operator interface devices or application programs in the Network Control Unit. This allows maximum energy savings while still allowing occupants some control over their environment.

A third option uses an occupancy sensor to automatically or manually set back or set up zone temperatures when no one is around. This can further increase energy savings in individual offices or conference rooms.

In addition, using the HVAC PRO for Windows software, you can access sideloops that are separate from the main control logic. See your *HVAC PRO for Windows User's Manual* for further explanation of this powerful feature.

Other options provide for control of room lighting as well as temperature, turning lights on or off based on the occupancy sensor, or scheduled commands issued from the network. A Boost mode switch allows an occupant to temporarily provide extra cooling or heating, which is useful for conference rooms that experience large heat load fluctuations.

You can choose to select a Temp Occ mode instead of the Boost mode. Temp Occ mode switch allows an occupant to put the controller into an unscheduled occupied mode for a specified period of time (i.e., go occupied for three hours when the switch is pressed.)

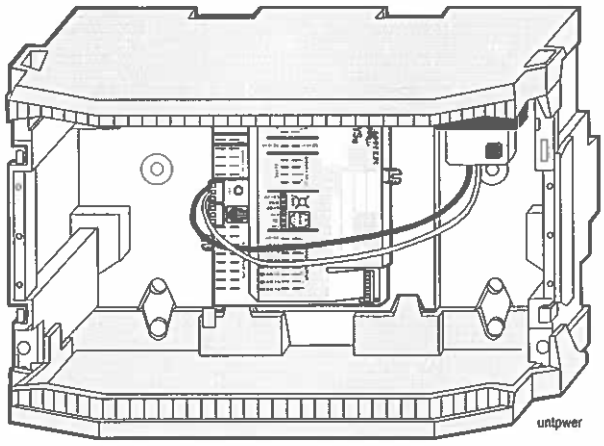


Figure 4: AS-UNT1nn-101 Enclosure with 50 VA Transformer

Table 3: Applications and Options

Application Classifications	Software Options
Primary Equipment Types	Unit vents — ASHRAE Cycle 1 ASHRAE Cycle 2 ASHRAE Cycle 3 ASHRAE Cycle W Heat pumps — Water to air Air to air Packaged rooftops Fan coils Generic point multiplexer
Primary Control Strategies	Room/zone control
Economizer Changeover Strategies	Dry bulb Outside air enthalpy Differential outside/return air temperature Outside air and return air enthalpy comparison Binary input from external economizer Supervisory network command
Mixed Air Control Strategies	Proportional output to OA/RA damper actuator Binary output to economizer actuator Zone bus output to OA/RA damper actuator
Heating Configuration	Modulated single coil Staged electric heat (3-stage max.) Modulated common heating/cooling coil Reversing valve logic for heat pumps Incremental
Cooling Configuration	Modulated single coil Staged DX (2-stage max.) Modulated common heating/cooling coil Reversing valve logic for heat pumps Incremental
Fan Start/Stop	Continuous operation Cycled with call for heating/cooling
Lighting Control	On and off outputs to lighting relay in conjunction with Occ/Unocc mode
Unoccupied Control	Setup and setback Morning warmup and cooldown

Conclusion

As either a member of the fully integrated system, or as a standalone controller, the UNT Controller represents a way to optimize the operation of your HVAC equipment.

The UNT Controller combines the best of ease-of-setup and operation, flexibility of application, and precise control for comfort and energy management.

Specifications

Product	**Separate Controllers** AS-UNT110-1 / AS-UNT111-1 AS-UNT120-1 / AS-UNT121-1 AS-UNT140-1 / AS-UNT141-1 **Pre-mounted Controllers (in an EWC10 enclosure with 50 VA transformer)** AS-UNT110-101 / AS-UNT111-101 AS-UNT140-101 / AS-UNT141-101
Ambient Operating Conditions	32 to 140°F (0 to 60°C) and -40 to 140°F (-40 to 60°C) for UNT12n-1 10 to 90% RH
Dimensions (H x W x D)	6.5 in. x 6.4 in. x 2.2 in. (165 x 163 x 56 mm) without enclosure 9 in. x 16 in. x 7.5 in. (229 x 406 x 191 mm) with AS-ENC100 enclosure
Ambient Storage Conditions	-40 to 158°F (-40 to 70°C) 10 to 90% RH
Power Requirements	24 VAC, 50/60 Hz at 40 VA (per typical system)
Shipping Weight	1.4 lb (0.64 kg)
Standards Compliance	IEEE 472 IEEE 518 IEEE 587 Category A FCC Part 15, Subpart J, Class A UL 916 UL 864
Agency Listings	UL Listed and CSA Certified as part of the Metasys Network.
Accessories (Order Separately)	
Power Supply	(AS-XFR100) or (EN-EWC15-0)
Zone Terminal	(AS-ZTU100-1)
Enclosure Kit	(AS-ENC100-0) or (EN-EWC10-0) or (EN-EWC15-0) or (BZ1000-7)
HVAC PRO Interface	(AS-CBLPRO-2)
N2 Plugs/Power Plugs Replacement Kit	(AS-TBKIT-0) (Kit consists of five of each plug type.)
Zone Sensors	(TE-6400 Series)
Converter	(MM-CVT101-0)

The performance specifications are nominal and conform to acceptable industry standards. For application at conditions beyond these specifications, consult the local Johnson Controls office. Johnson Controls, Inc. shall not be liable for damages resulting from misapplication or misuse of its products.

JOHNSON CONTROLS

Controls Group
507 E. Michigan Street
P.O. Box 423
Milwaukee, WI 53201

FAN 635
Metasys Network Sales Resource Manual
Printed in U.S.A.

0010-0001
Club Level Suites
FCU Control Upgrades

DRAWING NUMBER	DRAWING TITLE
TITLE	Title Page
PAGE 2	NAE Reference Drawing
PAGE 3	NAE Panel Detail Drawing
PAGE 4	Wireless Field Bus Riser (1 of 2)
PAGE 5	Wireless Field Bus Riser (2 of 2)
1.1	SUITE-27 Flow
1.2A	SUITE-27 Wiring Detail - Existing
1.2B	SUITE-27 Wiring Detail - New
1.3	SUITE-27 Sequence of Operations
1.4A	SUITE-27 Point Schedule (1 of 2)
1.4B	SUITE-27 Point Schedule (2 of 2)
2.1	UH & Exterior TV Control
RS-1	Room Schedule

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Creating a better climate for business.

- [x] Environmental Control System
- [x] Facility Management System
- [ ] Air and Water System Balancing
- [ ] Fire Management System
- [ ] Security System
- [ ] Lighting Services
- [ ] Instrumentation System Installation
- [ ] Building Operations Management
- [ ] Energy Conservation Control
- [ ] Training Programs
- [ ] Performance Contracting
- [ ] Planned Service Agreements

Air Conditioning
Heating
Diagnostic Services
Coil Cleaning
Refrigeration
Automatic Temperature Controls
Facility Management Systems
Fire Management
Security Management
Building Operations and Management
Water Treatment
Electrical Equipment
Emergency Generator / Lighting Equipment
Industrial Controls / Recording / Indication Equipment

PROJECT TITLE
MILLER PARK
CLUB LEVEL SUITES
FCU CONTROL UPGRADES

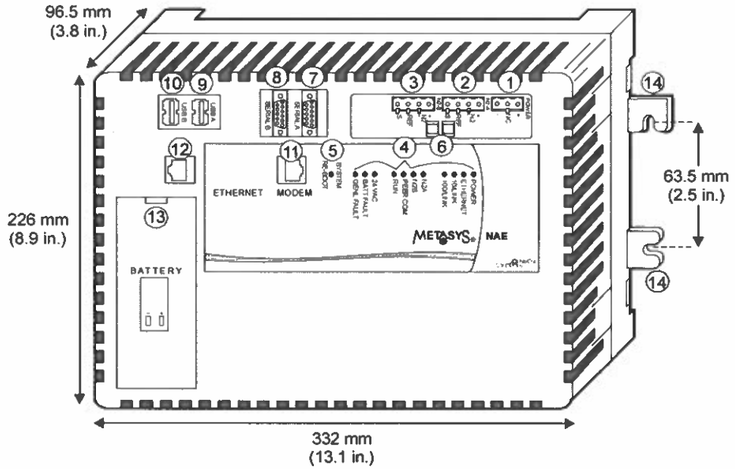
ARCHITECT	ENGINEER
Phone:	Phone:
MECHANICAL CONTRACTOR	**ELECTRICAL CONTRACTOR**
Phone:	Phone:

REFERENCE DRAWING	NO	REVISION LOCATION	ECN	DATE	BY

Johnson Controls

Branch Information
Phone:
Fax:

SALES ENGINEER	PROJECT MANAGER	APPLICATION ENGINEER	DATE	CONTRACT NUMBER
	KDP	KDP	2/2010	0010-0001



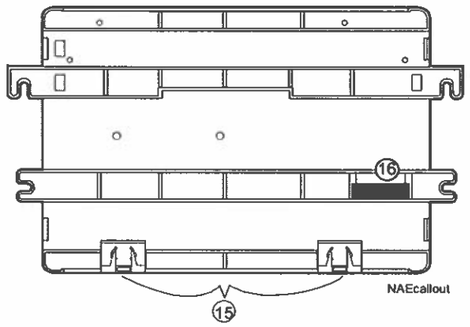
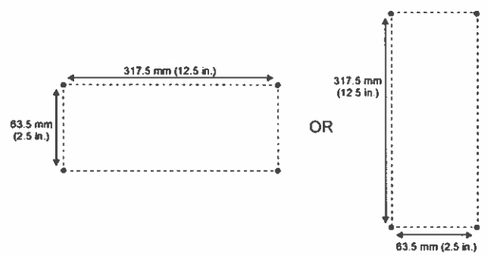
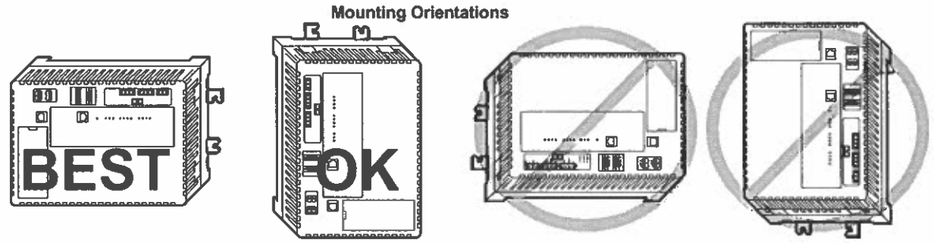


Table 1: NAE/NIE Callouts			
Callout	Description	Callout	Description
1	Pow er Termination	9	USB A connector
2	N2 A Bus termination	10	USB B connector
3	N2 B Bus termination	11	Modem RJ-11 connector
4	Light-Emitting Diodes (LEDs)	12	Ethernet RJ-45 connector
5	System Re-boot sw itch	13	Battery hatch
6	N2 End-of-Line (EOL) sw itches	14	Mounting feet (2 of 4)
7	Serial A RS-232 connector	15	DIN rail clips (2 of 2)
8	Serial B RS-232 connector	16	Battery Strap

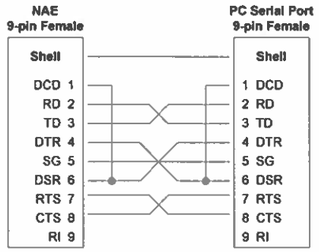


Mounting Hole Spacing

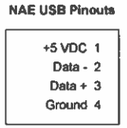
Mounting Orientations



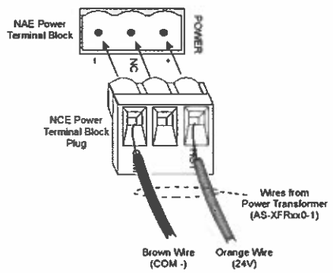
PC Serial Ports (SER A, SER B)



USB Ports (USB A and USB B)



Ethernet Port



24VAC Power Connection

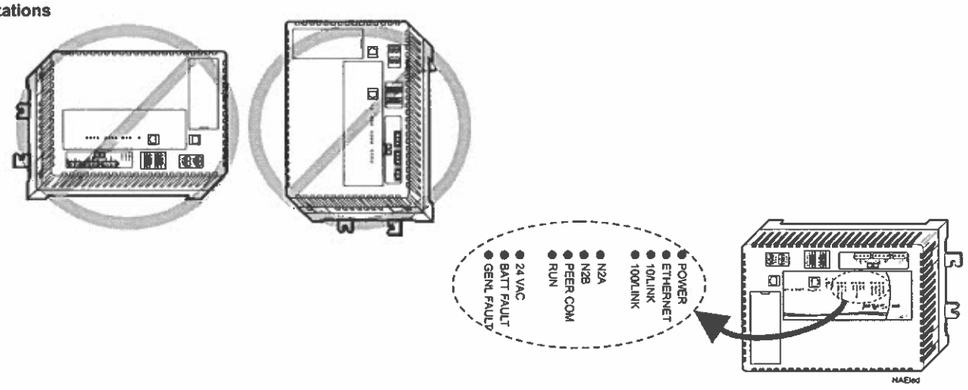
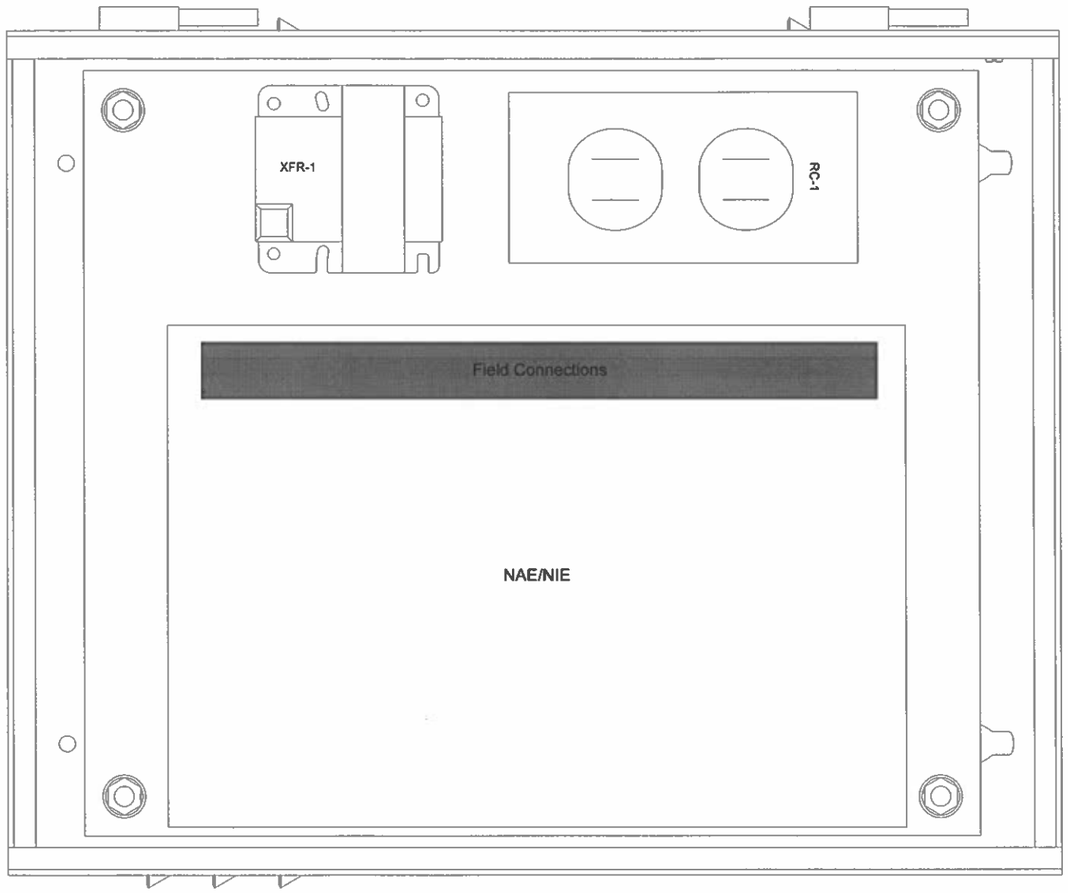


Table 4: NAE / NIE LEDs

LED	Normal	Descriptions / Other Conditions
POWER (GREEN)	On Steady	On Steady = Unit is getting power from either the battery or 24 VAC power. Also see the 24 VAC LED. Off Steady = Unit is shut down.
ETHERNET (GREEN)	Flicker	Flicker = Data is transferring on the Ethernet connection. Ethernet traffic is general traffic (may not be for the NAE / NIE). Off Steady = No Ethernet traffic, probably indicates a dead Ethernet network or bad Ethernet connection.
10/LINK (GREEN)	On Steady	On Steady = Ethernet connection is established at 10 Mb/sec.
100/LINK (GREEN)	On Steady	On Steady = Ethernet connection is established at 100 Mb/sec.
N2 A (GREEN) (NAE Only)	Flicker	Flicker = N2 A port is transmitting or receiving data. Flickers are generally in synch with data transmission, but should not be used to indicate specific transmission times. Off Steady = No traffic.
N2 B (GREEN) (NAE Only)	Flicker	Flicker = N2 B port is transmitting or receiving data. Flickers are generally in synch with data transmission, but should not be used to indicate specific transmission times. Off Steady = No traffic.
PEER COMM (GREEN)	Varies (see next column)	Flicker = Data traffic between NAE / NIE devices. For an NAE / NIE that is not a Site Director, this LED indicates regular heartbeat communications with the Site Director. For a Site Director NAE / NIE, flashes are more frequent and indicate heartbeat communications from all other NAE / NIE devices on the site.
Run	On Steady	On Steady = NAE / NIE software is running On 1 second, Off 1 second = NAE / NIE software is in startup mode. On 4 seconds, Off 1 second = NAE / NIE is in diagnostics mode. On 0.5 seconds, Off 0.5 seconds = NAE / NIE software is shutting down. Off Steady = Operating system is shutting down or software is not running.
24 VAC (GREEN)	On Steady	On Steady = 24 VAC power present. Off Steady = Loss of 24 VAC power. In the Off Steady condition, the NAE / NIE can be running on battery power. Also se the POWER LED.
BATT FAULT (RED)	Off Steady	On Steady = Battery fault. Replace the battery.
GENL FAULT (RED)	Off Steady	On Steady = General Fault. Fault conditions include excessive Central Processing Unit (CPU) flash, or memory use, or excessive CPU or Printed Wire Board (PWB) temperature. In normal operation, the GENL FAULT LED stays on steady for the first half of the startup sequence.

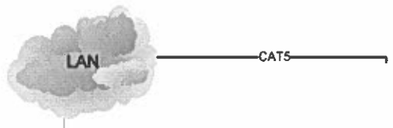
REVISION INFORMATION	Drawing Title: Visio NAE Reference Drawing								
NUMBER									
DATE: 02/02/12	REFERENCE DRAWING		NO	REVISION-LOCATION			ECN	DATE	BY
TIME: 12:03 PM	Sales Engineer	Project Manager	Application Engineer	DRAWN BY	DRAWN DATE	APPROVED BY	APPROVED DATE		
File Name: NAE Reference Drawing001.vsd	Project Title: Club Suite Controls		Johnson Controls	Branch Information		CONTRACT NUMBER: 0010-0001			
						DRAWING NUMBER: PAGE 2			



Drawing Title: **Visio Panel Detail Drawing**								
	REFERENCE DRAWING		NO	REVISION-LOCATION		ECN	DATE	BY
	Sales Engineer	Project Manager	Application Engineer	DRAWN BY	DRAWN DATE	APPROVED BY	APPROVED DATE	
Project Title: **Club Suite Controls**	Johnson Controls			Branch Information		CONTRACT NUMBER: **0010-0001**		
						DRAWING NUMBER: **PAGE 3**		

BILL OF MATERIALS

Designation	Qty	Part Number	Description
S1-NAE06	1	MS-NAE5510-1	
ZFR1810 COORDINATOR	3	MS-ZFR1810-0	SUPERVISORY WIRELESS INTERFACE MODULE
ZFR1811 ROUTER	53	MS-ZFR1811-0	WIRELESS ZIGBEE FIELD BUS ROUTER
REPEATER	4	MS-ZFRRPT-0	ZFR REPEATER POWER SUPPLY



S!-NAE06
IP: 192.168.55.75
Subnet: 255.255.255.0

22/3

22/3

FEU & REPEATER WIRELESS ROUTER SETTINGS

DIP SWITCH SETTINGS

ZFR1811 ROUTER
PAN Offset = 1
(Typical of 18)
SUITES 27-36
PARTY SUITES
REPEATERS (2)

FEU & REPEATER WIRELESS ROUTER SETTINGS

DIP SWITCH SETTINGS

ZFR1811 ROUTER
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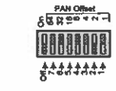
(Typical of 17)
SUITES 37-52
REPEATERS (1)

FEU & REPEATER WIRELESS ROUTER SETTINGS

DIP SWITCH SETTINGS



ZFR1811 ROUTER
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(Typical of 18)
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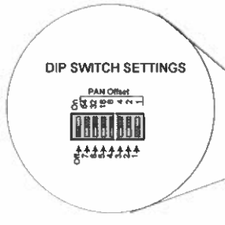
REPEATERS (1)

LOCATED IN SUITE 31

DIP SWITCH SETTINGS



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COORDINATOR
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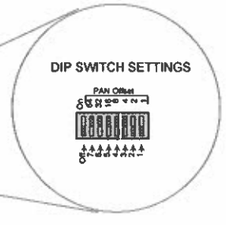
MS/TP Address = 121

LOCATED IN SUITE 45

ZFR1810-0-3
COORDINATOR
PAN Offset = 3
MS/TP Address = 123

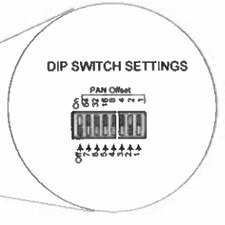
DIP SWITCH SETTINGS



LOCATED IN SUITE 58

ZFR1810-0-2
COORDINATOR
PAN Offset = 2
MS/TP Address = 122

DIP SWITCH SETTINGS



Drawing Title
Wireless Field Bus Riser (1 of 2)

REFERENCE DRAWING	NO	REVISION LOCATION	ECN	DATE	BY

Sales Engineer	Project Manager	Application Engineer	DRAWN BY	DRAWN DATE	APPROVED BY	APPROVED DATE

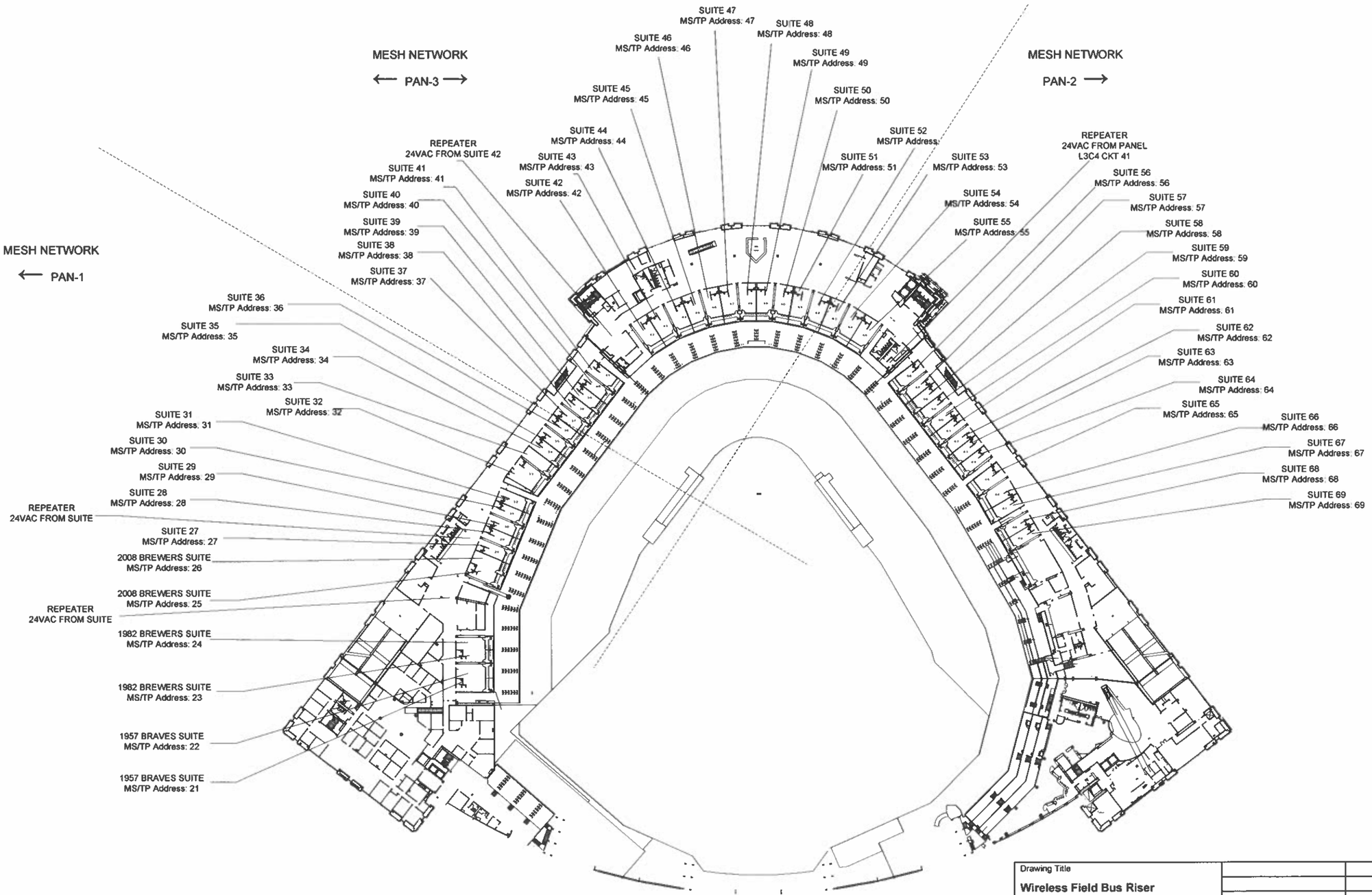
Project Title
Club Suite Controls

Johnson Controls

Branch Information

CONTRACT NUMBER
0010-0001

DRAWING NUMBER
PAGE 4



Drawing Title

Wireless Field Bus Riser (2 of 2)

REFERENCE DRAWING	NO	REVISION/LOCATION	ECN	DATE	BY

Sales Engineer	Project Manager	Application Engineer	DRAWN BY	DRAWN DATE	APPROVED BY	APPROVED DATE

Project Title

Club Suite Controls

Branch Information

Johnson Controls

CONTRACT NUMBER

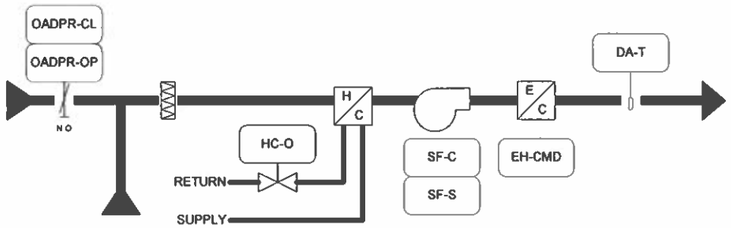
0010-0001

DRAWING NUMBER

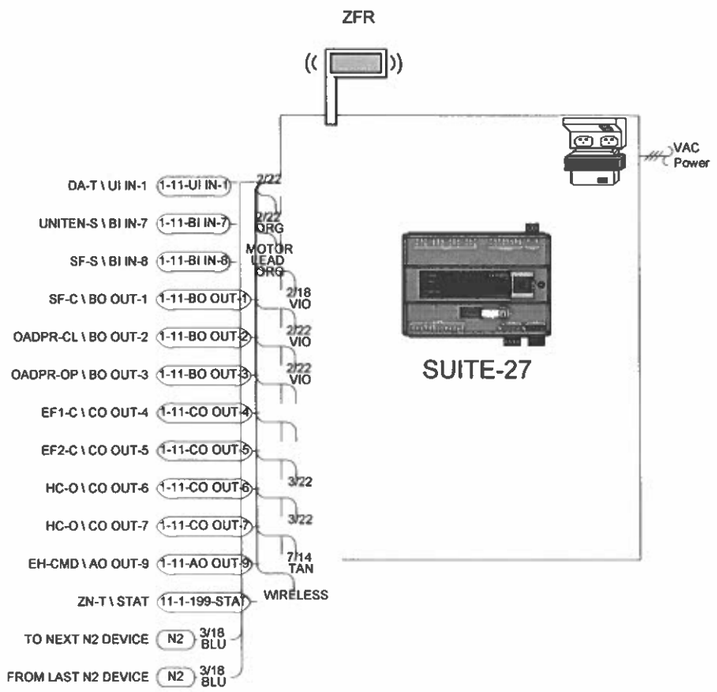
PAGE 5

BILL OF MATERIALS

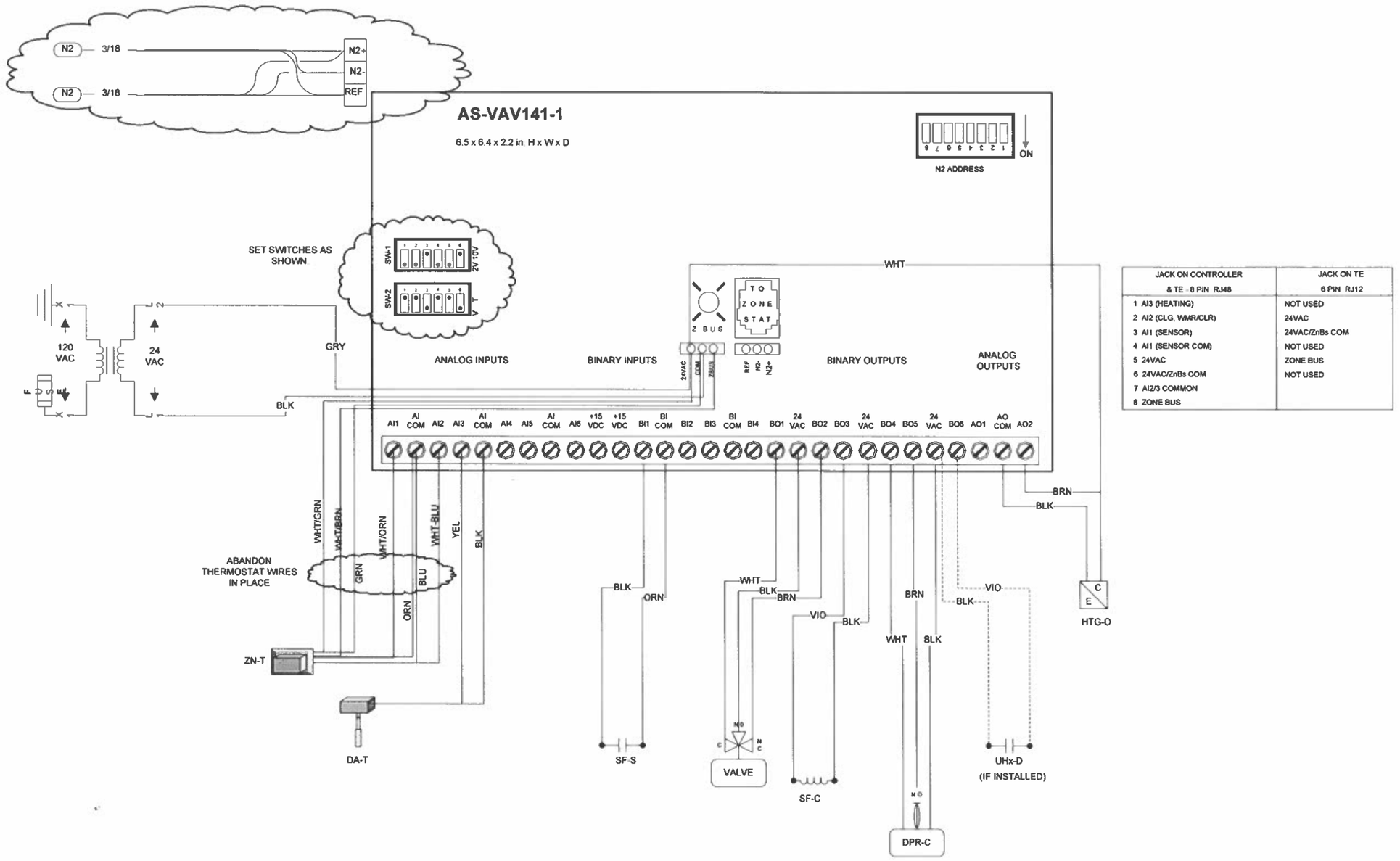
Designation	Qty	Part Number	Description
SUITE-27	18	MS-FEC2611-0	
ZFR	18	MS-ZFR1811-0	
ZN-T	18	WRZ-TTR-0000	



ZN-T



Drawing Title: **SUITE-27 Flow Panel Detail (Typical of 49)**						
REFERENCE DRAWING	NO.	REVISION-LOCATION		ECN	DATE	BY
Sales Engineer / Project Manager / Application Engineer		DRAWN BY / DATE	APPROVED BY / DATE			
Project Title: **Club Suite Controls**	Johnson Controls	Branch Information	CONTRACT NUMBER: **0010-0001**			
			DRAWING NUMBER: **1.1**			



JACK ON CONTROLLER & TE - 8 PIN RJ48	JACK ON TE 6 PIN RJ12
1 AI3 (HEATING)	NOT USED
2 AI2 (CLG, WMR/CLR)	24VAC
3 AI1 (SENSOR)	24VAC/ZnBs COM
4 AI1 (SENSOR COM)	NOT USED
5 24VAC	ZONE BUS
6 24VAC/ZnBs COM	NOT USED
7 AI2/3 COMMON	
8 ZONE BUS	

Drawing Title
SUITE-27 Wiring Details - Existing (Typical of 49) (1 of 2)

REFERENCE DRAWING	NO	REVISION-LOCATION	ECN	DATE	BY

Sales Engineer | Project Manager | Application Engineer | DRAWN BY / DATE | APPROVED BY / DATE

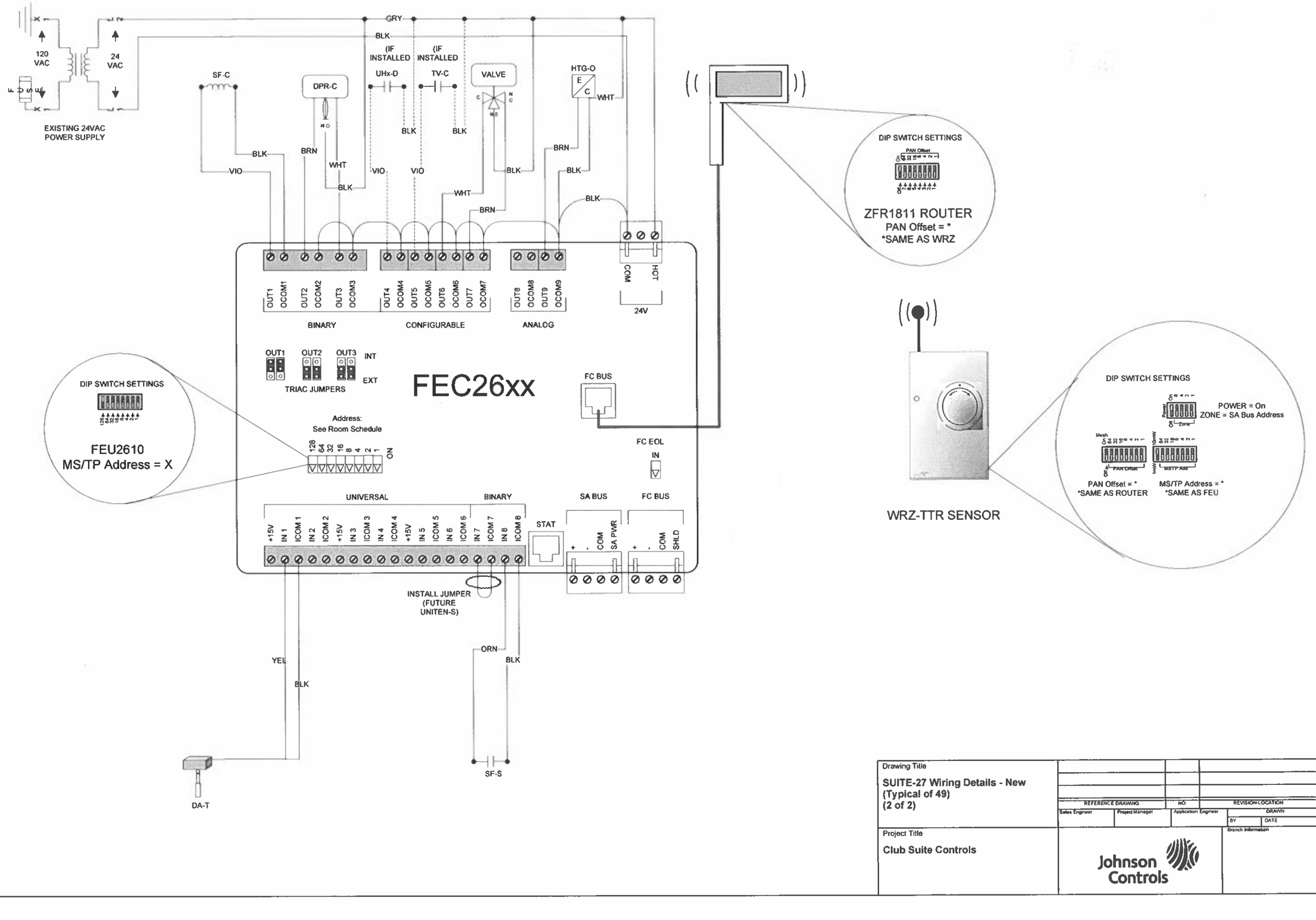
Project Title
Club Suite Controls

Branch Information

Johnson Controls

CONTRACT NUMBER
0010-0001

DRAWING NUMBER
1.2A



Drawing Title								
SUITE-27 Wiring Details - New (Typical of 49) (2 of 2)								
	REFERENCE DRAWING	NO	REVISION LOCATION		ECN	DATE	BY	
	Sales Engineer / Project Manager	Application Engineer	DRAWN BY / DATE	APPROVED BY / DATE				
Project Title	Branch Information		CONTRACT NUMBER					
Club Suite Controls	Johnson Controls		0010-0001					
			DRAWING NUMBER					
			1.2B					

SEQUENCE OF OPERATIONS

Upon a call for Occupied Mode, the outside air damper will move to the open position and the supply fan will be energized.

Operation of the fan coil heating/cooling valve is determined by the Summer-Winter Switchover point which is commanded through the BAS.

During Summer mode, chilled water is supplied to the coil, and the valve will modulate open to maintain the zone temperature setpoint. If heating is required, the two-stage electric duct heater will energize to maintain the electric heating zone temperature setpoint.

During Winter mode, hot water is supplied to the coil, and the valve will modulate open to maintain the zone temperature setpoint.

During the Unoccupied Mode, the supply fan and heating/cooling valve will operate intermittently to maintain a minimum space temperature of 45° F, and a maximum space temperature of 85° F.

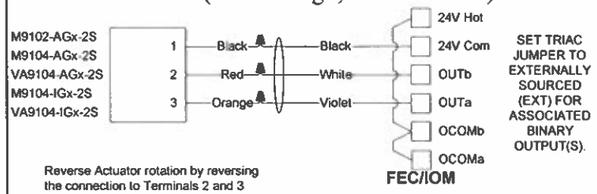
Drawing Title **Sequence of Operations**							
	REFERENCE DRAWING		NO	REVISION LOCATION	ECN	DATE	BY
	Sales Engineer	Project Manager	Application Engineer	DRAWN BY / DATE		APPROVED BY / DATE	
Project Title **Club Suite Controls**	Johnson Controls		Branch Information	CONTRACT NUMBER **0010-0001** DRAWING NUMBER **1.3**			

Electrician/Fitter	Point Information				Controller Information							Panel Information						Intermediate Device				Field Device					
Tag	Point Type	System Name	Object Name	Expanded ID	Controller Details	Trunk Type	Trunk Nbr	Trunk Addr.	Cable Destination Bay/Terminal	Module Type	Termination Out	Panel	Panel Location	Slot Number	Reference Drawing	Cable Number	Wiring /Tubing	Termination In	Device	Termination Out	Location	Wiring /Tubing	Termination In	Device	Location	Ref Detail Shape	Comment
		SUITE-27			FEC 26xx	MS/TP	1	27				EN-1	SUITE-27	0	M12												BacNet FC Bus
	UI IN-1	SUITE-27	DA-T	Discharge Air Temperature	FEC 26xx	MS/TP	1	27	UI IN-1		IN1, ICOM1	EN-1	SUITE-27	0	M12	1-27-UI IN-1						2/22	2-Wire	TE		F131	
	UI IN-2	SUITE-27			FEC 26xx	MS/TP	1	27	UI IN-2			EN-1	SUITE-27	0	M12	1-27-UI IN-2											
	UI IN-3	SUITE-27			FEC 26xx	MS/TP	1	27	UI IN-3			EN-1	SUITE-27	0	M12	1-27-UI IN-3											
	UI IN-4	SUITE-27			FEC 26xx	MS/TP	1	27	UI IN-4			EN-1	SUITE-27	0	M12	1-27-UI IN-4											
	UI IN-5	SUITE-27			FEC 26xx	MS/TP	1	27	UI IN-5			EN-1	SUITE-27	0	M12	1-27-UI IN-5											
	UI IN-6	SUITE-27			FEC 26xx	MS/TP	1	27	UI IN-6			EN-1	SUITE-27	0	M12	1-27-UI IN-6											
	BI IN-7	SUITE-27	UNITEN-S	Unit Enable Toggle Switch	FEC 26xx	MS/TP	1	27	BI IN-7		IN7, ICOM7	EN-1	SUITE-27	0	M12	1-27-BI IN-7						2/22	See wiring detail	Dry Contact		F301	
	BI IN-8	SUITE-27	SF-S	Supply Fan Status	FEC 26xx	MS/TP	1	27	BI IN-8		IN8, ICOM8	EN-1	SUITE-27	0	M12	1-27-BI IN-8	2/22	OUT, COM	Current Relay	Motor Lead		Motor Lead	See wiring detail	Motor Status (Contact)		F301	
	BO OUT-1	SUITE-27	SF-C	Supply Fan Command	FEC 26xx	MS/TP	1	27	BO OUT-1		OUT1, OCOM1	EN-1	SUITE-27	0	M12	1-27-BO OUT-1						2/18	See wiring detail	24VAC OUT (Sw Low, INT Source)		F701	
	BO OUT-2	SUITE-27	OADPR-CL	Outdoor Air Damper Comman	FEC 26xx	MS/TP	1	27	BO OUT-2		OUT-a OUT-b,24V COM	EN-1	SUITE-27	0	M12	1-27-BO OUT-2						3/22	ORG, RED, BLK	M910x-AGx-2S (Incr) (Sw Hi, EXT Sou		F559	
	BO OUT-3	SUITE-27	OADPR-OP	Outdoor Air Damper Comman	FEC 26xx	MS/TP	1	27	BO OUT-3		OUT-a,OUT-b,24V COM	EN-1	SUITE-27	0	M12	1-27-BO OUT-3						3/22	ORG, RED, BLK	M910x-AGx-2S (Incr) (Sw Hi, EXT Sou		F559	
	CO OUT-4	SUITE-27	UHx-D	Unit Heater Disable	FEC 26xx	MS/TP	1	27	CO OUT-4		OUT4, 24V COM	EN-1	SUITE-27	0	M12	1-27-CO OUT2/22		COIL (Wh/Yel,Wh/Blue)	RIB Relay	COM, NO (Yel, Org)		2/14	See wiring detail	Control Panel (NO) (Sw Hi, EXT Sourc		F902	
	CO OUT-5	SUITE-27	TV-C	Ext Suite TV Command	FEC 26xx	MS/TP	1	27	CO OUT-5		OUT5, 24V COM	EN-1	SUITE-27	0	M12	1-27-CO OUT2/22		COIL (Wh/Yel,Wh/Blue)	RIB Relay	COM, NO (Yel, Org)		2/14	See wiring detail	Control Panel (NO) (Sw Hi, EXT Sourc		F902	
	CO OUT-6	SUITE-27	HC-O	Heating/Cooling Output	FEC 26xx	MS/TP	1	27	CO OUT-6		OUT6, 24V COM	EN-1	SUITE-27	0	M12	1-27-CO OUT-6						2/22	White, White	VA-7010 (On-Off) (Sw Hi, EXT Source		F992	
	CO OUT-7	SUITE-27	HC-O	Heating/Cooling Output	FEC 26xx	MS/TP	1	27	CO OUT-7		OUT7, 24V COM	EN-1	SUITE-27	0	M12	1-27-CO OUT-7						2/22	White, White	VA-7010 (On-Off) (Sw Hi, EXT Source		F992	
	AO OUT-8	SUITE-27			FEC 26xx	MS/TP	1	27	AO OUT-8			EN-1	SUITE-27	0	M12	1-27-AO OUT-8											
	AO OUT-9	SUITE-27	EH-CMD	Sideloop Output	FEC 26xx	MS/TP	1	27	AO OUT-9		OUT9, OCOM9,24V HOT	EN-1	SUITE-27	0	M12	1-27-AO OUT-9		SIG IN, COM, 24V	Sequencer	See Detail		7/14	See wiring detail	Heating Sequencer (Vdc)		F1059	
		SUITE-27			NET STAT							EN-1	SUITE-27		M12												
		SUITE-27			NET STAT	SA Bus	1	199				EN-1	SUITE-27	0	M12												BacNet SA Bus
	STAT	SUITE-27	ZN-T	Zone Temperature	NET STAT	SA Bus	1	199	STAT		Wireless	EN-1	SUITE-27	0	M12	27-1-199-STAT						Wireless		WRZ-TTx0000 (ZONE Add Switch=1)		NS107	

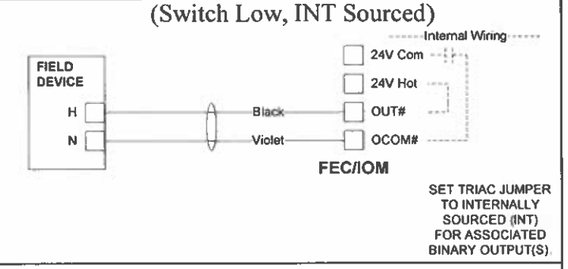
DETAIL F131 TEMPERATURE SENSOR INPUT

DETAIL F301 BINARY INPUT (DRY CONTACT)

DETAIL F559 INCREMENTAL CONTROL to M910x-AGx-2S, M9104-IGx-2S (Switch High, EXT Sourced)

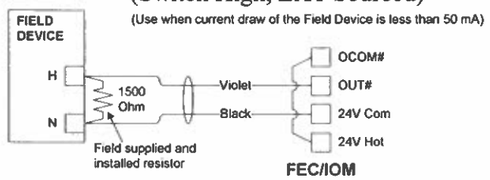


DETAIL F701 24 VAC BINARY OUTPUT (Switch Low, INT Sourced)

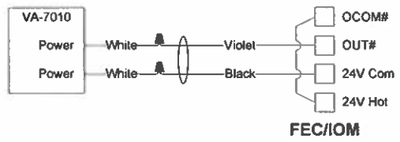


DETAIL F902 24 VAC TRIAC OUTPUT to LOW CURRENT DRAW DEVICE (Switch High, EXT Sourced)

(Use when current draw of the Field Device is less than 50 mA)



DETAIL F992 ON-OFF CONTROL to VA-7010 (Switch High, EXT Sourced)



Drawing Title
SUITE-27 Point Schedule (1 of 2)

REFERENCE DRAWING	NO	REVISION-LOCATION	ECN	DATE	BY

Sales Engineer	Project Manager	Application Engineer	DRAWN BY	DRAWN DATE	APPROVED BY	APPROVED DATE

Project Title
Club Suite Controls

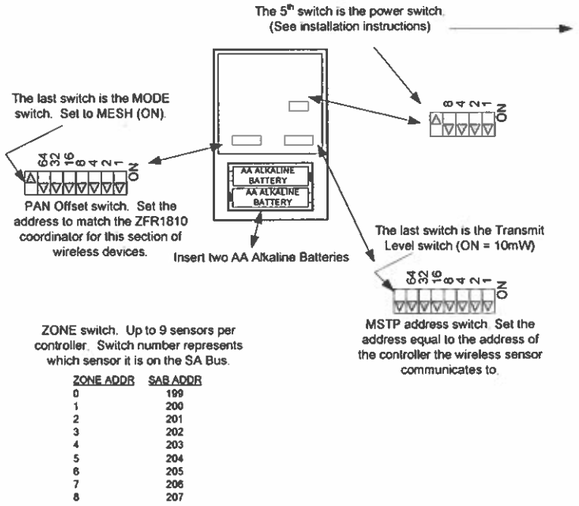
Branch Information

Johnson Controls

CONTRACT NUMBER
0010-0001

DRAWING NUMBER
1.4A

DETAIL NS107 WRZ-TTx0000 Wireless Zone Sensor



ZONE switch. Up to 9 sensors per controller. Switch number represents which sensor it is on the SA Bus.

ZONE ADDR	SAB ADDR
0	199
1	200
2	201
3	202
4	203
5	204
6	205
7	206
8	207

WRZ-TTx0000 Installation Instructions

Step 1 – Set the Power Switch to OFF.

Step 2 – Set the MODE switch to MESH (ON).

Step 3 – Set the PAN Offset switch to match the ZFR1810 Coordinator, and ZFR1811 Router for the controller (See MSTP Riser Details)

Step 4 – Set the ZONE switch. (See System Point Schedule for switch address.)

Step 5 – Set the MSTP Address switch to match the address of the controller. (See Room Schedule or Point Schedule for switch address)

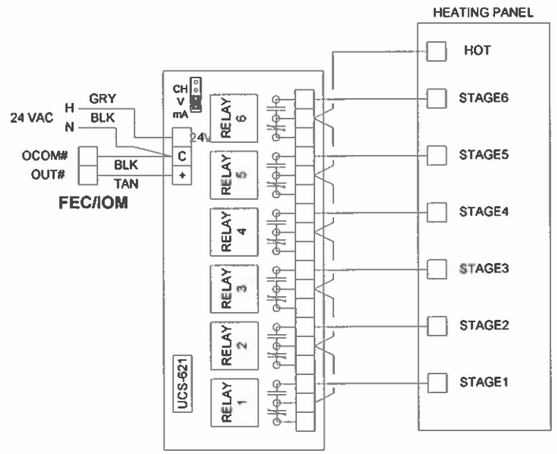
Step 6 – Set the Transmit Level switch to 10mW (ON).

Step 7 – Install two AA Alkaline Batteries.

Step 8 – Set the Power Switch to ON.

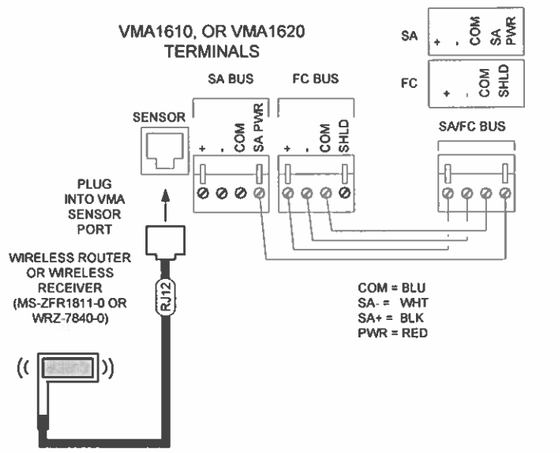
Step 9 – Mount Sensor in accordance of the installation instruction that come with the sensor

DETAIL F1059 Staged Heating Wiring Detail to Sequencer



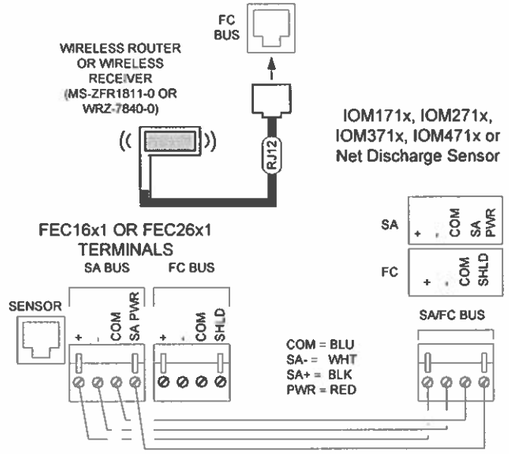
ZFR1811 Routers, WRZ-7840 Receivers and SA Bus wiring when wireless. Select correct controller for system.

VMA1610, OR VMA1620



IOM171x, IOM271x, IOM371x, IOM471x or Net Discharge Sensor

FEC16x1 AND FEC26x1

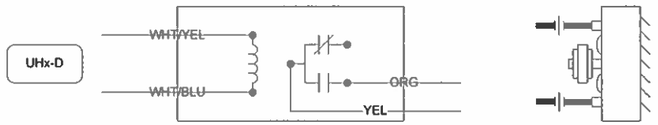


Drawing Title: SUITE-27 Point Schedule (2 of 2)						
	REFERENCE DRAWING	NO	REVISION LOCATION	ECN	DATE	BY
	Sales Engineer / Project Manager / Application Engineer		DRAWN BY / DATE	APPROVED BY / DATE		
Project Title: Club Suite Controls	Johnson Controls		Branch Information	CONTRACT NUMBER: 0010-0001		
				DRAWING NUMBER: 1.4B		

BILL OF MATERIALS

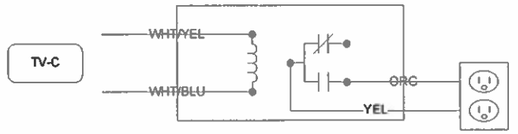
Designation	Qty	Part Number	Description
UHx-C	26	RIBU1C	SPDT, 10A, HC=10-30VAC/DCD, W/LED
TV-C	25		

ELECTRIC UNIT HEATER
TYPICAL OF 26



Hardware	I/O	Object Name	Description
21	CO-4	UH5802-1-D	Unit Heater Disable
21	CO-5	UH5802-2-D	Unit Heater Disable
26	CO-4	UH4712-D	Unit Heater Disable
27	CO-4	UH4713-D	Unit Heater Disable
28	CO-4	UH5704-D	Unit Heater Disable
30	CO-4	UH5703-D	Unit Heater Disable
34	CO-4	UH5602-D	Unit Heater Disable
38	CO-4	UH5601-D	Unit Heater Disable
42	CO-4	UH5504-1-D	Unit Heater Disable
42	CO-5	UH5504-2-D	Unit Heater Disable
43	CO-4	UH4512-D	Unit Heater Disable
44	CO-4	UH4511-D	Unit Heater Disable
48	CO-4	UH5501-1-D	Unit Heater Disable
48	CO-5	UH5501-2-D	Unit Heater Disable
52	CO-4	UH5409-1-D	Unit Heater Disable
52	CO-5	UH5409-2-D	Unit Heater Disable
55	CO-4	UH5407-1-D	Unit Heater Disable
55	CO-5	UH5407-2-D	Unit Heater Disable
56	CO-4	UH4413-D	Unit Heater Disable
57	CO-4	UH4412-D	Unit Heater Disable
61	CO-4	UH5301-D	Unit Heater Disable
62	CO-4	UH5302-D	Unit Heater Disable
65	CO-4	UH4213-D	Unit Heater Disable
66	CO-4	UH4214-D	Unit Heater Disable
67	CO-4	UH3403-D	Unit Heater Disable
68	CO-4	UH3301-D	Unit Heater Disable
69	CO-4	UH3204-D	Unit Heater Disable

SUITE TV COMMAND
TYPICAL OF 25



Hardware	I/O	Object Name	Description
22	CO-5	TV-C	Party Suites 57 and 82 TV Command
24	CO-5	TV-C	Section 310 TV Command
25	CO-5	TV-C	Party Suite 2011 TV Command
26	CO-5	TV-C	Party Suite 11 & Suite 27 TV Command
28	CO-5	TV-C	Suite 28 and 29 TV Command
30	CO-5	TV-C	Suite 30 and 31 TV Command
32	CO-5	TV-C	Suite 32 and 33 TV Command
34	CO-5	TV-C	Suite 34 and 35 TV Command
36	CO-5	TV-C	Suite 36 and 37 TV Command
38	CO-5	TV-C	Suite 38 TV Command
40	CO-5	TV-C	Suite 39 and 40 TV Command
41	CO-5	TV-C	Suite 41 TV Command
43	CO-5	TV-C	Suite 42, 43, and Section 324 TV Command
45	CO-5	TV-C	Suite 44 and 45 TV Command
47	CO-5	TV-C	Suite 46, 47, and 48 TV Command
49	CO-5	TV-C	Suite 49 and 50 TV Command
50	CO-5	TV-C	Suite 51 and 52 TV Command
54	CO-5	TV-C	Suite 53, 54, and 55 TV Command
57	CO-5	TV-C	Suite 56 and 57 TV Command
59	CO-5	TV-C	Suite 58 TV Command
61	CO-5	TV-C	Suite 59 and 60 TV Command
63	CO-5	TV-C	Suite 61, 62, and 63 TV Command
64	CO-5	TV-C	Suite 64 TV Command
66	CO-5	TV-C	Suite 65, 66, and 67 TV Command
68	CO-5	TV-C	Suite 68 and 69 TV Command

Drawing Title
Unit Heater & Exterior TV Control

REFERENCE DRAWING	NO	REVISION LOCATION	ECN	DATE	BY

Sales Engineer	Project Manager	Application Engineer	DRAWN BY	DRAWN DATE	APPROVED BY	APPROVED DATE

Project Title
Club Suite Controls

Johnson Controls

Branch Information

CONTRACT NUMBER
0010-0001

DRAWING NUMBER
2.1

Contract Name
Contract Number

Room Schedule

Box Location								Controller Information							Box Information										
	Room							Controller						Sensor			Box Config						Required (N2)		
								Required									Required								
Bldg./Flr.	No.	Name	System Name	Mech. Dwg.	System Serving this Box	Box Mfgr.	Mfgr Box Type	JCI Ctrl Dwg No.	Controller Part No.	NC/ NAE Addr	Trunk ID	Device Addr	PAN Offset	CSModel or Template	Code No.	Box Heat	Supplemental Heat	Config File Name	Inlet Size (Inches)	Inlet Area (Sq. Ft.)	K Factor	Clg Min Flow	Clg Max Flow	VMA Box Config	Comments	Generate Flag
Club Level Sect 8	4803	1957 Braves Suite	FC-C01	M2.48		Trane		1.1	MS-FEC-2610-0	S1-NAE06	1	21	1	SuiteFCU	WRZ-TTR-0000										
Club Level Sect 8	4802	1957 Braves Suite	FC-C02	M2.48		Trane		1.1	MS-FEC-2610-0	S1-NAE06	1	22	1	SuiteFCU	WRZ-TTR-0000										
Club Level Sect 8	4801	1982 Brewers Suite	FC-C03	M2.48		Trane		1.1	MS-FEC-2610-0	S1-NAE06	1	23	1	SuiteFCU	WRZ-TTR-0000										
Club Level Sect 7	4711	1982 Brewers Suite	FC-C04	M2.47		Trane		1.1	MS-FEC-2610-0	S1-NAE06	1	24	1	SuiteFCU	WRZ-TTR-0000										
Club Level Sect 7	4708	2011 Brewers Suite	FC-C07	M2.47		Trane		1.1	MS-FEC-2610-0	S1-NAE06	1	25	1	SuiteFCU	WRZ-TTR-0000										
Club Level Sect 7	4707	2011 Brewers Suite	FC-C08	M2.47		Trane		1.1	MS-FEC-2610-0	S1-NAE06	1	26	1	SuiteFCU	WRZ-TTR-0000										
Club Level Sect 7	4706	Suite 27	FC-C09	M2.47		Trane		1.1	MS-FEC-2610-0	S1-NAE06	1	27	1	SuiteFCU	WRZ-TTR-0000										
Club Level Sect 7	4705	Suite 28	FC-C10	M2.47		Trane		1.1	MS-FEC-2610-0	S1-NAE06	1	28	1	SuiteFCU	WRZ-TTR-0000										
Club Level Sect 7	4704	Suite 29	FC-C11	M2.47		Trane		1.1	MS-FEC-2610-0	S1-NAE06	1	29	1	SuiteFCU	WRZ-TTR-0000										
Club Level Sect 7	4703	Suite 30	FC-C12	M2.47		Trane		1.1	MS-FEC-2610-0	S1-NAE06	1	30	1	SuiteFCU	WRZ-TTR-0000										
Club Level Sect 7	4702	Suite 31	FC-C13	M2.47		Trane		1.1	MS-FEC-2610-0	S1-NAE06	1	31	1	SuiteFCU	WRZ-TTR-0000										
Club Level Sect 7	4701	Suite 32	FC-C14	M2.47		Trane		1.1	MS-FEC-2610-0	S1-NAE06	1	32	1	SuiteFCU	WRZ-TTR-0000										
Club Level Sect 6	4605	Suite 33	FC-C15	M2.46		Trane		1.1	MS-FEC-2610-0	S1-NAE06	1	33	1	SuiteFCU	WRZ-TTR-0000										
Club Level Sect 6	4604	Suite 34	FC-C16	M2.46		Trane		1.1	MS-FEC-2610-0	S1-NAE06	1	34	1	SuiteFCU	WRZ-TTR-0000										
Club Level Sect 6	4603	Suite 35	FC-C17	M2.46		Trane		1.1	MS-FEC-2610-0	S1-NAE06	1	35	1	SuiteFCU	WRZ-TTR-0000										
Club Level Sect 6	4602	Suite 36	FC-C18	M2.46		Trane		1.1	MS-FEC-2610-0	S1-NAE06	1	36	1	SuiteFCU	WRZ-TTR-0000										
Club Level Sect 6	4601	Suite 37	FC-C19	M2.46		Trane		1.1	MS-FEC-2610-0	S1-NAE06	1	37	3	SuiteFCU	WRZ-TTR-0000										
Club Level Sect 5	4518	Suite 38	FC-C20	M2.45		Trane		1.1	MS-FEC-2610-0	S1-NAE06	1	38	3	SuiteFCU	WRZ-TTR-0000										
Club Level Sect 5	4517	Suite 39	FC-C21	M2.45		Trane		1.1	MS-FEC-2610-0	S1-NAE06	1	39	3	SuiteFCU	WRZ-TTR-0000										
Club Level Sect 5	4516	Suite 40	FC-C22	M2.45		Trane		1.1	MS-FEC-2610-0	S1-NAE06	1	40	3	SuiteFCU	WRZ-TTR-0000										
Club Level Sect 5	4515	Suite 41	FC-C23	M2.45		Trane		1.1	MS-FEC-2610-0	S1-NAE06	1	41	3	SuiteFCU	WRZ-TTR-0000										
Club Level Sect 5	4507	Suite 42	FC-C25	M2.45		Trane		1.1	MS-FEC-2610-0	S1-NAE06	1	42	3	SuiteFCU	WRZ-TTR-0000										
Club Level Sect 5	4506	Suite 43	FC-C26	M2.45		Trane		1.1	MS-FEC-2610-0	S1-NAE06	1	43	3	SuiteFCU	WRZ-TTR-0000										
Club Level Sect 5	4505	Suite 44	FC-C27	M2.45		Trane		1.1	MS-FEC-2610-0	S1-NAE06	1	44	3	SuiteFCU	WRZ-TTR-0000										
Club Level Sect 5	4504	Suite 45	FC-C28	M2.45		Trane		1.1	MS-FEC-2610-0	S1-NAE06	1	45	3	SuiteFCU	WRZ-TTR-0000										
Club Level Sect 5	4503	Suite 46	FC-C29	M2.45		Trane		1.1	MS-FEC-2610-0	S1-NAE06	1	46	3	SuiteFCU	WRZ-TTR-0000										
Club Level Sect 5	4502	Suite 47	FC-C30	M2.45		Trane		1.1	MS-FEC-2610-0	S1-NAE06	1	47	3	SuiteFCU	WRZ-TTR-0000										
Club Level Sect 5	4501	Suite 48	FC-C31	M2.45		Trane		1.1	MS-FEC-2610-0	S1-NAE06	1	48	3	SuiteFCU	WRZ-TTR-0000										
Club Level Sect 4	4411	Suite 49	FC-C32	M2.44		Trane		1.1	MS-FEC-2610-0	S1-NAE06	1	49	3	SuiteFCU	WRZ-TTR-0000										
Club Level Sect 4	4410	Suite 50	FC-C33	M2.44		Trane		1.1	MS-FEC-2610-0	S1-NAE06	1	50	3	SuiteFCU	WRZ-TTR-0000										
Club Level Sect 4	4409	Suite 51	FC-C34	M2.44		Trane		1.1	MS-FEC-2610-0	S1-NAE06	1	51	3	SuiteFCU	WRZ-TTR-0000										
Club Level Sect 4	4408	Suite 52	FC-C35	M2.44		Trane		1.1	MS-FEC-2610-0	S1-NAE06	1	52	3	SuiteFCU	WRZ-TTR-0000										
Club Level Sect 4	4407	Suite 53	FC-C36	M2.44		Trane		1.1	MS-FEC-2610-0	S1-NAE06	1	53	2	SuiteFCU	WRZ-TTR-0000										
Club Level Sect 4	4406	Suite 54	FC-C37	M2.44		Trane		1.1	MS-FEC-2610-0	S1-NAE06	1	54	2	SuiteFCU	WRZ-TTR-0000										
Club Level Sect 4	4405	Suite 55	FC-C38	M2.44		Trane		1.1	MS-FEC-2610-0	S1-NAE06	1	55	2	SuiteFCU	WRZ-TTR-0000										
Club Level Sect 4	4403	Suite 56	FC-C40	M2.44		Trane		1.1	MS-FEC-2610-0	S1-NAE06	1	56	2	SuiteFCU	WRZ-TTR-0000										
Club Level Sect 4	4402	Suite 57	FC-C41	M2.44		Trane		1.1	MS-FEC-2610-0	S1-NAE06	1	57	2	SuiteFCU	WRZ-TTR-0000										
Club Level Sect 4	4401	Suite 58	FC-C42	M2.44		Trane		1.1	MS-FEC-2610-0	S1-NAE06	1	58	2	SuiteFCU	WRZ-TTR-0000										
Club Level Sect 3	4306	Suite 59	FC-C43	M2.43		Trane		1.1	MS-FEC-2610-0	S1-NAE06	1	59	2	SuiteFCU	WRZ-TTR-0000										
Club Level Sect 3	4305	Suite 60	FC-C44	M2.43		Trane		1.1	MS-FEC-2610-0	S1-NAE06	1	60	2	SuiteFCU	WRZ-TTR-0000										
Club Level Sect 3	4304	Suite 61	FC-C45	M2.43		Trane		1.1	MS-FEC-2610-0	S1-NAE06	1	61	2	SuiteFCU	WRZ-TTR-0000										
Club Level Sect 3	4303	Suite 62	FC-C46	M2.43		Trane		1.1	MS-FEC-2610-0	S1-NAE06	1	62	2	SuiteFCU	WRZ-TTR-0000										
Club Level Sect 3	4302	Suite 63	FC-C47	M2.43		Trane		1.1	MS-FEC-2610-0	S1-NAE06	1	63	2	SuiteFCU	WRZ-TTR-0000										
Club Level Sect 3	4301	Suite 64	FC-C48	M2.43		Trane		1.1	MS-FEC-2610-0	S1-NAE06	1	64	2	SuiteFCU	WRZ-TTR-0000										
Club Level Sect 2	4210	Suite 65	FC-C49	M2.42		Trane		1.1	MS-FEC-2610-0	S1-NAE06	1	65	2	SuiteFCU	WRZ-TTR-0000										
Club Level Sect 2	4209	Suite 66	FC-C50	M2.42		Trane		1.1	MS-FEC-2610-0	S1-NAE06	1	66	2	SuiteFCU	WRZ-TTR-0000										
Club Level Sect 2	4208	Suite 67	FC-C51	M2.42		Trane		1.1	MS-FEC-2610-0	S1-NAE06	1	67	2	SuiteFCU	WRZ-TTR-0000										
Club Level Sect 2	4207	Suite 68	FC-C52	M2.42		Trane		1.1	MS-FEC-2610-0	S1-NAE06	1	68	2	SuiteFCU	WRZ-TTR-0000										
Club Level Sect 2	4206	Suite 69	FC-C53	M2.42		Trane		1.1	MS-FEC-2610-0	S1-NAE06	1	69	2	SuiteFCU	WRZ-TTR-0000										

MS-NAE35xx-x, MS-NAE45xx-x, MS-NAE55xx-x, NAE8500-0

Network Automation Engine

Description

Network Automation Engines (NAEs) enable Internet Protocol (IP) connectivity and Web-based access to Metasys® Building Management Systems (BMSs).

NAEs leverage standard building management communication technologies, including BACnet® protocol, LONWORKS® network, and N2 Bus protocol to monitor and supervise a wide variety of HVAC, lighting, security, and fire safety equipment.

NAEs provide comprehensive equipment monitoring and control, scheduling, alarm and event management, energy management, data exchange, data trending, and data storage.

NAEs feature an embedded Site Management Portal user interface, support multiple concurrent Web browser sessions with password and permission access control, and provide the protection of industry standard Information Technology (IT) security.

NAE55 models support a comprehensive set of supervisory features and functions for large facilities and technically advanced buildings and complexes.

The NAE35/NAE45 models enable cost-effective NAE connectivity and control in smaller facilities, and can increase distribution of control in larger facilities.

The NAE85 is a high-capacity NAE that allows integration of large BACnet IP systems and can take the place of multiple NAEs.

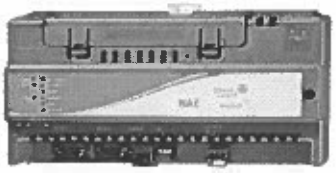
Refer to the *Network Automation Engine Product Bulletin (LIT-1201160)* for important product application information.

Features

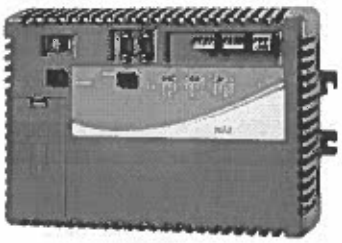
- communication using commonly accepted IT standards, including Web services, at the automation and enterprise level
- Web-based user interface
- Site Director function
- user interface and online system configuration software embedded in NAE
- supervision of field controller networks including N2 Bus, LONWORKS network, BACnet Master-Slave/Token-Passing (MS/TP), and BACnet IP devices
- multiple connection options for data access

Repair Information

If the NAE fails to operate within its specifications, refer to the *Network Automation Engine Product Bulletin (LIT-1201160)* for a list of repair parts available.



NAE35/NAE45



NAE55

NAE85

Selection Charts

NAE35

Product Code Number[1]	Description
MS-NAE35xx-x (Base Features of Each NAE35)	NAE35 Network Automation Engines: Requires a 24 VAC power supply. Each model includes one RS-232-C serial port, one USB serial port, one Ethernet port, and an MS-BAT1020-0 Data Protection Battery.
MS-NAE3510-2	Supports one N2 Bus or BACnet MS/TP (RS-485) trunk; includes an additional RS-232-C serial port for optional external modem; supports a maximum of 50 devices on the N2 Bus or BACnet MS/TP trunk.
MS-NAE3510-2U	Supports one BACnet MS/TP (RS-485) trunk; includes an additional RS-232-C serial port for optional external modem; supports a maximum of 50 devices on the BACnet MS/TP trunk. Note: This model is UL Listed, File S4977, UUKL 864 - 9th Edition Smoke Control Equipment.
MS-NAE3511-2	Supports one N2 Bus or BACnet MS/TP (RS-485) trunk; includes an internal modem; supports a maximum of 50 devices on the N2 Bus or BACnet MS/TP trunk.
MS-NAE3514-2	Supports one N2 Bus or BACnet MS/TP (RS-485) trunk; limited to Basic Access support; includes an additional RS-232-C serial port for optional external modem; supports a maximum of 50 devices on the N2 Bus or BACnet MS/TP trunk.
MS-NAE3515-2	Supports one N2 Bus or BACnet MS/TP (RS-485) trunk; limited to Basic Access support; includes an internal modem; supports a maximum of 50 devices on the N2 Bus or BACnet MS/TP trunk.
MS-NAE3520-2	Supports one LONWORKS trunk; includes an additional RS-232-C serial port for optional external modem. Supports a maximum of 64 devices on the LONWORKS port.
MS-NAE3521-2	Supports one LONWORKS trunk; includes an internal modem. Supports a maximum of 64 devices on the LONWORKS port.
MS-NAE3524-2	Supports one LONWORKS trunk, limited to Basic Access support; and includes an additional RS-232-C serial port for optional external modem. Supports a maximum of 64 devices on the LONWORKS trunks.
MS-NAE3525-2	Supports one LONWORKS trunk; limited to Basic Access support; and includes an internal modem. Supports a maximum of 64 devices on the LONWORKS trunks.

1. Some models are also available in a Buy American version (add a G after the code number). For repair parts, add -702 after the code number.

Network Automation Engine (Continued)

NAE45

Product Code Number[1]	Description
MS-NAE45xx-x (Base features of each NAE45)	NAE45 Network Automation Engines: Requires a 24 VAC power supply. Each model includes one RS-232-C serial port, one USB serial port, one Ethernet port, and an MS-BAT1020-0 Data Protection Battery.
MS-NAE4510-2	Supports one N2 Bus or BACnet MS/TP (RS-485) trunk; includes an additional RS-232-C serial port for optional external modem; supports a maximum of 100 devices on the N2 Bus or BACnet MS/TP trunk.
MS-NAE4510-2U	Supports one BACnet MS/TP (RS-485) trunk; includes an additional RS-232-C serial port for optional external modem; supports a maximum of 100 devices on the BACnet MS/TP trunk. Note: This model is UL Listed, File S4977, UUKL 864 - 9th Edition, Smoke Control Equipment.
MS-NAE4511-2	Supports one N2 Bus or BACnet MS/TP (RS-485) trunk; includes an internal modem; supports a maximum of 100 devices on the N2 Bus or BACnet MS/TP trunk.
MS-NAE4520-2	Supports one LONWORKS trunk, includes an additional RS-232-C serial port for optional external modem; supports a maximum of 127 devices on the LONWORKS port.
MS-NAE4521-2	Supports one LONWORKS trunk, includes an internal modem; supports a maximum of 127 devices on the LONWORKS port.

1. Some models are also available in a Buy American version (add a G after the code number). For repair parts, add -702 after the code number.

NAE55

Product Code Number[1]	Description
MS-NAE55xx-x (Base Features of Each NAE55)	NAE55 Network Automation Engines: Requires a 24 VAC power supply. Each model includes two RS-232-C serial ports, two USB serial ports, two RS-485 ports, one Ethernet port, and one MS-BAT1010-0 Data Protection Battery.
MS-NAE5510-1	Supports two N2 Bus or two BACnet MS/TP (RS-485) trunks (or one N2 Bus and one BACnet MS/TP trunk); supports a maximum of 100 devices on each N2 Bus or BACnet MS/TP trunk.
MS-NAE5510-1U	Supports two BACnet MS/TP (RS-485) trunks, which support a maximum of 100 devices on each BACnet MS/TP trunk. Note: This model is UL Listed, File S4977, UUKL 864 - 9th Edition Smoke Control Equipment.
MS-NAE5510-2	Supports two N2 Bus or two BACnet MS/TP (RS-485) trunks (or one N2 Bus and one BACnet MS/TP trunk); supports a maximum of 100 devices on each N2 Bus or BACnet MS/TP trunk.
MS-NAE5511-1	Supports two N2 Bus or two BACnet MS/TP (RS-485) trunks (or one N2 Bus and one BACnet MS/TP trunk); supports a maximum of 100 devices on each N2 Bus or BACnet MS/TP trunk: includes an internal modem.
MS-NAE5511-2	Supports two N2 Bus or two BACnet MS/TP (RS-485) trunks (or one N2 Bus and one BACnet MS/TP trunk); supports a maximum of 100 devices on each N2 Bus or BACnet MS/TP trunk: includes an internal modem.
MS-NAE5520-1	Supports a LONWORKS trunk, and two N2 Bus or two BACnet MS/TP (RS-485) trunks (or one N2 Bus and one BACnet MS/TP trunk). Supports a maximum of 255 devices on the LONWORKS trunk and a maximum of 100 devices on each N2 Bus or BACnet MS/TP trunk.
MS-NAE5520-2	Supports a LONWORKS trunk, and two N2 Bus or two BACnet MS/TP (RS-485) trunks (or one N2 Bus and one BACnet MS/TP trunk). Supports a maximum of 255 devices on the LONWORKS trunk and a maximum of 100 devices on each N2 Bus or BACnet MS/TP trunk.
MS-NAE5521-1	Supports a LONWORKS trunk, and two N2 Bus or two BACnet MS/TP (RS-485) trunks (or one N2 Bus and one BACnet MS/TP trunk); includes an internal modem. Supports a maximum of 255 devices on the LONWORKS trunk and a maximum of 100 devices on each N2 Bus or BACnet MS/TP trunk.
MS-NAE5521-2	Supports a LONWORKS trunk, and two N2 Bus or two BACnet MS/TP (RS-485) trunks (or one N2 Bus and one BACnet MS/TP trunk); includes an internal modem. Supports a maximum of 255 devices on the LONWORKS trunk and a maximum of 100 devices on each N2 Bus or BACnet MS/TP trunk.

1. Some models are also available in a Buy American version (add a G after the code number). For the European version, add an E after the code number. For repair parts, replace -701 after the -1 code numbers.

NAE85

Product Code Number	Description
MS-NIE8500-0	Rack-mount server, preloaded with NxE8500 software, support for up to 10,000 objects. Note: The NAE85 rack-mount servers ship as MS-NIE8500-0 rack-mount servers. Use the ChangeModel utility in the NxE85 Metasys software to change an NIE85 to an NAE85.
MS-NxE85SW-0[1]	New NxE85 software only; for new installations/projects
MS-NxE85SW-6[1]	Upgrade NxE85 software only; for existing NxE85 engines

1. Standard NxE85 packages supports 10,000 objects; an expansion upgrade is available to support an additional 15,000 objects.

Accessories

Product Code Number (Part 1 of 2)	Description
MS-BAT1010-0	Replacement data protection battery for NAE55 and NIE55. Rechargeable gel cell battery: 12 V, 1.2 Ah, with a typical life of 3 to 5 years at 21°C (70°F)
MS-BAT1020-0	Replacement data protection battery for NAE35, NAE45, and NCE25. Rechargeable NiMH battery: 3.6 V 500 mAh, with a typical life of 5 to 7 years at 21°C (70°F)
MS-15KUPG-0	15,000 object expansion upgrade for NxE85 (only one expansion per NxE85)

Network Automation Engine (Continued)

Product Code Number (Part 2 of 2)	Description
MS-MULTENGSW-6	Contains ToggleTunnel utility for converting an NAE55/NIE55 to an NAE55 model with the N2 Tunneling features enabled. Not for use with MS-NAE5510-1U
MS-RAP-0	Ready Access Portal Server provides a user interface that is a natural, complementary extension of the Metasys Site Management Portal user interface. Note: Ready Access Portal is provided with ADS/ADX software, therefore this option is not necessary for sites with an ADS/ADX.
MS-EXPORT-0	Export Utility extracts historical trend, alarm, and audit data from the system and presents the historical data in a variety of formats. Note: Export Utility is provided with ADS/ADX software, therefore this option is not necessary for sites with an ADS/ADX.
AS-XFR100-1	Power transformer (Class 2, 24 VAC, 92 VA maximum output), with enclosure
AS-XFR010-1	Power transformer (Class 2, 24 VAC, 92 VA maximum output), no enclosure
SC450RM1U (OEM Part No.)	Recommended Uninterruptable Power Supply (UPS) for NxE85 Models: American Power Conversion (APC®) Smart-UPS SC 450VA, 280 W 120 VAC input/output with NEMA 5-15R output connections

Technical Specifications

NAE35 and NAE45	
Power Requirement	Dedicated nominal 24 VAC, Class 2 power supply (North America), Safety Extra- Low Voltage (SELV) power supply (Europe), at 50/60 Hz (20 VAC minimum to 30 VAC maximum)
Power Consumption	25 VA maximum
Ambient Operating Conditions	0–50°C (32–122°F); 10–90% RH, 30°C (86°F) maximum dew point
Ambient Storage Conditions	-40–70°C (-40–158°F); 5–95% RH, 30°C (86°F) maximum dew point
Data Protection	Supports data protection on power failure. Rechargeable NiMH battery: 3.6 VDC 500 mAh, with a typical life of 5 to 7 years at 21°C (70°F); Product Code Number: MS-BAT1020-0
Processor	192 MHz Renesas™ SH4 7760 RISC processor
Memory	128 MB Flash nonvolatile memory for operating system, configuration data, and operations data storage and backup 128 MB Synchronous Dynamic Random Access Memory (DRAM) for operations data dynamic memory
Operating System	Microsoft® Windows® CE embedded
Network and Serial Interfaces	One Ethernet port; connects at 10 or 100 Mbps; 8-pin RJ-45 connector One optically isolated RS-485 port; 9.6k, 19.2k, 38.4k, or 76.8k baud (depending on protocol); with a pluggable and keyed 4-position terminal block (FC Bus available on NAE351x and NAE451x models only) One LONWORKS port; FTT10 78 Kbps; pluggable, keyed 3-position terminal block (LONWORKS port available on NAE352x-x and NAE452x models only) One RS-232-C serial port with standard 9-pin sub-D connector that supports standard baud rates. A second serial port, on models without an internal modem, that supports an optional, user-supplied external modem. One USB serial port with standard USB connector that supports an optional, user-supplied external modem. Option: One telephone port for internal modem; up to 56 Kbps; 6-pin modular connector (NAE models with an optional internal modem have one RS-232-C serial port only.)
Housing	Plastic housing material: ABS + polycarbonate UL94-5VB Protection: IP20 (IEC 60529)
Mounting	On flat surface with screws on three mounting clips or a single 35 mm DIN rail
Dimensions (Height x Width x Depth)	131 x 270 x 62 mm (5-3/16 x 10-5/8 x 2-1/2 in.) Minimum space for mounting NAE35 and NAE45: 210 x 350 x 110 mm (8-3/16 x 13-13/16 x 4.-5/16 in.)
Shipping Weight	1.2 kg (2.7 lb)
Compliance CE	**United States:** UL Listed, File E107041, CCN PAZX, UL 916, Energy Management Equipment UL Listed, File S4977, UUKL 864 - 9th Edition, Smoke Control Equipment (MS-NAE3510-2U and MS-NAE4510-2U models only); FCC Compliant to CFR47, Part 15, Subpart B, Class A
	Canada: UL Listed, File E107041, CCN PAZX7, CAN/CSA C22.2 No. 205, Signal Equipment Industry Canada Compliant, ICES-003
	Europe: CE Mark – Johnson Controls, Inc., declares that this product is in compliance with the essential requirements and other relevant provisions of the EMC Directive 2004/108/EC.
	Australia and New Zealand: C-Tick Mark, Australia/NZ Emissions Compliant
	BACnet International: BACnet Testing Laboratories™ (BTL) 135-2004 Listed BACnet Building Controller (B-BC)

NAE55xx-1U	
Power Requirement	Dedicated nominal 24 VAC, Class 2 power supply (North America), Safety Extra-Low Voltage (SELV) power supply (Europe), at 50/60 Hz (20 VAC minimum to 30 VAC maximum)
Power Consumption	50 VA maximum
Ambient Operating Conditions	0–50°C (32–122°F); 10–90% RH, 30°C (86°F) maximum dew point
Ambient Storage Conditions	-40–70°C (-40–158°F); 5–95% RH, 30°C (86°F) maximum dew point
Data Protection Battery	Supports data protection on power failure. Rechargeable gel cell battery: 12 V, 1.2 Ah, with a typical life of 3 to 5 years at 21°C (70°F); Product Code Number: MS-BAT1010-0
Clock Battery	Maintains real-time clock through a power failure. Onboard cell; typical life 10 years at 21°C (70°F)

Network Automation Engine (Continued)

NAE55xx-1U (Continued)	
Processor	400 MHz Pentium® class Geode® GX533 processor for MS-NAE55xx-1 models
Memory	512 MB Flash nonvolatile memory for operating system, configuration data, and operations data storage and backup for MS-NAE55xx-1 models. 256 MB Synchronous Dynamic Random Access Memory (DRAM) for operations data dynamic memory for all models
Operating System	Microsoft Windows XP® embedded
Network and Serial Interfaces	One Ethernet port; connects at 10 or 100 Mbps; 8-pin RJ-45 connector Two optically isolated RS-485 ports; 9.6k, 19.2k, 38.4k, or 76.8k baud; pluggable and keyed 4-position terminal blocks Two RS-232-C serial ports, with standard 9-pin sub-D connectors, that support all standard baud rates Two USB serial ports, standard USB connectors support an optional, user-supplied external modem Options: One telephone port for internal modem; up to 56 Kbps; 6-pin modular connector One LONWORKS port; FTT10 78 Kbps; pluggable, keyed 3-position terminal block (LONWORKS port available on NAE552x-xxx models only)
Housing	Plastic housing with internal metal shield Plastic material: ABS + polycarbonate UL94-5VB Protection: IP20 (IEC 60529)
Mounting	On flat surface with screws on four mounting feet or on dual DIN rail
Dimensions (Height x Width x Depth)	226 x 332 x 96.5 mm (8-7/8 x 13-1/8 x 3-13/16 in.) including mounting feet Minimum space for mounting: 303 x 408 x 148 mm (12 x 16-1/8 x 5-13/16 in.)
Shipping Weight	2.9 kg (6.4 lb)
Compliance	**United States:** UL Listed, File E107041, CCN PAZX, UL 916, Energy Management Equipment UL Listed, File S4977, UUKL 864 - 9th Edition, Smoke Control Equipment (MS-NAE5510-1U models only) FCC Compliant to CFR47, Part 15, Subpart B, Class A
	Canada: UL Listed, File E107041, CCN PAZX7, CAN/CSA C22.2 No. 205, Signal Equipment Industry Canada Compliant, ICES-003
CE	**Europe:** CE Mark – Johnson Controls, Inc., declares that this product is in compliance with the essential requirements and other relevant provisions of the EMC Directive 2004/108/EC.
	Australia and New Zealand: C-Tick Mark, Australia/NZ Emissions Compliant
	BACnet International: BACnet Testing Laboratories™ (BTL) 135-2004 Listed BACnet Building Controller (B-BC)

NAE55xx-2	
Power Requirement	Dedicated nominal 24 VAC, Class 2 power supply (North America), Safety Extra-Low Voltage (SELV) power supply (Europe), at 50/60 Hz (20 VAC minimum to 30 VAC maximum)
Power Consumption	50 VA maximum
Ambient Operating Conditions	0–50°C (32–122°F); 10–90% RH, 30°C (86°F) maximum dew point
Ambient Storage Conditions	-40–70°C (-40–158°F); 5–95% RH, 30°C (86°F) maximum dew point
Data Protection Battery	Supports data protection on power failure. Rechargeable gel cell battery: 12 V, 1.2 Ah, with a typical life of 3 to 5 years at 21°C (70°F); Product Code Number: MS-BAT1010-0
Clock Battery	Maintains real-time clock through a power failure. Onboard cell; typical life 10 years at 21°C (70°F)
Processor	1.6 GHz Intel® Atom™ processor
Memory	4 GB Flash nonvolatile memory for operating system, configuration data, and operations data storage and backup 1 GB Synchronous Dynamic Random Access Memory (DRAM) for operations data dynamic memory for all models
Operating System	Microsoft® Windows® Embedded Standard (WES) 2009
Network and Serial Interfaces	One Ethernet port; connects at 10 Mbps, 100 Mbps, or 1 Gbps; 8-pin RJ-45 connector Two optically isolated RS-485 ports; 9.6k, 19.2k, 38.4k, or 76.8k baud; pluggable and keyed 4 position terminal blocks Two RS-232-C serial ports, with standard 9-pin sub-D connectors, that support all standard baud rates Two USB serial ports; standard USB connectors support an optional, user-supplied external modem Options: One telephone port for internal modem; up to 56 Kbps; 6-pin modular connector One LONWORKS port; FTT10 78 Kbps; pluggable, keyed 3-position terminal block (LONWORKS port available on NAE552x-x models only)
Housing	Plastic housing with internal metal shield Plastic material: ABS + polycarbonate; Protection: IP20 (IEC 60529)
Mounting	On flat surface with screws on four mounting feet or on dual DIN rail
Dimensions (Height x Width x Depth)	226 x 332 x 96.5 mm (8-7/8 x 13-1/8 x 3-13/16 in.) including mounting feet Minimum space for mounting: 303 x 408 x 148 mm (12 x 16-1/8 x 5-13/16 in.)
Shipping Weight	2.9 kg (6.4 lb)
Compliance	**United States:** UL Listed, File E107041, CCN PAZX, UL 916, Energy Management Equipment FCC Compliant to CFR47, Part 15, Subpart B, Class A
	Canada: UL Listed, File E107041, CCN PAZX7, CAN/CSA C22.2 No. 205, Signal Equipment Industry Canada Compliant, ICES-003
CE	**Europe:** CE Mark – Johnson Controls, Inc., declares that this product is in compliance with the essential requirements and other relevant provisions of the EMC Directive 2004/108/EC.
	Australia and New Zealand: C-Tick Mark, Australia/NZ Emissions Compliant
	BACnet International: BACnet Testing Laboratories™ (BTL) 135-2004 Listed BACnet Building Controller (B-BC)

Network Automation Engine (Continued)

NAE85	
Computer Type	Dell® PowerEdge® R410
Power Requirement	100–240 VAC 50/60 Hz
Power Supply	480 W
Ambient Operating Conditions	10–35°C (50–95°F); 20–80% RH, noncondensing (twmax=29C)
Ambient Storage Conditions	-40–65°C (-40–149°F); 5–95% RH, noncondensing (twmax=38C)
Data Protection	Recommended Uninterruptable Power Supply (UPS): American Power Conversion (APC®) Smart-UPS SC 450 VA, 280 W, 120 VAC input/output, NEMA 5-15R output connections, OEM Part No. SC450RM1U
Processor	Intel® Xeon® E5506, 2.13 GHz, 4 MB Cache
Memory	2 GB DDR2, 1066 MHz, 2 x 1 GB, Single Ranked UDIMMs for 1 Processor
Hard Disk	2 x 160 GB 7.2K RPM Serial Advanced Technology Attachment (SATA), 8.9 cm (3-1/2 in.) Cabled 3 Gbps, RAID 1 configuration with add-in SAS6/iR (SATA/SAS Controller)
Internal Optical Drive	DVD ROM, SATA
Operating System	Microsoft Windows Web Server 2008 R2 Operating System (64-bit)
AntiVirus Software	Symantec® AntiVirus Corporate Edition Version 11
Network and Serial Interfaces	2 RJ45 1-Gbps Ethernet ports, Port 2 is disabled 2 video ports; 1 front, 1 back 1 9-pin Serial port 4 USB ports (2 front, 2 back)
Dimensions (Height x Width x Depth)	4.3 x 43.4 x 62.7 cm (1-11/16 x 17-1/8 x 24-11/16 in.)
Mounting	Mount in an EIA-310D compatible server cabinet
Shipping Weight	15.9 kg (35 lb)
Compliance	Europe: CE Mark (Record Holder: www.dell.com/regulatory_compliance) BACnet International: BACnet Testing Laboratories™ (BTL) 135-2004 Listed BACnet Building Controller (B-BC)

NAE85 Software System Requirements for Installation/Upgrade		
Product Code	MS-NxE85SW-0	NxE85 software for 10,000 objects (new projects only software)
Recommended Computer Platform	Intel® Xeon® E5506, 2.13 GHz, 4 MB Cache 2 x 160 GB 7.2K RPM Serial Advanced Technology Attachment (SATA), 8.9 cm (3.5 in.) Cabled 3 Gbps, RAID 1 configuration with add-in SAS6/iR (SATA/SAS Controller) DVD ROM, SATA	
Memory	1 GB RAM minimum	
Hard Disk	160 GB minimum	
Supported Operating Systems and Software	**Microsoft® Windows® Web Server 2008 R2 OS (64-bit)** IIS Version 7.5, Microsoft .NET Framework Version 3.5.1 **Microsoft Windows Web Server 2008 OS with SP1 (32-bit)** IIS Version 7.0, Microsoft .NET Framework Version 3.5 with SP1 **Microsoft Windows 2003 Web Edition OS[1] with SP2 (32-bit)** IIS Version 6.0, Microsoft .NET Framework Version 3.5 with SP1	
Network Communication	Network Interface Single 1 Gbps Ethernet network interface card connects at 10 Mbps, 100 Mbps or 1Gbps; (100 Mbps or better recommended)	
Data Protection	Recommended Uninterruptible Power Supply (UPS): American Power Conversion (APC®) Smart-UPS SC 450VA, 280 W, 120 VAC input/output, NEMA 5-15R output connections, OEM Part No. SC450RM1U	
Compliance	BACnet International: BACnet Testing Laboratories™ (BTL) 135-2004 Listed BACnet Building Controller	

1. We support the 32-bit version only. We do not support the 64-bit version.

Code No. LIT-1900346
Issued October 4, 2010

Field Equipment Controller (FEC) Series

Description

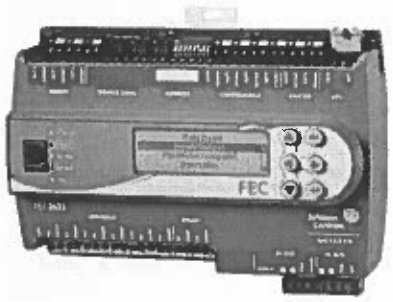
The FEC is a programmable digital controller that communicates via BACnet® Master-Slave/Token Passing (MS/TP) protocol. The FEC models include the 10-point FEC16 and the 17-point FEC26. FEC models include a 32-bit microprocessor, intuitive design, and are available with an optional built-in Liquid Crystal Display (LCD) screen local User Interface (UI).

A full range of FEC models combined with the Input/Output Module (IOM) models can be applied to a wide variety of building applications ranging from simple fan coil or heat pump control to advanced central plant management.

Refer to the *Metasys® System Field Equipment Controllers and Related Products Product Bulletin (LIT-12011042)* for important product application information.

Features

- Patented proportional adaptive control (P-Adaptive) and Pattern Recognition Adaptive Control (PRAC) technologies — provide continuous loop tuning.
- User-friendly graphic theme and clear push-button identification — facilitate easy controller use.
- Writable flash memory — allows you to download standard or customized applications from the Controller Configuration Tool (CCT) software.
- Large product family — provides a wide range of point mix to meet application requirements and allows for the addition of one or more IOMs and/or Network Sensors to provide even more application capacity.
- Network Automation Engine (NAE) and Network Control Engine (NCE) Automatic Discovery ability — allows for easy controller integration.
- Local UI display option (integral display or stand-alone display) — provides enhanced local monitoring.
- BACnet MS/TP communication — provides open system compatibility.
- 32-bit microprocessor — ensures optimum performance and meets industry specifications.
- Wireless capabilities via ZFR1800 Series Wireless Field Bus System enable wireless mesh connectivity between FECs to WRZ Series Wireless Room Temperature Sensors, and to NAE/NCE devices — facilitate easy initial location and relocation.
- Universal and configurable inputs and outputs — support multiple signal options and increase controller application flexibility.



FEC26 Controller

Repair Information

If the Field Equipment Controller fails to operate within its specifications, replace the unit. For a replacement FEC, contact the nearest Johnson Controls® representative.

Selection Charts

FEC Series Point Type Counts per Model

Point Types	Signals Accepted	FEC16	FEC26
Universal Input (UI)	Analog Input, Voltage Mode, 0–10 VDC Analog Input, Current Mode, 4–20 mA[1] Analog Input, Resistive Mode, 0–2k ohm, RTD (1k NI [Johnson Controls], 1k PT, A99B SI), NTC (10k Type L, 2.252k Type 2) Binary Input, Dry Contact Maintained Mode	2	6
Binary Input (BI)	Dry Contact Maintained Mode Pulse Counter/Accumulator Mode (High Speed), 100 Hz	1	2
Analog Output (AO)	Analog Output, Voltage Mode, 0–10 VDC Analog Output, Current Mode, 4–20 mA	0	2
Binary Output (BO)	24 VAC Triac	3	3
Configurable Output (CO)	Analog Output, Voltage Mode, 0–10 VDC Binary Output Mode, 24 VAC Triac	4	4

1. Analog Input, Current Mode is set by hardware for the FEC26, and as software for the FEC16.

Field Equipment Controller (FEC) Series (Continued)

Ordering Information

Product Code Number	Description
MS-FEC1611-0	10-Point Field Equipment Controller with 2 UI, 1 BI, 3 BO, and 4 CO; 24 VAC; SA Bus; Mounting Base
MS-FEC1621-0	10-Point Field Equipment Controller with 2 UI, 1 BI, 3 BO, and 4 CO; 24 VAC; SA Bus; Mounting Base; Integral Display
MS-FEC2611-0	17-Point Field Equipment Controller with 6 UI, 2 BI, 3 BO, 2 AO, and 4 CO; 24 VAC; SA Bus; Mounting Base
MS-FEC2621-0	17-Point Field Equipment Controller with 6 UI, 2 BI, 3 BO, 2 AO and 4 CO; 24 VAC; SA Bus; Integral Display; Mounting Base

Ordering Information for UL Listed, File S4977, UUKL 864 - 9th Edition, Smoke Control Equipment

Product Code Number[1]	Description
MS-FEU1610-0U	10-Point Field Equipment Controller with 2 UI, 1 BI, 3 BO, and 4 CO; 24 VAC; SA Bus; (includes Mounting Base and Cover)
MS-FEU1620-0U	10-Point Field Equipment Controller with 2 UI, 1 BI, 3 BO, and 4 CO; 24 VAC; SA Bus; Mounting Base; Integral Display
MS-FEU2610-0U	17-Point Field Equipment Controller with 6 UI, 2 BI, 3 BO, 2 AO, and 4 CO; 24 VAC; SA Bus; Mounting Base
MS-FEU2620-0U	17-Point Field Equipment Controller with 6 UI, 2 BI, 3 BO, 2 AO, and 4 CO; 24 VAC; SA Bus; Mounting Base; Integral Display

1. These devices are UL Listed, File S4977, UUKL 864 - 9th Edition, Smoke Control Equipment.

Accessories (Order Separately)

Product Code Number	Description
Y64T15-0	Transformer, 120/208/240 VAC Primary to 24 VAC Secondary, 92 VA, Foot Mount, 30 in. Primary Leads and 30 in. Secondary Leads, Class 2
Y65A13-0	Transformer, 120 VAC Primary to 24 VAC Secondary, 40 VA, Foot Mount (Y65AS), 8 in. Primary Leads and 30 in. Secondary Leads, Class 2
Y65T42-0	Transformer, 120/208/240 VAC Primary to 24 VAC Secondary, 40 VA, Hub Mount (Y65SP+), 8 in. Primary Leads and Secondary Screw Terminals, Class 2
Y65T31-0	Transformer, 120/208/240 VAC Primary to 24 VAC Secondary, 40 VA, Foot Mount (Y65AR+), 8 in. Primary Leads and Secondary Screw Terminals, Class 2
AP-TBK4SA-0	Replacement MS/TP SA Bus Terminal, 4-Position Connector, Brown, Bulk Pack
AP-TBK4FC-0	Replacement MS/TP FC Bus Terminal, 4-Position Connector, Blue, Bulk Pack
AP-TBK3PW-0	Replacement Power Terminal, 3-Position Connector, Gray, Bulk Pack
MS-BTCVT-1	Wireless Commissioning Converter, with Bluetooth® technology
MS-BTCVTCBL-700	Cable replacement Set for the MS-BTCVT-1 or the NS-ATV7003-0; includes one 5 ft (1.5 m) retractable cable.
MS-DIS1710-0	Local Controller Display for FEC1611 and FEC2611 models
MS-ZFR1810-0	Wireless Field Bus Coordinator, 10 mW Transmission Power. Functions with NAE35xx, NAE45xx, NAE55xx, and NCE25xx models.
MS-ZFR1811-0	Wireless Field Bus Router, 10 mW Transmission Power. Functions with Metasys BACnet FECs, VMA1600s, and WRZ-TTx Series Wireless Mesh Room Temperature Sensors.
MS-ZFRCBL-0	Wire Harness for use with ZFR1811 Router. Allows ZFR1811 Router to function with FEC1620; and with FEC1610, VMA1610, or VMA1620 controllers in conjunction with NS Series Sensors, Wireless Commissioning Converter, or DIS1710 Local Controller Display.

Field Equipment Controller (FEC) Series (Continued)

Technical Specifications

	FEC Series
Product Code Numbers	MS-FEC1611-0 – Field Equipment Controller MS-FEC2611-0 – Field Equipment Controller MS-FEC1621-0 – Field Equipment Controller with Display and Push Button User Interface MS-FEC2621-0 – Field Equipment Controller with Display and Push Button User Interface
Supply Voltage	24 VAC (nominal, 20 VAC minimum/30 VAC maximum), 50/60 Hz, power supply Class 2 (North America), Safety Extra-Low Voltage (SELV) (Europe)
Power Consumption	14 VA maximum for FEC1611 and FEC2611 (no integral display) 20 VA maximum for FEC1621 and FEC2621 (with integral display) Note: VA ratings do not include any power supplied to the peripheral devices connected to Binary Outputs (BOs) or Configurable Outputs (COs), which can consume up to 12 VA for each BO or CO; for a possible total consumption of an additional 84 VA (maximum).
Ambient Conditions	**Operating:** 0 to 50°C (32 to 122°F); 10 to 90% RH noncondensing **Storage:** -40 to 80°C (-40 to 176°F); 5 to 95% RH noncondensing
Controller Addressing	DIP switch set; valid field controller device addresses 4–127 (Device addresses 0–3 and 128–255 are reserved and not valid field controller addresses.)
Communications Bus	BACnet® MS/TP, RS-485: 3-wire FC Bus between the supervisory controller and field controllers 4-wire SA Bus between field controller, network sensors, and other sensor/actuator devices, includes a lead to source 15 VDC supply power (from field controller) to bus devices.[1]
Processor	H8SX/166xR Renesas® microcontroller
Memory	1 MB Flash Memory and 512 KB Random Access Memory (RAM)
Input and Output Capabilities	**FEC16 Models:** 2 - Universal Inputs: Defined as 0–10 VDC, 4–20 mA, 0–600k ohm, or Binary Dry Contact 1 - Binary Inputs: Defined as Dry Contact Maintained or Pulse Counter/Accumulator Mode 3 - Binary Outputs: Defined as 24 VAC Triac (selectable internal or external source power) 4 - Configurable Outputs: Defined as 0–10 VDC or 24 VAC Triac BO **FEC26 Models:** 6 - Universal Inputs: Defined as 0–10 VDC, 4–20 mA, 0–600k ohm, or Binary Dry Contact 2 - Binary Inputs: Defined as Dry Contact Maintained or Pulse Counter/Accumulator Mode 3 - Binary Outputs: Defined as 24 VAC Triac (selectable internal or external source power) 4 - Configurable Outputs: Defined as 0–10 VDC or 24 VAC Triac BO 2 - Analog Outputs: Defined as 0–10 VDC or 4–20 mA
Analog Input/Analog Output Resolution and Accuracy	Analog Input: 16-bit resolution Analog Output: 16-bit resolution and ±200 mV in 0–10 VDC applications
Terminations	Input/Output: Fixed Screw Terminal Blocks FC Bus, SA Bus, and Supply Power: 3-Wire and 4-Wire Pluggable Screw Terminal Blocks FC Bus and SA Bus: RJ-12 6-Pin Modular Jacks
Mounting	Horizontal on single 35 mm DIN rail mount (preferred), or screw mount on flat surface with three integral mounting clips on controller
Housing	Enclosure material: ABS and plycarbonate UL94 5VB; Self-extinguishing, Plenum-rated Protection Class: IP20 (IEC529)
Dimensions (Height x Width x Depth)	**FEC16 Models:** 150 x 164 x 53 mm (5-7/8 x 6-7/16 x 2-1/8 in.) including terminals and mounting clips **FEC26 Models:** 150 x 190 x 53 mm (5-7/8 x 7-1/2 x 2-1/8 in.) including terminals and mounting clips Note: Mounting space for FEC16 and FEC26 Models requires an additional 50 mm (2 in.) space on top, bottom, and front face of controller for easy cover removal, ventilation, and wire terminations.
Weight	**FEC16 Models:** 0.4 kg (0.9 lb) **FEC26 Models:** 0.5 kg (1.1 lb)
Compliance	**United States:** UL Listed, File E107041, CCN PAZX, UL 916, Energy Management Equipment; FCC Compliant to CFR47, Part 15, Subpart B, Class A
	Canada: UL Listed, File E107041, CCN PAZX7, CAN/CSA C22.2 No. 205, Signal Equipment Industry Canada Compliant, ICES-003
CE	**Europe:** CE Mark – Johnson Controls, Inc., declares that the FEC Series Field Equipment Controllers are in compliance with the essential requirements and other relevant provisions of the EMC Directive 2004/108/EC. Note: For **FEC26 Models**, Conducted RF Immunity within EN 61000-6-2 meets performance criteria B.
	Australia and New Zealand: C-Tick Mark, Australia/NZ Emissions Compliant
	BACnet International: BACnet Testing Laboratories™ (BTL) 135-2004 Listed BACnet Application Specific Controller (B-ASC)

1. For more information, refer to the *MS/TP Communications Bus Technical Bulletin (LIT-12011034)*.

Code No. LIT-1900509
Issued September 2, 2011

ZFR1800 Series

Wireless Field Bus System

Description

The ZFR1800 Series Wireless Field Bus System uses ZigBee™ technology to provide a new wireless platform for Metasys® Field Equipment Controllers (FEC), Input/Output Module (IOM), or Variable Air Volume (VAV) Modular Assembly 1600 Series (VMA16) field controllers using BACnet® protocol.

One ZFR1811 router is required per field controller. This pairing of a router and an FEC, IOM or VMA16 field controller is a Wireless Enabled Field Controller (WEFC).

A ZFR1800 Series system consists of:

- up to eight ZFR1810 Wireless Field Bus Coordinators per field bus
- up to 35 Wireless Enabled Field Controllers (WEFCs) per coordinator
- up to 100 WEFCs per field bus, depending on the network engine (32 with NCE, 50 with NAE35)
- up to nine WRZ Sensors per FEC or VMA16 field controller
- additional ZFR1811 Wireless Field Bus Routers connected to MS-ZFRRPT-0 Repeater accessories, as required, acting as repeaters.

Note: Repeaters extend the wireless transmission distance of the BACnet data communications, fill in any gaps within the wireless mesh network, and provide multiple wireless data transmission pathways. Together, these components create a wireless mesh network that allows the exchange of data between the collection of devices within the ZFR1800 Series System's wireless network and wired BACnet Master-Slave/Token-Passing (MS/TP) devices.

The wireless mesh network enhances reliability by providing redundant transmission paths for the data through other routers in the mesh network. The result is a resilient, self-healing network.

Refer to the *ZFR1800 Series Wireless Field Bus System Product Bulletin (LIT-12011336)* for important product application information.

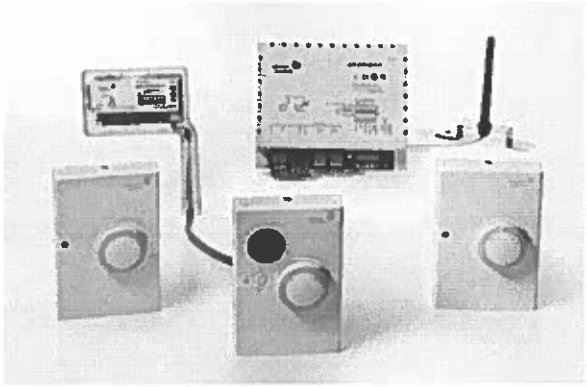
Features

- wireless communications for a Metasys system
- wireless mesh network
- improved application mobility and flexibility
- support of up to nine wireless room temperature sensors per wirelessly enabled field controller
- multiple diagnostic Light-Emitting Diodes (LEDs)
- compact, easy-to-install, and versatile ZFR1811 routers
- stylish, lightweight wireless room temperature sensors with optional LCD screen, occupancy override button, and optional setpoint adjustment

Applications

The wireless Metasys products within a Metasys system are ideal for any location where it is cost-prohibitive, difficult, or aesthetically unappealing to hardwire between Metasys products. Examples of these locations include the following:

- hospitals, office buildings, university campuses, educational facilities, correctional facilities, and other commercial structures with brick or solid concrete walls and/or ceilings that impede hard-wired applications
- office buildings, retail stores, and other commercial real estate where tenant turnover is frequent and temporary walls and ceilings are common
- museums, historical buildings, atriums, and other sites where building aesthetics and historical preservation are important



ZFR1811 Routers (top left), ZFR1810 Coordinator (top center), and WRZ Series Sensors (bottom)

- stadiums, arenas, gymnasiums, convention centers, airports, zoos, and other locations with large, open spaces
- buildings with marble, granite, glass, mirrored, wood veneer, or other decorative surfaces that present challenges to hard-wiring
- buildings with asbestos or other hazardous materials that must not be disturbed
- buildings with occupants sensitive to disruptions to business
- regions with high labor costs

The ZFR1800 Series System is approved by national compliance agencies for use only in the United States and Canada. See *Technical Specifications*.

Locations or applications that prohibit cellular telephones or Wireless Fidelity (WiFi) systems are unsuitable for the wireless Metasys products:

- operating rooms or radiation therapy rooms
- validated environments
- UL 864 applications
- Department of Defense applications requiring Diacap certification (for example, military bases and military hospitals)

Do not use the wireless Metasys products in applications that cannot tolerate intermittent interference or where:

- critical control features would affect life safety or result in large monetary loss, including secondary (backup) life-safety applications
- data centers, production lines, or critical areas would be shut down
- loss of critical control would result from loss of data from humidity or temperature sensor communications
- operation of exhaust fans or Air Handling Units (AHUs) would impair a purge or pressurization mode
- missing data would invalidate reporting required by the customer
- security points are monitored

Repair Information

If a ZFR1800 Series Wireless Field Bus System component fails to operate within its specifications, replace the unit. For a replacement ZFR1800 Series System component, contact the nearest Johnson Controls® representative.

Wireless Field Bus System (Continued)

Selection Charts

ZFR1800 Series Wireless Field Bus System Components

Product Code Number	Product Description
MS-ZFR1810-0	Wireless Field Bus Coordinator, 10 mW Transmission Power; functions with NAE35, NAE45, NAE55, and NCE25 Models
MS-ZFR1811-0	Wireless Field Bus Router, 10 mW Transmission Power; functions with Metasys BACnet FECs, IOMs, VMA16s, and WRZ Series Wireless Room Temperature Sensors
WRZ-THB0000-0	Wireless Temperature/Humidity Sensor with Display, Warmer/Cooler (+/-) Setpoint Adjustment or Setpoint Adjustment Scale: 13 to 29°C/55 to 85°F, F/C Button, Relative Humidity (RH) Button and Occupancy Button, 10 mW Transmission Power
WRZ-THN0000-0	Wireless Temperature/Humidity Sensor, Occupancy Button, No Temperature adjustment and No LCD temperature/humidity display, 10 mW Transmission Power
WRZ-THP0000-0	Wireless Temperature/Humidity Sensor, Warmer/Cooler (+/-) Setpoint Adjustment and Occupancy Button, No LCD temperature/humidity display, 10 mW Transmission Power
WRZ-TTB0000-0	Wireless Temperature Sensor with Display and F/C Button, 10 mW Transmission Power
WRZ-TTD0000-0	Wireless Temperature Sensor with Display, F/C Button and Fan Speed Control, 10 mW Transmission Power
WRZ-TTP0000-0	Wireless Room Temperature Sensor, Warmer/Cooler (+/-) Setpoint Adjustment, 10 mW Transmission Power
WRZ-TTR0000-0	Wireless Room Temperature Sensor, No Setpoint Adjustment, 10 mW Transmission Power
WRZ-TTS0000-0	Wireless Room Temperature Sensor, Setpoint Adjustment Scale: 13 to 29°C/55 to 85°F, 10 mW Transmission Power

WRZ Sensor Model Comparison

Sensor Model	Temperature	3% Humidity	Display	F/C Button	Fan Control	Occupancy Override	Setpoint Adjustment Dial[1]
WRZ-THB0000-0	x	x	x	x		x	Both
WRZ-THN0000-0	x	x				x	
WRZ-THP0000-0	x	x				x	W/C
WRZ-TTB0000-0	x		x	x		x	Both
WRZ-TTD0000-0	x		x	x	x	x	Both
WRZ-TTP0000-0	x					x	ABSOL
WRZ-TTR0000-0	x					x	
WRZ-TTS0000-0	x					x	ABSOL

1. Either Absolute Scale (ABSOL), Warmer/Cooler (W/C) or Both (BOTH).

Related Field Controllers

Product Code Number	Product Description[1]
MS-FEC1611-0	10-Point Field Equipment Controller with 2 UI, 1 BI, 3 BO, 4 CO, 24 VAC, and SA Bus, with Mounting Base
MS-FEC1621-0	Field Equipment Controller Cover with 2 UI, 1 BI, 3 BO, 4 CO, 24 VAC, and SA Bus with LCD Screen, with Mounting Base
MS-FEC2611-0	17-Point Field Equipment Controller with 6 UI, 2 BI, 3 BO, 2 AO, 4 CO, 24 VAC, and SA Bus with Mounting Base
MS-FEC2621-0	17-Point Field Equipment Controller with 6 UI, 2 BI, 3 BO, 2 AO, 4 CO, 24 VAC, and SA Bus with Mounting Base with LCD Screen
MS-IOM1711-0	4-Point IOM with 4 BI, FC Bus, and SA Bus Support
MS-IOM2711-0	6-Point IOM with 2 UI, 2 UO, 2 BO, FC Bus, and SA Bus Support
MS-IOM3711-0	12-Point IOM with 4 UI, 4 UO, 4 BO, FC Bus, and SA Bus Support
MS-IOM4711-0	17-Point IOM with 6 UI, 2 BI, 3 BO, 2 AO, 4 CO, 24 VAC, and SA Bus with Mounting Base
MS-VMA1610-0	Integrated VAV Controller/Actuator/Pressure Sensor (Cooling Only), FC Bus, and SA Bus
MS-VMA1620-0	Integrated VAV Controller/Actuator/Pressure Sensor (with Reheat and Fan Control), FC Bus, and SA Bus

1. Universal Input (UI), Binary Input (BI), Binary Output (BO), Analog Output (AO), Configurable Output (CO), Sensor Actuator (SA)

Accessories

Product Code Number	Product Description (Part 1 of 2)
MS-ZFRRPT-0	Optional Repeater Accessory for use with ZFR1811 Router as a repeater. Includes 20-28 VAC or 16-30 VDC input power, 12 VDC output power supply (regulated at 500 mA maximum, 6 VA), and 4 x 4 in. electrical box with cover.
MS-ZFRCBL-0	Wire Harness for use with ZFR1811 Router. Allows ZFR1811 Router to function with FEC1620; and with FEC1610, VMA1610, or VMA1620 controllers in conjunction with NS Series Sensors, Wireless Commissioning Converter, or DIS1710 Local Controller Display.
IA OEM-DAUB1 2400	Universal Serial Bus (USB) Dongle with ZigBee Driver provides a wireless connection through the Controller Configuration Tool (CCT) to allow wireless commissioning of the wirelessly enabled FEC and VMA1600 field controllers. Also allows use of the ZFR Checkout Tool (ZCT) in CCT. (Purchase through Johnson Controls eCounterline. Obtain the necessary price and description information from the Johnson Controls *Computer Price List*, which is available on the Johnson Controls Portal intranet site by Information Technology Acquisition Services [ITAS]).
WRZ-SST-100	Optional Wireless Sensing System Tool to be used with a WRZ-TTx Series Sensor to indicate wireless signal strength between potential locations of ZFR1800 System devices.

Wireless Field Bus System (Continued)

Product Code Number	Product Description (Part 2 of 2)
MS-BTCVT-1	Wireless Commissioning Converter, with Bluetooth® technology
MS-DIS1710-0	Local Controller Display for FEC1610 and FEC2610 models
TP-2420	Transformer, Wall Plug Mount, 120 VAC to 24 VAC, 20 VA, Class 2
Y65T31-0[1]	Transformer, 120/208/240 VAC to 24 VAC, 40 VA, Class 2, Foot Mount, 20 cm (8 in.) Primary Leads and Secondary Screw Terminals
T-4000-119	1.6 mm (1/16 in.) Allen-Head Adjustment Tool (30 per Bag) for Accessing and Securing WRZ-TTx Series Wireless Room Temperature Sensors
1.5 VDC, AA Alkaline Battery	Replacement Battery for WRZ-TTx Series Wireless Room Temperature Sensors (Purchase Locally.)

1. Additional Y60 Series Transformers are available from Johnson Controls.

Technical Specifications

ZFR1810 Wireless Field Bus Coordinator	
Product Code Number	MS-ZFR1810-0
Power Supply Input	**One of the following:** 24 VAC +10%/-15%, 50/60 Hz, Class 2. Transformer allowance should be 2.5 VA maximum, 2 VA typical. Provided through the three-position 24 V~ screw terminal pluggable block. 15 VDC, 180 mA (7 to 18 VDC, 185 mA maximum current draw) on the FC Bus provided through the FC/SA BUS IN RJ-12 jack from the FC Bus Jack on a Field Controller or NxE supervisory engine.
Power Supply Output	15 VDC; Provided through the FC/SA BUS, FC/SA BUS OUT RJ-12 jack for external devices.
Addressing	DIP Switches, Field Adjustable
Wireless Band	Direct-Sequence Spread-Spectrum, 2.4 GHz ISM Bands
Transmission Power	10 mW Maximum
Transmission Range	76.2 m (250 ft) Maximum Line-of-Sight 15 m (50 ft) Recommended
Ambient Conditions	**Operating:** 0 to 50°C (32 to 122°F), 5 to 95% RH, Noncondensing **Storage:** -20 to 70°C (-4 to 158°F), 5 to 90% RH, Noncondensing
Materials	White Plastic Housing with Plenum rating per UL1995 UL94-5VB Flammability Rating
Terminations	Two spade terminals with three-position screw terminal pluggable block for 24 VAC power supply input. Four spade terminals with four-position screw terminal pluggable block for RS-485 communications. RJ-12 IN jack for 15 VDC power supply and communications connection from an NxE or FEC FC Bus jack. RJ-12 OUT jack supplies 15 VDC and communications to BTCVT Wireless Commissioning Converter.
Dimensions	146 x 122 x 52 mm (5.8 x 4.8 x 2.1 in.)
Mounting Hardware	Four No. 6 Trade Size Sheet Metal Screws
Shipping Weights	0.45 kg (1.0 lb)
Compliance CE	**United States:** Intended for Connection to an NEC Class 2 Power Source; UL 916 Energy Management Plenum rated per UL1995 UL94-5VB Flammability Rating FCC Compliant to CFR47, Part 15, Subpart B, Class A Transmission Complies with FCC Part 15.247 Regulations for Low Power Unlicensed Transmitters Transmitter FCC Identification: TFB-MATRIXL **Canada:** CAN/CSA C22.2 No. 205, Signal Equipment Industry Canada (IC) Compliant to Canadian ICES-003, Class B Limits Industry Canada IC: 5969A-MATRIXL **Europe:** CE Mark – Johnson Controls, Inc., declares that this product is in compliance with the essential requirements and other relevant provisions of the R&TTE Directive 1999/05/EC and the EMC Directive 2004/108/EC. **Australia and New Zealand:** C-Tick Mark, Australia/NZ Emissions Compliant

ZFR1811 Wireless Field Bus Routers (Part 1 of 2)	
Product Code Number	MS-ZFR1811-0
Supply Voltage	8 to 18 VDC, 15 VDC nominal, Provided from the FC/SA BUS RJ-12 jack on the FEC or VMA1600
Current Consumption	90 mA maximum
Addressing	DIP Switches, Field Adjustable
Wireless Band	Direct-Sequence Spread-Spectrum, 2.4 GHz ISM Bands
Transmission Power	10 mW Maximum
Transmission Range	76.2 m (250 ft) Maximum Indoor Line-of-Sight 15 m (50 ft) Recommended

Wireless Field Bus System (Continued)

ZFR1811 Wireless Field Bus Routers (Part 2 of 2)	
Ambient Conditions	**Operating:** 0 to 50°C (32 to 122°F), 5 to 95% RH, Noncondensing **Storage:** -20 to 70°C (-4 to 158°F), 5 to 90% RH, Noncondensing
Materials	Translucent Plastic Housing with Plenum rating per UL1995 UL94-5VB Flammability Rating
Terminations	RJ-12 plug for connection to FEC or VMA1600 FC/SA Bus jack
Dimensions	136 x 100 x 18 mm (5-3/8 x 3-15/16 x 3/4 in.)
Mounting Hardware	1/2 in. trade size Electrical Mechanical Tubing (EMT) connector
Shipping Weights	0.095 kg (0.21 lb)
Compliance CE	**United States:** Intended for Connection to an NEC Class 2 Power Source; UL 916 Energy Management Plenum rated per UL1995 UL94-5VB Flammability Rating FCC Compliant to CFR47, Part 15, Subpart B, Class A Transmission Complies with FCC Part 15.247 Regulations for Low Power Unlicensed Transmitters Transmitter FCC Identification: TFB-MATRIXL **Canada:** CAN/CSA C22.2 No. 205, Signal Equipment Industry Canada (IC) Compliant to Canadian ICES-003, Class B Limits Industry Canada IC: 5969A-MATRIXL **Europe:** CE Mark – Johnson Controls, Inc., declares that this product is in compliance with the essential requirements and other relevant provisions of the R&TTE Directive 1999/05/EC and the EMC Directive 2004/108/EC. **Australia and New Zealand:** C-Tick Mark, Australia/NZ Emissions Compliant

WRZ Series Wireless Room Sensors (Part 1 of 2)	
Product Codes	**WRZ-THB0000-0:** Temperature/Humidity Sensor with Display, Warmer/Cooler (+/-) Setpoint Adjustment or Setpoint Adjustment Scale: 13 to 29°C/55 to 85°F, F/C Button, RH Button and Occupancy Button **WRZ-THN0000-0:** Temperature/Humidity Sensor with Occupancy Button **WRZ-THP0000-0:** Temperature/Humidity Sensor with Warmer/Cooler (+/-) Setpoint Adjustment and Occupancy Button **WRZ-TTB0000-0:** Temperature Sensor with Display and F/C Button **WRZ-TTD0000-0:** Temperature Sensor with Display, F/C Button and Fan Speed Control **WRZ-TTP0000-0:** Temperature Sensor with Warmer/Cooler (+/-) Setpoint Adjustment **WRZ-TTR0000-0:** Temperature Sensor with No Setpoint Adjustment **WRZ-TTS0000-0:** Temperature Sensor with Setpoint Adjustment Scale: 13 to 29°C (55 to 85°F)
Power Requirements	3 VDC Supplied by Two 1.5 VDC AA Alkaline Batteries (Included with Sensor); Typical Battery Life: 48 Months (36 Months Minimum)
Addressing	DIP Switches, Field Adjustable. MS/TP Address, Network Number, and Zone Address
Ambient Conditions	**Operating:** 0 to 50°C (32 to 122°F), 5 to 95% RH, Noncondensing **Storage:** -40 to 71°C (-40 to 160°F), 5 to 95% RH, Noncondensing
Wireless Band	Direct-Sequence Spread-Spectrum, 2.4 GHz ISM Band
Transmission Power	10 mW Maximum
Transmission Range	30 m (100 ft) Maximum Indoor Line-of-Sight; 15 m (50 ft) Recommended
Transmissions	Every 60 Seconds (±20 Seconds)
Temperature System Accuracy	0.6C°/1.0F° Over the Range of 13 to 29°C (55 to 85°F); 0.9C°/1.5F° Over a Range of 0 to 13°C (32 to 55°F) and 29 to 43°C (85 to 110°F)
Temperature Sensor Type	Internal 10k ohm Negative Temperature Coefficient (NTC) Thermistor
Humidity Calibrated Range	10% to 90% RH at 23°C (73°F)
Humidity Accuracy	±3% RH across the Range of 20% to 80% RH, ±6% RH across the Range of 10% to 20% RH and 80% to 90% RH; within the Temperature Range of 13 to 29°C (55 to 85°F)
Materials	NEMA 1 White Plastic Housing
Mounting	Screw Mount or Double-Sided Adhesive Foam Tape Mount; Double-Sided Adhesive Foam Tape Included
Dimensions	120 x 80 x 38 mm (4.7 x 3.1 x 1.5 in.)
Shipping Weight	0.14 kg (0.3 lb)

Wireless Field Bus System (Continued)

WRZ Series Wireless Room Sensors (Part 2 of 2)	
Compliance CE	**United States:** Transmission Complies with FCC Part 15.247 Regulations for Low Power Unlicensed Transmitters Transmitter FCC Identification: TFB-MATRIXL **Canada:** Industry Canada IC: 5969A-MATRIXL **Europe:** CE Mark – Johnson Controls, Inc., declares that this product is in compliance with the essential requirements and other relevant provisions of the R&TTE Directive 1999/05/EC and the EMC Directive 2004/108/EC. **Australia and New Zealand:** C-Tick Mark, Australia/NZ Emissions Compliant

Functional Devices, Inc.
310 South Union Street
Russiaville, IN 46979
www.functionaldevices.com

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Sales: (800) 888-5538
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Email: sales@functionaldevices.com

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RIBU1C

Enclosed Relay 10 Amp SPDT with 10-30 Vac/dc/120 Vac Coil

Functional Devices, Inc. A6000 2006

c UL us LISTED

CE

MADE IN USA

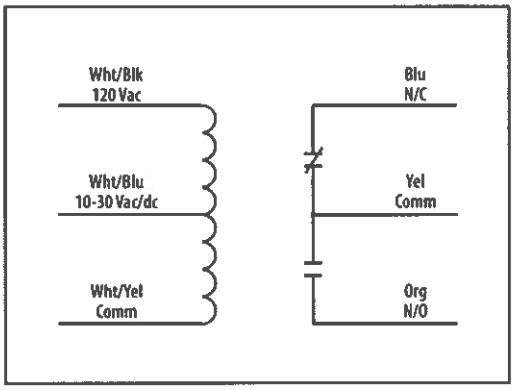
 # Relays & Contact Type: One (1) SPDT Continuous Duty Coil
Expected Relay Life: 10 million cycles minimum mechanical
Operating Temperature: -30 to 140° F
Operate Time: 20mS
Relay Status: LED On = Activated
Dimensions: 1.70" x 2.80" x 1.50" with .50" NPT nipple
Wires: 16", 600V Rated
Approvals: UL Listed, UL916, UL864, UL924, C-UL California State Fire Marshal, CE
Housing Rating: Plenum, NEMA 1
Gold Flash: Yes
Override Switch: No

Contact Ratings:
10 Amp Resistive @ 120-277 Vac
10 Amp Resistive @ 28 Vdc
480 VA Pilot Duty @ 240-277 Vac
480 VA Ballast @ 277 Vac
600 Watt Tungsten @ 120 Vac N/O
240 Watt Tungsten @ 120 Vac N/C
1/3 HP for N/O @ 120-240 Vac
1/6 HP for N/C @ 120-240 Vac
1/4 HP for N/O @ 277 Vac
1/8 HP for N/C @ 277 Vac

Coil Current:

30 mA @ 10 Vac	12 mA @ 10 Vdc
32 mA @ 12 Vac	14 mA @ 12 Vdc
42 mA @ 24 Vac	16 mA @ 24 Vdc
50 mA @ 30 Vac	18 mA @ 30 Vdc
25 mA @ 120 Vac	

Coil Voltage Input:
10-30 Vac/dc ; 120 Vac ; 50-60 Hz
Drop Out = 2.1 Vac / 2.8 Vdc
Pull In = 9 Vac / 10 Vdc



RIBU1C-RD
» Red housing

RIBU1C-N4
» NEMA 4X housing

NOTES

Code No. LIT-1900668
Issued September 14, 2011

WRZ Series Wireless Room Sensors

Description

The WRZ Series Wireless Room Sensors are designed to sense room/zone temperature and transmit wireless temperature control data. Some models also sense and transmit relative humidity.

In a ZFR1800 Series Wireless Field Bus System application, the sensors communicate with FEC16 Series, FEC26 Series, and VMA16 Series Controllers by means of the ZFR1811 Router.

In wired field bus applications, the sensors communicate with a WRZ-7850 Wireless Receiver. The WRZ-7850 Receiver transfers data to the controller by means of the Sensor Actuator (SA) communication bus. In a typical application, one WRZ Series Sensor reports to one WRZ-7850 Receiver, but up to five WRZ Series Sensors can be associated with a single WRZ-7850 Receiver for multi-sensor averaging or high/low temperature selection.

WRZ Series sensor models are available with or without a Liquid Crystal Display (LCD). Depending on the sensor model, the WRZ Series Sensor can transmit sensed temperature, setpoint temperature, sensed humidity, occupancy status, and low battery conditions to an associated router or receiver. The WRZ Series Sensors are designed for indoor, intra-building applications only.

The WRZ Sensors use direct-sequence, spread-spectrum RF technology, and operate on the 2.4 GHz Industrial, Scientific, and Medical (ISM) band. The receiver meets the IEEE 802.15.4 standard for low power, low duty cycle RF transmitting systems.

Refer to the *WRZ Series Wireless Room Sensors Product Bulletin (LIT-12011653)* for important product application information.

Features

- Wireless RF Design
- Integral Wireless Signal Strength Testing Built into the Sensor
- Easy Installation and Relocation
- Easily-Applicable Data Types
- Simple, Field Adjustable DIP Switches
- Optional, Battery-Powered WRZ-SST-110 Wireless System Survey Tool

WRZ Wireless Room Sensors

- High Resistance to RF Interference from Other Radio Devices or RF Noise Sources
- User Selectable Default Display for Humidity Models
- Display Models
- Three Temperature Setpoint Range Options

Repair Information

If the WRZ Wireless Room Sensor fails to operate within its specifications, replace the unit. For a replacement sensor, contact the nearest Johnson Controls® representative.

Selection

Selection

Product Code Number	Product Description
WRZ-THB0000-0	Wireless Room Temperature and Humidity Sensor with Display, Warmer/Cooler (+/-) Setpoint Adjustment or Setpoint Adjustment Scale: 55 to 85°F (13 to 27°C), F/C Button, Relative Humidity (RH) Button, and Manual Occupancy Override Button
WRZ-THN0000-0	Wireless Room Temperature and Humidity Sensor with Battery Level/Signal Strength LED and Manual Occupancy Override Button
WRZ-THP0000-0	Wireless Room Temperature and Humidity Sensor with Warmer/Cooler (+/-) Setpoint Adjustment and Manual Occupancy Override Button
WRZ-TTB0000-0	Wireless Room Temperature Sensor with Display, F/C Button, and Manual Occupancy Override Button
WRZ-TTD0000-0	Wireless Room Temperature Sensor with Display, F/C Button, Fan Speed Control, and Manual Occupancy Override Button
WRZ-TTP0000-0	Wireless Room Temperature Sensor with Warmer/Cooler (+/-) Setpoint Adjustment, Battery Level/Signal Strength LED, and Manual Occupancy Override Button
WRZ-TTR0000-0	Wireless Room Temperature Sensor with Battery Level/Signal Strength LED, Manual Occupancy Override Button, and No Setpoint Adjustment
WRZ-TTS0000-0	Wireless Room Temperature Sensor with Setpoint Adjustment Scale: 55 to 80°F (13 to 27°C), Battery Level/Signal Strength LED, and Manual Occupancy Override Button
WRZ-SST-110	Wireless System Survey Tool

WRZ Sensor Model Comparison

Sensor Model	Temperature	3% Humidity	Display	F/C Button	Fan Control	Occupancy Override	Setpoint Adjustment Dial[1]
WRZ-THB0000-0	x	x	x	x		x	CONFIG
WRZ-THN0000-0	x	x				x	NO DIAL
WRZ-THP0000-0	x	x				x	W/C
WRZ-TTB0000-0	x		x	x		x	CONFIG
WRZ-TTD0000-0	x		x	x	x	x	CONFIG
WRZ-TTP0000-0	x					x	W/C
WRZ-TTR0000-0	x					x	NO DIAL
WRZ-TTS0000-0	x					x	SCALED

1. Warmer/Cooler temperature offset (W/C), Single-value in 13 to 29°C (55 to 85°F) range (SCALED), CONFIG - system-configured (available on display models only)

WRZ Series Wireless Room Sensors (Continued)

Technical Specifications

WRZ Series Wireless Room Sensors	
Product Codes	WRZ-THB0000-0: Temperature/Humidity Sensor with Display, Warmer/Cooler (+/-) Setpoint Adjustment or Setpoint Adjustment Scale: 13 to 29°C/55 to 85°F, F/C Button, RH Button and Occupancy Button WRZ-THN0000-0: Temperature/Humidity Sensor with Occupancy Button WRZ-THP0000-0: Temperature/Humidity Sensor with Warmer/Cooler (+/-) Setpoint Adjustment and Occupancy Button WRZ-TTB0000-0: Temperature Sensor with Display and F/C Button WRZ-TTD0000-0: Temperature Sensor with Display, F/C Button and Fan Speed Control **WRZ-TTP0000-0:** Temperature Sensor with Warmer/Cooler (+/-) Setpoint Adjustment **WRZ-TTR0000-0:** Temperature Sensor with No Setpoint Adjustment **WRZ-TTS0000-0:** Temperature Sensor with Setpoint Adjustment Scale: 13 to 29°C (55 to 85°F)
Power Requirements	3 VDC Supplied by Two 1.5 VDC AA Alkaline Batteries (Included with Sensor); Typical Battery Life: 48 Months (36 Months Minimum)
Addressing	DIP Switches, Field Adjustable. MS/TP Address, PAN Number, and Zone Address
Ambient Conditions	**Operating:** 0 to 50°C (32 to 122°F), 5 to 95% RH, Noncondensing **Storage:** -40 to 71°C (-40 to 160°F), 5 to 95% RH, Noncondensing
Wireless Band	Direct-Sequence Spread-Spectrum, 2.4 GHz ISM Band
Transmission Power	10 mW Maximum
Transmission Range	30 m (100 ft) Maximum Line-of-Sight; 15 m (50 ft) Recommended
Transmissions	**Temperature:** Every 60 Seconds (±20 Seconds) **Humidity:** Every 3 minutes, or 1 minute intervals if temperature or humidity changes
Temperature System Accuracy	0.6C°/1.0F° Over the Range of 13 to 29°C (55 to 85°F); 0.9C°/1.5F° Over a Range of 0 to 13°C (32 to 55°F) and 29 to 43°C (85 to 110°F)
Temperature Sensor Type	Internal 10k ohm Negative Temperature Coefficient (NTC) Thermistor
Humidity Calibrated Range	10% to 90% RH at 23°C (73°F)
Humidity Accuracy	±3% RH across the Range of 20% to 80% RH, ±6% RH across the Range of 10% to 20% RH and 80% to 90% RH; within the Temperature Range of 13 to 29°C (55 to 85°F)
Materials	NEMA 1 White Plastic Housing
Mounting	Screw Mount or Double-Sided Adhesive Foam Tape Mount; Double-Sided Adhesive Foam Tape Included
Dimensions	120 x 80 x 38 mm (4.7 x 3.1 x 1.5 in.)
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0075-0164

Terrace Office Remodel
Baseball Ops

DRAWING NUMBER	DRAWING TITLE
TITLE	Title Page
PAGE 2	NAE Reference Drawing
PAGE 3	NAE Panel Detail Drawing
PAGE 4	N2 Bus Riser
1.1	RTU-1 Flow
1.2	RTU-1 Wiring Detail - Existing
1.3	RTU-1 Sequence of Operations
1.4	RTU-1 Point Schedule
2.1	VMA-11 Flow
2.2	VMA-11 Wiring Detail
2.3	VMA-11 Sequence of Operations
2.4	VMA-11 Point Schedule
3.1	VMA-13 Flow
3.2	VMA-13 Wiring Detail
3.3	VMA-13 Sequence of Operations
3.4	VMA-13 Point Schedule
RS-1	Room Schedule
VS-1	Valve Schedule

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- ■ Facility Management System
- ☐ Air and Water System Balancing
- ☐ Fire Management System
- ☐ Security System
- ☐ Lighting Services
- ☐ Instrumentation System Installation
- ☐ Building Operations Management
- ☐ Energy Conservation Control
- ☐ Training Programs
- ☐ Performance Contracting
- ☐ Planned Service Agreements

Air Conditioning
Heating
Diagnostic Services
Coil Cleaning
Refrigeration
Automatic Temperature Controls
Facility Management Systems
Fire Management
Security Management
Building Operations and Management
Water Treatment
Electrical Equipment
Emergency Generator / Lighting Equipment
Industrial Controls / Recording / Indication Equipment

PROJECT TITLE
MILLER PARK
TERRACE OFFICE REMODEL
BASEBALL OPS

ARCHITECT	ENGINEER
Phone:	Phone:
MECHANICAL CONTRACTOR	ELECTRICAL CONTRACTOR
Phone:	Phone:

REFERENCE DRAWING	NO	REVISION-LOCATION	ECN	DATE	BY

Johnson Controls

Branch Information
Phone:
Fax:

SALES ENGINEER	PROJECT MANAGER	APPLICATION ENGINEER	DATE	CONTRACT NUMBER
	KDP	KDP	1/2010	0075-0164

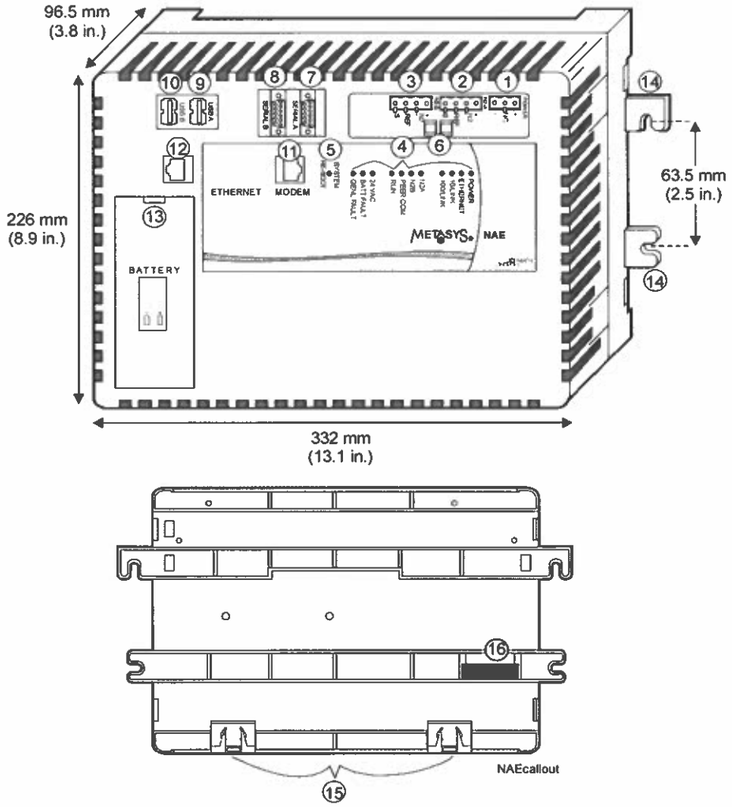
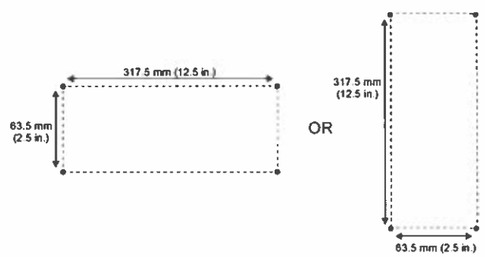
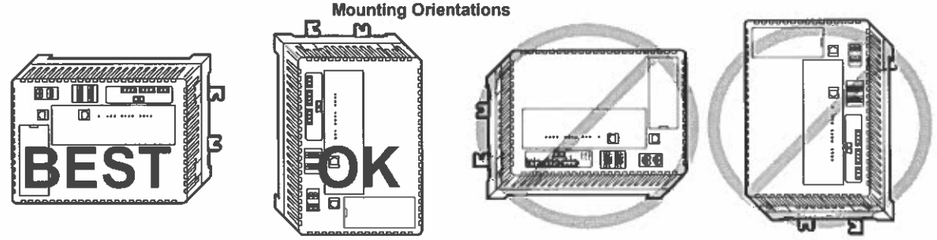


Table 1: NAE/NIE Callouts			
Callout	Description	Callout	Description
1	Pow er Termination	9	USB A connector
2	N2 A Bus termination	10	USB B connector
3	N2 B Bus termination	11	Modem RJ-11 connector
4	Light-Emitting Diodes (LEDs)	12	Ethernet RJ-45 connector
5	System Re-boot sw itch	13	Battery hatch
6	N2 End-of-Line (EOL) sw itches	14	Mounting feet (2 of 4)
7	Serial A RS-232 connector	15	DIN rail clips (2 of 2)
8	Serial B RS-232 connector	16	Battery Strap

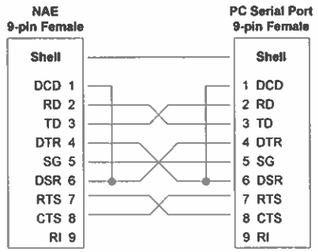


Mounting Hole Spacing

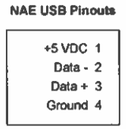
Mounting Orientations



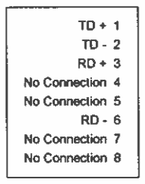
PC Serial Ports (SER A, SER B)

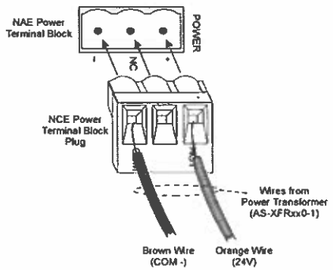


USB Ports (USB A and USB B)



Ethernet Port





24VAC Power Connection

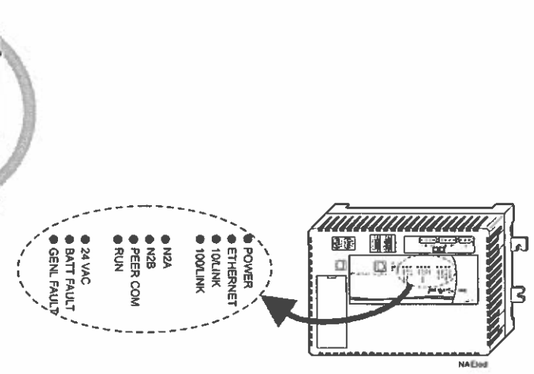


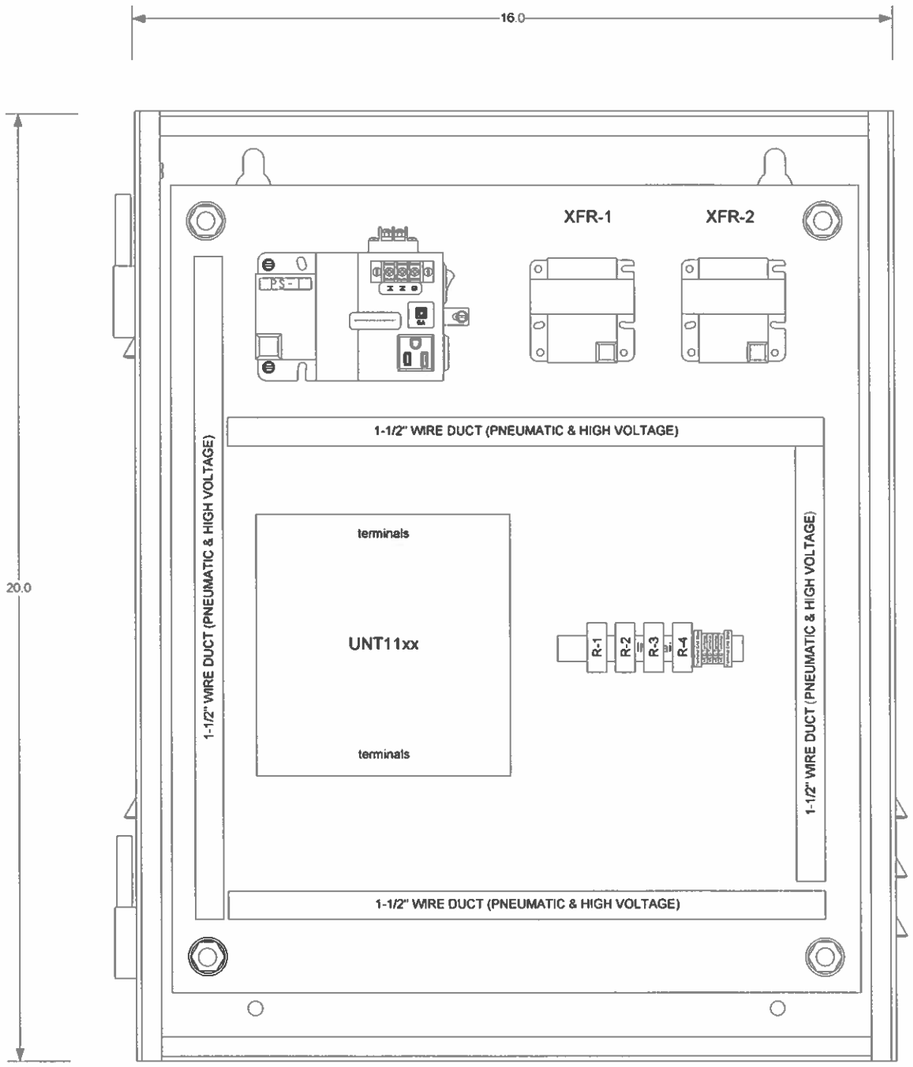
Table 4: NAE / NIE LEDs

LED	Normal	Descriptions / Other Conditions
POWER (GREEN)	On Steady	On Steady = Unit is getting power from either the battery or 24 VAC power. Also see the 24 VAC LED. Off Steady = Unit is shut down.
ETHERNET (GREEN)	Flicker	Flicker = Data is transferring on the Ethernet connection. Ethernet traffic is general traffic (may not be for the NAE / NIE). Off Steady = No Ethernet traffic, probably indicates a dead Ethernet network or bad Ethernet connection.
10/LINK (GREEN)	On Steady	On Steady = Ethernet connection is established at 10 Mb/sec.
100/LINK (GREEN)	On Steady	On Steady = Ethernet connection is established at 100 Mb/sec.
N2 A (GREEN) (NAE Only)	Flicker	Flicker = N2 A port is transmitting or receiving data. Flickers are generally in synch with data transmission, but should not be used to indicate specific transmission times. Off Steady = No traffic.
N2 B (GREEN) (NAE Only)	Flicker	Flicker = N2 B port is transmitting or receiving data. Flickers are generally in synch with data transmission, but should not be used to indicate specific transmission times. Off Steady = No traffic.
PEER COMM (GREEN)	Varies (see next column)	Flicker = Data traffic between NAE / NIE devices. For an NAE / NIE that is not a Site Director, this LED indicates regular heartbeat communications with the Site Director. For a Site Director NAE / NIE, flashes are more frequent and indicate heartbeat communications from all other NAE / NIE devices on the site.
Run	On Steady	On Steady = NAE / NIE software is running On 1 second, Off 1 second = NAE / NIE software is in startup mode. On 4 seconds, Off 1 second = NAE / NIE is in diagnostics mode. On 0.5 seconds, Off 0.5 seconds = NAE / NIE software is shutting down. Off Steady = Operating system is shutting down or software is not running.
24 VAC (GREEN)	On Steady	On Steady = 24 VAC power present. Off Steady = Loss of 24 VAC power. In the Off Steady condition, the NAE / NIE can be running on battery power. Also se the POWER LED.
BATT FAULT (RED)	Off Steady	On Steady = Battery fault. Replace the battery.
GENL FAULT (RED)	Off Steady	On Steady = General Fault. Fault conditions include excessive Central Processing Unit (CPU) flash, or memory use, or excessive CPU or Printed Wire Board (PWB) temperature. In normal operation, the GENL FAULT LED stays on steady for the first half of the startup sequence.

REVISION INFORMATION	Drawing Title: Visio NAE Reference Drawing								
NUMBER									
DATE: 02/02/12									
TIME: 12:24 PM		REFERENCE DRAWING	NO	REVISION-LOCATION		ECN	DATE	BY	
		Sales Engineer	Project Manager	Application Engineer	DRAWN BY	DRAWN DATE	APPROVED BY	APPROVED DATE	
File Name: NAE Reference Drawing001.vsd	Project Title: Terrace Remodel	Johnson Controls			Branch Information		CONTRACT NUMBER: 0075-0164		
							DRAWING NUMBER: PAGE 2		

BILL OF MATERIALS

Designation	Qty	Part Number	Description
PNL-1	1	PAUE00001FH0	CONT PANEL UNT1144 NO TB 16X20 HOFFMAN
XFR-x	2	Y64T15-0	TRANSFORMER UL CLASS 2



PNL-1

Drawing Title
RTU Panel Detail Drawing

REFERENCE DRAWING	NO	REVISION LOCATION	ECN	DATE	BY

Sales Engineer	Project Manager	Application Engineer	DRAWN BY	DRAWN DATE	APPROVED BY	APPROVED DATE

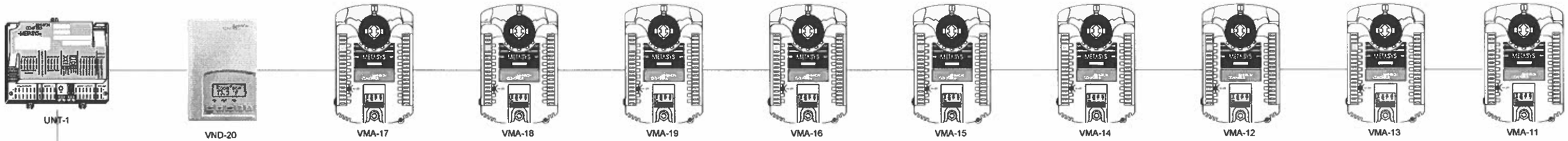
Project Title
Terrace Remodel

Johnson Controls

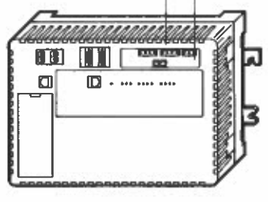
Branch Information

CONTRACT NUMBER
0075-0164

DRAWING NUMBER
PAGE 3



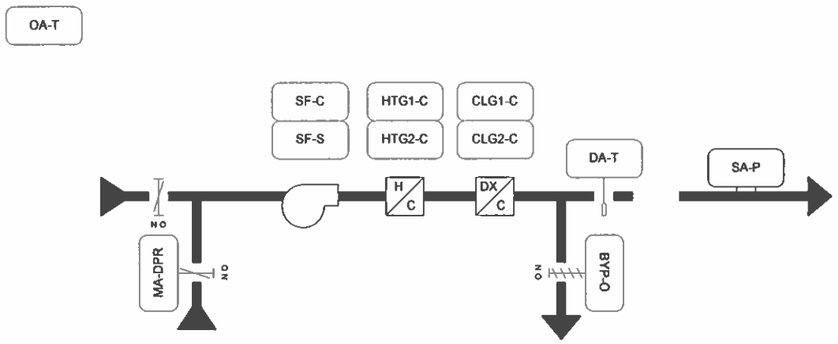
TO EXISTING N2
DEVICES (N2 Trunk 1)



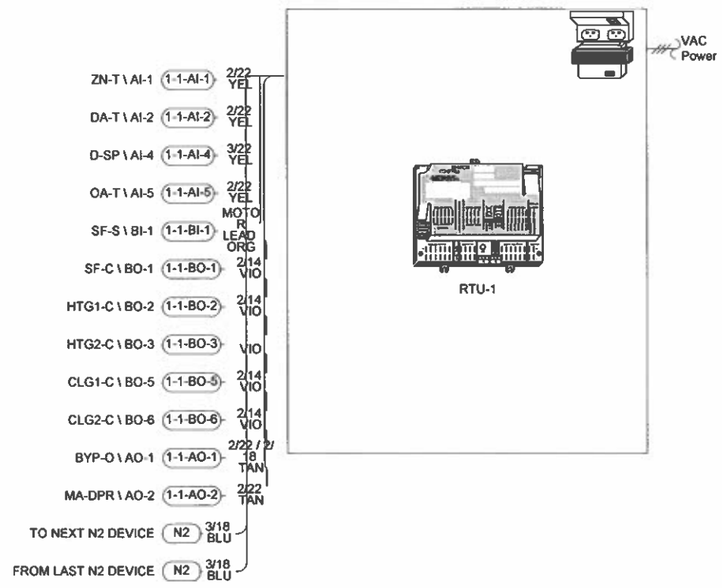
EXISTING MS-NAE5510-1
S1-NAE02
IP: 192.168.55.71
IP Mask: 255.255.255.0
Gateway:

LOCATED IN:
TERRACE SECTOR 8
MECH RM 5804

Drawing Title: N2 Bus Riser									
	REFERENCE DRAWING		NO	REVISION LOCATION		ECN	DATE	BY	
	Sales Engineer	Project Manager	Application Engineer	DRAWN		APPROVED			
				BY	DATE	BY	DATE		
Project Title: Terrace Remodel	Johnson Controls		Branch Information	CONTRACT NUMBER: 0075-0164					
				DRAWING NUMBER: PAGE 4					



ZN-T



BILL OF MATERIALS

Designation	Qty	Part Number	Description
RTU-1	1	AS-UNT141-1	UNITARY CONTROLLER, SCREW TERMINAL
DA-T	1	TE-6311P-1	TEMP SENSOR, 1000 OHM NI
SA-P	1	PXDXX02S	PRESSURE, DRY, PANEL LCD, 0-10" WC
BYP-O	1	M9210-GGA-3	10 NM SR DPR ACT 0(2)-10 VDC 24 VAC 50/60HZ
HTGx-C, CLGx-C	4	RH2B-ULAC24V	RELAY, DPDT BLADEWLITE
	4	SH2B-05	DIN RAIL SNAP-MT SOCKET
SF-C,SF-S	1	H948	CURRENT SWITCH, SPDT RELAY, SPLIT, N.O.

Drawing Title
RTU-1 Flow Panel Detail

REFERENCE DRAWING	NO	REVISION-LOCATION	ECN	DATE	BY

Sales Engineer | Project Manager | Application Engineer | DRAWN BY DATE | APPROVED BY DATE

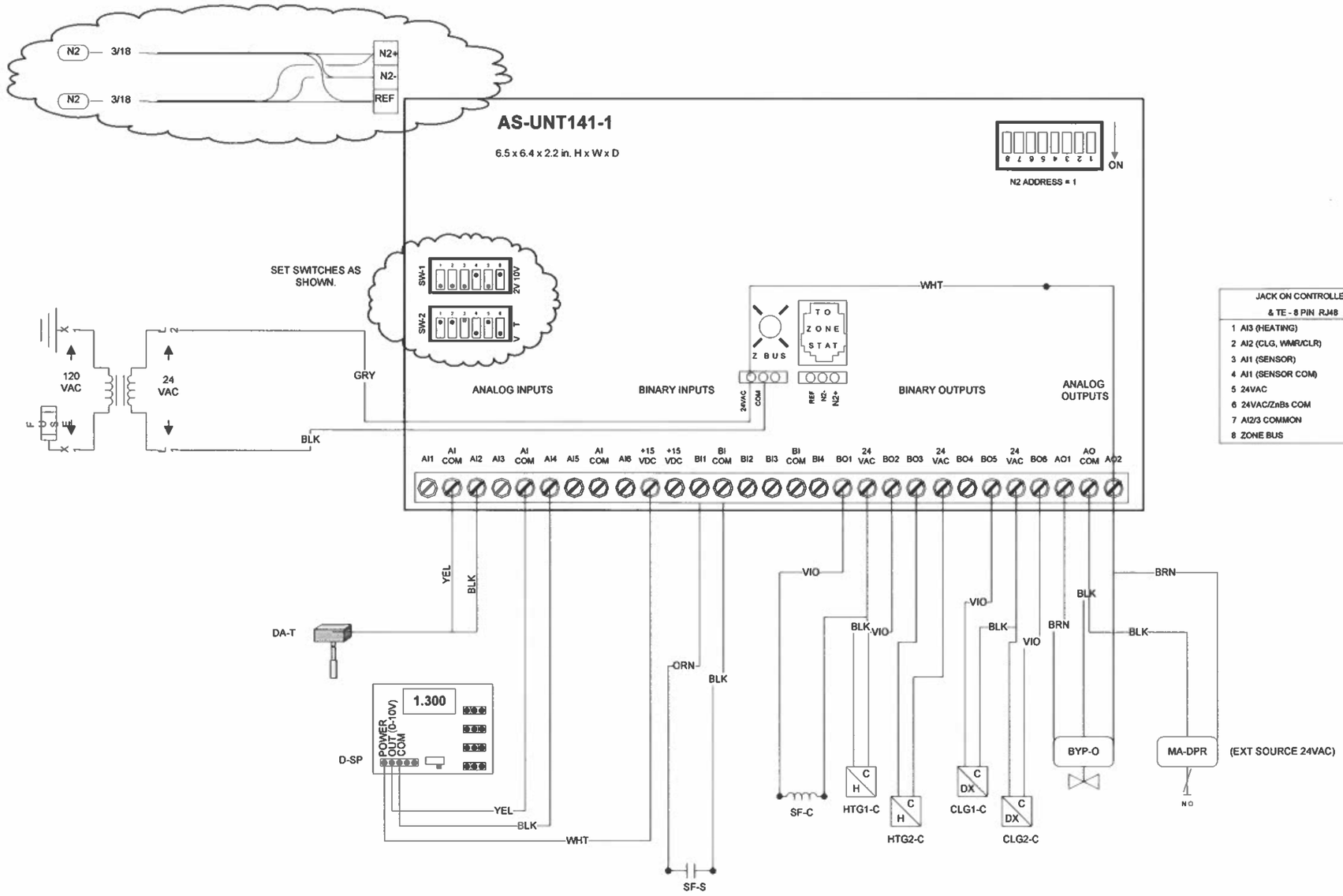
Project Title
Terrace Remodel

Johnson Controls

Branch Information

CONTRACT NUMBER
0075-0164

DRAWING NUMBER
1.1



JACK ON CONTROLLER & TE - 8 PIN RJ48	JACK ON TE 6 PIN RJ12
1 AI3 (HEATING)	NOT USED
2 AI2 (CLG, WMR/CLR)	24VAC
3 AI1 (SENSOR)	24VAC/ZnBs COM
4 AI1 (SENSOR COM)	NOT USED
5 24VAC	ZONE BUS
6 24VAC/ZnBs COM	NOT USED
7 AI2/3 COMMON	
8 ZONE BUS	

Drawing Title
RTU-1 Wiring Details

REFERENCE DRAWING	NO	REVISION-LOCATION	ECN	DATE	BY

Sales Engineer | Project Manager | Application Engineer | DRAWN BY | DRAWN DATE | APPROVED BY | APPROVED DATE

Project Title
Terrace Remodel

Branch Information

CONTRACT NUMBER
0075-0164

DRAWING NUMBER
1.2

Johnson Controls

SEQUENCE OF OPERATIONS

Upon a call for Occupied Mode, the economizer damper will move to its minimum position and the supply fan will be energized.

The supply air volume is modulated via a face/bypass damper based on a static pressure sensor located in the supply air ductwork. The damper will modulate to maintain the duct static pressure setpoint. A manual-reset high static pressure controller is also electrically interlocked with the supply fan to shutdown if duct static pressure reaches 3.0" w.c.

Heating and cooling is staged in sequence to prevent simultaneous heating and cooling, and to maintain zone temperature setpoint. Zone temperature is a result of calculating the average of the nine VAV zones fed by the RTU.

Upon a call for cooling, the mode of cooling operation will be determined. If outside air temperature is lower than the dry bulb switchover setpoint, the economizer dampers will be positioned for maximum free cooling using outside air to meet the cooling demand. Once the outside air temperature is greater than the dry bulb switchover setpoint, and outside air temperature is above the cooling lockout setpoint, the economizer damper will move to its minimum position, and cooling mechanical cooling will stage on and off to maintain the desired zone temperature setpoint.

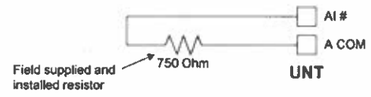
Upon a call for heating, and outside air temperature is below the heating lockout setpoint, the economizer damper will move to its minimum position, and the gas-fired heating will stage on and off to maintain the desired zone temperature setpoint.

During the Unoccupied Mode, the supply fan and heating and cooling stages will operate intermittently to maintain a minimum space temperature of 60° F, and a maximum space temperature of 80° F

Drawing Title: Sequence of Operations							
	REFERENCE DRAWING		NO	REVISION-LOCATION	ECN	DATE	BY
	Sales Engineer	Project Manager	Application Engineer	DRAWN BY / DATE	APPROVED BY / DATE		
Project Title: Terrace Remodel	Johnson Controls		Branch Information	CONTRACT NUMBER: 0075-0164			
				DRAWING NUMBER: 1.3			

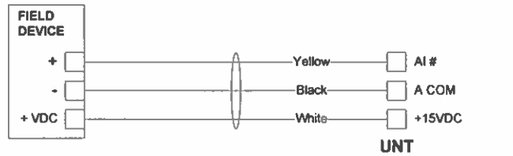
Electrician/Filter	Point Information			Controller Information							Panel Information					Intermediate Device				Field Device					
Tag	Point Type	System Name	Object Name	Expanded ID	Controller Details	Trunk Type	Trunk Nbr	Trunk Addr.	Cable Destination Bay/Terminal	Module Type	Termination Out	Panel	Panel Location	Slot Number	Reference Drawing	Cable Number	Wiring /Tubing	Termination In	Device	Termination Out	Location	Wiring /Tubing	Termination In	Device	Location	Ref Detail Shape	Comment
		RTU-1			UNT 141	N2	2	1				EN-1	Mech Room	0	M12											N2 Trunk
	AI-1	RTU-1	ZN-T	Zone Temp	UNT 141	N2	2	1 AI-1			AI1,A COM	EN-1	Mech Room	0	M12	1-1-AI-1						2/22	2-Wire	Analog Input (S/W Mapped)		UT108	
	AI-2	RTU-1	DA-T	Discharge Air Temp	UNT 141	N2	2	1 AI-2			AI2,A COM	EN-1	Mech Room	0	M12	1-1-AI-2						2/22	2-Wire	TE		UT131	
	AI-3	RTU-1			UNT 141	N2	2	1 AI-3				EN-1	Mech Room	0	M12	1-1-AI-3											
	AI-4	RTU-1	D-SP	Duct Static Pressure	UNT 141	N2	2	1 AI-4			AI4,A COM,+15VDC	EN-1	Mech Room	0	M12	1-1-AI-4						3/22	See wiring detail	Voltage Input (Internal Pwr)		UT102	
	AI-5	RTU-1	OA-T	Outdoor Air Temp	UNT 141	N2	2	1 AI-5			AI5,A COM	EN-1	Mech Room	0	M12	1-1-AI-5						2/22	2-Wire	Analog Input (S/W Mapped)		UT108	
	AI-6	RTU-1			UNT 141	N2	2	1 AI-6				EN-1	Mech Room	0	M12	1-1-AI-6											
	BI-1	RTU-1	SF-S	Supply Fan Status	UNT 141	N2	2	1 BI-1			BI1,24VAC	EN-1	Mech Room	0	M12	1-1-BI-1	2/22	OUT, COM	Current Relay	Motor Lead		Motor Lead	See wiring detail	Motor Status		UT301	
	BI-2	RTU-1			UNT 141	N2	2	1 BI-2				EN-1	Mech Room	0	M12	1-1-BI-2											
	BI-3	RTU-1			UNT 141	N2	2	1 BI-3				EN-1	Mech Room	0	M12	1-1-BI-3											
	BI-4	RTU-1			UNT 141	N2	2	1 BI-4				EN-1	Mech Room	0	M12	1-1-BI-4											
	BO-1	RTU-1	SF-C	Fan	UNT 141	N2	2	1 BO-1			BO1,RTN	EN-1	Mech Room	0	M12	1-1-BO-1	2/22	COIL (13,14)	IDEC Relay	COM, NO (9,5)		2/14	See wiring detail	Control Panel (NO) (Sw Low)		UT402	
	BO-2	RTU-1	HTG1-C	Htg Stage 1	UNT 141	N2	2	1 BO-2			BO2,RTN	EN-1	Mech Room	0	M12	1-1-BO-2	2/22	COIL (13,14)	IDEC Relay	COM, NO (9,5)		2/14	See wiring detail	Control Panel (NO) (Sw Low)		UT402	
	BO-3	RTU-1	HTG2-C	Htg Stage 2	UNT 141	N2	2	1 BO-3				EN-1	Mech Room	0	M12	1-1-BO-3											
	BO-4	RTU-1			UNT 141	N2	2	1 BO-4				EN-1	Mech Room	0	M12	1-1-BO-4											
	BO-5	RTU-1	CLG1-C	Clg Stage 1	UNT 141	N2	2	1 BO-5			BO5,RTN	EN-1	Mech Room	0	M12	1-1-BO-5	2/22	COIL (13,14)	IDEC Relay	COM, NO (9,5)		2/14	See wiring detail	Control Panel (NO) (Sw Low)		UT402	
	BO-6	RTU-1	CLG2-C	Clg Stage 2	UNT 141	N2	2	1 BO-6			BO6,RTN	EN-1	Mech Room	0	M12	1-1-BO-6	2/22	COIL (13,14)	IDEC Relay	COM, NO (9,5)		2/14	See wiring detail	Control Panel (NO) (Sw Low)		UT402	
	AO-1	RTU-1	BYP-D	Bypass Damper	UNT 141	N2	2	1 AO-1			AO1,AO COM,24VAC,C	EN-1	Mech Room	0	M12	1-1-AO-1						2/22 / 2/18	GRY, BLK/BLK, RED	M9210/20-GGx (Vdc) (Ext Source)		UT267	
	AO-2	RTU-1	MA-DPR	Mixed Air Damper	UNT 141	N2	2	1 AO-2			AO2,A COM	EN-1	Mech Room	0	M12	1-1-AO-2						2/22	AI#,AICM	0-10V (Output to Input)		UT203	

DETAIL UT108 ANALOG INPUT (Software Mapped)



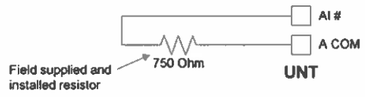
Set SW1 to Position "I" and SW2 to Position "2V"

DETAIL UT102 VOLTAGE INPUT - INTERNAL SOURCE



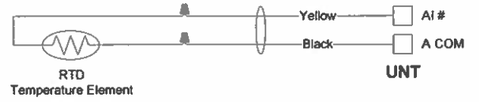
Set SW1 to Position "V" and SW2 to Position "10V"

DETAIL UT108 ANALOG INPUT (Software Mapped)



Set SW1 to Position "I" and SW2 to Position "2V"

DETAIL UT131 TEMPERATURE SENSOR INPUT

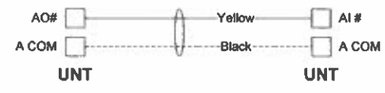


Set SW1 to Position "I" and SW2 to Position "2V"

DETAIL UT203 ANALOG OUTPUT to ANALOG INPUT

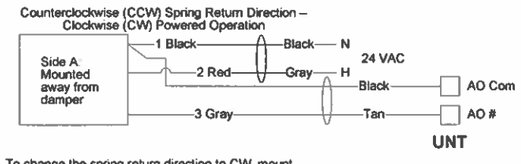
Note that the Analog Output Common and Analog Input Common are the same within a single controller.

If this is used between two controllers, ensure that the controllers have a common 24Vac connection.



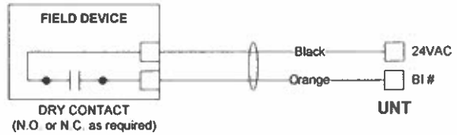
Set SW1 to Position "V" and SW2 to Position "10V"

DETAIL UT267 0-10VDC OUTPUT to M9210/20-GGx and HGx-3



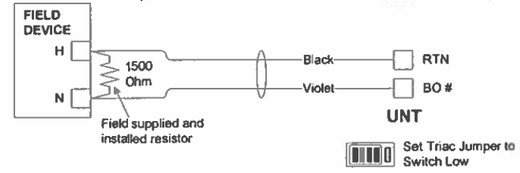
To change the spring return direction to CW, mount the actuator to the damper shaft so that Side B of the actuator is away from the damper. With power applied, the actuator now drives CCW from the 0° position, and spring returns CW.

DETAIL UT301 BINARY INPUT (DRY CONTACT)



DETAIL UT402 24 VAC BINARY OUTPUT to LOW CURRENT DRAW DEVICE (Switch Low)

(Use when current draw of the Field Device is less than 50 mA)



Drawing Title
RTU-1 Point Schedule

REFERENCE DRAWING	NO	REVISION-LOCATION	ECN	DATE	BY

Sales Engineer | Project Manager | Application Engineer | DRAWN BY / DATE | APPROVED BY / DATE

Project Title
Terrace Remodel

Branch Information

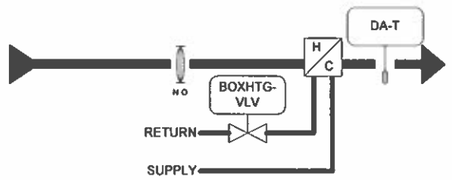
Johnson Controls

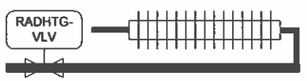
CONTRACT NUMBER
0075-0164

DRAWING NUMBER
1.4

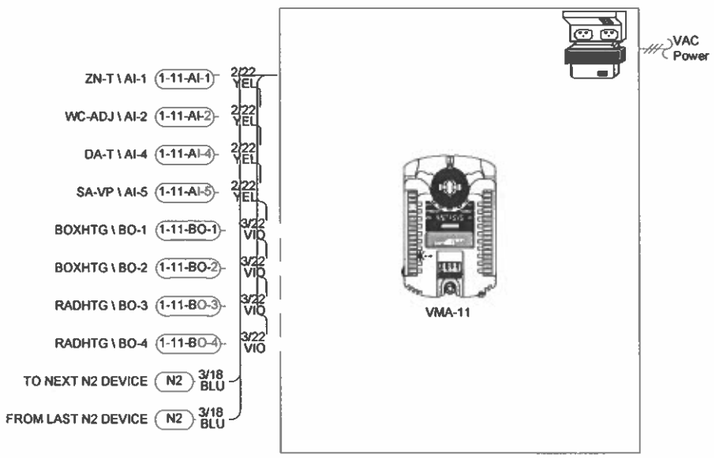
BILL OF MATERIALS

Designation	Qty	Part Number	Description
VMA-11	1	AP-VMA1420-0	ELEC MTR ACT, 35 IN LB/4NM 24VAC PROP
DA-T	1	TE-6311P-1	TEMP SENSOR, 1000 OHM, NI
ZN-T, WC-ADJ	1	TE-68NT-1NN0S	TE-6800 SENSOR 1000 OHM NICKEL
BOXHTG-VLV	2	VG7241ET+7150G	2W½ NPT 1.8 VA7150 ELEC
RADHTG-VLV			

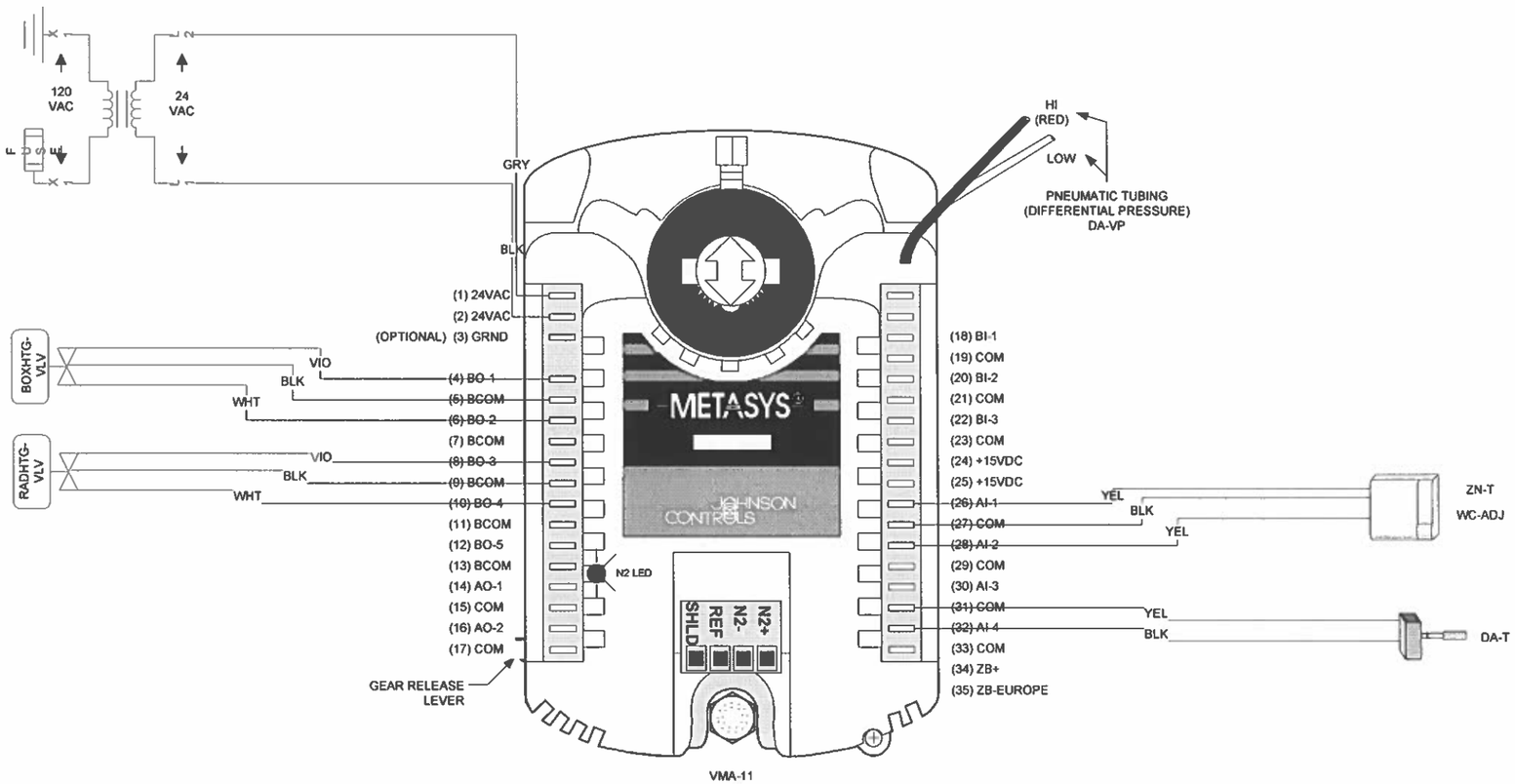




ZN-T
WC-ADJ



Drawing Title: **VMA-11 Flow Panel Detail (Typoical of 6)**						
	REFERENCE DRAWING	NO	REVISION-LOCATION	ECN	DATE	BY
	Sales Engineer / Project Manager / Application Engineer		DRAWN BY / DATE	APPROVED BY / DATE		
Project Title: **Terrace Remodel**	Johnson Controls		Branch Information	CONTRACT NUMBER: **0075-0164**		
				DRAWING NUMBER: **2.1**		



Drawing Title: **VMA-11 Wiring Details**							
REFERENCE DRAWING	NO	REVISION-LOCATION		ECN	DATE	BY	
Sales Engineer	Project Manager	Application Engineer	DRAWN BY	DRAWN DATE	APPROVED BY	APPROVED DATE	
Project Title: **Terrace Remodel**	Johnson Controls	Branch Information	CONTRACT NUMBER: **0075-0164**				
			DRAWING NUMBER: **2.2**				

SEQUENCE OF OPERATIONS

As space temperature rises above setpoint, the heating valve will move to the closed position and the integrated actuator will move to the minimum cooling flow position. On a further increase of space temperature, the integrated actuator will move to the maximum cooling flow position.

As space temperature decreases below setpoint, the integrated actuator will begin to modulate to its minimum flow position and the heating valve will modulate open. On a further decrease in space temperature, the integrated actuator will move to the maximum heating flow position, and the heating valve will move to the fully open position.

Exterior wall VAV zones are equipped with radiant baseboard heating, and will operate heating in a two-staged approach. If in its fully open position the radiant baseboard cannot maintain the space temperature requirements, the VAV box heating coil will begin to modulate open.

Drawing Title
Sequence of Operations

REFERENCE DRAWING	NO	REVISION-LOCATION	ECN	DATE	BY

Sales Engineer	Project Manager	Application Engineer	DRAWN BY	DRAWN DATE	APPROVED BY	APPROVED DATE

Project Title
Terrace Remodel

Johnson Controls

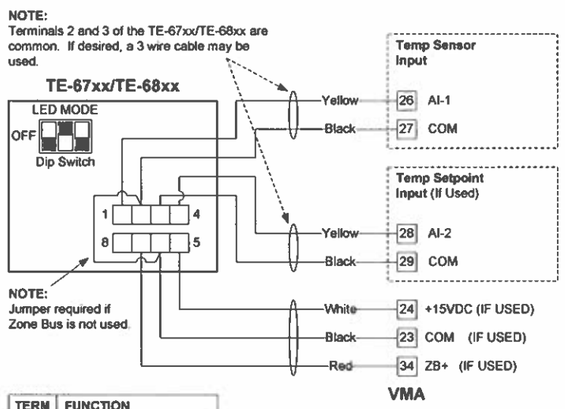
Branch Information

CONTRACT NUMBER
0075-0164

DRAWING NUMBER
2.3

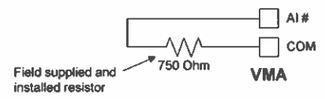
Electrician/Fitter	Point Information				Controller Information							Panel Information					Intermediate Device				Field Device					
Tag	Point Type	System Name	Object Name	Expanded ID	Controller Details	Trunk Type	Trunk Nbr	Trunk Addr.	Cable Destination Bay/Terminal	Module Type	Termination Out	Panel	Panel Location	Slot Number	Reference Drawing	Cable Number	Wiring /Tubing	Termination In	Device	Termination Out	Location	Wiring /Tubing	Termination In	Device	Location	Ref Detail Shape	Comment
		VMA-11			VMA 1420							EN-1	Mech Room		M12											Power to Controller
		VMA-11			VMA 1420	N2		2	11			EN-1	Mech Room	0	M12											N2 Trunk
	AI-1	VMA-11	ZN-T	Zone Temperature	VMA 1420	N2		2	11 AI-1		AI1,COM	EN-1	Mech Room	0	M12	1-11-AI-1						2/22	1, 2	TE-6800-TE (TB, Led OFF)		VMA138	
	AI-2	VMA-11	WC-ADJ	Remote Adjust	VMA 1420	N2		2	11 AI-2		AI2,COM	EN-1	Mech Room	0	M12	1-11-AI-2						2/22	4, 3	TE-6800-SET (TB, Led OFF)		VMA138	
	AI-3	VMA-11			VMA 1420	N2		2	11 AI-3			EN-1	Mech Room	0	M12	1-11-AI-3											
	AI-4	VMA-11	DA-T	Discharge Air Temp	VMA 1420	N2		2	11 AI-4		AI4,COM	EN-1	Mech Room	0	M12	1-11-AI-4						2/22	2-Wire	TE		VMA131	
	AI-5	VMA-11	SA-VP	Supply Delta P	VMA 1420	N2		2	11 AI-5		AI5,COM	EN-1	Mech Room	0	M12	1-11-AI-5						2/22	2-Wire	Analog Input (S/W Mapped)		VMA108	
	BI-1	VMA-11			VMA 1420	N2		2	11 BI-1			EN-1	Mech Room	0	M12	1-11-BI-1											
	BI-2	VMA-11			VMA 1420	N2		2	11 BI-2			EN-1	Mech Room	0	M12	1-11-BI-2											
	BI-3	VMA-11			VMA 1420	N2		2	11 BI-3			EN-1	Mech Room	0	M12	1-11-BI-3											
	BO-1	VMA-11	BOXHTG	Box Heating Cmd	VMA 1420	N2		2	11 BO-1		BO-a,BO-b,BCOM	EN-1	Mech Room	0	M12	1-11-BO-1						3/22	3, 2, 1	VA-7150 (Incr)		VMA481	
	BO-2	VMA-11	BOXHTG	Box Heating Cmd	VMA 1420	N2		2	11 BO-2		BO-a,BO-b,BCOM	EN-1	Mech Room	0	M12	1-11-BO-2						3/22	3, 2, 1	VA-7150 (Incr)		VMA481	
	BO-3	VMA-11	RADHTG	Suppl Heating Cmd	VMA 1420	N2		2	11 BO-3		BO-a,BO-b,BCOM	EN-1	Mech Room	0	M12	1-11-BO-3						3/22	3, 2, 1	VA-7150 (Incr)		VMA481	
	BO-4	VMA-11	RADHTG	Suppl Heating Cmd	VMA 1420	N2		2	11 BO-4		BO-a,BO-b,BCOM	EN-1	Mech Room	0	M12	1-11-BO-4						3/22	3, 2, 1	VA-7150 (Incr)		VMA481	
	BO-5	VMA-11			VMA 1420	N2		2	11 BO-5			EN-1	Mech Room	0	M12	1-11-BO-5											
	AO-1	VMA-11			VMA 1420	N2		2	11 AO-1			EN-1	Mech Room	0	M12	1-11-AO-1											
	AO-2	VMA-11			VMA 1420	N2		2	11 AO-2			EN-1	Mech Room	0	M12	1-11-AO-2											

DETAIL VMA138 TE-6700/TE-6800 (Terminal Block) - LED OFF

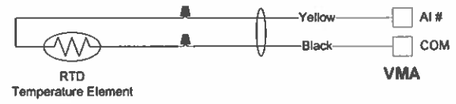


TERM	FUNCTION
1	SENSOR & OVERRIDE
2	SENSOR COMMON
3	SETPOINT COMMON
4	SETPOINT
5	POWER (24Vac or 15Vdc)
6	POWER/ZBUS COMMON
7	ZONE BUS
8	LED & OVERRIDE

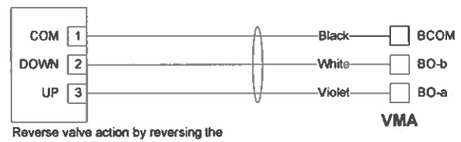
DETAIL VMA108 ANALOG INPUT (Software Mapped)



DETAIL VMA131 TEMPERATURE SENSOR INPUT

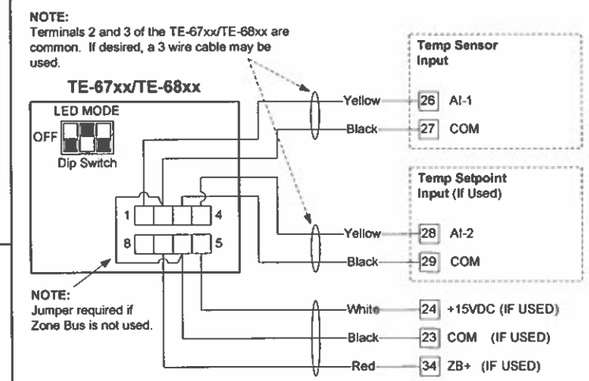


DETAIL VMA481 INCREMENTAL CONTROL to VA-7150 / VA-7200



Reverse valve action by reversing the connection to Terminals 2 and 3

DETAIL VMA138 TE-6700/TE-6800 (Terminal Block) - LED OFF



TERM	FUNCTION
1	SENSOR & OVERRIDE
2	SENSOR COMMON
3	SETPOINT COMMON
4	SETPOINT
5	POWER (24Vac or 15Vdc)
6	POWER/ZBUS COMMON
7	ZONE BUS
8	LED & OVERRIDE

Drawing Title
VMA-11 Point Schedule

REFERENCE DRAWING	NO.	REVISION-LOCATION	ECN	DATE	BY

Sales Engineer | Project Manager | Application Engineer | DRAWN BY DATE | APPROVED BY DATE

Project Title
Terrace Remodel

Branch Information

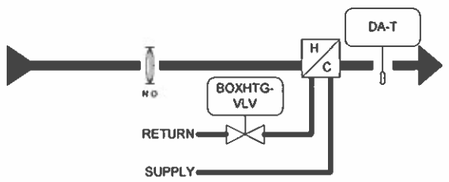
Johnson Controls

CONTRACT NUMBER
0075-0164

DRAWING NUMBER
2.4

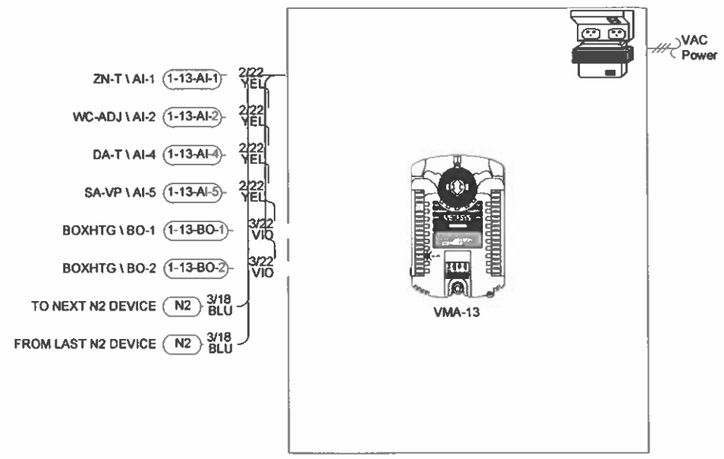
BILL OF MATERIALS

Designation	Qty	Part Number	Description
VMA-13	1	AP-VMA1420-0	ELEC MTR ACT, 35 IN LB/4NM 24VAC PROP.
DA-T	1	TE-6311P-1	TEMP SENSOR, 1000 OHM, NI
ZN-T, WC-ADJ	1	TE-68NT-1NN0S	TE-6800 SENSOR 1000 OHM NICKEL
BOXHTG-VLV	1	VG7241ET+7150G	2W½ NPT 1.8 VA 7150 ELEC

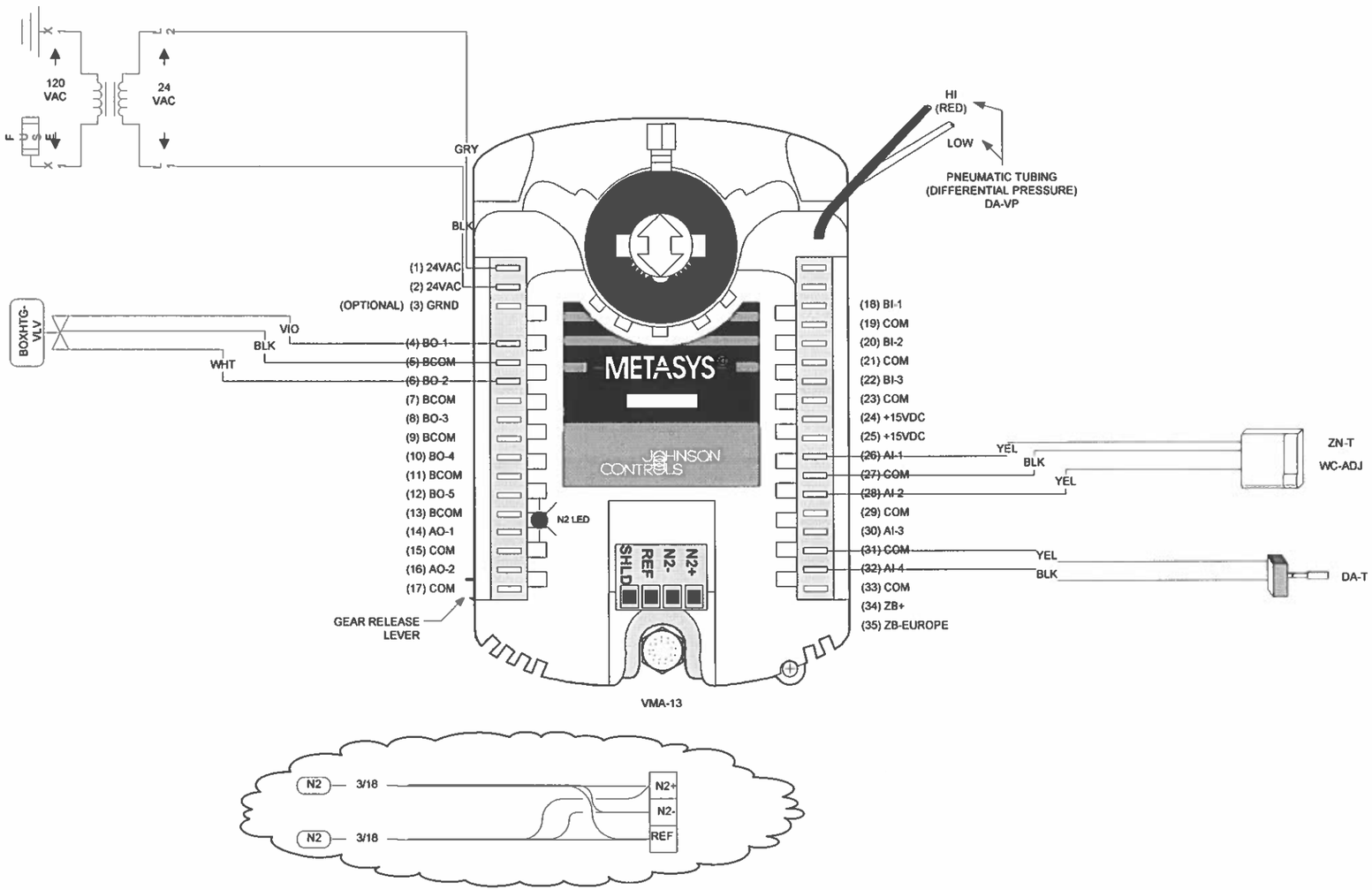


ZN-T

WC-ADJ



Drawing Title: VMA-13 Flow Panel Detail (Typical of 3)						
REFERENCE DRAWING	NO.	REVISION-LOCATION		ECN	DATE	BY
Sales Engineer / Project Manager / Application Engineer		DRAWN BY / DATE	APPROVED BY / DATE			
Project Title: Terrace Remodel	Johnson Controls	Branch Information		CONTRACT NUMBER: 0075-0164		
				DRAWING NUMBER: 3.1		



Drawing Title: **VMA-13 Wiring Details**							
REFERENCE DRAWING	NO	REVISION-LOCATION		ECN	DATE	BY
Sales Engineer	Project Manager	Application Engineer	DRAWN BY	DATE	APPROVED BY	DATE
Project Title: **Terrace Remodel**	Johnson Controls	Branch Information		CONTRACT NUMBER: **0075-0164**		
				DRAWING NUMBER: **3.2**		

SEQUENCE OF OPERATIONS

As space temperature rises above setpoint, the heating valve will move to the closed position and the integrated actuator will move to the minimum cooling flow position. On a further increase of space temperature, the integrated actuator will move to the maximum cooling flow position.

As space temperature decreases below setpoint, the integrated actuator will begin to modulate to its minimum flow position and the heating valve will modulate open. On a further decrease in space temperature, the integrated actuator will move to the maximum heating flow position, and the heating valve will move to the fully open position.

Drawing Title
Sequence of Operations

REFERENCE DRAWING	NO.	REVISION-LOCATION	ECN	DATE	BY

Sales Engineer	Project Manager	Application Engineer	DRAWN BY	DRAWN DATE	APPROVED BY	APPROVED DATE

Project Title
Terrace Remodel

Johnson Controls

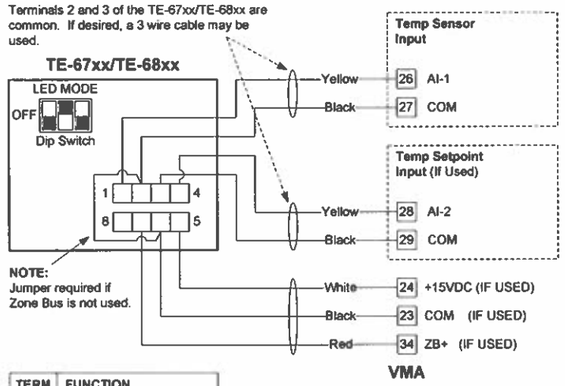
Branch Information

CONTRACT NUMBER
0075-0164

DRAWING NUMBER
3.3

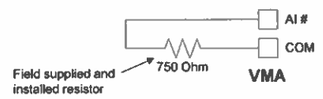
Electrician/Fitter		Point Information			Controller Information							Panel Information						Intermediate Device				Field Device					
Tag	Point Type	System Name	Object Name	Expanded ID	Controller Details	Trunk Type	Trunk Nbr	Trunk Addr.	Cable Destination Bay/Terminal	Module Type	Termination Out	Panel	Panel Location	Slot Number	Reference Drawing	Cable Number	Wiring /Tubing	Termination In	Device	Termination Out	Location	Wiring /Tubing	Termination In	Device	Location	Ref Detail Shape	Comment
		VMA-13			VMA 1420							EN-1	Mech Room		M12												Power to Controller
		VMA-13			VMA 1420	N2	2		13			EN-1	Mech Room	0	M12												N2 Trunk
	AI-1	VMA-13	ZN-T	Zone Temperature	VMA 1420	N2	2	2	13 AI-1		AI1,COM	EN-1	Mech Room	0	M12	1-13-AI-1						2/22	1, 2	TE-6800-TE (TB. Led OFF)		VMA138	
	AI-2	VMA-13	WC-ADJ	Remote Adjust	VMA 1420	N2	2	2	13 AI-2		AI2,COM	EN-1	Mech Room	0	M12	1-13-AI-2						2/22	4, 3	TE-6800-SET (TB. Led OFF)		VMA138	
	AI-3	VMA-13			VMA 1420	N2	2	2	13 AI-3			EN-1	Mech Room	0	M12	1-13-AI-3											
	AI-4	VMA-13	DA-T	Discharge Air Temp	VMA 1420	N2	2	2	13 AI-4		AI4,COM	EN-1	Mech Room	0	M12	1-13-AI-4						2/22	2-Wire	TE		VMA131	
	AI-5	VMA-13	SA-VP	Supply Delta P	VMA 1420	N2	2	2	13 AI-5		AI5,COM	EN-1	Mech Room	0	M12	1-13-AI-5						2/22	2-Wire	Analog Input (S/W Mapped)		VMA108	
	BI-1	VMA-13			VMA 1420	N2	2	2	13 BI-1			EN-1	Mech Room	0	M12	1-13-BI-1											
	BI-2	VMA-13			VMA 1420	N2	2	2	13 BI-2			EN-1	Mech Room	0	M12	1-13-BI-2											
	BI-3	VMA-13			VMA 1420	N2	2	2	13 BI-3			EN-1	Mech Room	0	M12	1-13-BI-3											
	BO-1	VMA-13	BOXHTG	Box Heating Cmd	VMA 1420	N2	2	2	13 BO-1		BO-a,BO-b,BCOM	EN-1	Mech Room	0	M12	1-13-BO-1						3/22	3, 2, 1	VA-7150 (Incr)		VMA481	
	BO-2	VMA-13	BOXHTG	Box Heating Cmd	VMA 1420	N2	2	2	13 BO-2		BO-a,BO-b,BCOM	EN-1	Mech Room	0	M12	1-13-BO-2						3/22	3, 2, 1	VA-7150 (Incr)		VMA481	
	BO-3	VMA-13			VMA 1420	N2	2	2	13 BO-3			EN-1	Mech Room	0	M12	1-13-BO-3											
	BO-4	VMA-13			VMA 1420	N2	2	2	13 BO-4			EN-1	Mech Room	0	M12	1-13-BO-4											
	BO-5	VMA-13			VMA 1420	N2	2	2	13 BO-5			EN-1	Mech Room	0	M12	1-13-BO-5											
	AO-1	VMA-13			VMA 1420	N2	2	2	13 AO-1			EN-1	Mech Room	0	M12	1-13-AO-1											
	AO-2	VMA-13			VMA 1420	N2	2	2	13 AO-2			EN-1	Mech Room	0	M12	1-13-AO-2											

DETAIL VMA138 TE-6700/TE-6800 (Terminal Block) - LED OFF

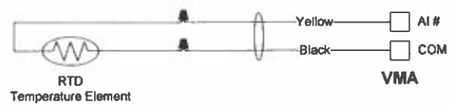


TERM	FUNCTION
1	SENSOR & OVERRIDE
2	SENSOR COMMON
3	SETPOINT COMMON
4	SETPOINT
5	POWER (24Vac or 15Vdc)
6	POWER/ZBUS COMMON
7	ZONE BUS
8	LED & OVERRIDE

DETAIL VMA108 ANALOG INPUT (Software Mapped)

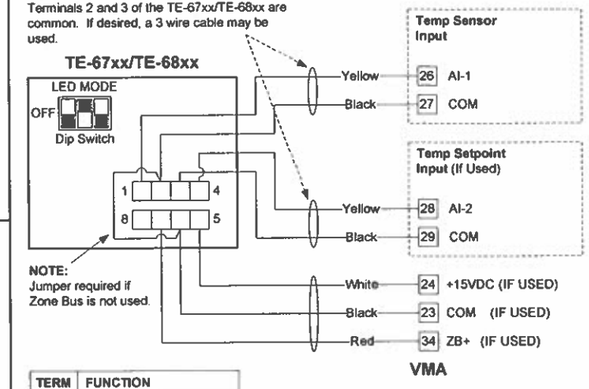


DETAIL VMA131 TEMPERATURE SENSOR INPUT



DETAIL VMA481 INCREMENTAL CONTROL to VA-7150 / VA-7200

DETAIL VMA138 TE-6700/TE-6800 (Terminal Block) - LED OFF



TERM	FUNCTION
1	SENSOR & OVERRIDE
2	SENSOR COMMON
3	SETPOINT COMMON
4	SETPOINT
5	POWER (24Vac or 15Vdc)
6	POWER/ZBUS COMMON
7	ZONE BUS
8	LED & OVERRIDE

Drawing Title
VMA-13 Point Schedule

REFERENCE DRAWING	NO	REVISION-LOCATION	ECN	DATE	BY

Sales Engineer	Project Manager	Application Engineer	DRAWN BY	DRAWN DATE	APPROVED BY	APPROVED DATE

Project Title
Terrace Remodel

Johnson Controls

Branch Information

CONTRACT NUMBER
0075-0164

DRAWING NUMBER
3.4

Contract Name
Contract Number

Room Schedule

Box Location								Controller Information						Sensor	Box Information									
	Room							Controller Required									Box Config Required						Required (N2)		
Bldg./Flr.	No.	Name	System Name	Mech. Dwg.	System Serving this Box	Box Mfgr.	Mfgr Box Type	JCI Ctrl Dwg No.	Controller Part No.	NC/ NAE Addr	Trunk ID	Device Addr	PAN Offset	CSModel or Template	Code No.	Box Heat	Supplemental Heat	Config File Name	Inlet Size (Inches)	Inlet Area (Sq. Ft.)	K Factor	Clg Min Flow	Clg Max Flow	VMA Box Config	Comments	Generate Flag
Terrace Sect 8	5825	Tom Flanagan Office	VAV-1		RTU-1	Trane		2.1	AP-VMA1420-0	S1-NAE02	2	11		VAVRHRAD	TE-68NT-1N00S	Yes	Yes	VMA-11	8	0.35	2.3	170	500	VMA-11.cfg		
Terrace Sect 8	5808	Cubicles	VAV-2		RTU-1	Trane		2.1	AP-VMA1420-0	S1-NAE02	2	12		VAVRHRAD	TE-68NT-1N00S	Yes	Yes	VMA-12	10	0.55	2.53	350	1000	VMA-12.cfg		
Terrace Sect 8	5810	Pantry	VAV-3		RTU-1	Trane		3.1	AP-VMA1420-0	S1-NAE02	2	13		VAVRH	TE-68NT-1N00S	Yes	No	VMA-13	8	0.35	2.3	170	500	VMA-13.cfg		
Terrace Sect 8	5820	Zack Minasian Office	VAV-4		RTU-1	Trane		2.1	AP-VMA1420-0	S1-NAE02	2	14		VAVRHRAD	TE-68NT-1N00S	Yes	Yes	VMA-14	4	0.2	1.9	50	150	VMA-14.cfg		
Terrace Sect 8	5819	Scott Martens Office	VAV-5		RTU-1	Trane		2.1	AP-VMA1420-0	S1-NAE02	2	15		VAVRHRAD	TE-68NT-1N00S	Yes	Yes	VMA-15	4	0.2	1.9	50	150	VMA-15.cfg		
Terrace Sect 8	5818	Bruce Seid Office	VAV-6		RTU-1	Trane		2.1	AP-VMA1420-0	S1-NAE02	2	16		VAVRHRAD	TE-68NT-1N00S	Yes	Yes	VMA-16	4	0.2	1.9	50	150	VMA-16.cfg		
Terrace Sect 8	5816	War Room	VAV-7		RTU-1	Trane		2.1	AP-VMA1420-0	S1-NAE02	2	17		VAVRHRAD	TE-68NT-1N00S	Yes	Yes	VMA-17	14	1.07	2.2	800	3000	VMA-17.cfg		
Terrace Sect 8	5815	Reception	VAV-8		RTU-1	Trane		3.1	AP-VMA1420-0	S1-NAE02	2	18		VAVRH	TE-68NT-1N00S	Yes	No	VMA-18	5	0.14	1.35	60	200	VMA-18.cfg		
Terrace Sect 8	5814	Craig Counsel Office	VAV-9		RTU-1	Trane		3.1	AP-VMA1420-0	S1-NAE02	2	19		VAVRH	TE-68NT-1N00S	Yes	No	VMA-19	6	0.2	2.5	150	450	VMA-19.cfg		

Terrace Remodel
Project Number: 0075-0164

Valve Schedule

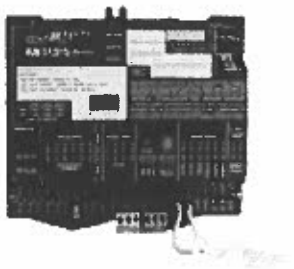
Tag						Valve Information													Actuator Information				
Item	System	Service	Medium	Qty.	Ref. Dwg.	Code Number	Family	Pipe Cfg.	Fail Position	Inlet Pipe Size (in)	Valve Size (in)	Flow (gpm or lbs/hr)	Design Delta P (psi)	Valve Delta P (psi)	Design Coefficient (Cv)	Valve Coefficient (Cv)	Design Close Off (psi)	Valve Close Off (psi)	Connection Type	Code Number	Control	Control Signal	Piping Detail	Comments
1	VAVRH	BXHTG-VLV	Water	9	3.1	VG7241ET+7150G	Globe Valve	2-Way	Last Position		1/2		0.1		0.1	1.8		345.0	Threaded	VA-7150-1001	Incremental	24VAC		
2	VAVRHRAD	RDHTG-VLV	Water	6	2.1	VG7241ET+7150G	Globe Valve	2-Way	Last Position		1/2		0.1		0.1	1.8		345.0	Threaded	VA-7150-1001	Incremental	24VAC		

JOHNSON CONTROLS

Controls Group 507 E. Michigan Street
P.O. Box 423, Milwaukee, WI 53202
Code No. LIT-1928145

UNT Series

Unitary Controller



Unitary Controller

Description

The Unitary (UNT) Controller is an electronic device for digital control of packaged air handling units, unit ventilators, fan coils, heat pumps, and other terminal units serving a single zone or room. It can also be configured as a generic input/output device for basic point monitoring applications when used within a Metasys Network.

You can easily configure point inputs and outputs and software features to control a wide variety of HVAC equipment applications.

You may use the UNT as a standalone controller or connected to the Metasys Network through a Network Control Module (NCM), N30, or Companion Supervisory Controller.

Features

- standalone control enhances system reliability
- network communications over N2 bus provides facility-wide control efficiencies and cost effective sensor sharing
- multiple modes of operation for various occupancy conditions provide comfort with economy
- removable N2 and 24 VAC power plugs allow disconnection of an individual controller without disrupting other controller connections
- built-in control program library within HVAC PRO software tool allows easy configuration
- multiple packaging options for both field and factory installations allow for installation flexibility
- isolated N2 circuitry for more reliable operation
- LED indicator for Power/Zone Bus provides visual indication of proper system function
- screw terminals for I/O connections available in some models; "Quick Connect" lugs and crimping tool not required
- UNT112/113 include isolated binary outputs when separate power sources are used.

To Order

See the selection chart on the next page.

Options

Application Options	Software Options
Primary Equipment Types	Unit Vents ASHRAE Cycle 1 ASHRAE Cycle 2 ASHRAE Cycle 3 ASHRAE Cycle W Heat Pumps Water to Air Air to Air Packaged Rooftops Fan Coils
Primary Control Strategies	Room/zone control
Economizer Changeover Strategies	- Dry bulb - Outside air enthalpy - Differential outside/return air temperature - Binary input from external economizer - Supervisory network command
Mixed Air Control Strategies	Proportional output to OA/RA damper actuator Binary output to economizer actuator
Heating/Cooling Configuration	Modulated single coil Staged (2-stage max) Modulated common heating/cooling coil Reversing valve logic
Fan Start/Stop	Continuous Operation Cycled with call for heating/cooling
Lighting Control	On and off outputs to lighting relay in conjunction with Occ/Unocc mode.
Unoccupied Control	Setup and setback, morning warmup and cooldown
Pump Lead / Lag	Lead/Standby pumps with common or separate flow switch(s)

Specifications

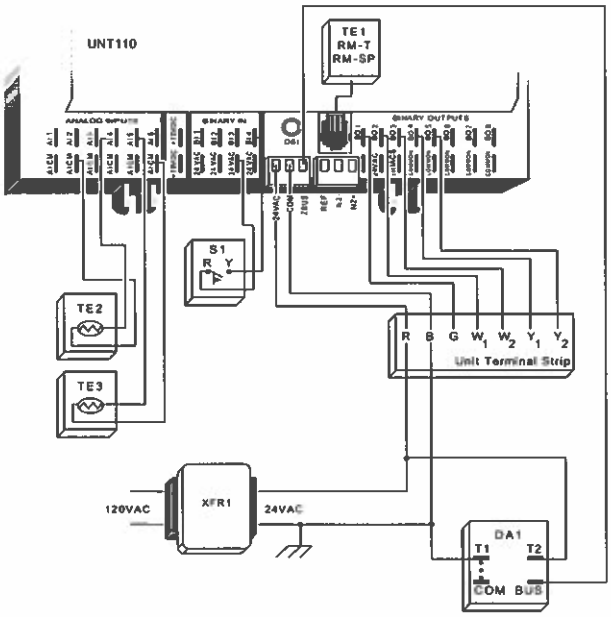
Unitary Controllers	
Product Codes	Spade quick connects: AS-UNT110-1, AS-UNT111-1 AS-UNT112-1, AS-UNT113-1 Screw terminations: AS-UNT140-1, AS-UNT141-1
Ambient Operating Conditions	0 to 60°C (32 to 140°F) and 10 to 90% RH
Dimensions (H x W x D)	165 x 163 x 56 mm (6.5. x 6.4 x 2.2 in.) without enclosure 173 x 185 x 119 mm (6.8 x 7.3 x 4.7 in.) with enclosure
Low Ambient Temperature Models	
Product Codes	Spade Quick Connects: AS-UNT120-1, AS-UNT121-1
Ambient Operating Conditions	-40 to 60°C (-40 to 140°F) 10 to 90% RH
Dimensions (H x W x D)	165 x 163 x 56 mm (6.5 x 6.4 x 2.2 in.) without enclosure 259 x 248 x 76 mm (10.2 x 9.8 x 3 in.) with enclosure
Low Ambient Temperature Models in Enclosures	
Product Codes	Spade quick connects: AS-UNT110-101, AS-UNT111-101 Screw terminations: AS-UNT140-101, AS-UNT 141-101 (mounted in EN-EWC10 enclosure with 50 VA Transformer)
Ambient Operating Conditions	0 to 60°C (32 to 140°F) and 10 to 90% RH
Dimensions (H x W x D)	7 x 13 x 6 in. (180 x 330 x 150 mm without enclosure
All Models	
Ambient Storage Conditions	-40 to 70°C (-40 to 158°F) 10 to 90% RH
Power Requirements	24 VAC, 50/60 Hz at 40 VA (per typical system)
N2 Bus	Isolated
Zone Bus	8-Pin Phone Jack or Terminal Block on Controller
Shipping Weight	0.64 kg (1.4 lbs)
Agency Compliance	CSA C22.2 No. 205, FCC Part 15, Subpart J, Class A, IEEE 446, IEEE 472, IEEE 518, IEEE 587 Category A, UL 916, UL 864; NEMA ICS 2, Part 2-230, VDE 0871 Class B
Agency Listings	UL Listed and CSA Certified as part of the Metasys Network

UNT Series Unitary Controller (Continued)

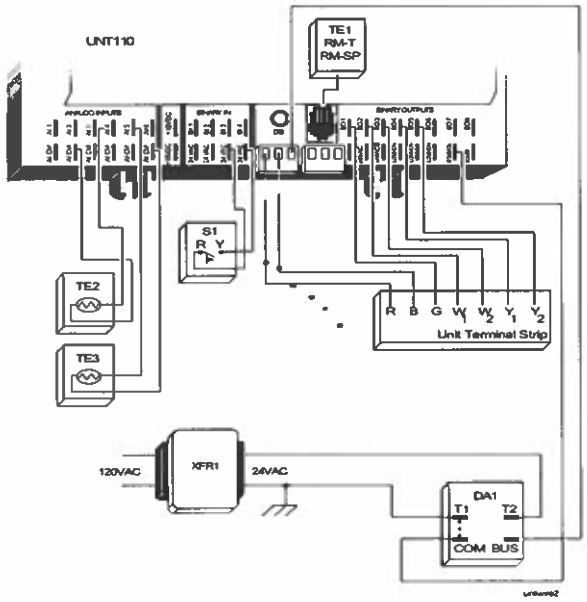
Selection Chart

Code Number	Termination Type	Analog Inputs	Binary Inputs	Analog Outputs	Binary Outputs
AS-UNT110-1	Spade Lug	6 • RTD Temp. Elem. (NI, SI or PT) • 0-10 VDC Trans. • 2K ohm Setpoint Potentiometers	4 • 4-Dry Contacts • 1-Momentary Push Button at Zone Sensor • BI4-Accum. Input	0	8 • 24 VAC Triacs at 0.5 amps • Low or High Side Common Selectable
AS-UNT111-1				2 • 0 to 10 VDC at 10 mA	6 (same as above)
AS-UNT112-1	Spade Lug	6 • RTD Temp. Elem. (NI, SI or PT) • 0-10 VDC Trans. • 2K ohm Setpoint Potentiometers	4 • 4-Dry Contacts • 1-Momentary Push Button at Zone Sensor • BI4-Accum. Input	0	8 • 24 VAC Triacs at 0.5 amps • Low or High Side Common Selectable • **Electrically Isolated BO's**
AS-UNT113-1				2 • 0 to 10 VDC at 10 mA	6 (same as above)
AS-UNT120-1	Spade Lug	6 • RTD Temp. Elem. (NI, SI or PT.) • 0-10 VDC Trans. • 2K ohm Setpoint Potentiometers	4 • 4-Dry Contacts • 1-Momentary Push Button at Zone Sensor • BI4-Accum. Input	0	8 • 24 VAC Triacs at 0.5 amps • Low or High Side Common Selectable
AS-UNT121-1				2 • 0 to 10 VDC at 10 mA	6 (same as above)
AS-UNT140-1	Screw Terminal	6 • RTD Temp. Elem. (NI, SI or PT.) • 0-10 VDC Trans. • 2K ohm Setpoint Potentiometers	4 • 4-Dry Contacts • 1-Momentary Push Button at Zone Sensor BI4-Accum. Input	0	8 • 24 VAC Triacs at 0.5 amps • Low or High Side Common Selectable
AS-UNT141-1				2 • 0 to 10 VDC at 10 mA	6 (same as above)

Wiring Diagram 1 – External Control Power

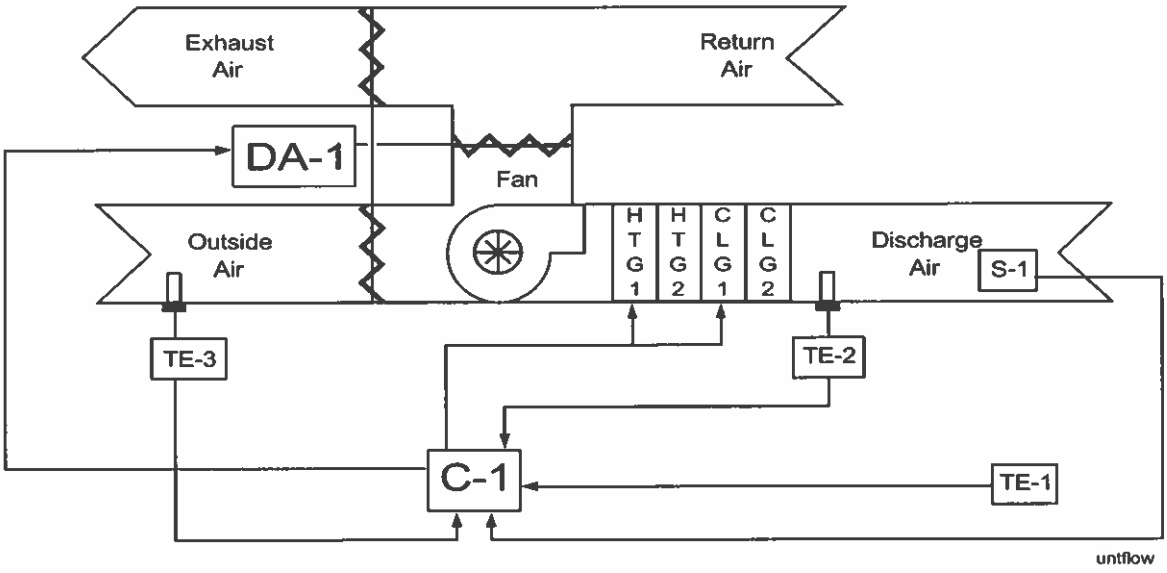


Wiring Diagram 2 – Internal Control Power



UNT Series Unitary Controller (Continued)

Room Control of Packaged Rooftop Unit - Flow Diagram



Configuration Selections

HVAC PRO Configuration Selections	
Economizer Output Type: Zone Bus	
Economizer Changeover Type	Dry Bulb
Heating Type	Two Stages
Cooling Type	Two Stages
Outdoor Air Lockout of Heating / Cooling	Two Stages
Zone Reset from Humidity	No
Heating / Cooling Diagnostics	Yes
Lighting Interface	No

Sequence of Operation

Digital Controller, C_1, shall modulate an economizer damper motor, DA_1, via zone bus and energize up to 2 stages each of heating or cooling to maintain a room temperature of 70°F. Economizer changeover shall be based on outdoor air temperature. The heating and cooling stages should be locked out based on 65°F or 50°F outdoor air temperature respectively.

Bill of Materials

ID	Qty.	Code Number	Description
C-1	1	AS-UNT110-1	Digital Controller
TE-1	1	TE-67NP-1B00	Zone Temperature Sensor
TE-2	1	TE-6100-2	Discharge Air Sensor
TE-3	1	TE-6001-2 TE-6000-1	Outdoor Air Sensor
S-1	1	P32AC-2	Air Flow Switch
DA-1	1	M110CGA-2	Damper Actuator
XFR-1	1	AS-XFR050-0	120/24 VAC, 50 VA Transformer

JOHNSON CONTROLS

Code No. LIT-1928275
Issued March 27, 2009

VMA1400 Series

Variable Air Volume Modular Assembly

Description

The Variable Air Volume Modular Assembly (VMA) is a family of configurable digital controllers. Differing models in the VMA1400 series combine a controller, pressure sensor and/or actuator housed in one pre-assembled unit.

The VMA1400 series is available in four models:

- Cooling Only (VMA1410)
- Cooling with Reheat and/or Fan (VMA1420)
- External Actuator (VMA1430)
- Metasys Zoning Package (VMA1440)

The VMA1410, VMA1420, and VMA1440 use an integrated actuator with a stepper motor drive for quick and accurate damper positioning.

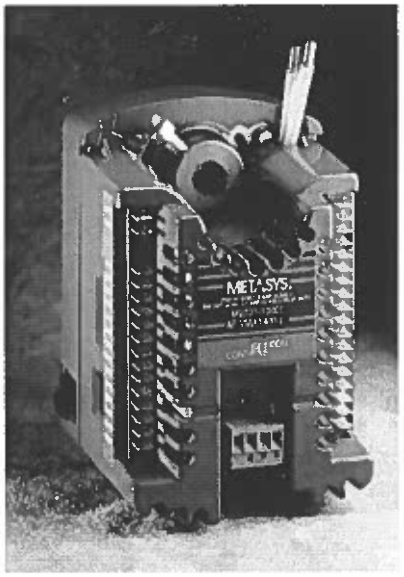
The VMA1410, 1420, 1430 are designed for pressure-independent, single duct systems. The VMA1420 and VMA1430 can also be used with parallel or series fan-powered boxes, supply/exhaust applications, and dual duct systems.

The VMA1440 is used exclusively as part of the Metasys Zoning Package. See the *Metasys Zoning Package Product Bulletin (LIT-639050)* for details.

Features

- easy-to-handle unit with a compact footprint
- pre-wired controller with pressure sensor and actuator for reduced installation time (VMA1430 uses external actuator, VMA1440 has no pressure sensor)
- fast response actuator that drives the damper from full open to full closed (90°) in 30 seconds (VMA1410, VMA1420, VMA1440) for reduced commissioning time
- continuous loop tuning through proportional adaptive algorithms using patented P-Adaptive and Pattern Recognition Adaptive Control (PRAC) technologies
- advanced diagnostics that identify and correct system deviations related to flow, damper travel, and energy
- N2 network communications for integrating VMA as a part of a facility management system with an NCM or N30 Series Supervisory Controller
- simple question/answer software format for quick, easy configuration of project-specific applications.

The VMA1400 Balancing Tool (VBT) software can be used with handheld interfaces (such as 3Com® PalmPilot™) to easily read and adjust parameters (not available for VMA1440). VBT software is included in M-Tools or can be ordered separately.



VMA1400

Software - The VMA can be configured, downloaded, and commissioned with HVAC PRO software, Release 7.00 or later, which uses a simple Q/A format. Dual duct applications, and TMZ1600 room sensor and supply/exhaust applications require HVAC PRO Rel. 8.01. The TE-7700 RF Temperature Sensor Application requires HVAC PRO Software Release 8.04 or later.

VMA Functionality

	Inputs/Outputs	Points	Rating	VMA1400 Model			
				1410	1420	1430	1440
Analog Inputs	Zone Temperature	AI-1	1 K Ni, Si, Pt, or 2.25 K NTC	✓	✓	✓	✓
	Zone Setpoint	AI-2	1.6 K ohm Potentiometer	✓	✓	✓	✓
	Sideloop (humidity, dew point) (for 1410, 1420, 1430) or Static Pressure (for 1440)	AI-3	0-10 VDC		✓	✓	✓
	Supply Air Temperature or Supplemental Heat Temperature	AI-4	1 K Ni, Si, Pt, or 2.25 K NTC		✓	✓	✓
	Velocity Pressure	Internal	0-374 pa (0-1.5 in. W.C.)	✓	✓	✓	
Binary Inputs	Temporary Occupied Button	BI-1	Dry contact	✓	✓	✓	✓
	Occupied or User Configurable (for 1440)	BI-2	Dry contact	✓	✓	✓	✓
	Off or Window or Shutdown (for 1410, 1420, 1430) or User Configurable (for 1440)	BI-3	Dry contact	✓	✓	✓	✓
Analog Outputs	Proportional Heat or External Damper (for 1440, AO-2 is Bypass/Slave Damper)	AO-1	0-10 VDC @ 10 mA		✓	✓	✓
		AO-2	0-10 VDC @ 10 mA		✓	✓	✓
Binary Outputs	Lights, Fan, External Damper, Box Heat - On/Off Valve or 1- 3 stage Electric, Supplemental Heat - On/Off Valve or Single Stage Electric Heat	BO-1 - BO-5 (BO-1 - BO-4 for 1440)	24 VAC Triac @ 0.5 A each		✓	✓	✓
	Stepper Motor with Position Feedback	Internal	2-phase Stepper (up to 93° rotation at 4 N·m (35 lb·in))	✓	✓	✓	✓

Variable Air Volume Modular Assembly (Continued)

Selection Chart

Code Number	Description
AP-VMA1410-0	Integrated VAV Controller/Actuator/Pressure Sensor (Cooling only) Single pack
AP-VMA1410-OD	AP-VMA1410 Bulk pack (10 maximum/pack)[1]
AP-VMA1420-0	Integrated VAV Controller/Actuator/Pressure Sensor (with Reheat and Fan-Powered) Single pack
AP-VMA1420-OD	AP-VMA1420 Bulk pack (10 maximum/pack)[1]
AP-VMA1430-0	Similar to AP-VMA1420 without internal actuator Single pack
AP-VMA1430-0D	AP-VMA1430 Bulk pack (10 maximum/pack)[1]
AP-VMA1440-0	VMA1440 for Metasys Zoning Package Single Pack

1. The VMA is bulk packed in 2-10 unit increments, depending on the order. A single *Variable Air Volume Modular Assembly (VMA) Installation Bulletin* is included in each order. Order quantity as you would for the standard single pack VMA.

Accessories

Description	Code Numbers	
Transformer	**AS-XFR050, AS-XFR100, Y63** through **Y66 Series**	
Screw Terminal Kit	**AP-TBK1002-0** - Removable 2-position screw terminal kit (100 pcs) [1] **AP-TBK1003-0** - Removable 3-position screw terminal kit (100 pcs) [1] **M9000-106** - Removable 4-position screw terminal (1 piece) **AP-TBK4N2-0** - Replacement N2 Bus 4-position screw terminal kit (10 pcs)	
Room Sensors	TE-6700, TE-7000 (Europe only), TE-7700 (using HVAC PRO Rel. 8.04 or later), and AP-TMZ1600-0 (using HVAC PRO Rel. 8.01)	
8-pin Room Sensor Communication Cables	**Length**	**Part Number**
	7.5 m (25 ft.)	**CBL-STAT25-SW**
	15 m (50 ft.)	**CBL-STAT50-SW**
	22.5 m (75 ft.)	**CBL-STAT75-SW**
	30 m (100 ft.)	**CBL-STAT100-SW**
Electronic Fan Speed Controller	**S66AA-1C or S66DC-1C** For specifications, refer to *S66 Series Electronic Fan Speed Control Product/ Technical Bulletin, LIT-121605*	
VBT Software	**AP-VMAVBT1-0** **MW-MTOOL-0, -6** Rel. 5.1 or later	
HVAC PRO Software Release 8.04 or later	**WS-EUROPRO-0**, Release 8.04 in Europe **MW-MTOOL-0** (New User) or **MW-MTOOL-6** (Upgrade), Rel 5.1 or later	
Converters	**AS-CVTPROx00-0, AS-CBLPRO-2, IU-9100-0** (Europe), **MM-CVT101-0** (US)	

1. These terminals fit over the existing I/O spade lugs.

Technical Specifications

VMA1400 Series Variable Air Volume Modular Assembly (Part 1 of 2)	
Supply Voltage	20 to 30 VAC at 50 or 60 Hz
Optional Fuse Current	0.6 ampere for VMA1410; 2.0 ampere for a VMA1420 and 1440; 1.2 ampere for VMA1430
Power Consumption	VMA1410/1420/1440:10 VA maximum (Relay and valve requirements not included.) VMA1430:3 VA maximum (Damper actuator, relay, and valve requirements not included.)
Ambient Operating Conditions	0 to 50°C (32 to 122°F) 10 to 90% RH non-condensing, limited by a 30°C (86°F) maximum dew point

VMA1400 Series Variable Air Volume Modular Assembly (Part 2 of 2)	
Ambient Storage Conditions	-40 to 70°C (-40 to 158°F)
Terminations	6.3 mm (1/4 inch) spade lugs (Communications has removable screw terminals included)
Optional Terminations	2, 3 or 4-position screw terminals that plug into spade lugs (accessories)
RS-485 Serial Interfaces	N2 Bus and Zone Bus
N2 Controller Addressing	DIP switch set (1 to 253) or through software
Communications Bus	N2 between VMA controller and N3x or NCM Zone Bus between VMA controller and room sensor (either 8-pin phone jack or spade lugs) (not available when TE-7700 used)
Mounting	One screw mounts the VMA to the VAV box One screw attaches damper shaft to the actuator, 8 mm (5/16 in.) square-head set screw with 44 N.m (375 lb.in) of axial holding power for 13 mm (1/2 in.) round damper shaft Minimum damper shaft length is 44.5 mm (1-3/4 in.)
Housing	Plastic housing for controller, sensor, and actuator with UL 94-5VB Plenum Flammability Rating
Dimensions (L x W x H)	VMA1410/1420/1440: 153 x 102 x 102 mm (6 x 4 x 4 in.) VMA1430: 153 x 102 x 83 mm (6 x 4 x 3.25 in.)
Actuator Rating	4 N·m minimum (35 lb·in)
Shipping Weight	VMA1410/1420/1440: 13.1 kg (29 lb) for a box of ten, 1.3 kg (2.8 lb) each VMA1430: 5 kg (10.6 lb) for a box of ten, 0.5 kg (1.06 lb) each
Velocity Pressure	Velocity Pressure for 0 to 374 Pascal (0 to 1.5 inch W.C.)
Electrical Inputs	Analog Inputs: Nickel, silicon, or platinum (1K ohm) or NTC (2.25K) RTD room sensors, 1.6K setpoint potentiometer (2-wire) Voltage input for 0-10 VDC (humidity or pressure sensor) Binary Inputs: Dry contacts Input configurations vary based on model type.
Outputs	No outputs on AP-VMA1410-0, except Stepper Motor Binary Outputs: 24 VAC triac switched; 25 to 500 mA loads Stepper Drive: 2 to 767 steps per second (23,000 step resolution) Analog Outputs: 0 to 10 VDC at 10 mA
Agency Compliance	CSA 22.2 No. 205 UL 916 UL 94-5VB FCC Part 15, Subpart B, Class A and B C-tick Australia/NZ, AS/NZS 4251.1, CISPR 22, Residential Class B CE Directive (89/336/EEC, EN50081/1, EN50082/2) Industrial and Residential IEEE 472 ANSI C62.41 A/B (IEEE 587 Category A/B) IEC 950 IEC 801-2, -3, -4, -6, -7, -8

For wiring details, refer to *VMA Installation Bulletin Part No. 24-8740-1* (VMA1410 and VMA1420), *P/N24-8986-18* (VMA1430), and *Part No. 24-9590-0* (VMA1440).

JOHNSON CONTROLS

Code No. LIT-1900375
Issued July 20, 2006

TEC21x7-2 Series N2 Networked Thermostats with Two Outputs

Description

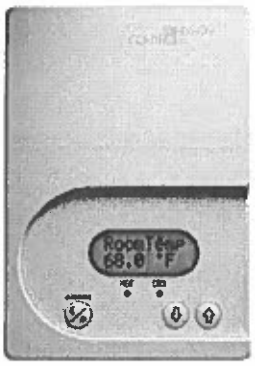
The TEC21x7-2 Series Thermostats are N2 networked devices that provide control of local hydronic reheat valves, pressure dependent Variable Air Volume (VAV) equipment with or without local reheat, or other zoning equipment using an on/off, floating, or proportional 0 to 10 VDC control input. The technologically advanced TEC21x7-2 Series Thermostats feature a Building Automation System (BAS) N2 Bus communication capability that enables remote monitoring and programmability for efficient space temperature control.

The TEC21x7-2 Series Thermostats feature an intuitive user interface with backlit display that makes setup and operation quick and easy. The thermostats also employ a unique, Proportional-Integral (PI) time-proportioning algorithm that virtually eliminates temperature offset associated with traditional, differential-based thermostats.

Refer to the *TEC21x7-2 Series N2 Networked Thermostats with Two Outputs Product Bulletin (LIT-12011112)* for important product application information.

Features

- BAS N2 open communication — provides compatibility with a proven communication network; N2 Bus is widely accepted by Heating, Ventilating, and Air Conditioning (HVAC) control suppliers
- backlit Liquid Crystal Display (LCD) — offers real-time control status of the environment in easy-to-read, English plain text messages with constant backlight that brightens during user interaction
- on/off, floating, or proportional 0 to 10 VDC control — offers additional application flexibility by providing more advanced control signals
- override interface key — allows easy access for temporarily overriding the unoccupied mode
- simplified setpoint adjustment — enables the user to change the setpoint by simply pressing the **UP/DOWN** arrow keys
- two configurable binary inputs — provide additional inputs for advanced functions such as remote night setback, service or filter alarms, motion detector, and window status
- over 20 configurable parameters — enable the thermostat to adapt to any application, allowing installer parameter access without opening the thermostat cover
- discharge air sensor — monitors unit efficiency



TEC21x7-2 Series N2 Networked Thermostat with Two Outputs

Repair Information

If the TEC21x7-2 Series Thermostat fails to operate within its specifications, replace the unit. For a replacement thermostat, contact the nearest Johnson Controls® representative.

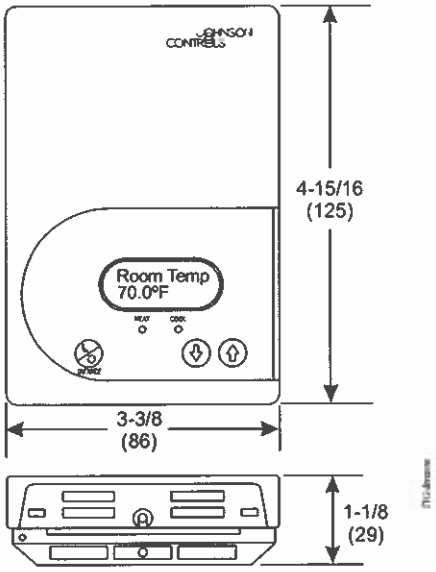
Selection Chart

Code Number	Control Outputs
TEC2127-2	Two On/Off or Floating
TEC2147-2	Two Proportional 0 to 10 VDC

Accessories

Code Number	Description
SEN-600-1	Remote Indoor Air Temperature Sensor
TE-6361P-1	Duct Mount Air Temperature Sensor
SEN-600-4	Remote Indoor Air Temperature Sensor with Occupancy Override and Light-Emitting Diode (LED)
TE-636S-1	Strap-On Temperature Sensor

TEC21x7-2 Series N2 Networked Thermostats with Two Outputs (Continued)



Thermostat Dimensions, in. (mm)

Technical Specifications

TEC21x7-2 Series N2 Networked Thermostats with Two Outputs		
Power Requirements		19 to 30 VAC, 50/60 Hz, 2 VA (Terminals 4 and 5) at 24 VAC Nominal, Class 2 or Safety Extra-Low Voltage (SELV)
Relay/Triac Contact Rating	**On/Off and Floating Control**	30 VAC, 1.0 A Maximum, 3.0 A In-Rush, Class 2 or SELV
Analog Output Rating	**Proportional Control**	0 to 10 VDC into 2k ohm Resistance (Minimum)
Auxiliary Output Rating	**Triac Output**	30 VAC, 1.0 A Maximum, 3.0 A In-Rush
Digital Inputs		Voltage-Free Contacts Across Terminal Scom to Terminals BI1, BI2, or UI3
Wire Size		18 AWG (1.0 mm Diameter) Maximum, 22 AWG (0.6 mm Diameter) Recommended
Thermostat Measurement Range		-40.0°F/-40.0°C to 122.0°F/50.0°C
Temperature Sensor Type		Local 10k ohm Negative Temperature Coefficient (NTC) Thermistor
Resolution		±0.2F°/±0.1C°
Control Accuracy		±0.9F°/±0.5C° at 70.0°F/21.0°C Typical Calibrated
Control Range	**Heating**	40.0°F/4.5°C to 90.0°F/32.0°C in 0.5° Increments
	Cooling	54.0°F/12.0°C to 100.0°F/38.0°C in 0.5° Increments
Minimum Deadband		2F°/1C° between Heating and Cooling
Ambient Conditions	**Operating**	32 to 122°F (0 to 50°C); 95% RH Maximum, Noncondensing
	Storage	-22 to 122°F (-30 to 50°C); 95% RH Maximum, Noncondensing
Compliance	**United States**	UL Listed, File E27734, CCN XAPX, Under UL 873, Temperature Indicating and Regulating Equipment
		FCC Compliant to CFR 47, Part 15, Subpart B, Class A
	Canada	UL Listed, File E27734, CCN XAPX7, Under CAN/CSA C22.2 No. 24, Temperature Indicating and Regulating Equipment
		Industry Canada, ICES-003
	Europe	CE Mark, EMC Directive 89/336/EEC
	Australia and New Zealand	C-Tick Mark, Australia/NZ Emissions Compliant
Shipping Weight		0.75 lb (0.34 kg)

M9210-xxx-3 Electric Spring Return Actuators

Description

The M9210-xxx-3 Actuators are direct mount, spring return electric actuators that operate with these available power options:

- AC 24 V at 50/60 Hz or DC 24 V (AGx, BGx, GGx, HGx)
- AC 120 V at 60 Hz (BAx)
- AC 230 V at 50/60 Hz (BDx)

These bidirectional actuators do not require a damper linkage, and are easily installed on dampers with 1/2 to 3/4 in. or 12 to 19 mm round shafts, or 3/8 and 1/2 in. or 10, 12, and 14 mm square shafts using the standard shaft clamp included with the actuator. An optional M9220-600 Jackshaft Coupler Kit is available for 3/4 to 1-1/16 in. or 19 to 27 mm round shafts, or 5/8 and 3/4 in. or 16, 18, and 19 mm square shafts.

The M9210-xxx-3 Electric Spring Return Actuators provide running and spring return torques of 89 lb·in (10 N·m). Integral line voltage auxiliary switches are available on the xxC models to indicate end-stop position, or to perform switching functions within the selected rotation range.

Refer to the *M9210-xxx-3 Electric Spring Return Actuators Product Bulletin (LIT-12011056)* for important product application information.

Features

- reversible mounting design — simplifies installation and enables the actuator to spring return in either direction
- removable coupler — adapts to a shorter damper shaft
- electronic stall detection throughout entire rotation range — extends the life of the actuator by deactivating the actuator motor when an overload condition is detected
- integral 48 in. (1.2 m) halogen-free cables with colored and numbered conductors — simplify field wiring
- integral auxiliary switches (xxC models) — provide one fixed and one adjustable switch point with line voltage capability
- NEMA 2 (IP54) rated aluminum enclosure — protects the internal components of the actuator from dirt and moisture
- easy-to-use locking manual override with auto release and crank storage — allows for manual positioning of the actuator hub
- integral connectors for 3/8 in. (10 mm) flexible metal conduit — simplify installation and field wiring
- microprocessor-controlled brushless DC motor (-AGx, -GGx, and -HGx) types — provides constant run-time independent of torque

Applications

The M9210-xxx-3 Electric Spring Return Actuators provide reliable control of dampers and valves in Heating, Ventilating, and Air Conditioning (HVAC) systems. The M9210-xxx-3 Actuators are available for use with on/off, floating, and proportional controllers.

M9210-xxx-3 Electric Spring Return Actuator

Repair Information

If the M9210-xxx-3 Electric Spring Return Actuators fails to operate within its specifications, refer to the *M9210-xxx-3 Electric Spring Return Actuators Product Bulletin (LIT-12011056)* for a list of repair parts available.

Selection Chart

Code Number	Control Type	Auxiliary Switches	Power Requirements
M9210-AGA-3	Floating	None	AC 24 V at 50/60 Hz or DC 24 V
M9210-AGC-3	Floating	Two	AC 24 V at 50/60 Hz or DC 24 V
M9210-BAA-3	On/Off	None	AC 120 V at 60 Hz
M9210-BAC-3	On/Off	Two	AC 120 V at 60 Hz
M9210-BDA-3	On/Off	None	AC 230 V at 50/60 Hz
M9210-BDC-3	On/Off	Two	AC 230 V at 50/60 Hz
M9210-BGA-3	On/Off	None	AC 24 V at 50/60 Hz or DC 24 V
M9210-BGC-3	On/Off	Two	AC 24 V at 50/60 Hz or DC 24 V
M9210-GGA-3	Proportional	None	AC 24 V at 50/60 Hz or DC 24 V
M9210-GGC-3	Proportional	Two	AC 24 V at 50/60 Hz or DC 24 V
M9210-HGA-3	Proportional w/Adjustable Zero and Span	None	AC 24 V at 50/60 Hz or DC 24 V
M9210-HGC-3	Proportional w/Adjustable Zero and Span	Two	AC 24 V at 50/60 Hz or DC 24 V

M9210-xxx-3 Electric Spring Return Actuators (Continued)

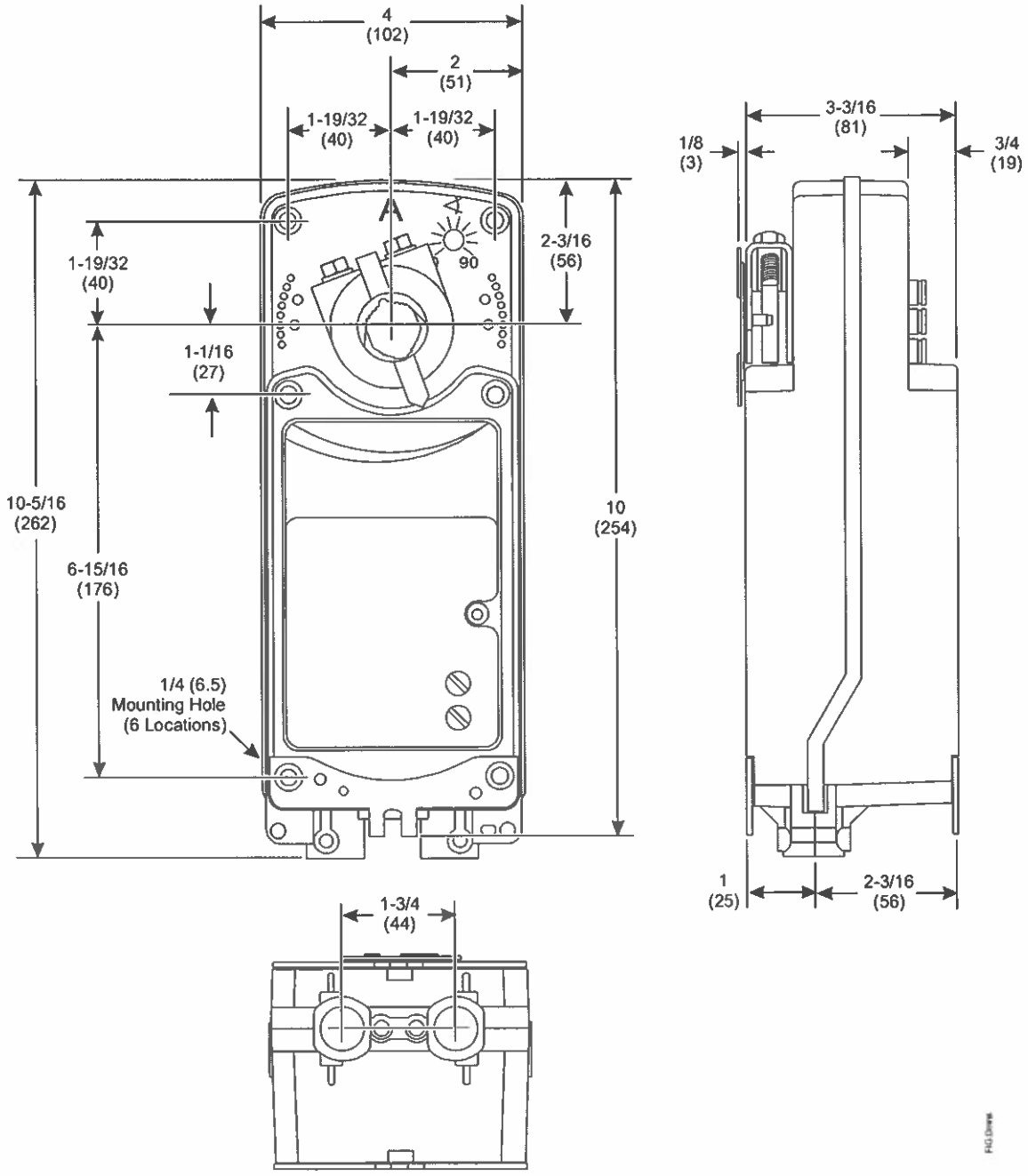
Accessories

Code Number	Description
DMPR-KC003[1]	7 in. (178 mm) Blade Pin Extension (without Bracket) for Johnson Controls® Direct-Mount Damper Applications (quantity 5)
M9000-153	Crank arm (quantity 1)
M9000-158	Tandem Mounting Kit used to Mount Two Models of M9220-xxx-3 Series Proportional Electric Spring Return Actuators (quantity 1)
M9000-170	Remote Mounting Kit, Horizontal. Kit includes Mounting Bracket, M9000-153 Crank Arm, Ball Joint, and Mounting Bolts (quantity 1)
M9000-171	Remote Mounting Kit, Vertical. Kit includes Mounting Bracket, M9000-153 Crank Arm, Ball Joint, and Mounting Bolts (quantity 1)
M9000-200	Commissioning Tool that Provides a Control Signal to Drive 24 V On/Off, Floating, Proportional, and/or Resistive Electric Actuators (quantity 1)
M9000-320	Weather Shield Enclosure - NEMA 3R enclosure for protecting a single M9210/20 actuator from rain, sleet, or snow (quantity 1)
M9000-400	Jackshaft Linkage Kit. Open-ended design enables clamping onto a jackshaft without requiring access to the ends of the jackshaft (quantity 1)
M9000-604	Replacement Anti-rotation Bracket Kit (with Screws) for M9220-xxx-3 Series Proportional Electric Spring Return Actuators (quantity 1)
M9200-100	Threaded Conduit Adapter, 1/2 NPSM, for M9210(20) and M(VA)9208 Series Actuators (quantity 5)
M9220-600	1 in. (25 mm) Jackshaft Coupler Kit (with Locking Clip) for Mounting M9220-xxx-3 Proportional Electric Spring Return Actuators on Dampers with 3/4 to 1-1/16 in. or 19 to 27 mm Round Shafts, or 5/8 and 3/4 in. or 16, 18, and 19 mm Square Shafts (quantity 1)
M9220-601	Replacement Coupler Kit (with Locking Clip) for Mounting M9220-xxx-3 Proportional Electric Spring Return Actuators on Dampers with 1/2 to 3/4 in. or 12 to 19 mm Round Shafts, or 3/8 and 1/2 in. or 10, 12, and 14 mm Square Shafts (quantity 1)
M9220-602	Replacement Locking Clips for M9220-xxx-3 Proportional Electric Spring Return Actuators (Five per Bag)
M9220-603	Adjustable Stop Kit for M9220-xxx-3 Proportional Electric Spring Return Actuators (quantity 1)
M9220-604	Replacement Manual Override Cranks for M9220-xxx-3 Proportional Electric Spring Return Actuators (Five per Bag)
M9220-610	Replacement Shaft Gripper, 10 mm Square Shaft with Locking Clip (quantity 1)
M9220-612	Replacement Shaft Gripper, 12 mm Square Shaft with Locking Clip (quantity 1)
M9220-614	Replacement Shaft Gripper, 14 mm Square Shaft with Locking Clip (quantity 1)

1. Furnished with the damper and may be ordered separately.

M9210-xxx-3 Electric Spring Return Actuators (Continued)

Dimensions



M9210-xxx-3 Electric Spring Return Actuator Dimensions, in. (mm)

M9210-xxx-3 Electric Spring Return Actuators (Continued)

Technical Specifications

M9210-xxx Electric Spring Return Actuators (Part 1 of 2)		
Product Codes		M9210-AGx-3 Models: Floating M9210-Bxx-3 Models: On/Off M9210-GGx-3 Models: Proportional M9210-HGx-3 Models: Proportional Adjustable
Power Requirements	**AGx, GGx, HGx Models**	AC 24 V (19.2 to 30 V) at 50/60 Hz: Class 2, 9.6 VA Running, 6 VA Holding Position; DC 24 V (21.6 to 26.4 V): Class 2, 3.9 W Running, 2.1 W Holding Position
	BAx Models	AC 120 V (AC 102 to 132 V) at 60 Hz: 0.25 A Running, 0.13 A Holding Position
	BDx Models	AC 230 V (AC 198 to 264 V) at 50/60 Hz: 0.15 A Running, 0.09 A Holding Position
	BGx Models	AC 24 V (19.2 to 30 V) at 50/60 Hz: Class 2, 17.7 VA Running, 5.1 VA Holding Position; DC 24 V (21.6 to 26.4 V): Class 2, 15.6 W Running, 2.6 W Holding Position
Transformer Sizing Requirements	**AGx, GGx, HGx Models**	15 VA Minimum per Actuator
	Bxx Models	25 VA Minimum per Actuator
Input Signal/Adjustments	**AGx Models**	DC 0 (2) to 10 V or 0 (4) to 20 mA with Field Furnished 500 ohm resistor; Switch Selectable Direct or Reverse Action with Signal Increase, 500 ms minimum pulse width
	GGx Models	Factory Set at DC 0 to 10 V, CW Rotation with Signal Increase; Selectable DC 0 (2) to 10 V or 0 (4) to 20 mA with Field Furnished 500 ohm, 0.25 W minimum resistor; Switch Selectable Direct or Reverse Action with Signal Increase
	HGx Models	Factory Set DC 0 to 10 V, CW Rotation with Signal Increase; Selectable DC 0 to 10 V or 0 to 20 mA with Field Furnished 500 ohm, 0.25 W minimum resistor; Start Point Programmable DC 0 to 10 V; Span Programmable DC 2 to 10 V; Switch Selectable Direct or Reverse Action with Signal Increase
Control Input Impedance	**GGx, HGx Models**	Voltage Input: 200,000 ohms; Current Input: 500 ohms with Field Furnished 500 ohm Resistor
Feedback Signal	**HGx Models**	DC 0 to 10 V for Desired Rotation Range up to 90°; Corresponds to Rotation Limits, 1 mA maximum
	GGx Models	DC 0 (2) to 10 V for Desired Rotation Range up to 90°; Corresponds to Rotation Limits, 1 mA maximum
Auxiliary Switch Rating	**xxC Models**	Two Single-Pole, Double-Throw (SPDT), Double-Insulated Switches with Gold Flash Contacts: AC 24 V, 50 VA Pilot Duty; AC 120 V, 5.8 A Resistive, 1/4 hp, 275 VA Pilot Duty; AC 240 V, 5.0 A Resistive, 1/4 hp, 275 VA Pilot Duty
Spring Return		Direction is Selectable with Mounting Position of Actuator: Side A, Actuator Face Away from Damper for CCW Spring Return; Side B, Actuator Face Away from Damper for CW Spring Return
Running and Spring Return Torque		89 lb·in (10 N·m)
Rotation Range		Adjustable from 30 to 90° CW or CCW with Optional M9210-603 Adjustable Stop Kit; Mechanically Limited to 90°
Rotation Time Power On (Running)	**AGx, GGx, HGx Models**	150 Seconds for 0 to 89 lb·in (0 to 10 N·m) at All Operating Conditions; Independent of Load
	Bxx Models	24 to 57 Seconds for 0 to 89 lb·in (0 to 10 N·m) at All Operating Conditions; 35 Seconds Nominal at Full Rated Load
Rotation Time Power Off (Spring Returning)	**AGx, GGx, HGx Models**	26 Seconds for 0 to 89 lb·in (0 to 10 N·m) at Room Temperature
	Bxx Models	11 to 15 Seconds for 0 to 89 lb·in (0 to 10 N·m) at Room Temperature; 35 Seconds Maximum for 0 to 89 lb·in (0 to 10 N·m) at -22°F (-30°C) 130 Seconds Maximum for 0 to 89 lb·in (0 to 10 N·m) at -40°F (-40°C)
Cycles		60,000 Full Stroke Cycles, 1,500,000 repositions
Audible Noise Rating (AGx, HGx, GGx Models)	**Power On (Running)**	<40 dBA at 39-13/32 in. (1 m)
	Power On (Holding)	<20 dBA at 39-13/32 in. (1 m)
	Power Off (Spring Returning)	<55 dBA at 39-13/32 in. (1 m)

M9210-xxx-3 Electric Spring Return Actuators (Continued)

M9210-xxx Electric Spring Return Actuators (Part 2 of 2)		
Audible Noise Rating (Bxx Models)	**Power On (Running)**	<66 dBA at 39-13/32 in. (1 m)
	Power On (Holding)	<18 dBA at 39-13/32 in. (1 m)
	Power Off (Spring Returning)	<66 dBA at 39-13/32 in. (1 m)
Electrical Connections	**Actuator (All Models)**	48 in. (1.2 m) Halogen-Free Cable with 18 AWG (0.75 mm^2) Wire Leads
	Auxiliary Switches (GGC Models)	48 in. (1.2 m) Halogen-Free Cable with 18 AWG (0.75 mm^2) Wire Leads
Conduit Connections		Integral Connectors for 3/8 in. (10 mm) Flexible Metal Conduit
Mechanical Connections	**Standard Shaft Clamp Included with Actuator**	1/2 to 3/4 in. or 12 to 19 mm Diameter Round Shafts, or 3/8 and 1/2 in. or 10, 12, and 14 mm Square Shafts
	Optional M9210-600 Jackshaft Coupler Kit	3/4 to 1-1/16 in. or 19 to 27 mm Diameter Round Shafts, or 5/8 and 3/4 in. or 16, 18, and 19 mm Square Shafts
Aluminum Enclosure		NEMA 2 (IP54) for All Mounting Orientations
Ambient Conditions	**Operating**	-40 to 131°F (-40 to 55°C); 90% RH Maximum, Noncondensing
	Storage	-85 to 185°F (-65 to 85°C); 95% RH Maximum, Noncondensing
Dimensions		See *Dimensions*.
Compliance	**United States**	UL Listed, CCN XAPX, File E27734; to UL 60730-1A: 2003-08, Ed. 3.1, Automatic Electrical Controls for Household and Similar Use; and UL 60730-2-14: 2002-02, Ed. 1, Part 2, Particular Requirements for Electric Actuators. (Models: All)
	Canada	UL Listed, CCN XAPX7, File E27734; to UL 60730-1:02-CAN/CSA: July 2002, 3rd Ed., Automatic Electrical Controls for Household and Similar Use; and CSA C22.2 No. 24-93 Temperature Indicating and Regulating Equipment (Models: All).
CE	**Europe**	CE Mark – Johnson Controls, Inc., declares that this product is in compliance with the essential requirements and other relevant provisions of the EMC Directive 2004/108/EC and Low Voltage Directive 2006/95/EC.
	Australia and New Zealand	C-Tick Mark, Australia/NZ Emissions Compliant (Models: All)
Shipping Weight	**xGx Models**	6.4 lb (2.9 kg)
	BAx and BDx Models	7.6 lb (3.5 kg)

Code No. LIT-1900084
Issued January 15, 2008

VG7000 Series

Brass Trim Globe Valves with VA-715x Series Electric Actuators

Description

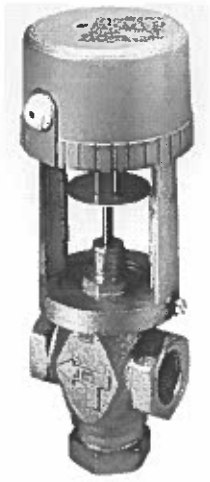
VG7000 Brass Trim Globe Valves with VA-715x Series Non-Spring Return Electric Actuator control hot or chilled water, or steam.

Features

- 90 lb force – provides tight closeoff
- direct coupled – no linkage required
- magnetic clutch – protects gearing, ensures tight closeoff
- controls – hot water, chilled water, or steam
- fits VG7000 valves 1/2 through 2 in.
- valve body static pressure rating: ANSI Class 250
- factory or field assembly
- voltage: 24 VAC, 50/60 Hz, 4.7 VA

Repair Information

If the VG7000 Brass Trim Globe Valve with VA-715x Series Non-Spring Return Electric Actuator fails to operate within its specifications, replace the unit. For a replacement valve or actuator, contact the nearest Johnson Controls® representative.



VA-715x Series Electric Actuator mounted on VG7842 Brass Globe Valve

Selection Chart

VG7000 Brass Trim Globe Valve with VA-715x Series Non-Spring Return Electric Actuator (Part 1 of 2)

Actuator Code				VA-7150-1001	VA-7153-1001	VA-7152-1001
Actuator Input				On/Off (Floating)	On/Off (Floating) with Feedback	0 to 10 VDC Proportional
Temperature Range				35 to 284°F Fluid Temperature, 38 psig Saturated Steam		
Valve	Size	Cv	Closeoff	Non-Spring Return		
Two-Way Push-Down-to-Close – NPT End Connections						
VG7241CT	1/2"	0.73	345	VG7241CT+7150G	VG7241CT+7153G	VG7241CT+7152G
VG7241ET	1/2"	1.8	345	VG7241ET+7150G	VG7241ET+7153G	VG7241ET+7152G
VG7241GT	1/2"	4.6	216	VG7241GT+7150G	VG7241GT+7153G	VG7241GT+7152G
VG7241LT	3/4"	7.3	138	VG7241LT+7150G	VG7241LT+7153G	VG7241LT+7152G
VG7241NT	1"	11.6	86	VG7241NT+7150G	VG7241NT+7153G	VG7241NT+7152G
VG7241PT	1-1/4"	18.5	52	VG7241PT+7150G	VG7241PT+7153G	VG7241PT+7152G
VG7241RT	1-1/2"	28.9	34	VG7241RT+7150G	VG7241RT+7153G	VG7241RT+7152G
VG7241ST	2"	46.2	21	VG7241ST+7150G	VG7241ST+7153G	VG7241ST+7152G
Three-Way Mixing – NPT End Connections						
VG7842CT	1/2"	0.73	345 / 345	VG7842CT+7150G	VG7842CT+7153G	VG7842CT+7152G
VG7842ET	1/2"	1.8	345 / 345	VG7842ET+7150G	VG7842ET+7153G	VG7842ET+7152G
VG7842GT	1/2"	4.6	216 / 257	VG7842GT+7150G	VG7842GT+7153G	VG7842GT+7152G
VG7842LT	3/4"	7.3	138 / 153	VG7842LT+7150G	VG7842LT+7153G	VG7842LT+7152G
VG7842NT	1"	11.6	86 / 100	VG7842NT+7150G	VG7842NT+7153G	VG7842NT+7152G
VG7842PT	1-1/4"	18.5	52 / 57	VG7842PT+7150G	VG7842PT+7153G	VG7842PT+7152G
VG7842RT	1-1/2"	28.9	34 / 36	VG7842RT+7150G	VG7842RT+7153G	VG7842RT+7152G
VG7842ST	2"	46.2	21 / 22	VG7842ST+7150G	VG7842ST+7153G	VG7842ST+7152G
Two-Way Push-Down-to-Close – Union Sweat End Connections						
VG7281CT	1/2"	0.73	345	VG7281CT+7150G	VG7281CT+7153G	VG7281CT+7152G
VG7281ET	1/2"	1.8	345	VG7281ET+7150G	VG7281ET+7153G	VG7281ET+7152G
VG7281GT	1/2"	4.6	216	VG7281GT+7150G	VG7281GT+7153G	VG7281GT+7152G
VG7281LT	3/4"	7.3	138	VG7281LT+7150G	VG7281LT+7153G	VG7281LT+7152G
VG7281NT	1"	11.6	86	VG7281NT+7150G	VG7281NT+7153G	VG7281NT+7152G
VG7281PT	1-1/4"	18.5	52	VG7281PT+7150G	VG7281PT+7153G	VG7281PT+7152G
VG7281RT	1-1/2"	28.9	34	VG7281RT+7150G	VG7281RT+7153G	VG7281RT+7152G
VG7281ST	2"	46.2	21	VG7281ST+7150G	VG7281ST+7153G	VG7281ST+7152G

Brass Trim Globe Valves with VA-715x Series Electric Actuators (Continued)

VG7000 Brass Trim Globe Valve with VA-715x Series Non-Spring Return Electric Actuator (Part 2 of 2)

Actuator Code				VA-7150-1001	VA-7153-1001	VA-7152-1001
Actuator Input				On/Off (Floating)	On/Off (Floating) with Feedback	0 to 10 VDC Proportional
Temperature Range				35 to 284°F Fluid Temperature, 38 psig Saturated Steam		
Valve	Size	Cv	Closeoff	Non-Spring Return		
Three-Way Mixing – Union Sweat End Connections						
VG7882CT	1/2"	0.73	345 / 345	VG7882CT+7150G	VG7882CT+7153G	VG7882CT+7152G
VG7882ET	1/2"	1.8	345 / 345	VG7882ET+7150G	VG7882ET+7153G	VG7882ET+7152G
VG7882GT	1/2"	4.6	216 / 257	VG7882GT+7150G	VG7882GT+7153G	VG7882GT+7152G
VG7882LT	3/4"	7.3	138 / 153	VG7882LT+7150G	VG7882LT+7153G	VG7882LT+7152G
VG7882NT	1"	11.6	86 / 100	VG7882NT+7150G	VG7882NT+7153G	VG7882NT+7152G
VG7882PT	1-1/4"	18.5	52 / 57	VG7882PT+7150G	VG7882PT+7153G	VG7882PT+7152G
VG7882RT	1-1/2"	28.9	34 / 36	VG7882RT+7150G	VG7882RT+7153G	VG7882RT+7152G
VG7882ST	2"	46.2	21 / 22	VG7882ST+7150G	VG7882ST+7153G	VG7882ST+7152G
Two-Way Push-Down-to-Close – 3/8 in. Union Sweat End Connections						
VG7271CT	1/2"	0.73	345	VG7271CT+7150G	VG7271CT+7153G	VG7271CT+7152G
VG7271ET	1/2"	1.8	345	VG7271ET+7150G	VG7271ET+7153G	VG7271ET+7152G
VG7271GT	1/2"	4.6	216	VG7271GT+7150G	VG7271GT+7153G	VG7271GT+7152G
Three-Way Mixing – 3/8 in. Union Sweat End Connections						
VG7872CT	1/2"	0.73	345 / 345	VG7872CT+7150G	VG7872CT+7153G	VG7872CT+7152G
VG7872ET	1/2"	1.8	345 / 345	VG7872ET+7150G	VG7872ET+7153G	VG7872ET+7152G
VG7872GT	1/2"	4.6	216 / 257	VG7872GT+7150G	VG7872GT+7153G	VG7872GT+7152G
Two-Way Push-Down-to-Close – 3/4 in. Union Sweat End Connections						
VG7291CT	1/2"	0.73	345	VG7291CT+7150G	VG7291CT+7153G	VG7291CT+7152G
VG7291ET	1/2"	1.8	345	VG7291ET+7150G	VG7291ET+7153G	VG7291ET+7152G
VG7291GT	1/2"	4.6	216	VG7291GT+7150G	VG7291GT+7153G	VG7291GT+7152G
Three-Way Mixing – 3/4 in. Union Sweat End Connections						
VG7892CT	1/2"	0.73	345 / 345	VG7892CT+7150G	VG7892CT+7153G	VG7892CT+7152G
VG7892ET	1/2"	1.8	345 / 345	VG7892ET+7150G	VG7892ET+7153G	VG7892ET+7152G
VG7892GT	1/2"	4.6	216 / 257	VG7892GT+7150G	VG7892GT+7153G	VG7892GT+7152G
Two-Way Push-Down-to-Close – Union Globe End Connections						
VG7251CT	1/2"	0.73	345	VG7251CT+7150G	VG7251CT+7153G	VG7251CT+7152G
VG7251ET	1/2"	1.8	345	VG7251ET+7150G	VG7251ET+7153G	VG7251ET+7152G
VG7251GT	1/2"	4.6	216	VG7251GT+7150G	VG7251GT+7153G	VG7251GT+7152G
VG7251LT	3/4"	7.3	138	VG7251LT+7150G	VG7251LT+7153G	VG7251LT+7152G
VG7251NT	1"	11.6	86	VG7251NT+7150G	VG7251NT+7153G	VG7251NT+7152G
VG7251PT	1-1/4"	18.5	52	VG7251PT+7150G	VG7251PT+7153G	VG7251PT+7152G
VG7251RT	1-1/2"	28.9	34	VG7251RT+7150G	VG7251RT+7153G	VG7251RT+7152G
Two-Way Push-Down-to-Close – Union Angle End Connections						
VG7551CT	1/2"	0.73	345	VG7551CT+7150G	VG7551CT+7153G	VG7551CT+7152G
VG7551ET	1/2"	1.8	345	VG7551ET+7150G	VG7551ET+7153G	VG7551ET+7152G
VG7551GT	1/2"	4.6	216	VG7551GT+7150G	VG7551GT+7153G	VG7551GT+7152G
VG7551LT	3/4"	7.3	138	VG7551LT+7150G	VG7551LT+7153G	VG7551LT+7152G
VG7551NT	1"	11.6	86	VG7551NT+7150G	VG7551NT+7153G	VG7551NT+7152G
VG7551PT	1-1/4"	18.5	52	VG7551PT+7150G	VG7551PT+7153G	VG7551PT+7152G
VG7551RT	1-1/2"	28.9	34	VG7551RT+7150G	VG7551RT+7153G	VG7551RT+7152G

Brass Trim Globe Valves with VA-715x Series Electric Actuators (Continued)

Technical Specifications

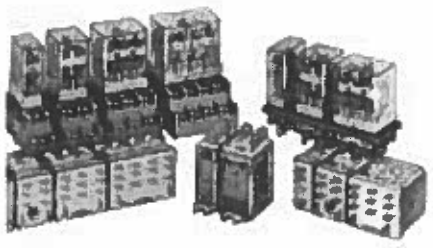
VG7000 Brass Trim Globe Valves with VA-715x Series Non-Spring Return Electric Actuators		
Service[1]		Hot Water, Chill Water, 50/50 Glycol Solutions and Steam for HVAC Systems
Fluid Temperature Limits	**Water**	35 to 284°F (2 to 140°C)
	Steam	38 psig (262 kPa) Saturated Steam
Maximum Allowable Pressure Temperature	**Water**	400 psig (2,756 kPa) Up to 150°F (66°C) decreasing to 365 psig (2,515 kPa) at 248°F (120°C)
	Steam	38 psig (262 kPa) Saturated Steam at 284°F (140°C)
Valve Body Pressure/ Temperature Rating		Meets Requirements of ANSI B16.15, Class 250
Maximum Recommended Operating Pressure Drop	**Water**	35 psig (241 kPa) for ½ through 1-1/4 in. valves 30 psig (207 kPa) for 1-1/2 and 2 in. valves
	Steam	15 psig (103 kPa)
Flow Characteristics	**Two-Way Valves**	Equal Percentage
	Three-Way Valves	Linear Flow Characteristics
Rangeability[2]		25:1
Leakage		0.01% of Maximum Flow per ANSI/FCI 70-2, Class 4
Actuator Ambient Operating Temperature Limits		0 to 140°F (-18 to 60°C)
Actuator Input Signal	**VA-7150-1001**	24 VAC Three-Wire Floating Control
	VA-7152-1001	0 to 10 VDC Proportional Control
	VA-7153-1001	24 VAC Three-Wire Floating Control with 0 to 2000 ohm feedback potentiometer for 25/32 in. valve stroke
Actuator Power Requirements	**VA-7150-1001**	24 VAC (20 to 30 VAC), 50/60 Hz, 2.7 VA Nominal
	VA-7152-1001	24 VAC (20 to 30 VAC), 50/60 Hz, 4.7 VA Nominal
	VA-7153-1001	24 VAC (20 to 30 VAC), 50/60 Hz, 2.7 VA Nominal
Materials	**Body**	Cast Bronze
	Bonnet	Brass
	Stem	Stainless Steel
	Plug	Brass
	Seat	Brass Against Molded Elastomeric Disk
	Packing	Self Adjusting Ethylene Propylene Rubber (EPR) Ring Pack U-Cups

1. Refer to VDI 2035 Standard for recommended proper water treatment.
2. Rangeability is defined as the ratio of maximum controllable flow to minimum controllable flow.

RH Series — General Purpose Midget Relays

Key features of the RH series include:

- **Compact midget size saves space**
- **High switching capacity (10A)**
- **Choice of blade or PCB style terminals**
- **Relay options include indicator light, check button, and top mounting bracket**
- **DIN rail, surface, panel, and PCB type sockets available for a wide range of mounting applications**



UL Recognized
Files No. E67770
E59804
E64245

CSA Certified
File No.LR35144

TÜV PRODUCT SERVICE File No. BL951113332319

CE

D

Specifications

Contact Material	Silver cadmium oxide
Contact Resistance	50mΩ maximum (initial value)
Minimum Applicable Load	24V DC/30mA, 5V DC/100mA (reference value)
Operating Time	SPDT (RH1), DPDT (RH2): 20ms maximum 3PDT (RH3), 4PDT (RH4): 25ms maximum
Release Time	SPDT (RH1), DPDT (RH2): 20ms maximum 3PDT (RH3), 4PDT (RH4): 25ms maximum
Power Consumption	**SPDT** (RH1): DC: 0.8W AC: 1.1VA (50Hz), 1VA (60Hz) **DPDT** (RH2): DC: 0.9W AC: 1.4VA (50Hz), 1.2VA (60Hz) **3PDT** (RH3): DC: 1.5W AC: 2VA (50Hz), 1.7VA (60Hz) **4PDT** (RH4): DC: 1.5W AC: 2.5VA (50Hz), 2VA (60Hz)
Insulation Resistance	100MΩ min (measured with a 500V DC megger)
Dielectric Strength	**SPDT** (RH1) Between live and dead parts: 2,000V AC, 1 minute; Between contact circuit and operating coil: 2,000V AC, 1 minute; Between contacts of the same pole: 1,000V AC, 1 minute
	DPDT (RH2), **3PDT** (RH3), **4PDT** (RH4) Between live and dead parts: 2,000V AC, 1 minute; Between contact circuit and operating coil: 2,000V AC, 1 minute; Between contact circuits: 2,000V AC, 1 minute; Between contacts of the same pole: 1,000V AC, 1 minute
Frequency Response	1,800 operations/hour
Temperature Rise	Coil: 85°C maximum Contact: 65°C maximum
Vibration Resistance	0 to 6G (55Hz maximum)
Shock Resistance	SPDT/DPDT: 200N (approximately 20G) 3PDT/4PDT: 100N (approximately 10G)
Life Expectancy	Electrical: over 500,000 operations at 120V AC, 10A; (over 200,000 operations at 120V AC, 10A for SPDT [RH1], 3PDT [RH3], 4PDT [RH4]) Mechanical: 50,000,000 operations
Operating Temperature	–30 to +70°C
Weight	SPDT: 24g, DPDT: 37g (approximately) 3PDT: 50g, 4PDT: 74g (approximately)

Operational Characteristics

Maximum Continuous Applied Voltage (AC/DC) at 20°C	110% of the rated voltage
Minimum Operating Voltage (AC/DC) at 20°C	80% of the rated voltage
Drop-Out Voltage (AC)	30% or more of the rated voltage
Drop-Out Voltage (DC)	10% or more of the rated voltage

Ordering Information

Order standard voltages for fastest delivery. Allow extra delivery time for non-standard voltages.

Basic Part No.	Coil Voltage:
RH2B-U	**AC110-120V**

See page D-29 for dimensions.

Part Numbers

Part Numbers: RH Series with Options

Termination	Contact Configuration	Basic Part No.	Indicator Light	Check Button	Indicator Light and Check Button	Top Bracket
B (blade)	SPDT	RH1B-U	RH1B-L*	—	—	RH1B-UT
	DPDT	RH2B-U	RH2B-UL	RH2B-UC	RH2B-ULC	RH2B-UT
	3PDT	RH3B-U	RH3B-UL	RH3B-UC	RH3B-ULC	RH3B-UT
	4PDT	RH4B-U	RH4B-UL	RH4B-UC	RH4B-ULC	RH4B-UT
V2 (PCB 0.078" [2mm] wide)	SPDT	RH1V2-U	RH1V2-L*	—	—	—
	DPDT	RH2V2-U	RH2V2-UL	RH2V2-UC	RH2V2-ULC	—
	3PDT	RH3V2-U	RH3V2-UL	RH3V2-UC	RH3V2-ULC	—
	4PDT	RH4V2-U	RH4V2-UL	RH4V2-UC	RH4V2-ULC	—

*1. * RH1B(V2)-L is* **not** *UL recognized.*
2. For Coil and Contact Ratings, see the next page.

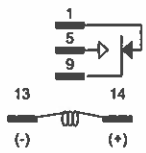
D

Part Numbers: Sockets

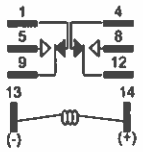
Relay	Standard DIN Rail Mount	Finger-Safe DIN Rail Mount	Surface Mount	Panel Mount	PCB Mount	Spring (optional)
RH1B	SH1B-05	SH1B-05C	—	SH1B-51	SH1B-62	SY2S-02F1 SFA-101 SFA-202 SY4S-51F1 SFA-301 SFA-302
RH2B	SH2B-05	SH2B-05C	SH2B-02	SH2B-51	SH2B-62	SY4S-02F1 SFA-101 SFA-202 SY4S-51F1
RH3B	SH3B-05	SH3B-05C	—	SH3B-51	SH3B-62	SH3B-05F1 SFA-101, -202 SY4S-51F1
RH4B	SH4B-05	SH4B-05C		SH4B-51	SH4B-62	SH4B-02F1 SFA-101, -202 SY4S-51F1

3. See Section F for details on sockets. All DIN rail mount sockets shown above can be mounted using DIN rail BNDN1000.

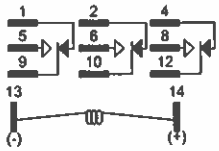
Internal Circuit



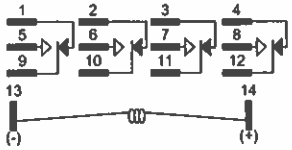
RH1



RH2



RH3



RH4

Ratings

Coil Ratings

Rated Voltage		Rated Current ±15% at 20°C								Coil Resistance ±15% at 20°C			
		60Hz				50Hz							
		SPDT		DPDT		3PDT		4PDT		SPDT	DPDT	3PDT	4PDT
AC	6V	150mA	200mA	280mA	330mA	170mA	238mA	330mA	387mA	18.8Ω	9.4Ω	6.0Ω	5.4Ω
	12V	75mA	100mA	140mA	165mA	86mA	118mA	165mA	196mA	76.8Ω	39.3Ω	25.3Ω	21.2Ω
	24V	37mA	50mA	70mA	83mA	42mA	59.7mA	81mA	98mA	300Ω	153Ω	103Ω	84.5Ω
	120V*	7.5mA	11mA	14.2mA	16.5mA	8.6mA	12.9mA	16.4mA	19.5mA	7,680Ω	4,170Ω	27,70Ω	22,20Ω
	240V†	3.2mA	5.5mA	7.1mA	8.3mA	3.7mA	6.5mA	8.2mA	9.8mA	3,1200Ω	15,210Ω	12,100Ω	91,20Ω
		SPDT		DPDT		3PDT		4PDT		SPDT	DPDT	3PDT	4PDT
DC	6V	128mA		150mA		240mA		250mA		47Ω	40Ω	25Ω	24Ω
	12V	64mA		75mA		120mA		125mA		188Ω	160Ω	100Ω	96Ω
	24V	32mA		36.9mA		60mA		62mA		750Ω	650Ω	400Ω	388Ω
	48V	18mA		18.5mA		30mA		31mA		2,660Ω	2,600Ω	1,600Ω	15,50Ω
	110V‡	8mA		9.1mA		12.8mA		15mA		13,800Ω	12,100Ω	8,600Ω	7,340Ω

** For RH2 relays = 110/120V AC.*
† For RH2 relays = 220/240V AC.
‡ For RH2 relays = 100/110V DC.

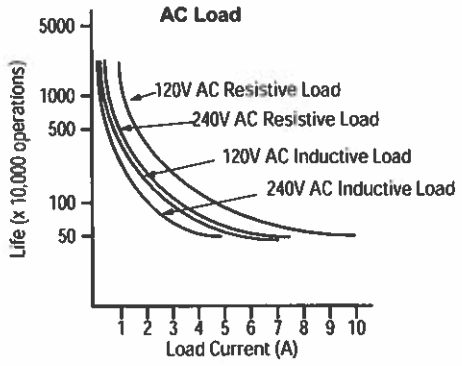
D

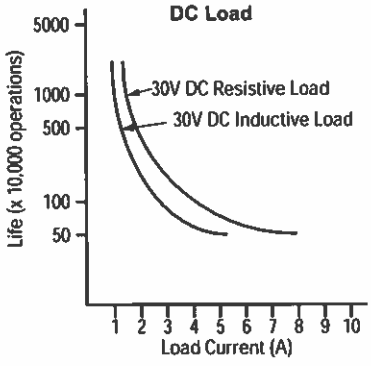
Contact Ratings

		Resistive				Inductive				Motor Load	
Voltage	Rating	SPDT	DPDT	3PDT	4PDT	SPDT	DPDT	3PDT	4PDT	SPDT	DPDT
28V DC	UL	10A	10A	10A	10A	7.5A	—	—	7.5A	—	—
30V DC	UL	10A	10A	10A	—	7A	7A	—	—	—	—
	CSA				10A		7.5A			—	—
	Nominal							7.5A	7.5A	—	—
110V DC	Nominal	0.5A	0.5A	0.5A	0.5A	0.3A	0.3A	0.3A	0.3A	—	—
120V AC	UL	10A	10A	10A	10A	7.5A	—	—	7.5A	1/6	1/6
	CSA						7.5A			—	—
	Nominal					7A		7.5A			
240V AC	UL	10A	10A	—	7.5A	7A	7A	*	5A	1/3	1/3
	CSA							7A		—	—
	Nominal	7A	7.5A	7.5A	4.5A	5A	5A	5A			

*1. * 6.5A/pole, 20A total.*
2. Inductive load cos ø = 0.3, L/R = 7ms.

Electrical Life Curves

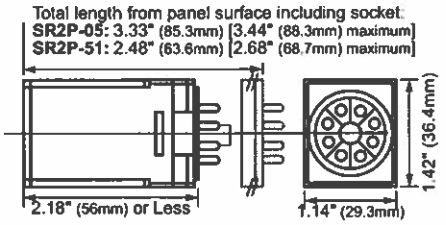




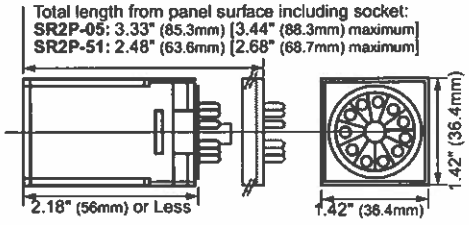
General Purpose and Latching Relay Dimensions

RR Series

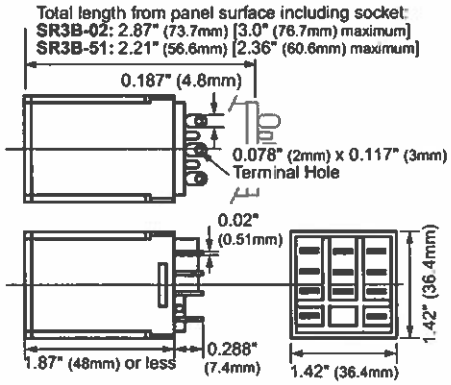
8-Pin
RR2P



11-Pin
RR3PA

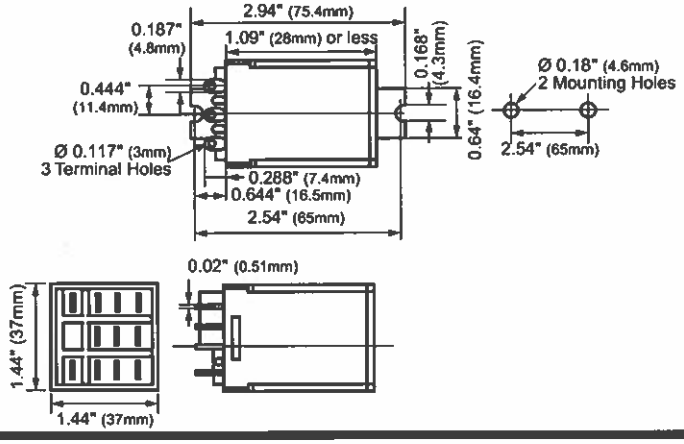


Blade
RR1BA, RR2BA, RR3B



Note: Dimensions in [ ] include hold-down spring.

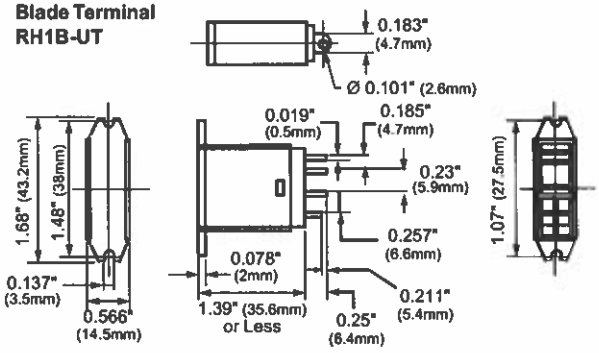
Side Flange
RR1BA-US, RR2BA-US, RR3B-US



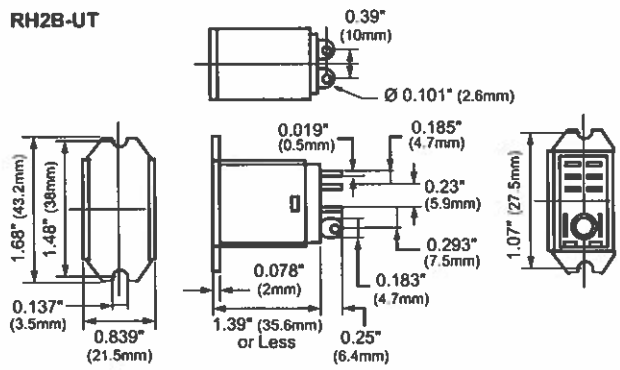
D

RH Series

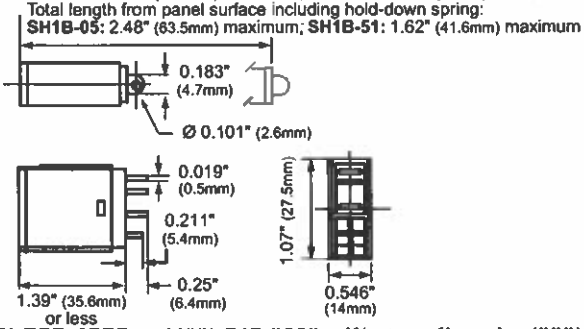
Top Bracket Mounting
Blade Terminal
RH1B-UT



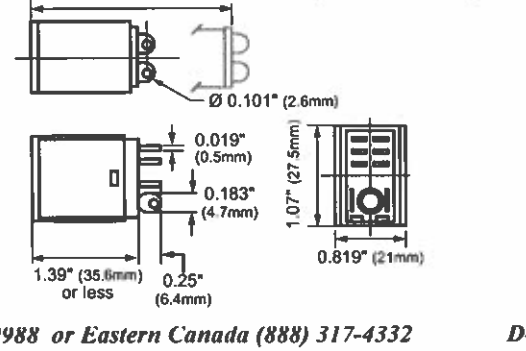
RH2B-UT



Plug-in
Blade Terminal
RH1B



RH2B

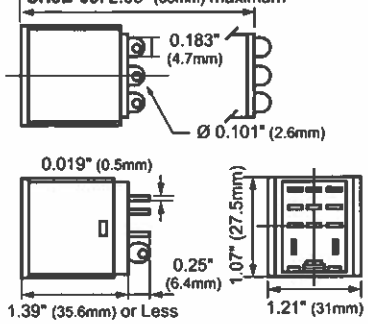


Dimensions, continued

RH Series, continued

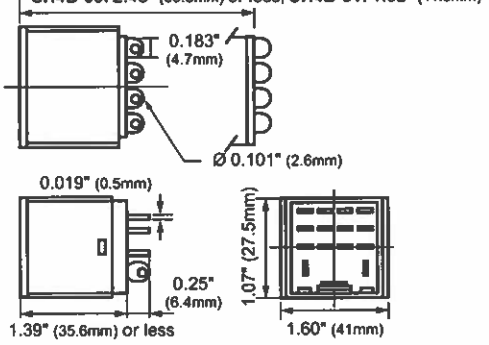
Plug-in
Blade Terminal
RH3B

Total length from panel surface including socket:
SH3B-05: 2.57" (66mm) maximum
Total length from panel surface including hold-down spring:
SH3B-05: 2.65" (66mm) maximum



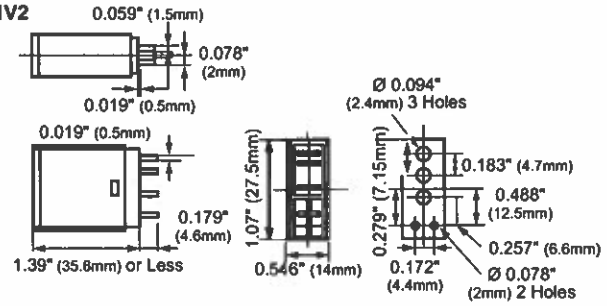
RH4B

Total length from panel surface including socket:
SH4B-05: 2.40" (61.5mm) or less; **SH4B-51:** 1.54" (39.6mm)
Total length from panel surface including hold-down spring:
SH4B-05: 2.48" (63.5mm) or less; **SH4B-51:** 1.62" (41.6mm)

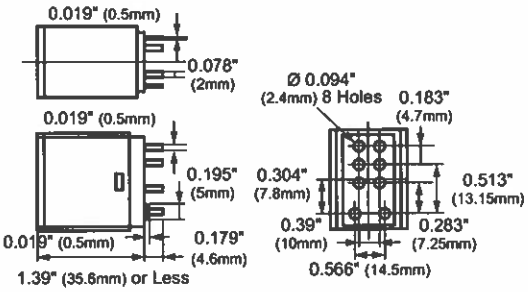


D

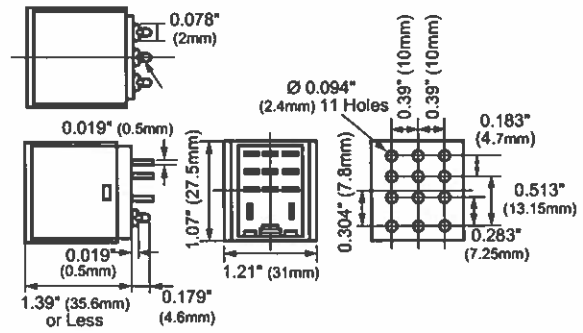
PCB Terminal
RH1V2



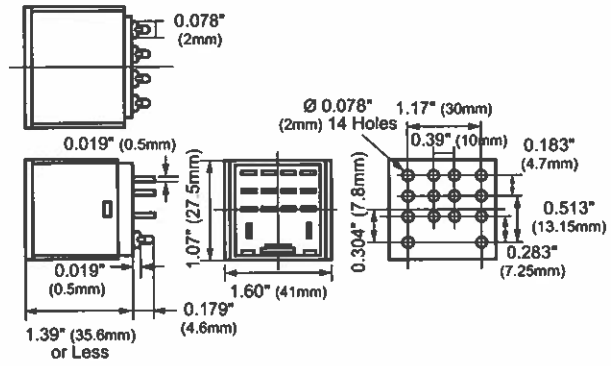
RH2V2

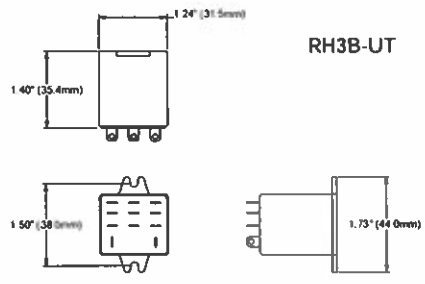


RH3V2

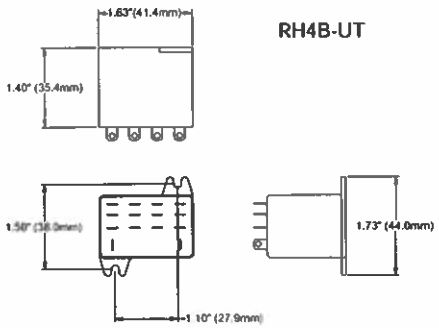


RH4V2





RH3B-UT



RH4B-UT

Selection Guides, continued

General Purpose Relays

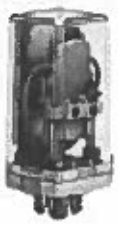
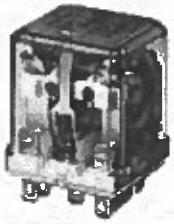
	RR Series	RH Series	RM Series	RY Series
Appearance				
Page	D-8	D-11	D-14	D-17
Features	• Highly reliable • Large capacity • 8-pin, 11-pin, or 11-blade plug-in base • 1 to 3 pole switching • AC or DC coils	• Compact midget size • Highly reliable • Large capacity • AC or DC coils • 1 to 4 pole switching	• Compact miniature size • Highly reliable • AC or DC coils	• Compact ice-cube size • 2- or 4-pole switching • Bifurcated contacts for dry circuit switching
Options	Indicator light Check button Side flange	Indicator light Check button Top mount	Indicator light Check button Top mount	Indicator light Check button Top mount
Contact Configuration	1, 2, 3 Form C	1, 2, 3, 4 Form C	2 Form C	2, 4 Form C
Contact Rating (resistive)	10A, 30V DC 10A, 120V, 240V AC 1/3HP, 240V AC 1/4HP, 120V AC	10A, 30V DC 10A, 120V, 240V AC 1/3HP, 240V AC 1/6HP, 120V AC	5A, 30V DC 5A, 120V AC, 240V AC	DPDT: 3A, 30V DC; 3A, 120V AC, 240V AC 4PDT: 5A, 30V DC; 5A, 120V AC, 240V AC
Contact Material	Silver	Silver-cadmium oxide	Silver	Silver, gold-plated
Minimum Electrical Life	500,000 operations (10A, 120V AC)	500,000 operations (10A, 120V AC)	500,000 operations (5A, 240V AC)	200,000 operations (DPDT: 3A, 120V AC) (4PDT: 5A, 120V AC)
Minimum Mechanical Life	10,000,000 operations	50,000,000 operations	50,000,000 operations	50,000,000 operations
Dielectric Strength (between contact and coil)	2,000V AC, 1 minute	2,000V AC, 1 minute	2,000V AC, 1 minute	2,000V AC, 1 minute (4-pole version)
Coil Voltage	6, 12, 24, 48, 110V DC	6, 12, 24, 48, 110V DC	6, 12, 24, 48, 110V DC	6, 12, 24, 48, 110V DC
	6, 12, 24, 120, 240V AC	6, 12, 24, 120, 240V AC	6, 12, 24, 120, 240V AC	6, 12, 24, 120, 240V AC
Power Consumption (approximately)	2.5VA/1.5W	SPDT: 1VA/0.8W 2PDT: 1.2VA/0.9W 3PDT: 1.7VA/1.5W 4PDT: 2VA/1.5W	1.4VA/0.9W	DPDT: 1.0VA/0.8W 4PDT: 1.2VA/0.9W
Termination	Pin/Blade	Blade/PCB	Blade/PCB	Blade/PCB
Sockets	SR2P SR3P SR3B	SH1B SH2B SH3B SH4B	SY4S	SY2S SY4S
Approvals	UL Recognized Files No. E67770 E59804 E64245 CSA Certified File No.LR35144 TÜV PRODUCT SERVICE * File No. BL951113332319 CE *		UL Recognized Files No. E59804 E64245 CSA Certified File No.LR35144 TÜV PRODUCT SERVICE * File No. BL951113332319 CE *	

D

* *CE marking and TUV ratings do not apply to RR blade style relays.*

Selection Guides, continued

General Purpose Latching Relays

	RR2KP Series	RH2L Series	RY2KS Series	RY2L Series
Appearance				
Page	D-20	D-22	D-24	D-26
Features	• Magnetic dual coil • Self-maintaining without power • Separate set and reset coils • AC or DC coils	• Midget size latch relay • 10A capacity • Dual coil • Power saving pulse input • Indicator shows set-reset condition • AC or DC coils	• Magnetic dual coil • Self-maintaining without power • Separate set and reset coil • AC or DC coils	• Miniature size latch relay • 3A capacity • Dual coil • Power saving pulse input • Mechanical indicator to show set/reset condition • AC or DC coils
Options	Check button	—	Check button	—
Contact Configuration	2 Form C	2 Form C	2 Form C	2 Form C
Contact Rating (resistive)	10A, 30V DC 10A, 120V AC	10A, 30V DC 7.5A, 240V AC 10A, 120V AC	3A, 30V DC 3A, 120V AC	3A, 30V DC 3A, 120V AC 3A, 240V AC
Contact Material	Silver	Silver-cadmium oxide	Silver, gold-plated	Silver, gold-flashed
Minimum Electrical Life	500,000 operations	200,000 operations	200,000 operations	200,000 operations
Minimum Mechanical Life	5,000,000 operations	10,000,000 operations	5,000,000 operations	10,000,000 operations
Dielectric Strength (between contact and coil)	1,500V AC, 1 minute	2,000V AC, 1 minute	1,500V AC, 1 minute	1,500V AC, 1 minute
Coil Voltage	6, 12, 24, 110V DC 6, 12, 24, 120, 240V AC	6, 12, 24V DC 6, 12, 24, 120V AC	6, 12, 24, 110V DC 6, 12, 24, 120, 240V AC	6, 12, 24V DC 6, 12, 24, 120V AC
Power Consumption	AC: 2.2VA DC: 1.5W	1.2VA/2W (set) 0.5VA/0.9W (reset)	AC: 1.5VA DC: 1.2W	0.7VA/1.2W (set) 0.35VA/0.6W (reset)
Termination	Pin	Blade/PCB	Blade	Blade/PCB
Sockets	SR3P	SH3B	SY4S	SY4S
Approvals	UL Recognized Files No. E67770 E55996		CSA Certified File No.LR35144	

D

Sockets (for reference only)

Panel Mount

SH1B-51

SH3B-51

SY2S-61

SY4S-51

For more socket information, see Section F.

Selection Guides, continued

Solid State Relays

		RSS Series	RA Series	RB Series
Appearance				
Page		D-35	D-39	D-42
Isolation Method		Phototransistor coupler	Phototransistor coupler	Phototransistor coupler
Zero-Voltage Switching		Yes	Yes	Yes
Input Rating	Voltage Range	DC: 4 – 32V AC: 90 – 280V	3 – 28V DC	3 – 28V DC
	Impedance	1500Ω (DC) 40K, +10% (AC)	1.2kΩ (approximately)	1.5kΩ (approximately)
Output Rating	Maximum Load Current	10, 25, 50, 75, and 90A	1.2A	1.5A, 2A
	Voltage Range	48 – 660V AC	70 – 250V AC	5 – 60V DC
	Drop-Out Voltage	1.5V, maximum	0.8V DC, minimum	0.8V DC, minimum
Mounting Style		Panel mount	Blade/Plug-in, Pin/Plug-in, PC mount	
Sockets		—	SR2P-... SH1B-...	SR2P-... SH1B-... SH2B-...
Approvals		CE UL Recognized Files No. E59804 CSA Certified File No.LR38595-94M	—	

D

Sockets (for reference only)

DIN Rail Mount

SR2P-05

SR3P-05C (finger-safe)

SH2B-05

DIN Rail

BNDN-1000

PC Mount

SH1B-62

SY2S-05

SY4S-05

SH-05C (finger-safe)

SH4B-62

Hold-Down Springs/Clips

SR2B-02F1

SH4B-02F1

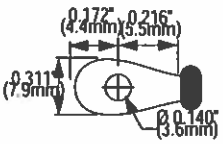
SFA-202

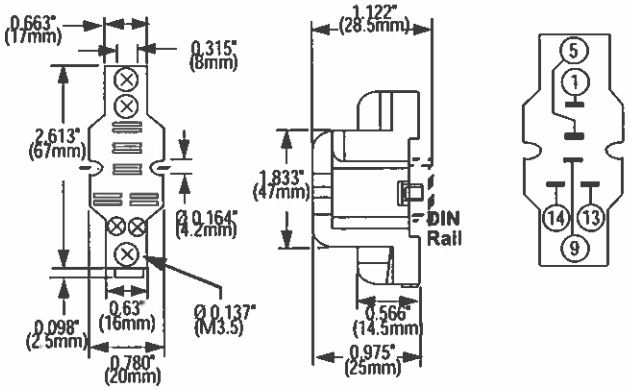
SFA-301

For more details on sockets, see Section F.

SH Series: DIN Rail Snap-Mount Sockets

SH1B Sockets

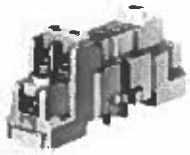


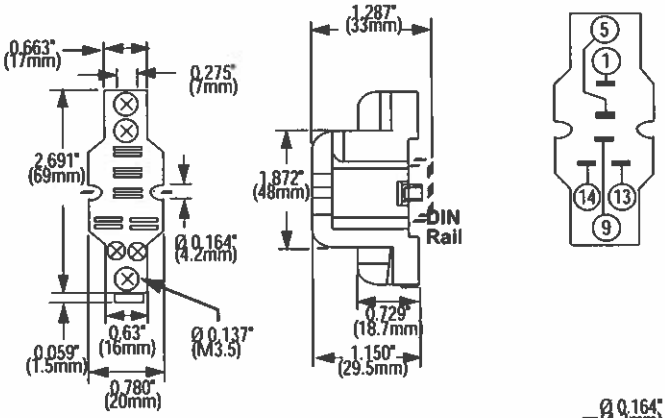


SH1B-05

Style	5-blade, snap-mount/surface mount
Terminal	(Coil) M3 screws/(contact) M3.5 screws with captive wire clamp
Wire Size	Maximum up to 2–#12AWG
Electrical Rating	250V, 10A
Compatible Relay	RH1B, RAHB, RBHB
Hold-Down Spring	SY2S-02F1
Hold-Down Clip	SFA-101, SFA-202

F



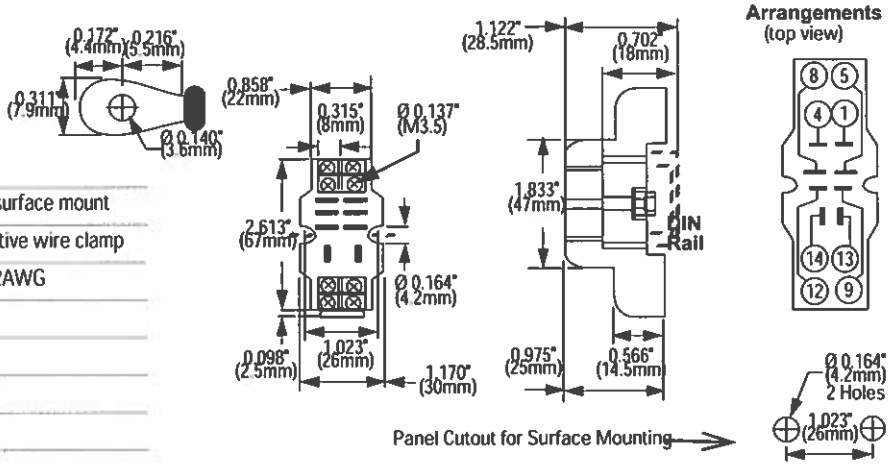


SH1B-05C Fingersafe

Style	5-blade, snap-mount/surface mount
Terminal	(Coil) M3 screws/(contact) M3.5 screws with captive wire clamp, fingersafe
Wire Size	Maximum up to 2–#12AWG
Electrical Rating	250V, 10A
Compatible Relay	RH1B, RAHB, RBHB
Hold-Down Spring	SY2S-02F1
Hold-Down Clip	SFA-101, SFA-202

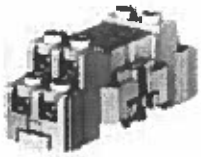
1. For socket mounting accessories, see page F-22.
2. For hold-down clip/spring selections, see page F-4.

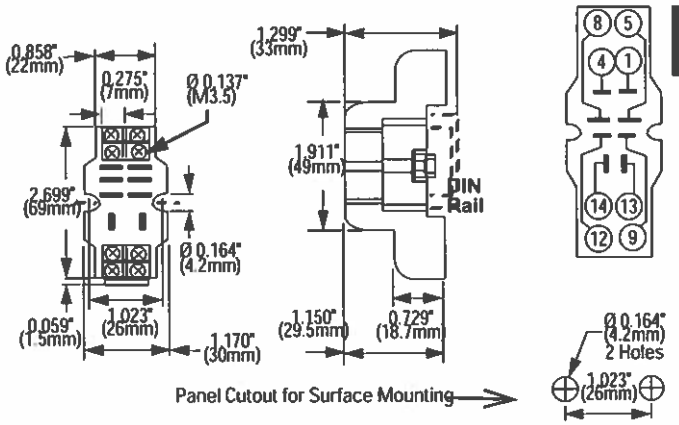
SH2B Sockets



SH2B-05

Style	8-blade, snap-mount/surface mount
Terminal	M3.5 screws with captive wire clamp
Wire Size	Maximum up to 2–#12AWG
Electrical Rating	300V, 10A
Compatible Relay	RH2B, RAMB, RBMB
Hold-Down Spring	SY4S-02F1
Hold-Down Clip	SFA-101, SFA-202





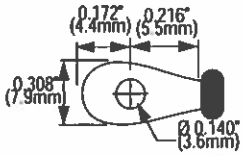
SH2B-05C Fingersafe

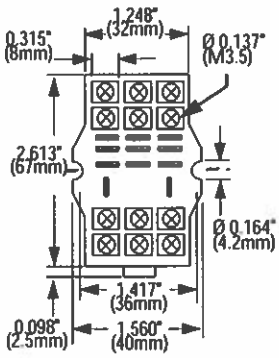
Style	8-blade, snap-mount/surface mount
Terminal	M3.5 screws with captive wire clamp, fingersafe
Wire Size	Maximum up to 2–#12AWG
Electrical Rating	300V, 10A
Compatible Relay	RH2B, RAMB, RBMB
Hold-Down Spring	SY4S-02F1
Hold-Down Clip	SFA-101, SFA-202

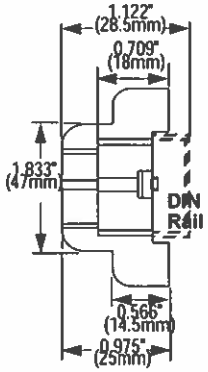
F

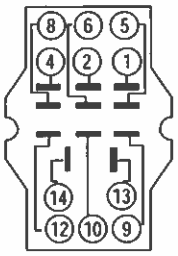
1. For socket mounting accessories, see page F-22.
2. For hold-down clip/spring selections, see page F-4.

SH3B Sockets





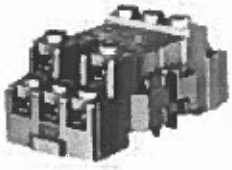


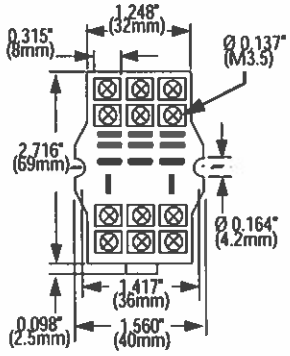


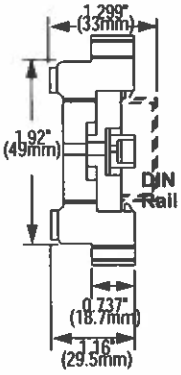
SH3B-05

Style	11-blade, snap-mount/surface mount
Terminal	M3.5 screws with captive wire clamp
Wire Size	Maximum up to 2–#12AWG
Electrical Rating	300V, 10A
Compatible Relay	RH3B, *RH2LB (*latching relay)
Hold-Down Spring	SH3B-05F1
Hold-Down Clip	SFA-101, SFA-202

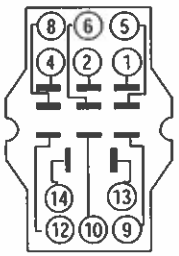
F







Terminal Arrangements (top view)

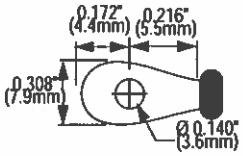


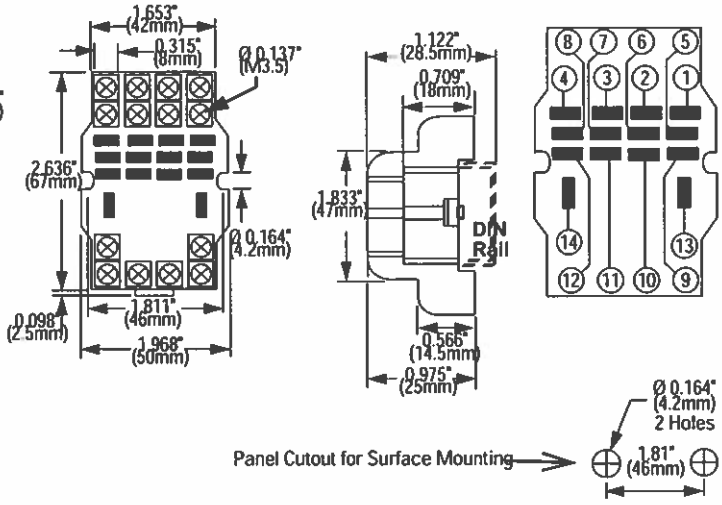
SH3B-05C Fingersafe

Style	11-blade, snap-mount/surface mount
Terminal	M3.5 screws with captive wire clamp, fingersafe
Wire Size	Maximum up to 2–#12AWG
Electrical Rating	300V, 10A
Compatible Relay	RH3B, *RH2LB (*latching relay)
Hold-Down Spring	SH3B-05F1
Hold-Down Clip	SFA-101, SFA-202

1. For socket mounting accessories, see page F-22.
2. For hold-down clip/spring selections, see page F-4.

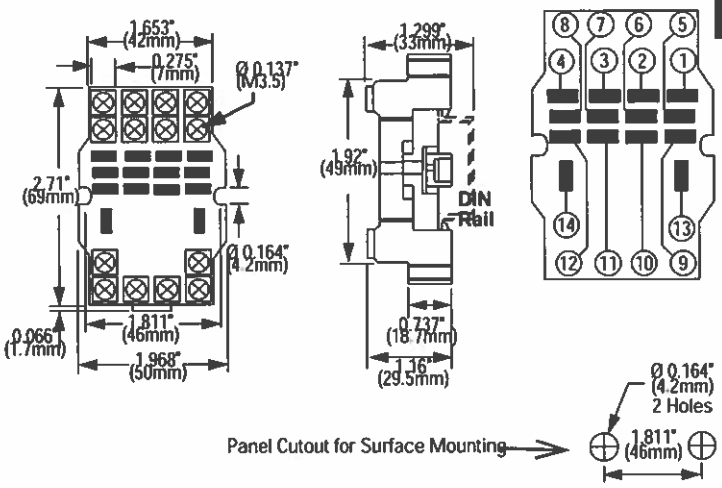
SH4B Sockets





SH4B-05

Style	14-blade, snap-mount/surface mount
Terminal	M3.5 screws with captive wire clamp
Wire Size	Maximum up to 2–#12AWG
Electrical Rating	300V, 10A
Compatible Relay	RH4B
Hold-Down Spring	SH4B-02F1
Hold-Down Clip	SFA-101, SFA-202



SH4B-05C Fingersafe

Style	14-blade, snap-mount/surface mount
Terminal	M3.5 screws with captive wire clamp, fingersafe
Wire Size	Maximum up to 2–#12AWG
Electrical Rating	300V, 10A
Compatible Relay	RH4B
Hold-Down Spring	SH4B-02F1
Hold-Down Clip	SFA-101, SFA-202

1. For socket mounting accessories, see page F-22.
2. For hold-down clip/spring selections, see page F-4.

Accessories

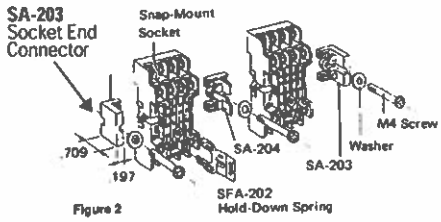
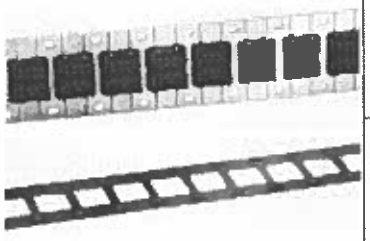


Figure 2

Description	Appearance	Use with	Part No.	Remarks
Aluminum DIN Rail (1 meter length)		All DIN rail sockets	BNDN1000	IDEC offers a low-profile DIN rail (BNDN-1000). The BNDN-1000 is designed to accommodate snap-mount sockets and surface mount sockets. Made of durable extruded aluminum, the BNDN-1000 measures 0.413" in height and 1.37" (35mm) in width (DIN standard). Standard length is 39" (1,000mm).
DIN Rail End Stop		BNDN1000 DIN rail	BNL5	9.1 mm wide.
Surface Mount End Connector		SY2S, SY4S, SR3B, SH1B, SH2B, SH3B, SH4B	SA-203	For use on ends of socket groupings when surface mounting.
			SA-204	For use between adjoining sockets when surface mounting.
Surface Mount Connector		SY2S, SY4S, SR3B, SH1B, SH2B, SH3B, SH4B	SA-405	For use between adjoining sockets when surface mounting.
DIN Rail Spacer		All DIN rail sockets	SA-406	
Steel Mounting Plates (for panel mount sockets)		SY4S-51, SH2B-51	SA-402	11.42" length with 10 holes.
		SY4S-51, SH2B-51	SA-403	23.33" length with 21 holes.
Relay Holders		RH2B, RM2S, RY4S, RY42S, RY2LS, RAMB, RBMB	RH-01	For diagram, see next page.
		RY2S, RAHB,RBHB, RH1B	RH-03	
Replacement Hold-Down Spring Anchor (horseshoe clip)		All DIN rail sockets	Y778-011	For use with hold-down springs (bale wire types). or DIN rail mount sockets. 2 pieces included with each socket.

Instructions

Mounting Snap-Mount Sockets

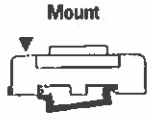


Figure 1

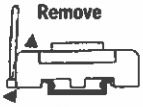


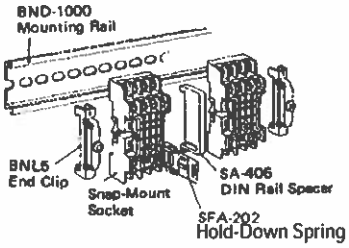
Figure 2

Snap-mount sockets are designed to mount on the BNDN-1000 mounting rail. The built-in mounting clip eliminates mounting hardware and reduces mounting time by 80%.

To mount see Figure 1. Place the end of the socket (end opposite of mounting clip against the outer edge of the rail). Press the socket down firmly until the clip snaps onto the mounting rail. To remove see Figure 2. Pull out the mounting clip with a screwdriver, and lift the socket.

For spacing between adjoining sockets, use the SA-406 DIN rail spacer. Spacers are 0.195" wide. Spacing can be adjusted according to the number of spacers added. Spacers snap on and off easily like snap-mount sockets.

To prevent side-to-side movement, use a BNL-5 end clip at **each** end of every socket row.



Mounting Relay Holders

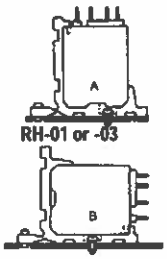


Figure 1

Mount directly onto panel boards in two alternate positions: A and B (see Figure 1).

To mount the relay into the holder, hook the bottom edge of the relay case (coil terminal side) onto the relay holder (see Figure 2).

Push down until the relay snaps into place.

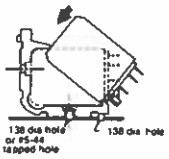


Figure 2

F

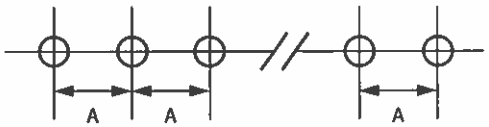
Dimensions

Surface Mount Sockets (SH2B-02)

IDEC surface mount sockets (SH2B-02) are also designed to mount individually or collectively on a flat surface without the use of a DIN rail. Use the mounting screw between adjoining sockets and at the outer ends of the row of sockets.

Dimension Table

Socket Part No.	Dimension A
SH2B-02	1.14"



1. Drawing is not to scale.

Snap-Mount Sockets

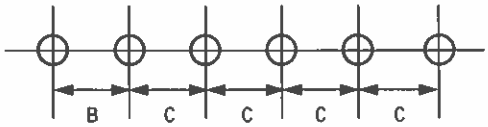
F

Snap-mount sockets are designed to mount individually or collectively without using a rail. Use a SA-405 connector or SA-204 connector between adjoining sockets (see Figures 1 and 2). Use the SA-203 end connector at the outer ends of each socket row when using the SA-204 connector (see Figure 2).

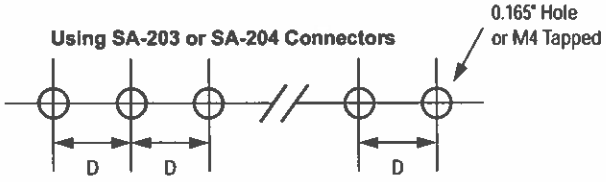
Dimension Table

Socket Part No.	Dim. B	Dim. C	Dim. D
SY2S-05, SY2S-05C	0.669"	0.826"	0.866"
SY4S-05, SY4S-05C	1.024"	1.181"	1.220"
SR3B-05	1.496"	1.693"	1.732"
SH1B-05, SH1B-05C	0.630"	0.787"	0.827"
SH2B-05, SH2B-05C	1.024"	1.181"	1.220"
SH3B-05, SH3B-05C	1.417"	1.575"	1.614"
SH4B-05, SH4B-05C	1.811"	1.969"	2.008"

Using an SA-406 Connector



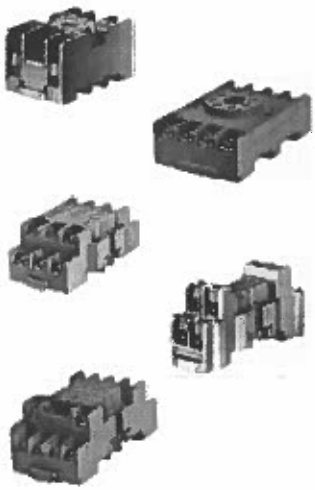
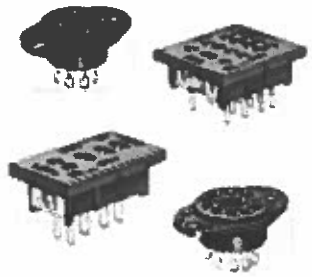
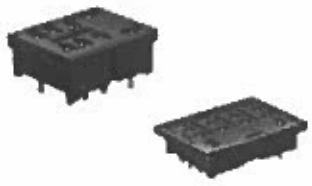
Using SA-203 or SA-204 Connectors



2. Drawings are not to scale.

Relay Socket Selection Guide

Relay Sockets

Mounting	Series	Page	Part No.	No. of Poles	Receptacle	Terminal	Compatible IDEC Relay and Timer
DIN Rail Snap-Mount 	SR	F-5	SR2P-05 SR2P-05C SR2P-06	2	8-Pin	M3.5 Screw	RR2P, RAPP, RBPP, GT5P, RTE-P1, GT3 (8-pin)
			SR3P-05 SR3P-05C SR3P-06	3	11-Pin		RR3PA, RR2KP, RTE-P2 GT3 (11-pin)
			SR3B-05	3	11-Blade		RR1BA, RR2BA, RR3B, RTE-B
	SH	F-8	SH1B-05 SH1B-05C	1	5-Blade	M3.5 Screw Coil Terminal: M3	RH1B, RAHB, RBHB
			SH2B-05 SH2B-05C	2	8-Blade	M3.5 Screw	RH2B, RAMB, RBMB
			SH3B-05 SH3B-05C	3	11-Blade		RH3B, RH2LB
			SH4B-05 SH4B-05C	4	14-Blade		RH4B
	SY	F-12	SY2S-05 SY2S-05C	2	8-Blade	M3 Screw	RY2S, RY22S
			SY4S-05 SY4S-05C	4	14-Blade		RY4S, RY42S, RY2KS, RY2LS, RM2S, GT5Y
Panel Mount 	SR	F-14	SR2P-51	2	8-Pin	Solder	RR2P, RAPP, RBPP, GT5P, RTE-P1, GT3 (8-pin)
			SR3P-51	3	11-Pin		RR3PA, RR2KP, RTE-P2, GT3 (11-pin)
			SR3B-51	3	11-Blade		RR1BA, RR2BA, RR3B
	SH	F-15	SH1B-51	1	5-Blade		RH1B, RAHB, RBHB
			SH2B-51	2	8-Blade		RH2B, RAMB, RBMB
			SH3B-51	3	11-Blade		RH3B, RH2LB
			SH4B-51	4	14-Blade		RH4B
	SY	F-17	SY2S-51	2	8-Blade		RY2S, RY22S
			SY4S-51	4	14-Blade		RY4S, RY42S, RY2KS, RY2LS, RM2S, GT5Y
Surface Mount 	SH	F-18	SH2B-02	2	8-Blade	M3.5 Screw	RH2B, RAMB, RBMB
PCB Mount 	SH	F3-19	SH1B-62	1	5-Blade	PC Board	RH1B, RAHB, RBHB
			SH2B-62	2	8-Blade		RH2B, RAMB, RBMB
			SH3B-62	3	11-Blade		RH3B, RH2LB
			SH4B-62	4	14-Blade		RH4B
	SY	F3-20	SY2S-61	2	8-Blade		RY2S, RY22S
			SY4S-61	4	14-Blade		RY4S, RY42S, RY2KS, RY2LS, RM2S, GT5Y
			SY4S-62	4	14-Blade		RY4S, RY42S, RY2KS, RY2LS, RM2S, GT5Y

For relay mounting accessories, see page F-22.

F

Specifications		
	Rated Insulation Voltage	300V; except SH1B and SY4S-62: 250V
	Rated Current	SR/SH: 10A, SY: 7A (SH1B coil terminal 7A)
	Insulation Resistance	100MΩ minimum
	Dielectric Strength	2,000V AC, 1 minute
	Material Grade	UL94V-0

UL Recognized
File No. E62437

CSA Certified
File No.LR35144

TÜV PRODUCT SERVICE
File No. BL950813332307 *

CE

*1. * Applicable to DIN rail sockets only.*

Relay Socket Part Numbering Guide

Relay socket part numbers are composed of 5 part number codes. When ordering a relay socket, select one code from each category.
Example: SR2P-05C

SR	2	P	—	05	C
① Socket Series	② No. of Poles	③ Termination		④ Mounting Style	⑤ Fingersafe Option

F

Part Numbers: Relay Sockets

	Description	Part Number Code	Remarks
① Socket Series	SR	SR	For use with RR series relays
	SH	SH	For use with RH series relays
	SY	SY	For use with RY series relays
② No. of Poles	1-pole	1	SH series
	2-pole	2	SR, SH, and SY series
	3-pole	3	SR, and SH series
	4-pole	4	SH series
③ Termination	Tubular pin	P	SR series
	Blade	B	SH series
	Solder/blade	S	SY series
④ Mounting Styles	DIN rail snap-mount	05	To decide between configuration 05 and 06, see pictures and schematics beginning on page F-5
		06	Model 05 is available as 05C with a fingersafe option; see ⑤ below
	Panel mount	51	
	PC board mount	61	
		62	
⑤ Fingersafe Option	With finger-protection terminals	C	Available only on SR, SH, and SY series snap-mount sockets
	Without finger-protection terminals	Leave blank	

2. For hold-down springs and clips for DIN rail snap-mount, panel mount, and PC board mount, see page F-4.
3. For socket accessories, see page F-22.

Hold-Down Springs and Clips Selection Guide

DIN Rail Snap-Mount Sockets

Socket Part No.	Applicable Relays, Timer	Hold-Down Spring	Hold-Down Clip
SR2P-05 SR2P-05C	RR2P, RAPP, RBPP	SR2B-02F1	SFA-203
	RTE-P1, GT3, GT5P	—	SFA-203
SR2P-06	RR2P, RAPP, RBPP	SR2B-02F1	SFA-202
	GT3 (8-pin), RTE-P1, GT5P	—	SFA-202
SR3P-05 SR3P-05C	RR3PA	SR3B-02F1	SFA-203
	RR2KP	SR3P-06F3	SFA-203
	RTE-P2, GT3 (11-pin)	—	SFA-203
SR3P-06	RR3PA	SR3B-02F1	SFA-202
	RR2KP	SR3P-06F3	SFA-202
	RTE-P2, GT3 (11-pin)	—	SFA-202
SR3B-05	RR1BA, RR2BA, RR3B, RTE-B	SR3B-02F1	SFA-202
SH1B-05 SH1B-05C	RH1B, RAHB, RBHB	SY2S-02F1	SFA-101 SFA-202
SH2B-05 SH2B-05C	RH2B, RAMB, RBMB	SY4S-02F1	SFA-101 SFA-202
SH3B-05 SH3B-05C	RH3B, RH2LB	SH3B-05F1	SFA-101 SFA-202
SH4B-05 SH4B-05C	RH4B	SH4B-02F1	SFA-101 SFA-202
SY2S-05 SY2S-05C	RY2S, RY22S	SY2S-02F1	SFA-101 SFA-202
SY4S-05 SY4S-05C	RY4S, RY42S, RY2LS, RM2S	SY4S-51F1	SFA-101 SFA-202
	RY2KS, GT5Y	(SY4S-51F3)	SFA-202

Panel and PC Board Mount Sockets

Socket Part No.	Applicable Relays, Timer	Hold-Down Spring	Hold-Down Clip
SR2P-51	RR2P, RAPP, RBPP	SR3P-01F1	—
	GT3 (8-pin), RTE-P1	—	SFA-402
SR3P-51	RR3PA	SR3P-01F1	—
	RR2KP	SR3P-51F3	
	GT3 (11-pin), RTE-P2	—	SFA-402
SR3B-51	RR1BA, RR2BA, RR3B, RTE-B	SR3B-02F1	—
SH1B-51 SH1B-62	RH1B, RAHB, RBHB	SY4S-51F1	SFA-301 SFA-302
SH2B-51	RH2B, RAMB, RBMB	SY4S-51F1 (SY4S-02F1)	SFA-301 SFA-302
SH2B-62	RH2B, RAMB, RBMB	SY4S-51F1 (SY4S-02F1)	—
SH3B-51 SH3B-62	RH3B, RH2LB	SY4S-51F1 (SY4S-02F1)	SFA-301 SFA-302
SH4B-51 SH4B-62	RH4B	SY4S-51F1 SY4S-02F1)	SFA-301 SFA-302
SY2S-51 SY2S-61	RY2S, RY22S	SY4S-51F1	SFA-301 SFA-302
SY4S-51 SY4S-61	RY4S, RY42S, RY2LS	SY4S-51F1 (SY4S-02F1)	SFA-301 SFA-302
	RY2KS	SY4S-51F1 (SY4S-02F3)	SFA-302
	GT5Y	—	SFA-302
SY4S-62 *	RY4S, RY42S, RY2LS, RM2S	SY4S-51F1 (SY4S-02F1)	—
	RY2KS	SY4S-51F1 (SY4S-02F3)	—

** Does not accept hold down clips*

1. *When mounting relays with a check button onto panel mount or PC board mount sockets, use the hold-down spring shown in parenthesis. Hold-down springs for relays with check buttons are not available for SR2P-51.*
2. *For close mounting of panel mount or PC mount sockets, use hold-down clips rather than hold-down springs.*


SFA-101


SFA-202


SFA-302

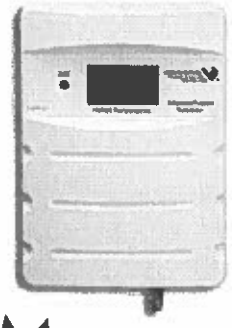

SFA-402


SR3P-01F1


SY4S-51F1

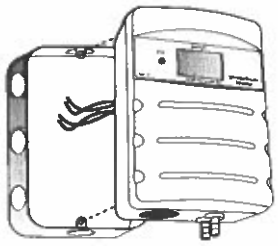
PX Series *Differential Pressure Transducer–Dry Media*

Selectable Ranges...LCD Display... Automatic Zero...



FIVE-YEAR 5 WARRANTY

LCD DISPLAY!



The digital **PX Series** differential pressure transducers utilize a highly accurate and stable sensor, which is microprocessor profiled for improved accuracy and reliability. The stability, accuracy and ease of use characteristics of the PX models make them the ideal product for differential pressure monitoring applications.

Designed to monitor duct and static pressure in commercial buildings and to provide exceptional job-site flexibility, all PX models feature four field-selectable range options allowing just two models to cover applications for 0-0.1" to 0-10" W.C. The directional mode jumper provides the means to configure the transducer in unidirectional or bidirectional mode for room and building static pressure applications.

All models feature a pushbutton and digital input terminal to zero the output. A microprocessor algorithm prevents accidental zero adjustment during normal operation.

Advanced pressure sensing technology

PX Series pressure transducers utilize an advanced ceramic capacitive sensing element which provides a highly stable linear output. Output offset errors due to changes in temperature, warm-up and long term drift are significantly reduced compared to conventional sensors.

Applications

- Static pressure in duct or room applications
- Variable air volume system
- Filter status monitoring

Exceptional accuracy and stability

- Improved tolerance to overpressure and vibration reduces field failures
- High accuracy digital sensor maintains calibration and reduces callbacks
- High reliability sensor technology for long-term maintenance-free operation

Lowest total installed cost

- Switch-selectable ranges reduce setup time and number of models to stock
- Microprocessor allows for a nine-point calibration increasing product accuracy and reliability
- Brass barb fittings prevent breakage and accomodate popular tubing sizes
- Built-in pickup tube simplifies installation and saves time (duct model)
- Circuit protection, prevents damage due to incorrect wiring

Low-differential room pressure sensor with LCD display

- Ideal for clean rooms, hospitals, fume hoods, computer rooms, and other very low differential pressure applications
- Monitors positive and negative pressure
- Field-adjustable ranges for maximum resolution
- Flush mount directly on wall or duct

ORDERING INFORMATION

	(Enclosure)	(Local Display)	(NIST)	(Range)	(US or EU)
PX	☐	☐	☐	☐	S
	D = Duct P = Panel	L = LCD Display X = No Display	N = NIST X = None	01 = 0-1" wc 02 = 0-10" wc	S = Standard

Example:

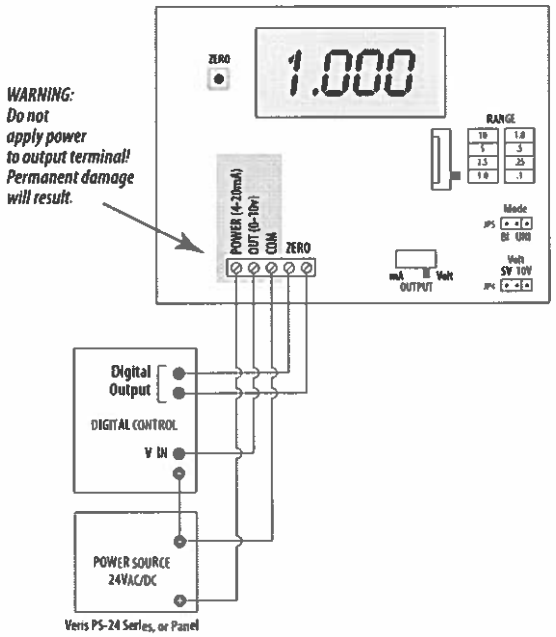
PX [D] [L] [X] [01] [S]

ACCESSORIES

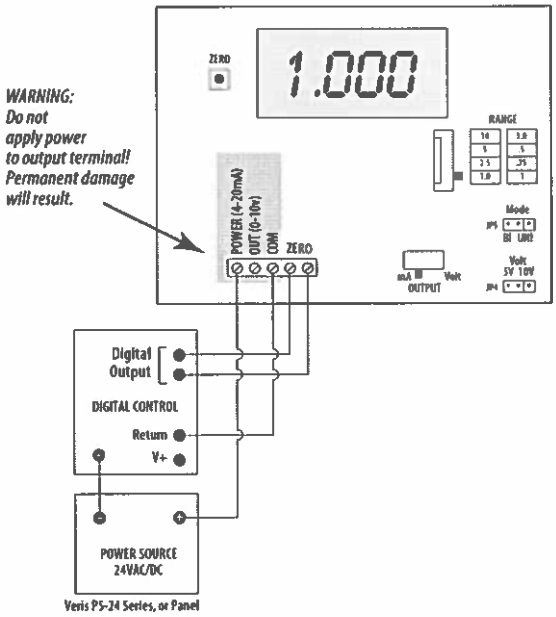
Room and duct static pickup tubes...
See page 206

WIRING DIAGRAMS

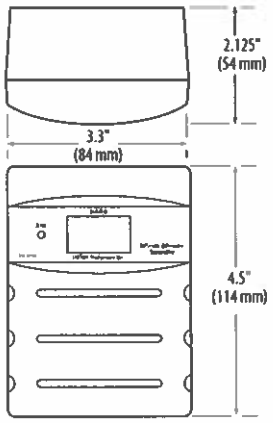
3-wire, 0-5V/0-10V



2-wire, 4-20mA



DIMENSIONAL DRAWINGS



SPECIFICATIONS

Media Compatibility		Dry air or inert gas
Input Power		12-30VDC, or 24VAC nominal
Output		Field selectable: 2-wire, loop-powered 4-20mA, (clipped and capped), or 3-wire 0-5V/0-10V
Pressure Ranges:	01	Unidirectional: 0.1/0.25/0.5/1.0" W.C. F.S., jumper-selectable
		Bidirectional: ±0.1/±0.25/±0.5/±1.0" W.C. F.S., jumper-selectable
	02	Unidirectional: 1.0/2.5/5.0/10" W.C. F.S., jumper-selectable
		Bidirectional: ±1.0/±2.5/±5.0/±10" W.C. F.S., jumper-selectable
Mode		Unidirectional or bidirectional, jumper-selectable
Display (option)		Signed 3-1/2 digit LCD, indicates pressure in inches of water column
Proof Pressure		3 psid
Burst Pressure		5 psid
Accuracy		±1% F.S. Combined linearity and hysteresis
Temperature Effect		1" models: 0.05%/°C; 10" models: 0.01%/°C (Relative to 25°C) 0° to 50°C
Zero Drift (1-year)		1" models: 2.0% max.; 10" models: 0.5% max.
Zero Adjust		Pushbutton auto-zero and digital input (2-pos terminal block)
Operating Environment		0°- 60°C; 0 to 90% RH non-condensing
Fittings		Brass barb; 1/8" o.d.
Physical		High-impact ABS plastic

Code No. LIT-1900217
Issued May 6, 2011

TE-6300 Series Temperature Sensors

Description

The TE-6300 Temperature Sensor line provides economical solutions for a wide variety of temperature sensing needs, including wall-mount, outdoor-air, duct, strap-mount, well-insertion, duct-averaging, and Variable Air Volume (VAV) flange-mount duct-probe applications. The TE-6300 line offers both a metal and a plastic enclosure for the most popular models.

Sensors are available in the following types:

- 1k ohm thin-film nickel
- 1k ohm nickel averaging
- 1k ohm thin-film platinum
- 100 ohm platinum equivalent averaging
- 1k ohm platinum equivalent averaging
- 2.2k (2,252) ohm thermistor
- 10k ohm thermistor, Johnson Controls® Type II

Each sensor is packaged with the necessary mounting accessories to maximize ordering and installation ease and reduce both commissioning time and cost.

Refer to the *TE-6300 Temperature Sensors Product Bulletin (LIT-216320)* for important product application information.

Features

- full line of versatile sensors — supports all your temperature sensing needs from a single supplier: wall mount, outdoor air, duct probe, duct averaging, strap-mount, well insertion, and flange mount duct probe
- single assembly ordering — simplifies ordering; provides a complete assembly in one box
- models featuring an integral NPT Adaptor — increase sensor connection strength, which eliminates the need for a special adaptor
- models with a stainless steel sensor probe — protect the sensor while increasing corrosion resistance
- metal enclosure (TE-63xxM Models only) — meets plenum requirements
- models featuring a retainer for the sensor holder — allow you to lock the sensor holder into the conduit box
- brushed stainless steel mounting plate — offers a durable, aesthetically-pleasing design
- low profile flush mount design — provides a tamper-proof installation ideally suited for schools, sporting complexes, retailers, prisons, and more

All TE-6300 series sensors are two-wire, passive, resistance output devices.

TE-63xxA Models

The TE-63xxA (adjustable length) models:

- provide a thermoplastic mounting flange and gland nut to adjust the length of the probe
- include two hex-head self-drilling screws for mounting
- come equipped with a 10 ft (3 m) plenum-rated cable with 1/4 in. (6.35 mm) female insulated quick-connect terminations on leads

TE-63xxF Models

The TE-63xxF (flush mount) models:

- provide a low profile when installed in an electrical box
- feature thermally isolated sensor from the wall with a foam pad
- offer a rugged stainless steel cover
- provide 22 AWG lead wires with low voltage installation

TE-63xxM Models

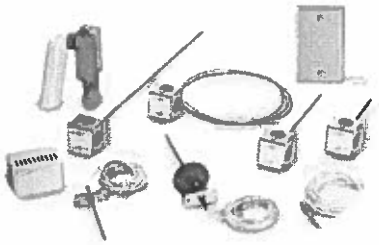
The TE-63xxM (metal enclosure) models:

- come with a corrosion-protected steel enclosure with a 0.88 in. (22 mm) hole for a 1/2 in. (12.7 mm) conduit fitting
- include two hex-head self-drilling screws for mounting the duct and duct averaging models
- offer (well models only) either a direct mount or 1/2-14 NPT threaded well sensor holder for mounting in TE-6300W Series thermal wells (Order the thermal well separately.)
- provide optional well sensor holders (order separately) to mount duct models in thermal wells.
- meet UL 1995 plenum use requirements
- offer optional accessory kit (order separately) to replace plastic hole plug and wiring bushing to meet International Mechanical Code (IMC) requirements

TE-63xxP Models

The TE-63xxP (plastic enclosure) models:

- provide a thermoplastic conduit box with 1/2-14 NPT female thread for connecting to conduit
- provide aluminum mounting plate and 1/2-14 NPT threaded hub mounting options for the duct and duct averaging models
- use the 1/2-14 NPT female thread to mount the Outdoor Air models directly to ridged conduit
- provide optional sensor holders (order separately) to mount duct models in thermal wells
- offer an optional accessory metal cover kit (order separately) to replace the plastic cover to meet UL 1995 plenum use requirements



TE-6300 Series Temperature Sensors

- include a replaceable sensing probe on duct probe, outdoor air, and well insertion models

TE-63x4P Wall Mount Models

The TE-63x4P (plastic enclosure) models:

- come with a white thermoplastic ventilated cover with a brushed aluminum face plate and a steel mounting plate for surface mounting
- include faceplates for both horizontal and vertical mounting
- offer an accessory mounting kit for mounting to a standard electrical box
- offer optional covers

TE-63xS Models

The TE-63xS (Strap-Mount) models:

- provide a 1/4 in. (6.35 mm) diameter stainless steel probe without an enclosure
- include three cable ties for mounting to pipe up to 2-5/8 in. (67 mm) diameter
- come equipped with a 10 ft (3 m) plenum rated cable
- meet UL 1995 plenum use requirements
- offer an accessory mounting kit for mounting to a pipe up to 11 in. (280 mm) diameter

TE-63xxV Models

The TE-63xxV (VAV flange mount) models:

- provide a stainless steel mounting flange with two hex-head self-drilling mounting screws
- come equipped with a 10 ft (3 m) plenum rated cable with 1/4 in. (6.35 mm) female insulated quick-connect terminations on leads
- meet UL 1995 plenum use requirements

Repair Information

If the TE-6300 Series Temperature Sensor fails to operate within its specifications, refer to the *TE-6300 Series Temperature Sensors Product Bulletin (LIT-216320)* for a list of repair parts available.

TE-6300 Series Temperature Sensors (Continued)

Selection Charts

Sensor	Mounting Style	Probe Length in. (mm)	Product Code Number
Nickel (1k ohm)	Adjustable[1]	8 ft (203)	TE-6311A-1
		8 ft (2.4 m)	TE-6315M-1
			TE-6315V-2[1]
		17 ft (5.2 m)	TE-6316M-1
			TE-6316V-2[1]
	Duct	4 (102)	TE-631GM-1
		8 (203)	TE-6311M-1
			TE-6311P-1
		18 (457)	TE-631JM-1
	Flange	4 (102)	TE-631GV-2
		8 (203)	TE-6311V-2
	Flush	N/A	TE-6310F-1
	Outdoor Air	3 (76)	TE-6313P-1
	Strap-Mount	3 (76)	TE-631S-1
	Wall[2]	N/A	TE-6314P-1
	Well	6 (152)	TE-631AM-2
		8 (203)	TE-6312M-1
Platinum (1k ohm)	Adjustable	8 (203)	TE-6351-A
	Duct	4 (102)	TE-635GM-1
		8 (203)	TE-6351M-1
			TE-6351P-1
		18 (457)	TE-635JM-1
	Flange	4 (102)	TE-635GV-2
		8 (203)	TE-6351V-2
	Flush	N/A	TE-6350F-1
	Strap-Mount	3 (76)	TE-635S-1
	Outdoor Air	3 (76)	TE-6353P-1
	Wall[2]	N/A	TE-6324P-1
	Well	6 (152)	TE-635AM-2
		8 (203)	TE-6352M-1
Platinum Equivalent	1k ohm Averaging[1]	10 ft (3 m)	TE-6327P-1
		20 ft (6.1 m)	TE-6328P-1
	100 ohm Averaging[1]	10 ft (3 m)	TE-6337P-1
		20 ft (6.1 m)	TE-6338P-1
Thermistor (2.2k ohm)	Adjustable	8 (203)	TE-6341A-1
	Duct	8 (203)	TE-6341P-1
	Flange	4 (102)	TE-634GV-2
		8 (203)	TE-6341V-2
	Outdoor Air	3 (76)	TE-6343P-1
	Wall[2]	N/A	TE-6344P-1
	Well	8 (203)	TE-6342M-1
		6 (152)	TE-634AM-2
Thermistor (10k ohm) Type II	Adjustable	8 (203)	TE-6361A-1
	Duct	4 (102)	TE-636GM-1
		8 (203)	TE-6361M-1
			TE-6361P-1
		18 (457)	TE-636JM-1
	Flange	4 (102)	TE-636GV-2
		8 (203)	TE-6361V-2
	Flush	N/A	TE-6360F-1
	Outdoor Air	3 (76)	TE-6363P-1
	Strap-Mount	3 (76)	TE-636S-1
	Well	6 (152)	TE-636AM-2
		8 (203)	TE-6362M-1

1. Two TE-6001-8 Element Holders come with the platinum equivalent averaging sensors. Order separately to use with a nickel averaging sensor.
2. Order the TE-1800-9600 Mounting Hardware separately to mount the wall unit to a wallbox.

Optional Accessories

Product Code Number	Description
F-1000-182	Thermal Conductive Grease for element wells (8 oz.)
T-4000-xxxx	Wall Mount Cover
T-4000-119	Allen Head Tool for Wall Mount Cover Screws (order in multiples of 30)
TE-1800-9600	Mounting Hardware for mounting the wall mount unit to a wall box
TE-6001-8	Element Holder for mounting an averaging sensor (order in multiples of 10)
TE-6001-13	Metal Cover and Gasket Kit (5 per package)
TE-6300-101	12 in. (305 mm) (1k ohm) Nickel Probe (cut to an appropriate length)[1]
TE-6300-105	12 in. (305 mm) (1k ohm) Platinum Class A Probe (cut to an appropriate length)[1]
TE-6300-103	1/2-14 NPT Plastic Sensor Holder without retainer (order in multiples of 10)
TE-6300-104	12 in. (305 mm) (2.2k ohm) Thermistor Probe (cut to an appropriate length)[1]
TE-6300-613	IMC Kit, Metal Knockout Plug, Metal Clamp Connector (order in multiples of 10)
TE-6300-614	Cable Tie Mounting Kit, 0.50 to 2.625 in. (12.7 to 66.7 mm) Bundle Diameter (10 per package)
TE-6300-615	Cable Tie Mounting Kit, 11 in. (280 mm) Max Bundle Diameter
TE-6300-616	8 in. (203 mm) 1k ohm Platinum Class A Probe
TE-6300-617	3 in. (76 mm) 1k ohm Platinum Class A Probe
TQ-6000-1	4 to 20 mA Output Transmitter for use with the 100 ohm platinum sensor
TE-6300W-102	6 in. (152 mm) Stainless Steel Well (direct mount)
TE-6300W-101	6 in. (152 mm) Brass Well (direct mount with thermal grease included)
TE-6300W-110	8 in. (203 mm) Stainless Steel Well

1. Cut 12 in. probes to a minimum of 3 in. (76 mm).

TE-6300 Series Temperature Sensors (Continued)

T-4000 Covers Available for the Wall Mount TE-63x4P Series

Product Code Number	Horizontal Johnson Controls Logo	Vertical Johnson Controls Logo	Thermometer, with °F/°C Scale	Faceplate/Cover Color
T-4000-2138[1]	—	—	—	Brushed Aluminum/Beige
T-4000-2139	X	—	—	
T-4000-2140	X	—	X	
T-4000-2144	—	X	—	
T-4000-2639	X	—	—	Brown and Gold/Beige
T-4000-2640	X	—	X	
T-4000-2644	—	X	—	
T-4000-3139	X	—	—	Brushed Aluminum/White
T-4000-3140	X	—	X	
T-4000-3144	—	X	—	

1. Without Johnson Controls logo

Technical Specifications

TE-6300 Series Temperature Sensors (Part 1 of 2)		
Sensor Reference Resistance	1k ohm Nickel	1k ohms at 70°F (21°C)
	1k ohm Nickel Averaging	
	1k ohm Platinum	1k ohms at 32°F (0°C)
	100 ohm Platinum Averaging	100 ohms at 32°F (0°C)
	1k ohm Platinum Averaging	1k ohms at 32°F (0°C)
	2.2k ohm Thermistor	2,252 ohms at 77°F (25°C)
	10k ohm Thermistor	10.0k ohms at 77°F (25°C)
Sensor Accuracy	1k ohm Nickel	±0.34F° at 70°F (±0.19C° at 21°C)
	1k ohm Nickel Averaging	±3.4F° at 70°F (±1.9C° at 21°C)
	1k ohm Platinum Class A	±0.35F° at 70°F (±0.19C° at 21°C), DIN Class A
	1k ohm Platinum Class B	±0.73F° at 70°F (±0.41C° at 21°C), DIN Class B
	100 ohm Platinum Averaging	±1.0F°at 70°F (± 0.58C° at 21°C)
	1k ohm Platinum Averaging	
	2.2k ohm Thermistor	±0.36F° (±0.2C°) in the range: 32 to 158°F (0 to 70°C)
	10k ohm Thermistor	±0.9F° (±0.5C°) in the range: 32 to 158°F (0 to 70°C)
Sensor Temperature Coefficient	1k ohm Nickel	Approximately 3 ohms/F° (5.4 ohms/C°)
	1k ohm Nickel Averaging	
	1k ohm Platinum	Approximately 2 ohms/F° (3.9 ohms/C°) 3850 ppm/K
	100 ohm Platinum Averaging	Approximately 0.2 ohms/F° (0.39 ohms/C°)
	1k ohm Platinum Averaging	Approximately 2 ohms/F° (3.9 ohms/C°)
	2.2k ohm Thermistor	Nonlinear, Negative Temperature Coefficient (NTC)
	10k ohm Thermistor	Nonlinear NTC, Johnson Controls Type II
Electrical Connection	TE-63xxM	22 AWG (0.6 mm diameter) x 6 in. (152 mm) long
	TE-63xxP	
	TE-63xxF-1	22 AWG (0.6 mm diameter) x 12 ft (3 m) braided-copper wires, low voltage insulation, half-stripped ends
	TE-63xxP Nickel Averaging	18 AWG (1.0 mm diameter) x 6 in. (152 mm) long
	TE-63xS	22 AWG (0.6 mm diameter) x 10 ft (3 m) long plenum-rated cable
	TE-63xxA, TE-63xxV	22 AWG (0.6 mm diameter) x 10 ft (3 m) long plenum-rated cable with 0.25 in. (6.35 mm) female quick-connect terminals

TE-6300 Series Temperature Sensors (Continued)

TE-6300 Series Temperature Sensors (Part 2 of 2)		
Materials	**Probes**	Nickel Averaging: 0.094 in. (2.4 mm) Outside Diameter (O.D.) copper tubing Nickel Averaging Adaptor: 0.25 in. (6.35 mm) O.D. Brass Platinum Averaging Probe: 0.19 in. (4.8 mm) Aluminum tubing All others (except Averaging): 0.25 in. (6.35 mm) O.D. Stainless Steel
	TE-63xxA	Mounting Adapter Plate and Gland: Thermoplastic
	TE-63xxF-1	Flush Mount: Stainless Steel
	TE-63xxM	Enclosure: Corrosion-Protected Steel Well Sensor Holder: 0.875 in. (22.2 mm) Hex Brass
	TE-63xxP	Conduit box and Shield: Rigid Thermoplastic Mounting Plate: Aluminum Sensor Holder: Rigid Thermoplastic Wall Mount Base Plate: Corrosion-Protected Steel Wall Mount Cover: Rigid Thermoplastic (White) Wall Mount Face Plate: Brushed Aluminum
	TE-63xxV	Mounting Flange: Stainless Steel
Operating Conditions	**TE-63xxA**	-50 to 140°F (-46 to 60°C)
	TE-63xxF	32 to 104°F (0 to 40°C)
	TE-63xxM	-50 to 220°F (-46 to 104°C)
	TE-63xxP	Enclosure: -50 to 122°F (-46 to 50°C) Sensor Probe: -50 to 220°F (-46 to 104°C)
	TE-63xS	Sensor Probe: -50 to 220°F (-46 to 104°C) Wire Harness: -50 to 122°F (-46 to 50°C)
	TE-63xxV	
Shipping Weight	**TE-63xxA**	0.2 lb (0.09 kg)
	TE-63xxF	0.25 lb (113.4 kg)
	TE-63xxM	Duct Averaging: 0.9 lb (0.41 kg) Duct Mount: 0.4 lb (0.18 kg) Well Insertion: 0.5 lb (0.23 kg)
	TE-63xxP	Duct Averaging: 0.5 lb (0.23 kg) Duct Mount: 0.4 lb (0.18 kg) Outdoor Air: 0.5 lb (0.23 kg) Wall Mount: 0.2 lb (0.09 kg) Well Insertion: 0.35 lb (0.16 kg)
	TE-63xS	Strap-Mount: 0.2 lb (0.09 kg)
	TE-63xxV	Duct Averaging: 0.7 lb (0.32 kg) Duct Mount: 0.2 lb (0.09 kg)
Dimensions (H x W x D)	**TE-63xxA**	2.17 in. (55 mm) diameter plus 4 or 8 in. (102 or 203 m) element
	TE-63xxF	Flush Mount: 4.50 x 2.75 in. (114.3 x 69.85 mm)
	TE-63xxM	Duct Averaging: 1.87 x 1.87 x 1.80 in. (47.5 x 47.5 x 45.8 mm) plus 8 or 17 ft (2.4 or 5.2 m) element Duct Mount: 1.87 x 1.87 x 1.80 in. (47.5 x 47.5 x 45.8 mm) plus 4, 8, or 18 in. (102, 203, or 457 mm) element Well Insertion: 1.87 x 1.87 x 1.80 in. (47.5 x 47.5 x 45.8 mm) plus 6 or 8 in. (152 or 203 mm) element
	TE-63xxP	Duct Averaging: 5.97 x 1.38 x 2.75 in. (152 x 35 x 70 mm) plus 8, 10, 17, or 20 ft (2.4, 3.0, 5.2, or 6.1 m) element Duct Mount: 5.97 x 1.38 x 2.75 in. (152 x 35 x 70 mm) plus 6 or 8 in. (152 or 203 mm) probe Outdoor Air: 5.97 x 3.47 x 4.46 in. (152 x 88 x 113 mm) Wall Mount: 2.09 x 3.12 x 1.80 in. (53 x 79 x 46 mm) Well Insertion: 5.97 x 1.38 x 2.75 in. (152 x 35 x 70 mm) plus 6 or 8 in. (152 or 203 mm) probe
	TE-63xS	Strap-Mount: 0.25 in. (6.35 mm) diameter x 3.00 in. (76 mm.) long
	TE-63xxV	Duct Averaging: 2.25 x 1.50 in. (57 x 38 mm) plus 8 or 17 ft (2.4 or 5.2 m) element Duct Mount: 2.25 x 1.50 in. (57 x 38 mm) plus 4 or 8 in. (102 or 203 m) element

Code No. LIT-1900601
Issued July 21, 2010

TE-68xx-xN00S

TE-6800 Series Temperature Sensors

Description

The TE-68xx-xN00S Series provides temperature sensing in room wall mount applications. It allows local setpoint temperature adjustment and temporary occupancy override.

A warmer/cooler dial is included on certain models for minor temperature adjustments from the setpoint. An occupancy override button allows the user to request a time-of-day scheduling override when the space is occupied outside of the normal occupied hours schedule. All sensors have DIP switches that enable or disable unit functions.

Depending on the model chosen, the wires connecting the sensor to the controller can be terminated using a screw terminal block or modular jack connection, offering wiring flexibility. All models include a Zone Bus access port for connecting accessories to access the 6-pin modular jack. This feature allows a technician to commission or service the controller via the sensor.

Refer to the *TE-6800 Series Temperature Sensors Product Bulletin (LIT-12011542)* for important product application information.

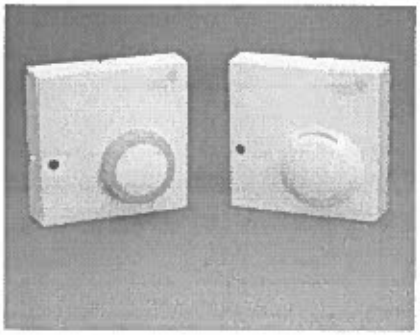
Features

- controller configuration switch — allows users to adjust room comfort and to choose occupancy features that match the application and controller
- occupancy Light-Emitting Diode (LED) indicator — displays the current operating mode of the controller (VMA1200 and VMA1400 Series controllers only)
- manual override Pushbutton (PB) — overrides time-of-day scheduling when the space is occupied outside of normal occupied hours schedule

Repair Information

Do not field repair the TE-6800 Series Temperature Sensors. As with any electrical device, keep the air vents clean and free from dust or obstruction.

If the TE-6800 Series Temperature Sensor fails to operate within its specifications, replace the unit. For a replacement sensor, contact the nearest Johnson Controls® representative.



TE-6800 Series Temperature Sensors

IMPORTANT: Do not remove the Printed Circuit Board (PCB). Removing the PCB voids the product warranty.

Selection Chart

Product Code Number	Temperature Sensing Element	Warmer/Cooler Temperature Setpoint Adjustment Override	Temperature Display	Connection	Enclosure Dimension, mm
TE-68NT-0N00S	Ni1000	No	No	Terminal Block	80 x 80
TE-68NT-1N00S	Ni1000	Yes	No	Terminal Block	80 x 80
TE-68NP-0N00S	Ni1000	No	No	Modular Jack	80 x 80
TE-68NP-1N00S	Ni1000	Yes	No	Modular Jack	80 x 80
TE-68PP-0N00S	Pt1000	No	No	Modular Jack	80 x 80
TE-68PP-1N00S	Pt1000	Yes	No	Modular Jack	80 x 80
TE-68PT-0N00S	Pt1000	No	No	Terminal Block	80 x 80
TE-68PT-1N00S	Pt1000	Yes	No	Terminal Block	80 x 80

Accessories

Product Code Number	Description
ACC-INSL-0[1]	Wallbox Mounting Pad (10/bag)
ACC-INSL-1[1]	Surface Mounting Pad (10/bag)
NS-WALLPLATE-0	Adapts a TE-6800 Sensor (80 x 80 mm) to a standard 80 x 120 mm wallbox
T-4000-119	Hex-head Adjustment Tool (30/bag)

1. These foam pads help prevent drafts from entering the unit through the wall, and make installation easier when mounting on an uneven surface.