JOHNSON CONTROLS

Table of Contents

Unitary (UNT) Controller 1100 Series User's Guide

Chapter 1

Using this Guide

Introduction

The *Unitary (UNT) Controller 1100 Series User's Guide* provides information about how to use the UNT1100 series controller. This chapter outlines the guide's organization and content.

Code No. LIT-63630831

Key Concepts

Chapter Organization

Each chapter of this *Unitary (UNT) Controller 1100 Series User's Guide* is divided into five sections as described in Table 1-1.

Table 1-1: Chapter Organization

Section	Description
Introduction	Briefly outlines the contents of the chapter.
Key Concepts	Describes background information necessary to perform or understand specific tasks.
Procedure Overview	Describes general steps for performing the tasks described in the *Detailed Procedures* section.
Detailed Procedures	Describes in detail the steps needed to complete specific tasks described within the chapter. This section is geared toward users who are new to the UNT1100 controller.
Troubleshooting	Presents potential problems and solutions.

If a particular section is not needed for a chapter, it is not included. For example, in this chapter, the *Detailed Procedures* section is not required.

Chapter 2

Introduction to the UNT1100 Series

Introduction

The UNT1100 Series 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 also can be configured as a generic Input/Output (I/O) device for basic point monitoring applications when used within a Metasys® Network. This chapter gives an overview of the product.

Code No. LIT-63630832

Key Concepts

UNT1100 Series Operation

You can easily configure point inputs and outputs, and software features to control a wide variety of Heating, Ventilating, and Air Conditioning (HVAC) equipment applications. The UNT1100 may be used as a standalone controller or connected to the Metasys Network through a Network Control Module (NCM), N30, N31, or Companion™ supervisory controller.

When connected to the Metasys Network, the UNT1100 provides all point control information to the rest of the network. The devices communicate through an N2 Bus. For a smaller facility, the UNT1100 can function as a standalone controller. Figure 2-1 is an example of the UNT1100 Series controller.

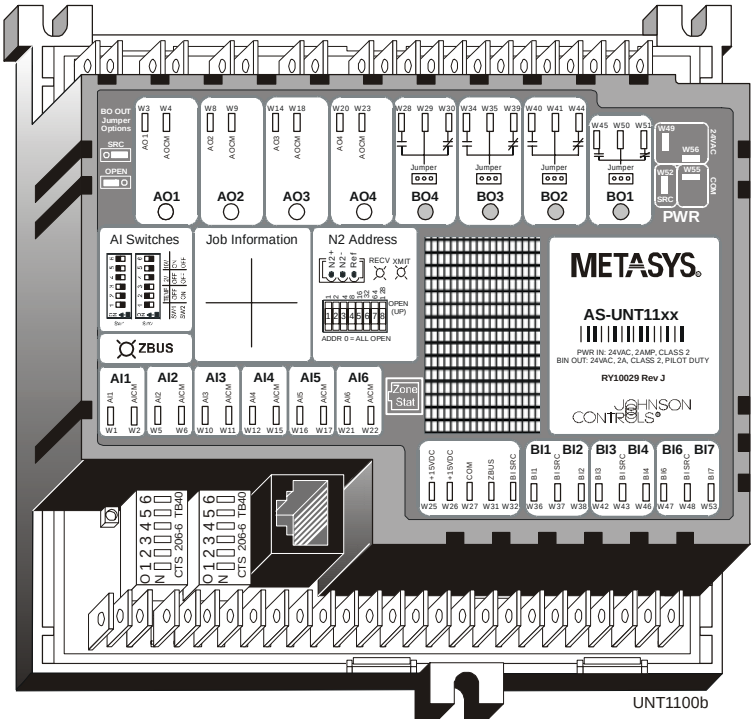


Figure 2-1: UNT1100 Controller

You can use the UNT1100 for unit ventilator, rooftop, heat pump, or fan coil applications, or as a generic I/O multiplexer and I/O sideloop control. Each has a different sequence of operation, all of which are covered in the *HVAC PRO User's Manual (FAN 637.5)*.

The UNT1100 Series is available in different hardware sets to suit different application needs. Table 2-1 lists the common features of the different hardware sets. Table 2-2 lists the differences by model.

Table 2-1: UNT1100 Series Hardware Characteristics - Similarities Among Models

Characteristic	Description
6 Analog Inputs	• RTD temperature elements (1000 ohm nickel, platinum, or silicon) • Adjustable 0 to 2k ohm setpoint potentiometers • 0 to 10 VDC or 0 to 2 VDC transmitters
6 Binary Inputs	• (6) 24 VAC input • Momentary pushbutton from Zone Sensor for temporary occupancy mode (BI5) • BI 4 may be used as an accumulator input for frequencies less than 2 Hz.
N2 Bus	Isolated
Zone Bus	• Light-Emitting Diode (LED) Indication • 8-pin phone jack on controller • Removable screw terminal block
Operating Temperature Rating	-40 to 60°C (-40 to 140°F)
I/O Terminations	Quick Connects (Spade Lugs)
24 VAC Power in Termination	Quick Connects (Spade Lugs)

Table 2-2: UNT1100 Series Hardware Characteristics — Differences Among Models

Characteristic	UNT1108	UNT1126	UNT1144
Analog Outputs: **0 to 10 VDC @ 10 mA**	None	2	4
Binary Outputs: **2A 24 VAC Pilot Relays SPDT (Single-Pole, Double-Throw)**	8	6	4

Related Information

Table 2-3 describes where to find information on items related to the UNT1100 Series.

Table 2-3: Related Information

Description	Document
Sales and Marketing Information	*Unitary Controller (UNT) 1100 Series Product Bulletin (LIT-635066)* in the *Metasys Network Sales Resource Manual (FAN 635)*
Using HVAC PRO™ Software	*HVAC PRO User's Manual (FAN 637.5)*
Using the Operator Workstation	*Operator Workstation User's Manual (FAN 634)*

Standards Compliance

The UNT1100 Series complies with the following standards:

- FCC Part 15, Subpart B, Class A
- IEEE 472
- IEEE 587 Category A
- UL 916, UL 864 (Listed)
- CSA C22.2 No.205
- EN50081-1 (EN55011 Class B)
- EN50082-2 (1995), (EN61000-4-2, EN50140 [1993], EN50204, EN50141 [1993])
  EN61000-4-4, EN50141
- UL873 (Recognized)
- UL94-5VA (Enclosure)

Chapter 3

Configuring the UNT1100 Series

Introduction

This chapter includes information about configuring the UNT1100 Series controller.

This section describes how to:

- define a UNT1100 in a Metasys Network
- define a UNT1100 in N30 software

Code No. LIT-63630833

Key Concepts

HVAC PRO Configuration Tool

All UNT1100 series models require HVAC PRO software (Release 8.01 or later). This software tool configures, commissions, uploads, and downloads the UNT1100 Series database. Refer to the *HVAC PRO User's Manual (FAN 637.5)* for more information on configuring the UNT1100 Series.

Bench Testing

We recommend verifying any new configuration by pulling a sample of the UNT1100 shipment for bench testing and loading a job configuration before all the controllers are mounted in the unit cabinets.

Procedure Overview

Table 3-1: Configuring the UNT1100 Series

To Do This	Follow These Steps:
Define a UNT1100 in a Metasys Network	In the Metasys Operator Workstation (OWS), open the Network Map and define the UNT1100 as a new object. Fill in the blank UNT1100 Series Definition attribute fields as required. Click Save to add the object to the NCM database. Upload the NCM to make an archive copy of the new object.
Define a UNT1100 in N30 Software	Refer to the *Object Dictionary (FAN 694).*

Detailed Procedures

Defining a UNT1100 in a Metasys Network

To define a UNT1100 Series device object in a Metasys Network:

1. Go to the Network Map on the Operator Workstation (OWS) and double-click a system name.
2. On the Item menu, click New. The Item New dialog box appears (Figure 3-1).
3. Select Type/N2 devices in the Item New dialog box.

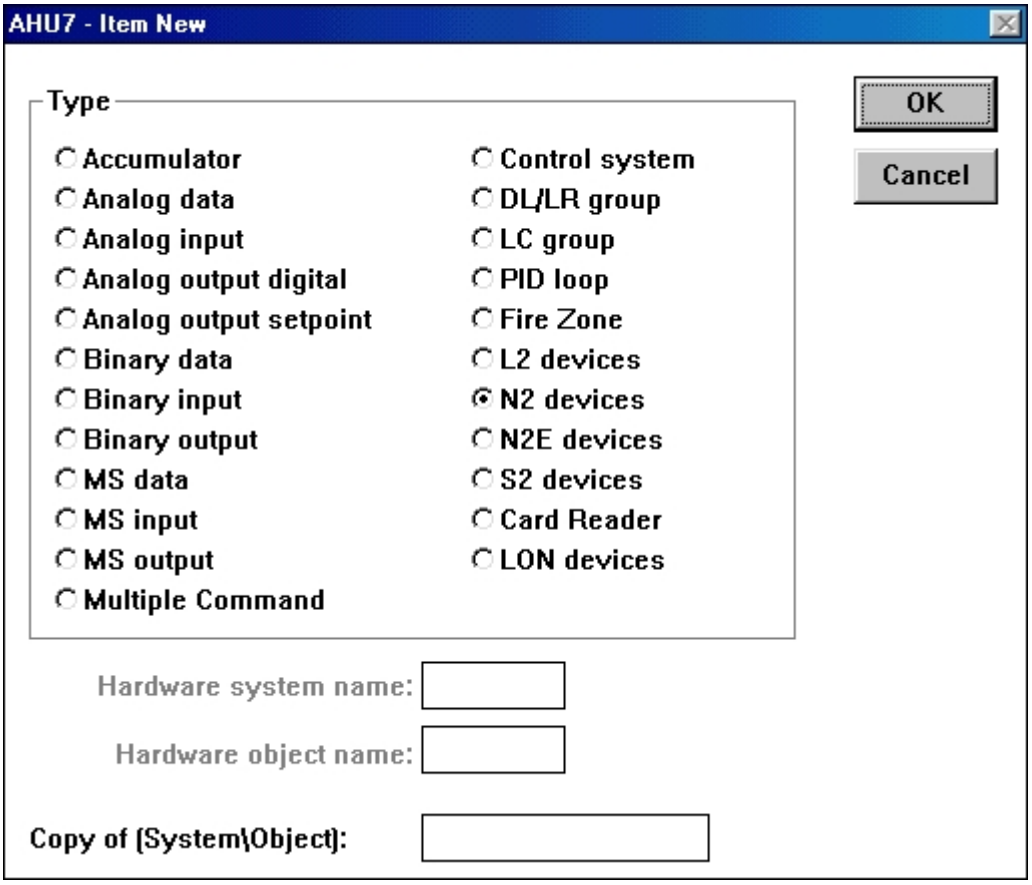


Figure 3-1: Item New Dialog Box itemnew

Note: The Hardware System and Hardware Object text fields are not used for this object type.

4. Click OK.

5. Highlight UNT in the Add N2 Device dialog box as shown in Figure 3-2.

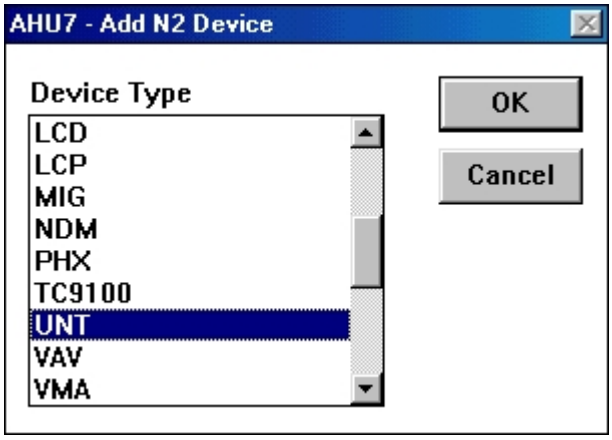


Figure 3-2: Add N2 Device Dialog Box add_n2

6. Click OK.
7. Complete the attribute fields in the UNT Definition window as shown in Figure 3-3.

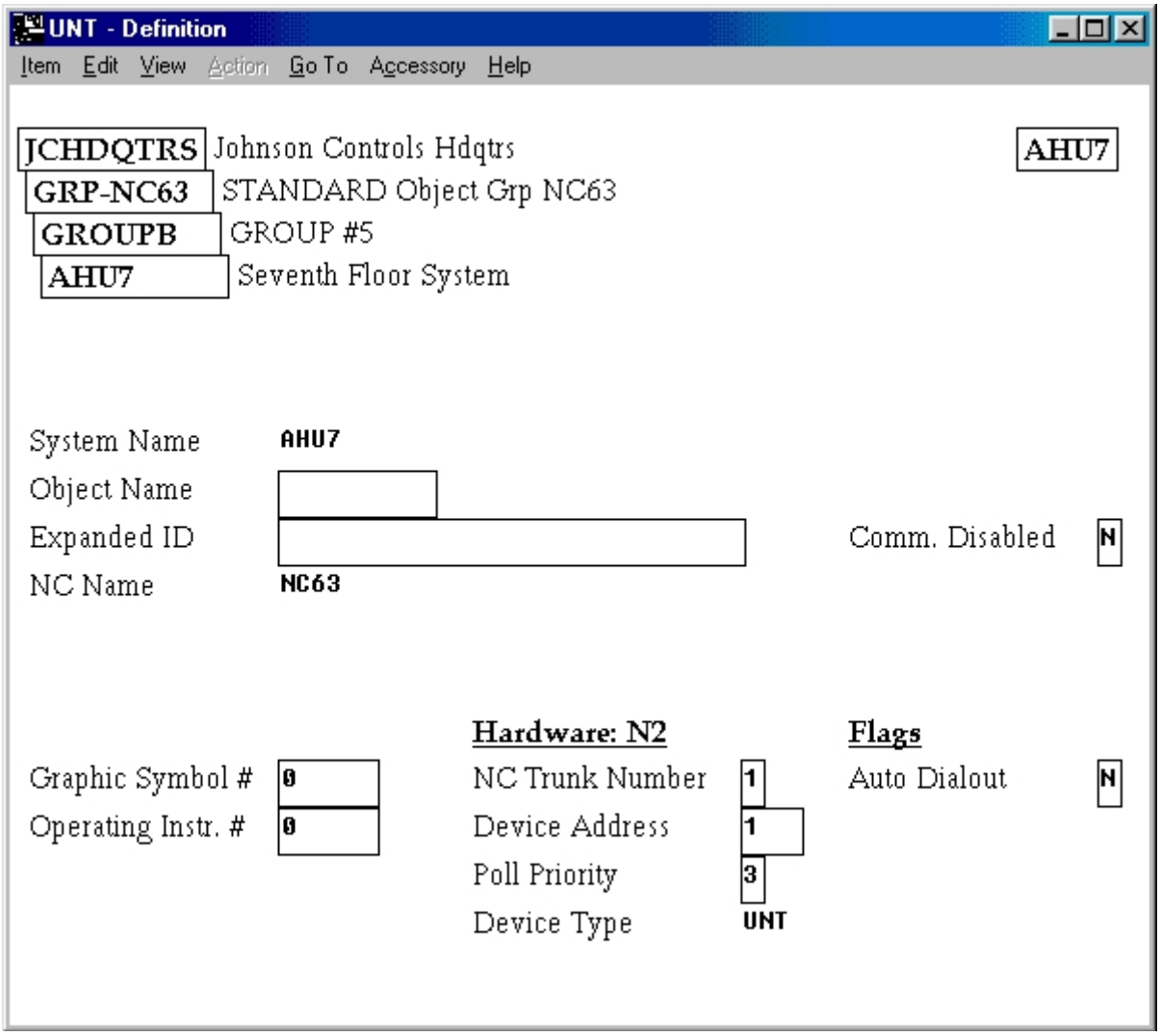


Figure 3-3: UNT Definition Window definition

Note: Fill in the blank UNT1100 Series Definition attribute fields as required. Specify an N2 Device Address from 1 to 254. You may accept or change the default values in the remaining attribute fields. Table 3-2 explains the blank attribute fields. The *Operator Workstation User's Manual (FAN 634)* describes the general procedures for entering and modifying data.

Table 3-2: Blank UNT1100 Series Object Attributes

Attribute	Description	Entry Values . . .
Object Name	Identifies the object (i.e., UNT1108). The object name cannot be duplicated in the system.	1 to 8 alphanumeric characters
Expanded ID	Further identifies the object (i.e., Garage Level Heater)	0 to 24 alphanumeric characters (optional)

8. On the Item menu, select Save to save the new UNT1100 Series object and add the object to the NCM database.
9. Upload the NCM to make an archive copy of the new object. Refer to *Uploading from the NCM* in the *Advanced User's Guide* section in the *Operator Workstation User's Manual (FAN 634).*

Defining a UNT1100 in N30 Software

To define a UNT1100 Series device object in N30 software, refer to the *Object Dictionary (FAN 694).*

Chapter 4

Installing the UNT1100 Series

Introduction

This chapter describes how to:

- mount the enclosure in an enclosure kit
- install the UNT1100 in an AS-ENC100-0 Enclosure Kit
- install the UNT1100 in an EWC10 Enclosure Kit

Code No. LIT-63630834

Key Concepts

Design Considerations

The number and types of components (sensors and actuators) used with the UNT1100 varies according to application. Analyze the proposed installation for logical locations to place these devices, and draw an inventory based on that study. Information on available accessory devices is in the *Ordering the UNT1100 Series 6363081johnson* chapter of this user's guide.

Decide how close the UNT can be to the air handling equipment, while still allowing adequate room for installation and maintenance accessibility. Also consider any existing power sources and communication lines. Secure the controller vertically to a solid wall or panel and not to any vibrating surface.

IMPORTANT: Do not mount the UNT1100 near high voltage or electrically noisy devices. Refer to *Appendix B: Precautions for Rooftop Installations*6363081apndxaenviron.

IMPORTANT: For Underwriter's Laboratories, Inc.® (UL) 864 installations, You **must** use only the XFR50 or XPR100 transformers to power the UNT1100. (24 VAC power to the BO leads **only** are excluded from this requirement.)

Tools Needed for Installation

For a typical installation, you need the following:

- HVAC PRO software, Release 8.01 or later
- IBM® PC-compatible laptop computer
- Microsoft® Windows® AS-CBLPRO-2 (for Zone Bus downloading, uploading, and commissioning) or MM-CVT101-0 (for N2 downloading, uploading, and commissioning)
- two screwdrivers (1/8 in. and 1/4 in. flat-blade)
- drill
- (optional) AS-ZTU100-1 (Zone Terminal unit)

Note: The AS-ZTU100-1 supports the AS-UNT11xx models, as well as previous models of UNT: the AS-UNTxxx-0 and AS-UNTxxx-1 models.

Environmental Information

The installation site of the UNT must meet the following environmental standards:

- The atmosphere must be free of explosive vapors and escaping gases.
- The atmosphere must be free of exposure to corrosive chemical or salt vapors that might damage electrical equipment.
- For UNT1100 controllers, the temperature must be maintained between -40 and 60°C (-40 and 140°F) with relative humidity (non-condensing) maintained between 10 and 90 percent.

Controller Physical Dimensions

The UNT1100 Series controllers have the following dimensions:

162 x 157 x 42 mm (6.4 x 6.2 x 1.7 in.) H x W x D (without enclosure)

Allow enough room to install an enclosure and conduit for wiring terminations to the controller.

Power Line Wiring Transient Noise Precautions

The standard UNT, when powered by any typical Johnson Controls separate isolation transformer or stepdown transformer, operates reliably in an electrical environment defined as Location Category A by the IEEE 587 Standard; that is, when installed **more than 30 feet** from electrical distribution panels or major bus and feeder systems in industrial plants.

IEEE 587 Location Category A power line surge/noise level is specified at 6 kV, 500A (Normal Mode Ringwave).

Surge Levels

The UNT exceeds the Category A specification by meeting these surge levels as well:

IEEE-587 style Common Mode Pulse	3 kV
IEEE-587 style Normal Mode Pulse	1.5 kV
IEEE-472 style Common Mode Ringwave	1.5 kV
IEEE-472 style Normal Mode Ringwave	500V

When the controller is installed within 9m (30 ft) of electrical distribution panels or major bus and feeder systems in industrial plants, you **must** take further precautions to prevent unwanted Binary Output (BO) cycling, resetting, or other possible controller malfunctions. This electrical environment is defined as Location Category B by the IEEE 587 Standard.

You can prevent electrical noise from adversely affecting the controller. The UNT meets the following power line surge/noise standards:

IEEE-587	Common Mode Pulse	1.5 kV
	Normal Mode Pulse	6 kV
	Normal Mode Ringwave	6 kV
IEEE-472	Common Mode Ringwave	1.5 kV
	Normal Mode Ringwave	500V

For more information, refer to *Appendix B: Precautions for Rooftop Installations* in this user's guide.

I/O and Communications Wiring Transient Noise Precautions

The I/O wiring and N2 Bus must be "clean," without electrical noise transients from nearby lighting, heavy equipment switching, or inductive loads being driven.

For the N2 Bus, the Transient Eliminator®, model TE/JC04C12, made by Advanced Protection Technologies (APT) is recommended. Refer to the *Metasys Network Technical Manual (FAN 636)* and the *N2 Communications Bus Technical Bulletin (LIT-636018)636018toc@metlit.mvb* for more information.

Grounding the UNT1100 with an Earth Ground Connection

An earth ground connection to the common terminal of the UNT1100 series controllers is allowed for the 24 VAC power supply and the binary output (when set up for high side switching). If this earth ground connection exists, it must be at the transformer secondary common terminal only. There should be 0 VAC measured from a common terminal to earth ground and over 20 VAC from a 24 VAC terminal to earth ground, when power is applied. If no earth ground connections were planned for the power supply and/or binary outputs, and you suspect that an earth ground may exist, use the procedure described above for the UNT1100 to test for the presence of a ground loop condition.

Detailed Procedures

Mounting the UNT in an Enclosure Kit

To mount the UNT in an enclosure kit:

1. Position the controller and enclosure on the proposed vertical mounting surface to ensure that the calculated mounting area is correct.

Note: You can make precise distance measurements between controller terminals and sensor/actuator mounting points on the air handling equipment if the equipment is in place.

2. Confirm electrical power source and conduit requirements.

Note: You can install a UNT1100 in a control panel or in an AS-ENC100-0 or EN-EWC10-0 enclosure.

3. Use a flat-blade screwdriver and pliers to remove the necessary wire passage knockouts ① as shown in Figure 4-1.

4. Position the enclosure firmly against the mounting surface and, using the predrilled mounting holes, mount it with the appropriate screws.

Note: This also applies to remote location packages.

Installing the UNT1100 in an AS-ENC100-0 Enclosure Kit

To install the UNT1100 in an AS-ENC100-0 Enclosure Kit:

1. Secure the UNT ② inside the enclosure kit ③, using the three mounting tabs ④ on the sides of the controller board base.

2. Attach the enclosure cover ⑤ after installing the wiring.

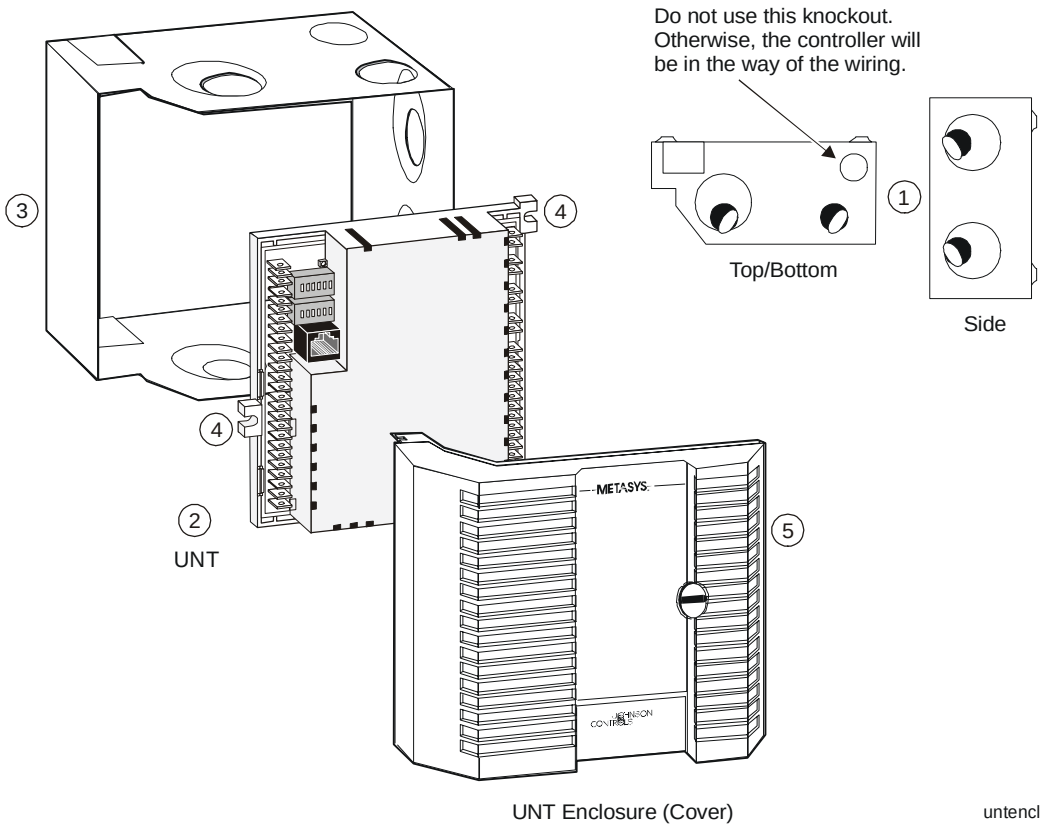


Figure 4-1: Installing the UNT1100 in an ENC100 Enclosure Kit

Installing the UNT1100 in an EWC10 Enclosure Kit

To install the UNT1100 in an EWC10 Enclosure Kit:

1. Position the terminals of the UNT toward the low voltage wiring trough located on the left side of the enclosure.
2. Align the three mounting holes in the base of the controller with the holes in the backbone of the enclosure. On the side with four mounting holes, use the two outside holes for mounting in the EWC.
3. Secure the controller with three No. 8 x 1 in. screws. For best results, use a Plastite® type thread. A thread forming or sheet metal type thread may also be used.

Troubleshooting

Tools Needed

Tools needed for typical troubleshooting include:

- *ASC and N2 Bus Networking and Troubleshooting Guide Technical Bulletin (LIT-6363003)*
- Digital Multimeter (DMM)
- 100k ohm resistor
- (optional) Double banana plug (see Figure 4-2; available from a local electronics store or ITT Pomona Stock No. 34F856 or 34F845), 100k ohm 1/4-watt resistor for earth ground voltage tests

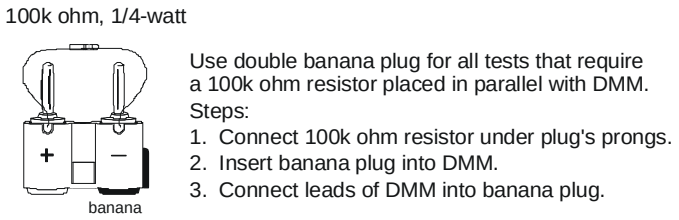


Figure 4-2: Double Banana Plug Used with 100k Ohm Resistor

Installation Checkout

Review the mounted UNT1100 and compare it with the appropriate illustrations in the *Detailed Procedures* section in this chapter to ensure proper installation. Also, refer to the engineering drawings supplied for the individual site. Check the following:

- the mounting screws holding the subassembly onto the base frame are secure
- accessory equipment is connected and labeled correctly
- the controller terminal connections are secure
- if applicable, the N2 connections are secure and labeled correctly
- the UNT switches are appropriately positioned (refer to the *Wiring the UNT1100 Series* chapter of this user's guide)
- there are no unwanted earth ground connections to the controller

Although a single earth ground connection to the common terminal of UNT1100 series controllers is allowed, you may not want to have one. The procedures described in the following directions may be used **when no earth ground connections to the UNT are intended or to ensure that there is only one earth ground connection**.

Isolation and Grounding UNT1100 Series without an Earth Ground Connection

The following tests are not required, but are recommended to reduce installation errors. To ensure proper isolation within your system, test the following:

- field device wiring for proper isolation
- transformer for isolation and correct polarity termination
- connected field devices, transformer, and UNT for proper isolation

Chapter 5

Wiring the UNT1100 Series

Introduction

This chapter includes information about wiring the UNT1100 Series controller, and details the special precautions and grounding procedures you must observe when installing the controller.

WARNING: Risk of Electric Shock. Disconnect power supply before making electric connections. Contact with components carrying hazardous voltage can cause electric shock and may result in severe personal injury or death.

Key Concepts

Power Source and Loads

The power transformer used must comply with:

- CSA 22.2 No. 205
- NEMA ICS 2, Part 2, 230

The power to each UNT1100 is from a Class 2 transformer. A Class 2 transformer must be limited to 4 amperes or less. However, **if you use one low voltage power trunk to power multiple controllers, follow these precautions**:

- Ensure that polarity is maintained at each 24 VAC connection.
- Enclose 24 VAC power trunks with greater than 4 amperes (100 VA) in conduit as required by the National Electric Code (NEC).
- Do not share a UNT's power transformer with a Companion Panel or any other device with a full-wave rectifier in its power supply. (UNTs use "half-wave" rectification. Half-wave circuitry and full-wave circuitry must not share the same transformer.)
- Consider all the actual loads as well as the basic load of the controller when determining the system load. 10 VA is listed as the power draw for the controller alone.
- Only **2-5** UNTs can be powered from one **100 VA** low voltage power limited, Class 2 transformer. The number of UNTs per transformer varies, depending on power requirements of the valve actuators and relays (see Table 5-2). A **40 VA** transformer is limited to **two** UNTs maximum.
- The M100 or M9220 actuators draw 20 VA each. We recommend that each M100/M9220 use its own 24 VAC transformer.
- The NEC requires that the secondary common of the stepdown transformer be connected to earth ground on units powered by greater than 150 VAC.
- Low line conditions, 20 VAC or less, can result in unreliable controller operation. It is important to ensure that adequate source power is delivered to the device when all loads are energized.

- Any individual binary output (relay) drives up to 2 amperes at 24 VAC. You must limit the power draw of a controller and its loads to avoid heat dissipation problems.

  The total 24 VAC power draw of a UNT installed in an ENC100 or similar size box must be limited to a maximum of 40 VA.

  The total 24 VAC power draw of a UNT mounted in an open air environment must be limited to a maximum of 75 VA.

- When the binary outputs are used to source an inductive load (for example a contactor, starter, or other coil), the common for the load typically is connected to the common for the controller. This creates a current path for large inductive spikes to be coupled directly into the control circuitry of the UNT.

  Consider using a separate transformer for inductive loads. If this is not possible, surge protection such as the AS-MOVKIT-0 or Electrocube™ surge suppression device P/N RG1782-6 or RG2031-6, must be installed across the coil to prevent misoperation of the unitary controller.

Table 5-1 assists you in determining the total 24 VA power draw of your system.

Table 5-1: UNT1100 Power and Load Specifications

System Loads		Power Draw
UNT1100 with Sensors/Transmitters		10 VA (400 mA)
BO Load	Relay, Contactor, Solenoid, Actuators*	Refer to specific product documentation or Table 5-2.
	Maximum allowable load for any individual BO (relay) is 48 VA (2 amperes at 24 VAC) at a power factor between 0.6 and 1.0.	
	Minimum required load for each BO (relay) used is 0.24 VA (10 mA at 24 VAC) or 10 mA at 10 to 28 VDC. *	
AO Load – Actuator (included in the 10 VA power draw of the UNT)		
	Maximum allowable load for each AO is 10 mA @ 10 VDC with a minimum load resistance of 1,000 ohms.	
Zone Terminal or CBLPRO		1.2 VA (50 mA)

* Relays come with gold flash contacts. If ever used for high currents, the gold flash is burned off and the minimum levels (10mA) shown above are no longer valid. Low voltage/low current outputs must remain low voltage low current.

You can use one 24 VAC power trunk to power multiple UNT1100s. In this case, transformers of up to 100 VA should be centrally located and the secondary wiring can be run without conduit.

Note: The 24 V power transformer must be UL/CSA listed as NEC Class 2 Power Limited. See NEC Article 725/Class 2 (30 VRMS maximum) and (100 VA maximum).

The UNT1100 draws 10 VA without actuators or other loads. The number of UNT1100s per transformer is dependent on the binary output loads and actuators. The actuators and relay loads must be added to the 10 VA of the controller, then divided into the 100 VA transformer power.

For example, the UNT1100 draws 10 VA without loads. If there were two VA-8020 valve actuators per UNT1100, its 8 VA (4 VA times 2) must be added to the UNT1100 for a total of 18 VA. Then five UNT1100 with two VA8020's each could be powered from one 100 VA transformer. As more loads are added to each UNT, the 100 VA transformer may only power one or two UNTs. When you use a 40 VA transformer, the limit is two UNTs but the same rules apply.

Table 5-2 shows the power rating for each valve actuator. The actuator power plus the UNT1100 power must not exceed 100VA. If a device is not listed in the following table, refer to the product literature for the specific device.

Table 5-2: Actuator VA Power Rating

Actuator	Type	Power Rating
VA-8020	Incremental	4 VA
VA-8050	Incremental	6 VA
VA-8090	Incremental	76 VA
J Series Electric Zone Valve	On/Off	7 VA
VA-8122	Voltage (0 to 10 VDC)	4 VA
VA-8052	Voltage (0 to 10 VDC)	6 VA
VA-8092	Voltage (0 to 10 VDC)	6 VA
	Lighting relay	42 VA for 50 ms*
VA-7450	Incremental	2.5 VA
VA-7452	Voltage (0 to 10 VDC)	2.5 VA
VA-7050	Thermal (DAO)	3 VA
VA-7310	Incremental	2 VA
VA-7312	Voltage (0 to 10 VDC)	2 VA
VA-7010	On/Off	7 VA
VA-7152	Proportional	4.7 VA
VA-7202	Proportional	705 VA
M120, M140, M150	Non-spring Return Voltage (0 to 10 VDC)	20 VA
M110, M130	Spring Return	25 VA
M9100	Non-spring Return Voltage (0 to 10 VDC)	7.5 VA
M9200	Non-spring Return Voltage (0 to 10 VDC)	12 VA
M9220		20 VA

* Do not schedule all lights on one transformer to turn on at the same time. The current surge on the transformer could open the circuit breaker.

Power Wiring Layout

When you use a single transformer to supply 24 VAC to multiple UNT1100s, use wire gauge large enough for the load. The voltage drop on the 24 VAC cabling is much larger than for line voltage wiring for the same power draw. For example, a 100 VA (equivalent to 100 watt) load at 120 VAC consumes only 0.8 amperes. However, at 24 VAC, you need **4 amperes**. Current draw determines the wire size. Therefore a 100 VA load requires 88 feet of 14 AWG (140 cable feet needs 12 AWG and 222 feet needs 10 AWG) with all loads at one end.

To handle the large wires, two connection methods are available: spade lugs or optional screw terminals. Individual spade lugs accept a single 10 to 22 AWG/4 mm² to 0.8 mm wire and still fit on 1/4 inch/6 mm tabs. When two wires are crimped into one spade lug, a larger spade lug barrel is needed, or a wire nut could connect two heavy wires to a short 6 inch/150 mm-thinner wire.

Optional screw terminals can be assembled over the spade lugs (Table 5-3). The screw terminals accept up to a single 12 AWG/4 mm² wire or two 14 AWG/2.5 mm² wires.

Table 5-3: Optional Screw Terminals

Option	Description
Screw Terminal Kit	AP-TBK1002-0: Removable 2-position screw terminal kit (100 pcs)*
	AP-TBK1003-0: Removable 3-position terminal kit (100 pcs)*
	AP-TBK4N2-0: Replacement N2 Bus 4-position screw terminal kit (10 pcs)

* Terminals fit over the existing I/O spade lugs.

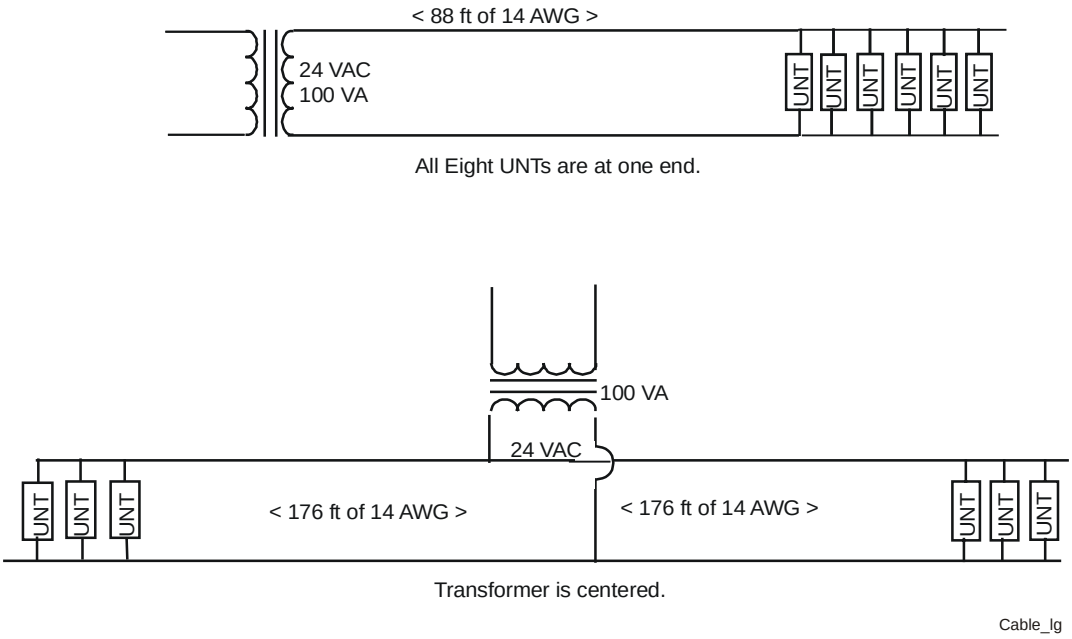


Figure 1: 100 VA Power Cable Lengths

Note: The standard 14 AWG/2.5 mm² cable (top example in Figure 1) is limited to 88 feet/27 M with six UNT1100s consuming 12 VA each, all at one end of the cable. If the transformer is centered (bottom example in Figure 1) with three UNT1100s on the left and three UNT1100s on the right, the distance in each direction can be increased. This is because the current (and voltage drop) are halved. In this example, both the left and the right legs could be increased to 176 feet/53 m from the transformer, creating a 352 foot/108m total length. For longer cable runs at a given wire size, multiple legs can extend the distance. Four legs would only consume 25 VA per leg, such that 366 feet per leg or 732 feet end-to-end would work for 14 AWG.

Important: The use of 18AWG cable for 24VAC power is limited to 35 feet at 100 VA with all loads at one end. To increase this distance, use 50 VA at each end with the transformer centered (100 VA total). In this case up to 140 feet of 18 AWG cable can be used.

Note: Table 5-4 describes the relationship between cable length and power at the end of wires.

Table 5-4: Maximum Cable Length for Given Power/Gauge (U.S. Measurements)

Power (VA) at End of Wire	Cable Size					
	8 Gauge	10 Gauge	12 Gauge	14 Gauge	16 Gauge	18 Gauge
	Cable Length (Feet)					
10	3520	2200	1400	880	550	350
20	1760	1110	700	440	275	175
30	1173	740	467	293	183	117
40	880	555	350	220	138	88
50	704	444	280	176	110	70
60	587	370	233	147	92	58
70	503	317	200	126	79	50
80	440	278	175	110	69	44
90	391	247	156	98	61	39
100	352	222	140	88	55	35

Table 5-5: Maximum Cable Length for Power/Wire Gauge (Metric Measurements)

Power (VA) at End of Wire	Cable Size		
	4 mm²	2.5 mm²	1.5 mm²
	Cable Length (Meters)		
10	427	268	168
20	213	134	84
30	142	89	56
40	107	67	42
50	85	54	34
60	71	45	28
70	61	38	24
80	53	34	21
90	48	30	19
100	43	27	17

Wiring Precautions

Follow these precautions when wiring:

- Make all wiring connections in accordance with the NEC as well as in accordance with local regulations.
- Locate equipment and route the wiring so that signal wiring is a separated from line voltage power wiring.
- Make all wiring connections to the UNT using only copper conductors.
- If the UNT1100 is included in a network, daisy chain the N2. The use of “Y” or “T” bus topologies without a repeater installed in the “T” may cause a loss of communications. Do not use wire smaller than 22 AWG.

- Do not run N2 Bus, Zone Bus, Analog Input (AI), Binary Input (BI), Analog Output (AO), or Binary Output (BO) wiring in the same conduit or bundle as line voltage wiring (30 VAC or above), or wiring that switches power to highly inductive loads such as contactors, coils, motors, or generators.

Only Shielded N2 Bus wiring can be run in the same bundle or conduit as 24 VAC power wiring.

Zone Bus, AI, AO, and BI wiring can be run in the same bundle or conduit, where convenient.

You may have either no earth ground connection, or one earth ground connection, which **must** be at the transformer secondary common, whether one or multiple controllers are powered by the same transformer.

Grounding and Isolation for UNT1100

You may connect the UNT power transformer secondary directly to earth ground as shown in Figure 5-2. If you elect to do so, the grounded side must connect to the common power input terminal of the controller.

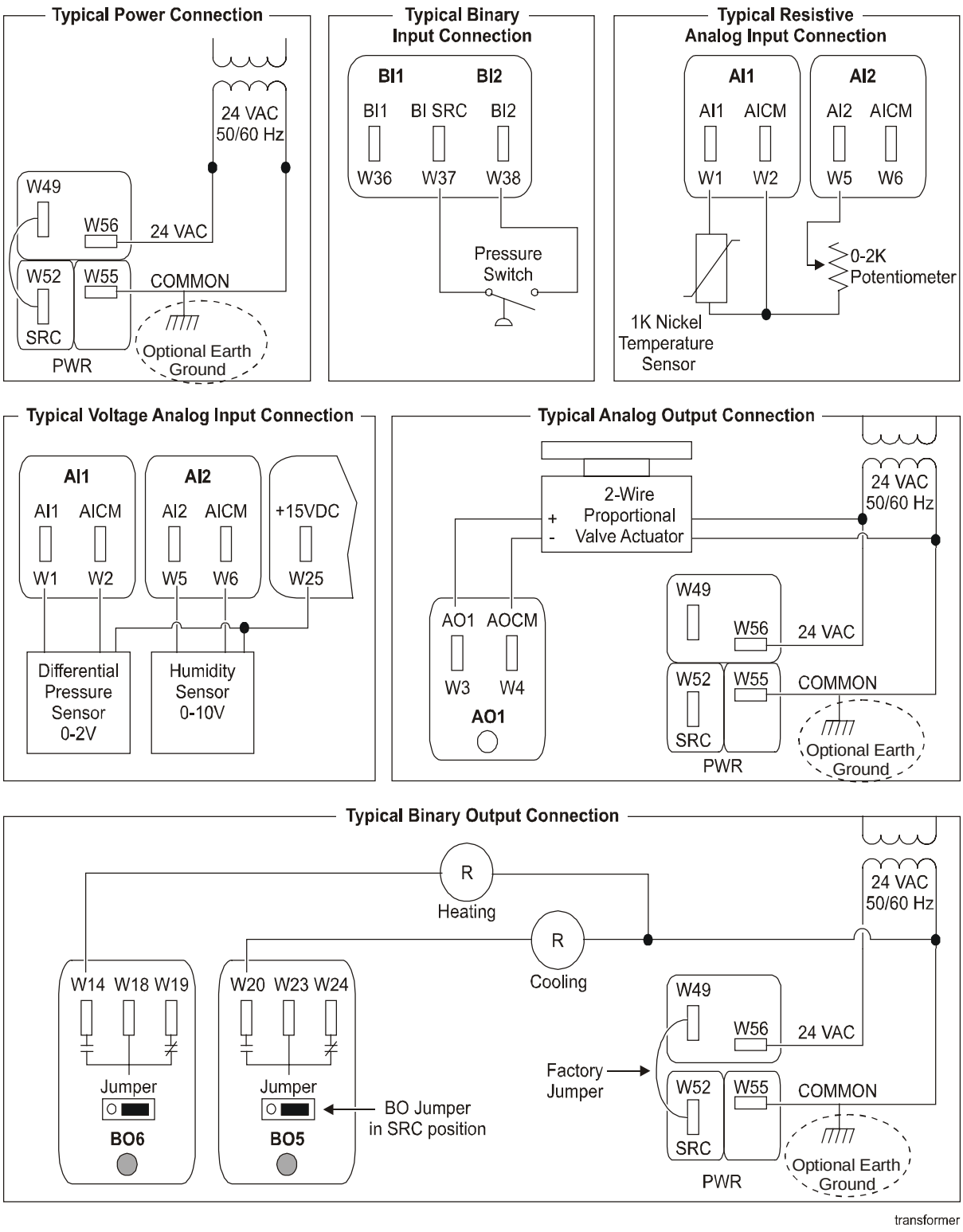


Figure 5-2: Wiring Diagram for UNT1100

CAUTION: Risk of Property Damage. You may have a maximum of one single earth ground connection, which must be at the transformer secondary common, whether one or multiple controllers are powered by the same transformer. Connection of more than one earth ground could damage other connected equipment. (Approved 05/04)

Power Transformer Isolation

24 VAC to 24 VAC isolation transformers for UNT1100 Series controllers are not mandatory.

Load Isolation

There are two methods of isolating the load power supply (see Figure 5-3):

1. Connect the load transformer to the SRC terminal (after removing factory jumper from W49 to W52) and one side of the load. Install the binary output jumper to the SRC position and wire the second side of the load to either the Normally Open (N.O.), or Normally Closed (N.C.) output terminal. Multiple outputs can share the same load transformer.
2. Connect the load transformer to the center terminal of the output and one side of the load. Install the binary output jumper to the open position and wire the second side of the load to either the N.O. or N.C. output terminal.

A separate load transformer may be necessary because of transformer VA limitations, or may be desirable to completely isolate loads from the UNT digital circuitry for better noise immunity.

Note: External noise suppressors are recommended for inductive loads (AS-MOVKIT-0 or Electrocube™ surge suppression device P/N RG1782-6 or RG2031-6).

You may connect the UNT1100 power transformer secondary directly to earth ground. If you elect to do so, the grounded side must connect to the common input terminal of the controller (W55).

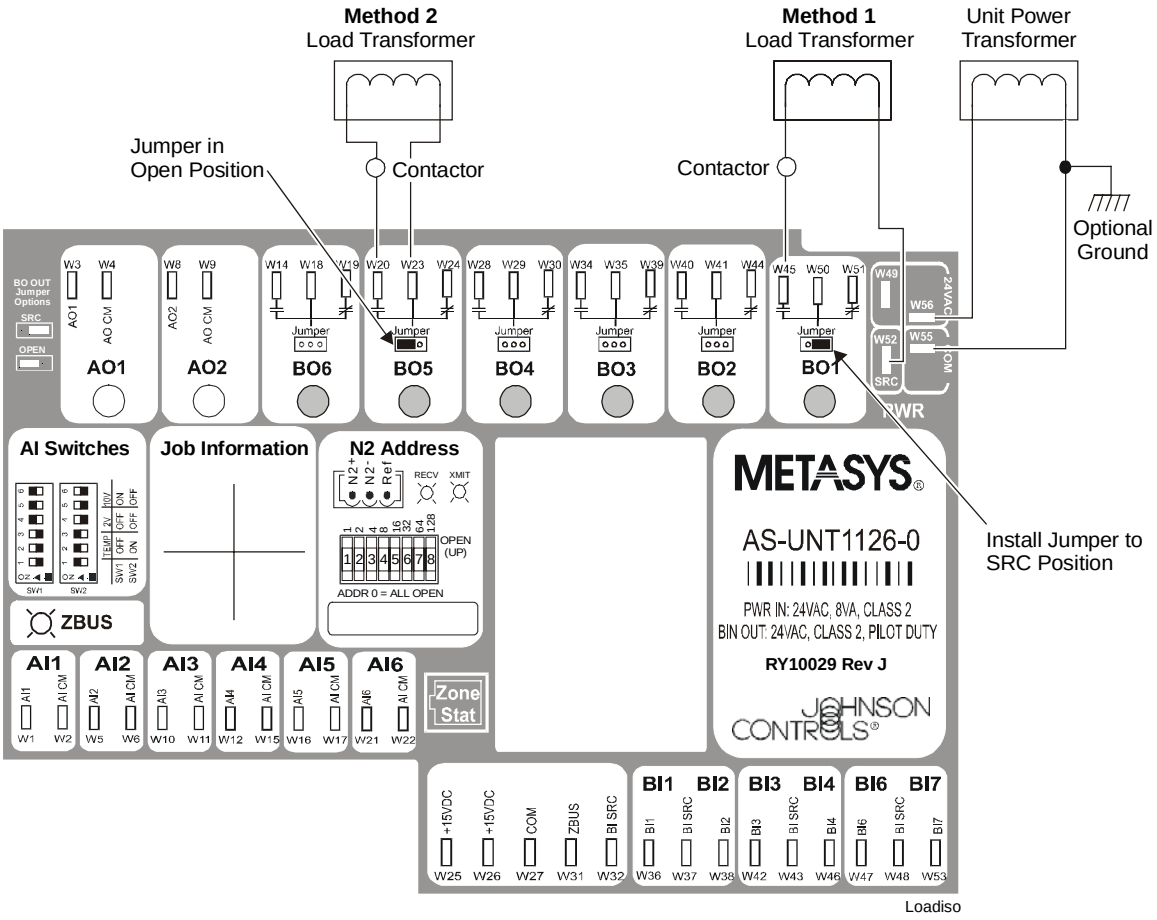


Figure 5-3: Load Isolation Example Grounding and Isolation for UNT1100 with Separate Load Transformer

> **CAUTION: Risk of Property Damage.** Do not interconnect two Class 2 transformers. Interconnecting two Class 2 transformers in series could increase the applied voltage to 48 VAC and may result in electric shock.

CAUTION: Risk of Property Damage. You may have a maximum of one single earth ground connection, which must be at the transformer secondary common, whether one or multiple controllers are powered by the same transformer. Connection of more than one earth ground could damage other connected equipment. (Approved 05/04)

When you ground one side of the transformer secondary, the grounded side must connect to the common power input terminal (W55).

Connecting the grounded side of the transformer to the 24 VAC power input terminal will damage a CBLPRO-1(-0) or laptop.

You may connect the separate load power transformer secondary to earth ground as long as doing so is compatible with the equipment being controlled.

Terminal Designations

Terminal points are identified on the front label and circuit board of each UNT1100 model (Figure 5-4).

You may make connections to the UNT by connecting single wires to the individual screw or spade terminals. Label and terminal point identification are different for each UNT1100 model. Table 5-6 and Table 5-7 identify the terminals.

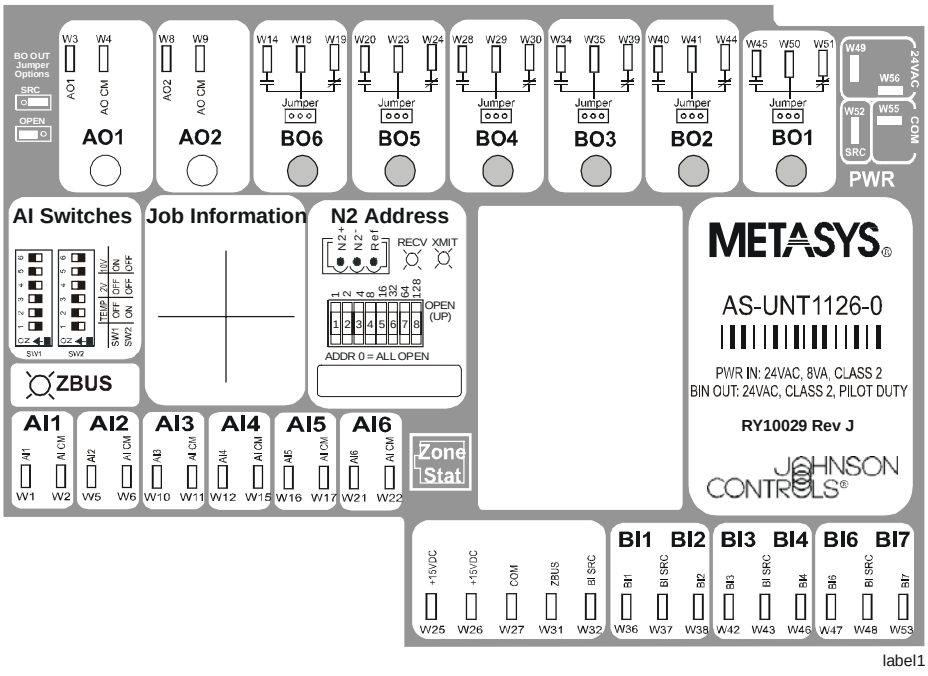


Figure 5-4: Example of UNT1100 Label

Table 5-6: UNT1100 Terminal Identification (Bottom Terminals Left to Right)

Terminal Identification	UNT1100	Description
W1	AI1	Analog Input 1
W2	AI CM	Analog Input Common
W5	AI2	Analog Input 2
W6	AI CM	Analog Input Common
W10	AI3	Analog Input 3
W11	AI CM	Analog Input Common
W12	AI4	Analog Input 4
W15	AI CM	Analog Input Common
W16	AI5	Analog Input 5
W17	AI CM	Analog Input Common
W21	AI6	Analog Input 6
W22	AI CM	Analog Input Common
W25	+15 VDC	+15 Volts DC Output
W26	+15 VDC	+15 Volts DC Output
W27	COM	24 VAC Common
W31	ZB	Zone Bus
W32	BI SRC	Input Common, 24 VAC
W36	BI1	Binary Input 1
W37	BI SRC	Input Common, 24 VAC
W38	BI2	Binary Input 2
W42	BI3	Binary Input 3
W43	BI SRC	Input Common, 24 VAC
W46	BI4	Binary Input 4
W47	BI6	Binary Input 6
W48	BI SRC	Input Common, 24 VAC
W53	BI7	Binary Input 7 BI SRC signal is 24 VAC Class 2 output. Binary Input 5 is internal to the controller

Table 5-7: UNT1100 Terminal Identification (Top Terminals Left to Right)

Terminal	UNT1108	UNT1126	UNT1144	Description
W3	NO8	AO1	AO1	BO8, Relay Normally Open
				AO1 Signal
W4	OUT8	AO CM	AO CM	BO8, Relay Center Contact
				AO1 Common
W7	NC8	(space)	(space)	BO8, Relay Normally Closed
				(not used)
W8	NO7	AO2	AO2	BO7, Relay Normally Open
				AO2 Signal
W9	OUT7	AO CM	AO CM	BO7, Relay Center Contact
				AO2 Common
W13	NC7	(space)	(space)	BO7, Relay Normally Closed
				(not used)
W14	NO6	NO6	AO3	BO6, Relay Normally Open
				AO3 Signal
W18	OUT6	OUT6	AO CM	BO6, Relay Center Contact
				AO3 Common
W19	NC6	NC6	(space)	BO6, Relay Normally Closed
				(not used)
W20	NO5	NO5	AO4	BO5, Relay Normally Open
				AO4 Signal
W23	OUT5	OUT5	AO CM	BO5, Relay Center Contact
				AO4 Common
W24	NC5	NC5	(space)	BO5, Relay Normally Closed
				(not used)
W28	NO4	NO4	NO4	BO4, Relay Normally Open
W29	OUT4	OUT4	OUT4	BO4, Relay Center Contact
W30	NC4	NC4	NC4	BO4, Relay Normally Closed
W34	NO3	NO3	NO3	BO3, Relay Normally Open
W35	OUT3	OUT3	OUT3	BO3, Relay Center Contact
W39	NC3	NC3	NC3	BO3, Relay Normally Closed
W40	NO2	NO2	NO2	BO2 Relay Normally Open
W41	OUT2	OUT2	OUT2	BO2, Relay Center Contact
W44	NC2	NC2	NC2	BO2, Relay Normally Closed
W45	NO1	NO1	NO1	BO1, Relay Normally Open
W50	OUT1	OUT1	OUT1	BO1, Relay Center Contact
W51	NC1	NC1	NC1	BO1, Relay Normally Closed
W52	SRC*	SRC*	SRC*	Jumper Selectable Source Voltage (factory installed jumper)
W49	24 VAC	24 VAC	24 VAC	High Side of Power Transformer
W56	24 VAC	24 VAC	24 VAC	High Side of Power Transformer
W55	COM	COM	COM	Low Side of Power Transformer

* SRC is the Common to all relay out terminals via jumper clips.

Analog Inputs

The six analog input terminals, their power supply, and their common points occupy the lower left corner of the controller. These inputs are one of two types: resistive or voltage. A pair of DIP switches configures the analog input for the desired type.

Use these switches and HVAC PRO software to select the type of analog input. Use the Temp switch positions for all temperature sensors and setpoint potentiometers. Use the Voltage positions for all active voltage transmitters. For humidity applications using 3-wire voltage transmitters, such as the HE-6300 Series, use the 15 VDC power supply terminals next to the inputs for AI6. Table 5-8 shows each configuration.

Table 5-8: Analog Input Configurations

AI Type	Range	Switch Position
Voltage (V)	0 to 2 VDC	SW1 to Off SW2 to Off
Voltage (V)	0 to 10 VDC	SW1 to On SW2 to Off
Resistance/ Temperature (T)	1,000 ohm Nickel, Platinum, Silicon, 2 k ohm potentiometer	SW1 to Off SW2 to On

Setting the Analog DIP Switches

The UNT has one set of DIP switches for configuring the analog input points. Use Table 5-9 to set analog input DIP switches. Instructions for setting the N2 Address DIP switches are in the *UNT1100 Series Installation Bulletin (Part No. 24-9534-7).*

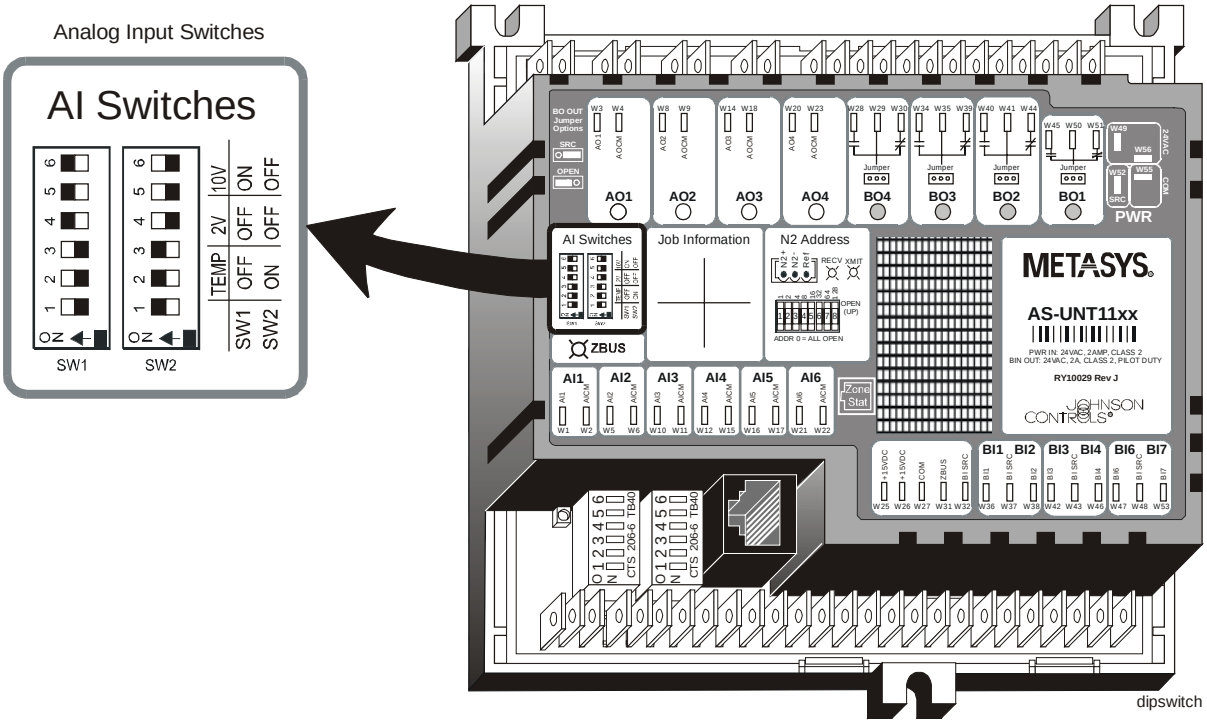


Figure 5-5: Setting the Analog Input DIP Switches

The AI switches are factory set with AI 1, 2, and 3 as resistive inputs, and AI 4, 5, and 6 as 0 to 10 VDC inputs. You may reconfigure the switches using Table 5-9. For example, if you connect a 10 VDC input to AI 4, set SW1-4 to On and SW2-4 to Off.

Table 5-9: Analog Input DIP Switch Settings

Hardware Point	Temp (Resistive Input)		2 VDC (0 to 2 VDC Input)		10 VDC (0 to 10 VDC Input)	
Switch	**SW1**	**SW2**	**SW1**	**SW2**	**SW1**	**SW2**
AI 1	OFF	ON	OFF	OFF	ON	OFF
AI 2	OFF	ON	OFF	OFF	ON	OFF
AI 3	OFF	ON	OFF	OFF	ON	OFF
AI 4	OFF	ON	OFF	OFF	ON	OFF
AI 5	OFF	ON	OFF	OFF	ON	OFF
AI 6	OFF	ON	OFF	OFF	ON	OFF

Binary Inputs

Six binary inputs on the controller are located at the right of the lower terminal strip.

The binary inputs on the UNT1100 Series controllers are inactive when open or connected to UNT common. When a binary device closes to complete a binary circuit, the BI SRC terminal provides the 24 VAC, which, in turn, activates the input. Binary Inputs 1-4 have an input threshold between 2.5 and 11.5 VAC (2.9 and 9.0 VDC). Binary Inputs 6 and 7 have input thresholds between 1.8 and 6.9 VAC (1.8 and 6.0 VDC). Binary Input 4 may be used as an accumulator input for frequencies less than 2 Hz.

Binary Input 5 is an internal input that detects the Temporary Occupancy pushbutton on a TE-6700 sensor.

Binary Outputs (Relay Jumper Information)

Binary outputs are relays on the controller hardware. The controller has four, six, or eight BOs, depending on the model. A typical output circuit is shown in Figure 5-6.

Each binary output has both Normally Open and Normally Closed electrically isolated contacts available at the terminal. The Common point of each Relay may also be independently jumpered to the SRC terminal, or wired to an external isolated supply. Place the jumper clip to the SRC (right) position to connect the Relay Common (OUTx) to the SRC signal. When the jumper clip is placed in the OPEN (left) position, the relay common must be externally supplied.

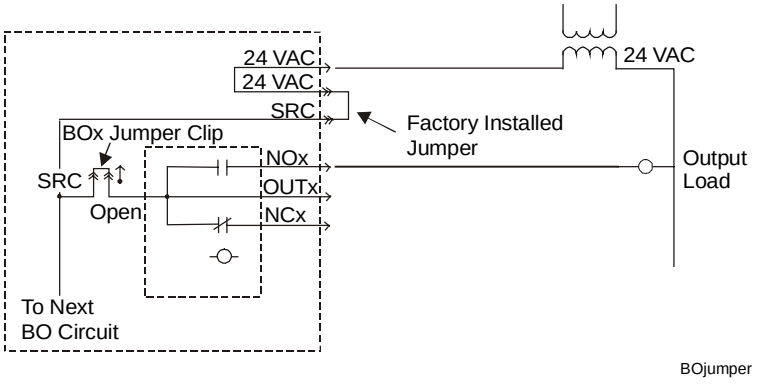


Figure 5-6: Typical Binary Output Circuit

The jumper wire shown in Figure 5-6 is connected to the 24 VAC terminal and the SRC terminal. The OUTx terminal also can be used when using a separate load transformer. Remove the BOx jumper clip on the controller for this application. For important power and load specifications, see Table 5-1.

The terminal labeled SRC on the controller is the internal shared node of each relay output (see Figure 5-6). When connecting this terminal (via the wire jumper) to 24 VAC for high side switching, each load must be connected between the binary output N.O. terminal and the common terminal of the transformer. When connecting this terminal to common for low side switching, each load must be connected between the binary output N.O. terminal and the 24 VAC terminal of the transformer.

Analog Outputs

The UNT1126 and the UNT1144 have two and four AOs, respectively. The load connects between the AO and AO common terminals. Each output generates a proportional voltage output of 0 to 10 VDC to common. The maximum load for each output is 10 mA with a minimum 1000 ohm load resistance.

Zone Bus

The Zone Bus provides UNT serial communication connections for M100C Series actuators, CBLPRO (for HVAC PRO commissioning), the Zone Terminal (ZT), and the TMZ1600 sensor.

Wiring to Unit Mounted Controls—UNT1100

CAUTION: Risk of Property Damage. When connecting an earth ground on the power transformer secondary, connect only one such ground, regardless of the number of controllers powered by the transformer. Connecting more than one earth ground may result in damage to other equipment connected to the controller.

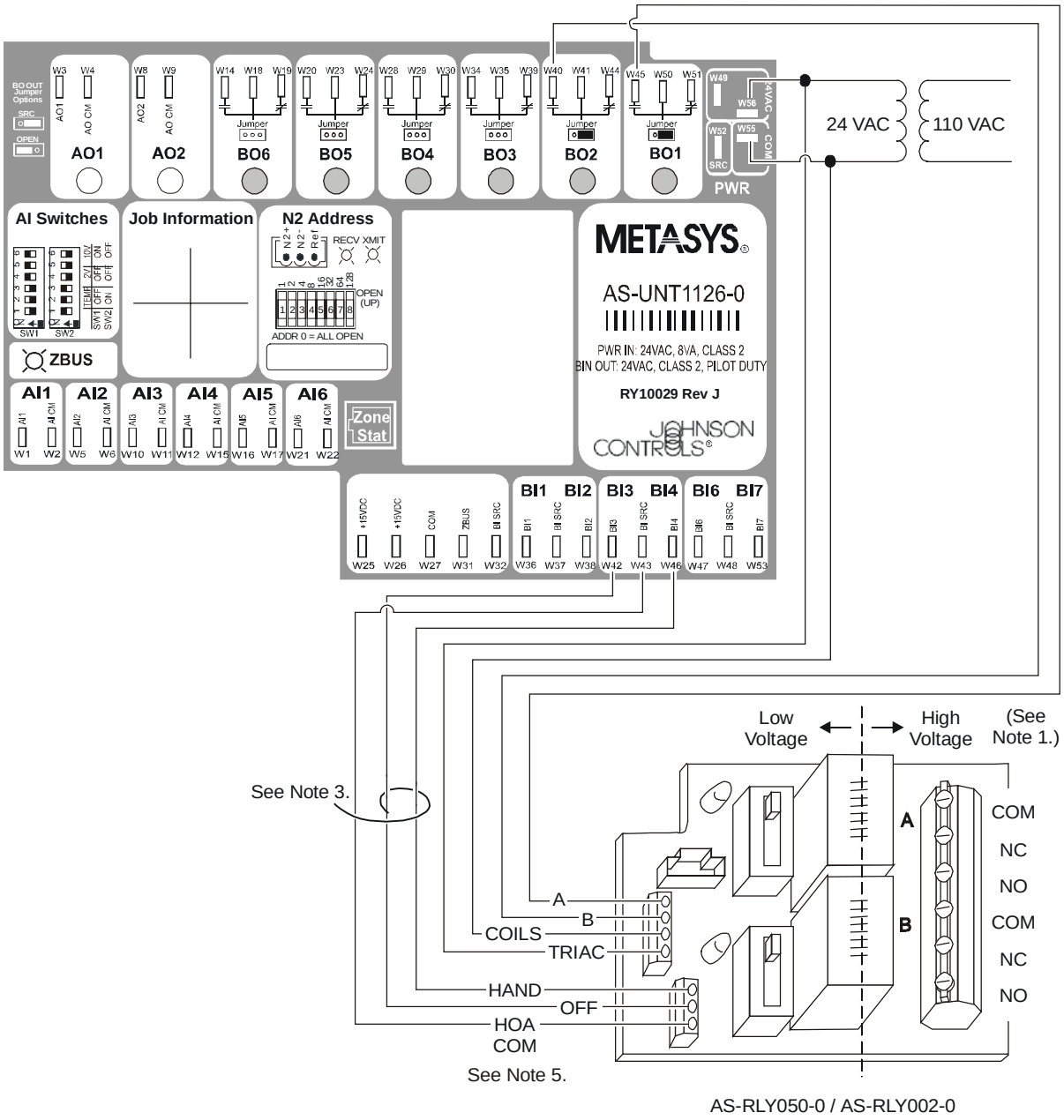
CAUTION: Risk of Property Damage. Connect the earth ground to the W55 COM terminal of the UNT controller. Connecting the earth ground to any other terminal may result in damage to equipment connected to the controller.

Wiring to RLY050/002 Relays

Connect power to the relay module and the transformer through the conduit knockouts in each box. Wire the module according to Figure 5-7. For a schematic diagram of the relay module, see the *Air Handling Unit (AHU) Controller Technical Bulletin (LIT-6363010), Appendix A: AHU Tower, AHU Tower Wiring Details* section.

WARNING: Risk of Electric Shock. Disconnect power supply before making electric connections. Contact with components carrying hazardous voltage can cause electric shock and may result in severe injury or death.

Figure 5-7 shows a UNT1100 wired to an RLY050/002 with all BOs isolated from earth ground.



Notes:

Note 1: Separate low voltage wiring on the left from line voltage wiring on the right.

Note 2: Hand operation using the H/O/A switch requires common to the COILS terminal and 24 VAC to the TRIAC terminal to energize the relay.

Note 3: The Hand or Off position signals the binary input connected to those terminals. These switches can be hardwire "OR"ed and connected to one BI. This switch uses the HOA COM terminal, which is isolated from the relays.

Note 4: Your application will determine exact connections to UNT.

Note 5: HOA COM must be connected to one of the BI SRC terminals.

unt2ahu

Figure 5-7: UNT1100 Wired to RLY050/002 with Electrically Isolated BOs

You can obtain a Double-Pole, Double-Throw (DPDT) relay configuration by connecting the BO signal to two terminals on the relay kit terminal block (for example, B and C). If you require a phone jack at a remote relay kit, add an AS-CBLCON-0.

Wiring Sensors and Actuators

Use 18 AWG twisted pair wire for all sensor and output wiring. Shielding is not required. However, if you decide to use it, earth ground the shield at the transformer. Remember that you may have either no earth ground connection, or one earth ground connection, which must be at the transformer secondary common. You may also use 24 AWG wire in some applications, but maximum wire length will be reduced due to the increased resistance. To minimize sensor error caused by field wiring, the total resistance of all resistive sensor wiring should be less than 3.0 ohms.

Note: For Nickel and Platinum temperature sensors, a 1°F error occurs for every 90 feet of 22 AWG cable.

CAUTION: Risk of Property Damage. Do not run low voltage cable in the same conduit or wiring troughs with line voltage wires. Running low and line voltage wires in the same conduit or wiring troughs may damage the equipment or cause system malfunction.

Table 5-10: Input and Output Load Impedances

Function	Range	DC Input Impedance	Sensor or Load Impedance
DC Supply	15-18 VDC at 50 mA	N/A	162-10 M ohm
	Inputs		
AI Voltage	0-2V or 0-10 VDC	470 k ohm	0-5 k ohm
AI Temperature/ Potentiometer	1000 ohm Si, Ni, Pt, or 0-2 k ohm Potentiometer	3540 ohm	0-2 k ohm
BI VAC 60 Hz	0-24 VAC, 2.5 V threshold	9.8 k (DC) ohm 6.2 k (AC) ohm	0-5 k ohm
	Outputs		
AO Voltage	0-10 VDC @ 10 mA maximum	N/A	1 k-10 M ohm
BO VAC Relay	AC 24 V 2 A maximum, 15 A inrush, PF=0.6 min DC 10-28 V 0.5 A maximum	N/A	12-48 0 ohm

Table 5-11: Sensor Wire Sizes and Maximum Lengths

Sensor Type	18 AWG Wire Size Run Length In Meters (Feet)	24 AWG Wire Size Run Length In Meters (Feet)
AI Temperature (Resistive)	152.4 m (500 ft)	30.5 m (100 ft)
AI Voltage	152.4 m (500 ft)	30.5 m (100 ft)
BI Voltage/Contact	152.4 m (500 ft)	152.4 m (500 ft)
Single BO at 0.1A*	76.2 m (250 ft)	18.9 m (62 ft)
Single BO at 0.5 A*	15.2 m (50 ft)	3.7 m (12 ft)
Single BO at 2.0A*	3.8 m (12.5 ft)	0.9 m (3.1 ft)
Zone Bus	152.4 m (500 ft)	15.2 m (50 ft)
Zone Thermostat	30.5 m (100 ft)**	Eight Conductor Phone Cable (6.1 m [20 ft])

* Round trip wire distances shown, assuming 2.8% voltage drop due to cable length and wire gauge.

** If a CBLPRO-2 and a Zone Terminal are used, the cable length must be limited to 15 m (50 ft).

Figure 5-8 shows connections between an M100C motor and the Zone Bus.

When you connect an M100C actuator to the Zone Bus, we recommend powering it with a separate 24 VAC transformer. However, you may use the UNT's transformer if it is sized to provide the required additional 20 VA, connected with the correct polarity and run with 18 AWG or thicker wire. See Figure 5-8 for terminal locations when wiring an M100C actuator.

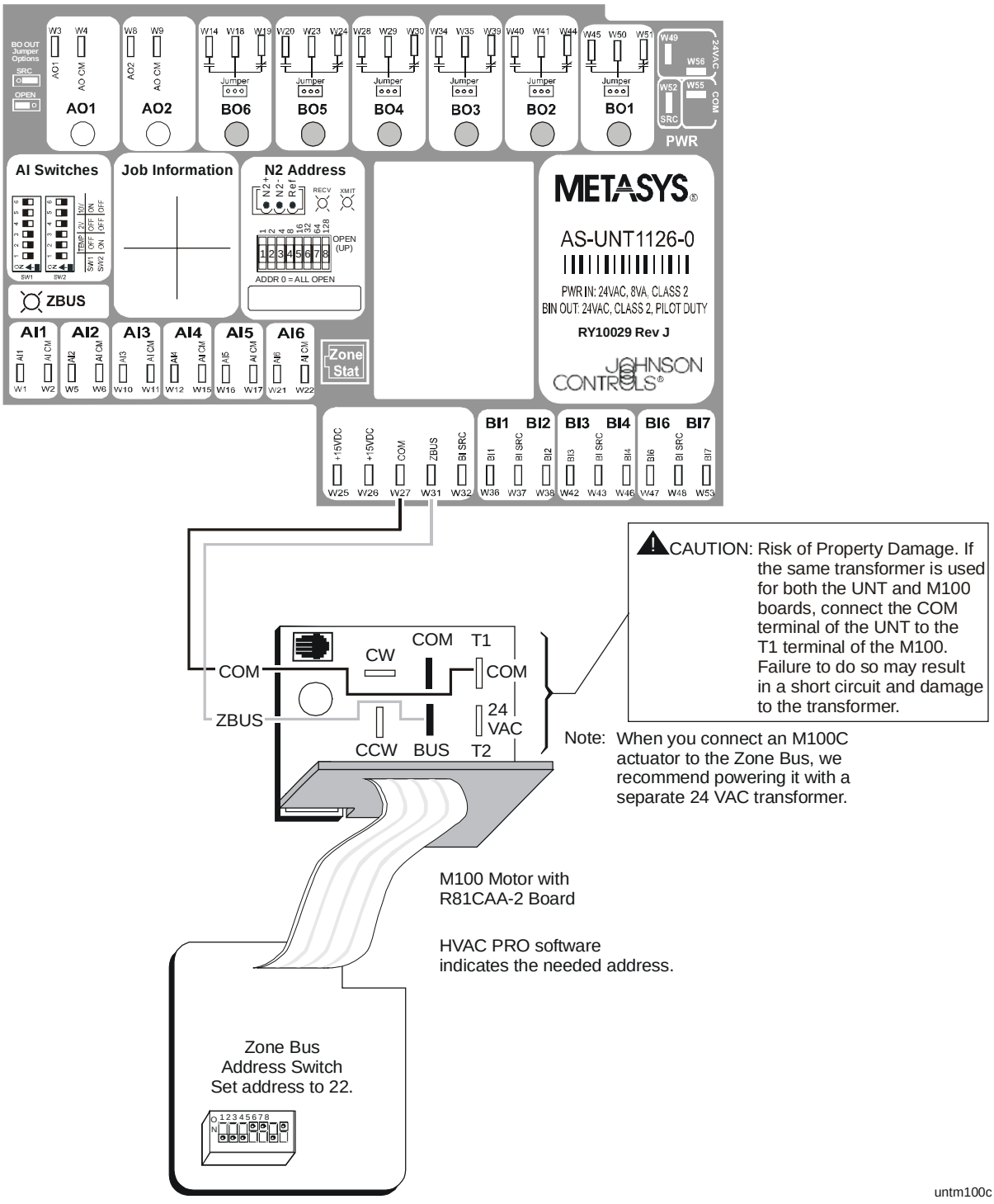


Figure 5-8: M100C Motor Zone Bus Connection Using an R81CAA-2 Board

Temperature Sensors

Figure 5-9 shows the connections between a UNT1100 and a TE-6700 temperature sensor.

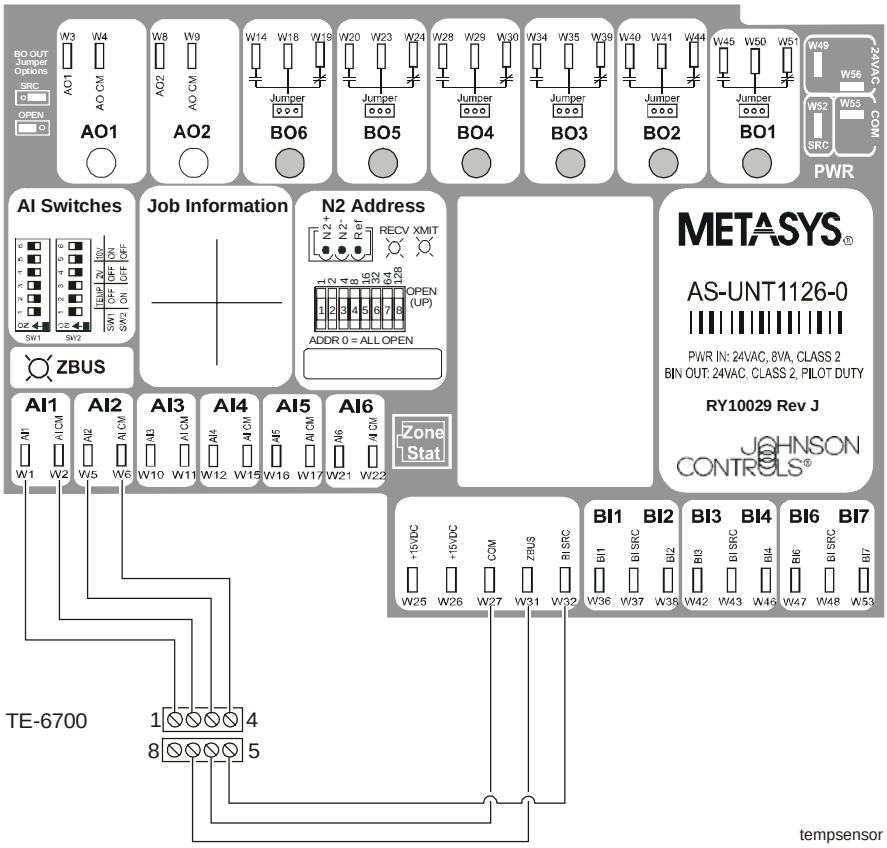


Figure 5-9: Example of TE-6700 Temperature Sensor Connection

To make all necessary wiring terminations between the UNT and TE-6700 Series sensor, use phone cable that has pre-terminated 8-pin RJ-45 connectors. For cable ordering information, refer to *Ordering Information for Outside Vendors* in the *Ordering the UNT1100 Series* chapter of this user's guide.

Phone Jack Polarization

Figure 5-10 illustrates the polarization of the 6-pin and 8-pin phone jacks on the UNT or sensor. Terminal 1 is to the extreme left as you face the jack opening, tab notch down.

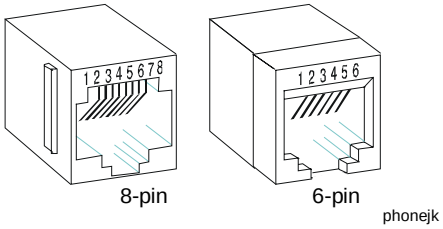


Figure 5-10: Phone Jack Polarization

Table 5-12 defines the pin usage for each jack.

Table 5-12: Phone Jack Pin Identification

8-Pin Jack (UNT1100 Series to Temperature Sensor)		6-Pin Jack (CBLPRO or ZT to Temperature Sensor)	
Pin	**Signal**	**Pin**	**Signal**
1	AI 3 Heating Setpoint	1	Not Used
2	AI 2 Warmer/Cooler, or Cooling Setpoint	2	24 VAC
3	AI 1 Temperature Sensor	3	24 VAC/ZnBs Common
4	AI 1 Sensor Common	4	Not Used
5	24 VAC (Class 2) BI SRC	5	Zone Bus
6	24 VAC / ZnBs Common	6	Not Used
7	AI 2/3 Common		
8	Zone Bus		

When using the TE-6700 sensor, do not move the hardware point assignments in the HVAC PRO software.

For information on cables, refer to the *Ordering Information for Outside Vendors* in the *Ordering the UNT1100 Series* chapter of this user's guide.

Detailed Procedures

Connecting HE-6300 Humidity Sensor

To connect an HE-6300 humidity sensor to the UNT1100:

1. Set the analog input DIP switches on the AS-UNTxxx board to 10 volts (Figure 5-11):
2. Switch 1 = ON
3. Switch 2 = OFF
4. Enter the range of the humidity sensor through the HVAC PRO software (0 to 10 VDC is equal to 0 to 100% RH).

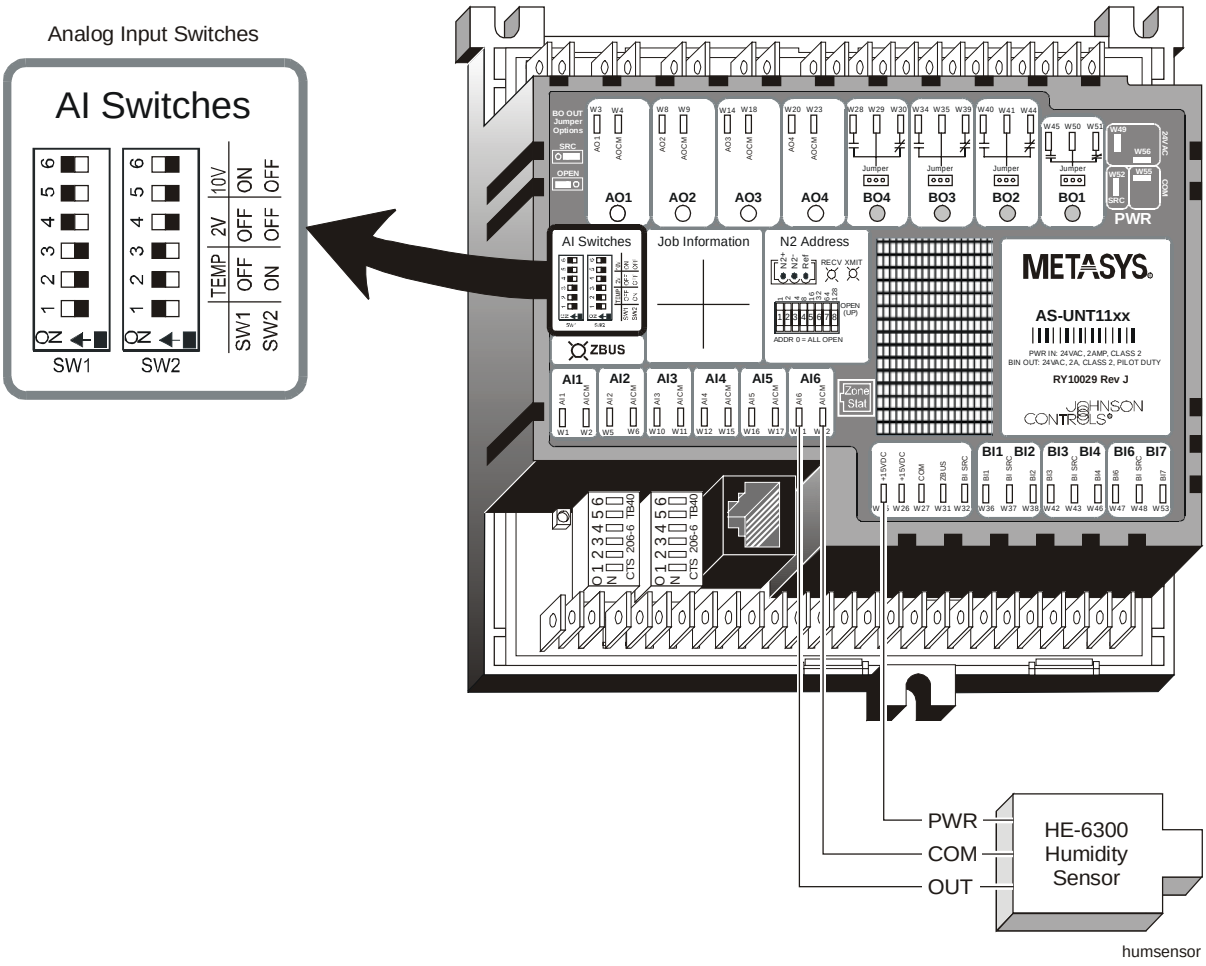


Figure 5-11: Example of HE-6300 Humidity Sensor Connection

Troubleshooting

Internal Thermal Protection

The UNT1100 Series products have internal circuit protection from accidental shorts or overloads. Any shorted BI_SRC terminal or short to the 24 VAC, which is available on the 8-pin RJ-45 phone jack, can cause the circuit protection to trip as current draw on the source increases with each addition to the load. If the circuit protection device has opened due to a high current condition, it may be necessary to remove power to the controller and allow a few minutes for the protection device to cool.

If the circuit protection device has tripped, the UNT will act as though no power has been applied. It will not communicate, and it may feel slightly warm to the touch. Again, it may be necessary to remove power to the controller and allow a few minutes for the protection device to cool.

Maximum combined power current of BI_SRC and 24 VAC at phone jack total ≤ 2.4VA (100 mA).

Chapter 6

Downloading and Commissioning the UNT1100 Series

Introduction

This section describes what you need to know when downloading and commissioning a UNT1100. This chapter describes:

- commissioning via Zone Bus
- commissioning via N2 Bus

Code No. LIT-63630836

Key Concepts

Commissioning Procedures

Commissioning a UNT begins after the unit is mounted and wired, and the control and hardware/software features have been defined through HVAC PRO software. Refer to the *HVAC PRO User's Manual (FAN 637.5)* for complete controller configuration and commissioning information. We recommend a Zone Terminal or laptop Personal Computer (PC) with HVAC PRO software to perform a complete system startup procedure. However, these accessories are not required for the basic procedure detailed in this section.

Via Zone Bus

HVAC PRO software, Release 8.01 or later, allows you to perform downloading and commissioning via the Zone Bus. This requires using the CBLPRO interface and a laptop or PC running the HVAC PRO software. You can connect to the TE-6700 sensor 6-pin connector or directly at the controller. Communication rate is 1200 baud over the Zone Bus.

Via N2 Bus

HVAC PRO software, Release 8.01 or later, allows you to perform downloading and commissioning over the N2 Bus using MM-CVT101-0, Metasys OWS Release 6.0 or higher, or Companion Release 6.00 and Controller Access. Because the communication rate is 9600 baud, performing this process over the N2 Bus saves a great deal of time when loading the initial configuration files and parameters into the controller.

Troubleshooting

There are some errors that may occur while using the HVAC PRO commissioning tool with the UNT1100 Series over the Zone Bus. The cause of the error is often a loose or improper connection between the CBLPRO (AS-CBLPRO), laptop PC, and the controller. A defective COM port on the laptop, or a defective controller could also be at fault.

Note: It takes ten seconds for a UNT to reset and resume communication after being downloaded.

An effective troubleshooting technique is to use a CBLCON and observe its LEDs, which will indicate the problem. You may also try exchanging the component that you believe is defective with a working component of the same type.

A noisy wire adjacent to the Zone Bus can also cause communication errors. Noise can be periodically induced into the Zone Bus, thereby causing sporadic communication failures between the laptop and the UNT. Most often, noisy lines cause intermittent disruption, not total loss of communication.

For more information on HVAC PRO software, refer to the *HVAC PRO User's Manual (FAN 637.5).*

Chapter 7

Ordering the UNT1100 Series

Introduction

This chapter lists ordering information for the UNT1100 and related Johnson Controls products as well as information on ordering accessories from outside vendors.

Code No. LIT-63630837

Key Concepts

Ordering Information for Johnson Controls

This section includes code numbers and descriptions for the UNT1108/1126/1144 and accessory equipment.

Controllers

Use Table 7-1 to order controllers and accessory equipment.

Table 7-1: UNT1100 and Accessory Equipment

Code Number	Description				
	Analog Output	Relay Output	Analog Input	Binary Input	N2 Communication
AS-UNT1108-0	0	8	6	6	✓
AS-UNT1126-0	2	6	6	6	✓
AS-UNT1144-0	4	4	6	6	✓

Sensors/Transmitters

Use Table 7-2 to order controllers and accessory equipment.

Table 7-2: UNT1100 Sensors and Transmitters

Code Number	Description	Type
EP-8000 Series	Electro-Pneumatic Transducer 0.5 to 19 psig	0 to 10 VDC, High Volume (relay)
HE-6300 Series	Wall Mount Humidity Transmitter	12-30 VDC Supply
HE-6310 Series	Duct Mount Humidity Transmitter	12-30 VDC Supply
HE-6700 Series	Humidity/Temperature Transmitter (Wall Mount)	Various
TE-6100-11, -12 Series	Zone Temperature Sensor	Nickel, 1000 ohm with Phone Jack
TE-6300 Series	Temperature Sensor	Nickel, Platinum, Silicon
TE-6700 Series	Zone Temperature Sensor Series	Resistance
AP-TMZ1600-0	Room Sensor with LCD Display	Nickel PTC, 1000 ohm with Phone Jack

Dampers and Valve Actuators

Use Table 7-3 to order controllers and accessory equipment.

Table 7-3: UNT1100 Dampers and Valve Actuators

Code Number	Description	Type
VA-7152 Series	Valve Actuator	0 to 10 VDC Proportional
VA-7202 Series	Valve Actuator	0 to 10 VDC Proportional
VA-8122 Series	Valve Actuator Assemblies 1/2 inch	0 to 10 VDC
VA-8052 Series	Valve Actuator Assemblies 1/2 inch, 3/4 inch, 1 inch, and 1-1/2 inch	0 to 10 VDC
M100C Series	Zone Bus Damper Actuators	Zone Bus Addressable
M100E Series	Standalone Economizer Actuators	24 VAC Triac
M100G Series	Proportional Damper Actuators	0 to 10 VDC
M9000-500 Series	Valve Linkage Assembly for M9100 and M9200 Direct Mount Actuators	0.5- through 2-inch Globe Style Valve Bodies
M9100	Direct Mount Proportional Damper Actuator	0 to 10 VDC
M9200	Direct Mount Proportional Damper Actuator, Spring Return	0 to 10 VDC

Accessories

Use Table 7-4 to order controllers and accessory equipment.

Table 7-4: UNT1100 Accessories

Code Number	Description	Type
AP-TBK1002-0	Removable 2-position Screw Terminal Kit (100 pcs)	
AP-TBK1003-0	Removable 3-position Screw Terminal Kit (100 pcs)	
AS-CBLPRO-2	HVAC PRO Cable	N/A
AS-ENC100-0	Enclosure for UNT1100 Series (optional)	Sheet Metal
AS-RLY002-0	Relay, 2 SPDT, 5A, 240 VAC	
AS-RLY050-0	Relay Kit, 2 SPDT, 5A, 240 VAC with enclosure	
AS-RLY100-1	Relay Kit, 4 SPDT, 5A, 240 VAC with enclosure	
AS-XFR050-0	Transformer	50 VA, 120 to 24 VAC
AS-XFR010-1	Transformer	100 VA
AS-TBKIT-0	Replacement N2 Bus and Power Terminal Block Connectors	Five N2 Bus and Five Power Terminal Blocks
AS-ZTU100-1	Zone Terminal *	N/A
EN-EWC10-0	Enclosure for UNT (optional)	UPM Plastic
EN-EWC15-0	Enclosure with 50 VA Transformer	UPM with 50 VA
MM-CVT101-0	RS-232/RS-485 Converter for N2 Download/Commissioning with HVAC PRO Software	N/A
P32 Series	Air Flow Switch	N/A
TE-6001-961	Momentary Button Kit for Temporary Occupancy or Boost Modes (for TE-6100-11, 12 only)	N/A
WS-WINPRO-0	HVAC PRO Software	N/A
WS-WINPRO-6	HVAC PRO Software Upgrade	N/A
Y65XX-X Series	Transformer	24/120/220/277-480 VAC to 24 VAC

* The AS-ZTU100-1 supports the AS-UNT11xx-0, AS-UNTxxx-0, AS-UNTxxx-1, and AS-UNTxxx-2 models. The AS-ZTU100-0 supports AS-UNTxxx-0 models only.

Ordering Information for Outside Vendors

The following tables list preconfigured cables and cable components available from CSC Southwest Wire and Windy City Wire.

CSC Southwest Wire

Use Table 7-5 to order preconfigured cables from CSC Southwest Wire.

Table 7-5: Preconfigured Cables, CSC Southwest Wire

Description	Cable Length	Part Number
RJ45 Straight-through Cable Assembly Plenum	7.62m (25 ft)	CBL-STAT25-SW
• **Non keyed plugs**	15.24m (50 ft)	CBL-STAT50-SW
• **24 AWG**	22.86m (75 ft)	CBL-STAT75-SW
• **8 Conductor**	30.48m (100 ft)	CBL-STAT100-SW
• **Solid Wire**		

Use Table 7-6 to order cable components available from CSC Southwest Wire for creating your own cables.

Table 7-6: Cable Components, CSC Southwest Wire

Description	Part Number
304.8m (1000 ft) Roll of Plenum Rated	CBL-24/NAT-SW
• **24 AWG**	
• **8 Conductor**	
• **Solid Wire**	
RJ45 Modular Plugs (100 pcs)	S100710
Economy Crimp Tool	S104012
Premium Crimp Tool	S104015
Twisted Pair Easy Strip Tool	S104020

Windy City Wire

Use Table 7-7 to order preconfigured cables from Windy City Wire.

Table 7-7: Preconfigured Cables, Windy City Wire

Description	Cable Length	Part Number
RJ45 Straight-through Cable Assembly Plenum	7.62m (25 ft)	CBL-STAT25-WC
• **Non keyed plugs**	15.24m (50 ft)	CBL-STAT50-WC
• **24 AWG**	22.86m (75 ft)	CBL-STAT75-WC
• **8 Conductor**	30.48m (100 ft)	CBL-STAT100-WC
• **Solid Wire**		

Use Table 7-8 to order cable components available from Windy City Wire for creating your own cables.

Table 7-8: Cable Components, Windy City Wire

Description	Part Number
304.8m (1000 ft) Roll of Plenum Rated	CBL-24/8STAT-WC
• **24 AWG**	
• **8 Conductor**	
• **Solid Wire**	
RJ45 Modular Plugs	S100710
Premium/Economy Crimp Tool	S104012
Twisted Pair Easy Strip	S104020

Specifications

Table 7-9: Specifications

Product	AS-UNT1108-0 AS-UNT1126-0 AS-UNT1144-0
Power Requirements	24 VAC, 50/60 Hz at 40 VA (per typical system), 8 VA for controller alone with comm module.
Ambient Operating Conditions	-40 to 60°C (-40 to 140°F) 10 to 90% RH
Ambient Storage Conditions	-40 to 70°C (-40 to 158°F) 10 to 90% RH
Dimensions (H x W x D)	160 x 146 x 39 mm (6.3 x 5.8 x 1.5 in.) without enclosure (ENC)
Shipping Weight	0.43 kg (0.95 lb)
Processor	80C652
Memory	32K RAM 64K ROM 24K EEPROM
Interfaces	Zone Bus, N2
Standards Compliance	IEEE 472 IEEE 518 IEEE 587 Category A FCC Part 15, Subpart J, Class A UL 916 UL 864
Agency Listings	UL 864 Listed

Appendix A

Application Examples

Introduction

All examples in this appendix were created by answering configuration questions using HVAC PRO software to identify terminal locations of the inputs and outputs.

Note: Default answers are accepted for configuration questions not included in this appendix.

Refer to the *HVAC PRO User's Manual (FAN 637.5)* for detailed information regarding controller configuration. The UNT1100 series controller was used in all examples. Refer to *UNT Applications Application Note (LIT-6375100)* for additional examples and configuration information.

This appendix describes the following applications:

- fan coil
- unit vent
- packaged rooftop
- heat pump
- lead/lag pump sequence

Code No. LIT-63630838

Key Concepts

Fan Coil

Table A-1 lists the selections made through HVAC PRO software for the example in Figure A-1.

Table A-1: Fan Coil Parameters and Configuration Selections

HVAC PRO Parameters	Configuration Selections
Heating Type	Two-Pipe Common Htg/Clg Coil (Prop)
Lighting Integration	Yes

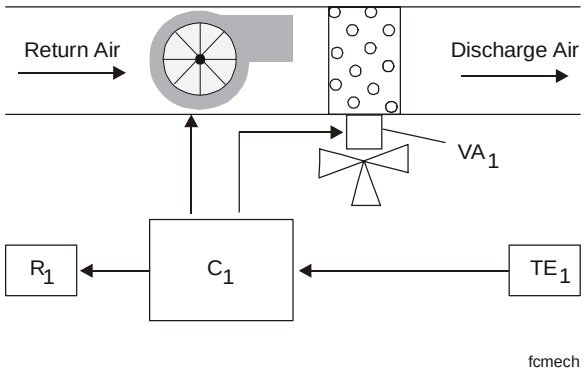
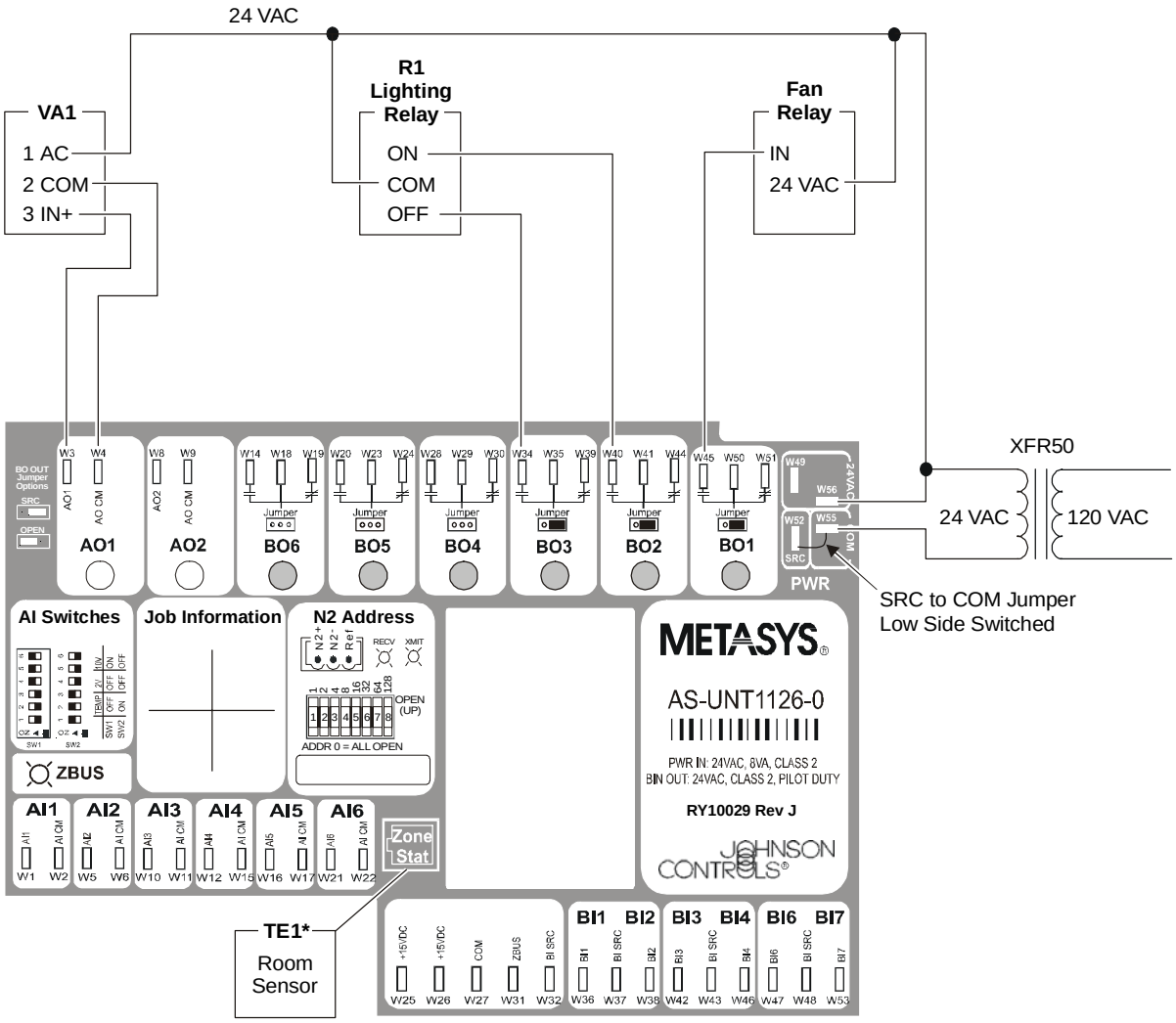


Figure A-1: Fan Coil Mechanical Flow Diagram



ON
1 2 3

* Preferred DIP Switch Position for TE-6700 Room Sensor

fcwire

Figure A-2: Fan Coil Wiring Example

Bill of Materials

Table A-2: Fan Coil Bill of Materials

Component		Part Number
C1	**Digital Controller**	AS-UNT11xx-0
TE1	**Zone Temperature Sensor**	TE-6700 Series
VA1	**Valve Actuator**	VA-8052 Valve Actuator Assembly
R1	**Lighting Relay**	GE-RR7

Unit Vent

Table A-3 lists the selections made through HVAC PRO software for the example in Figure A-3.

Table A-3: Unit Vent Parameters and Configuration Selections

HVAC PRO Parameters	Configuration Selections
Control Cycle	ASHRAE Cycle 2
Economizer Changeover	Dry Bulb
Heating Type	Proportional
Unoccupied Override of Heating Valve	Heating Valve Fixed Position on Low DAT
Cooling Type	None
Lighting Integration	No

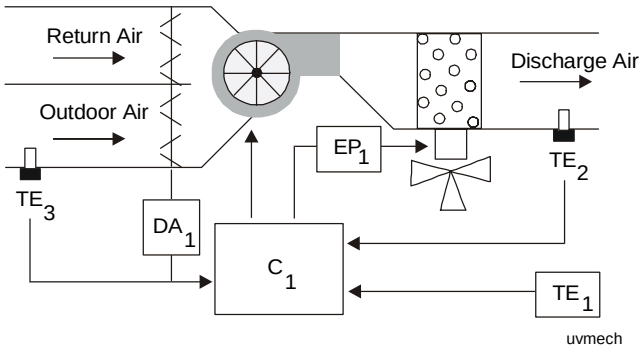


Figure A-3: Unit Vent Mechanical Flow Diagram

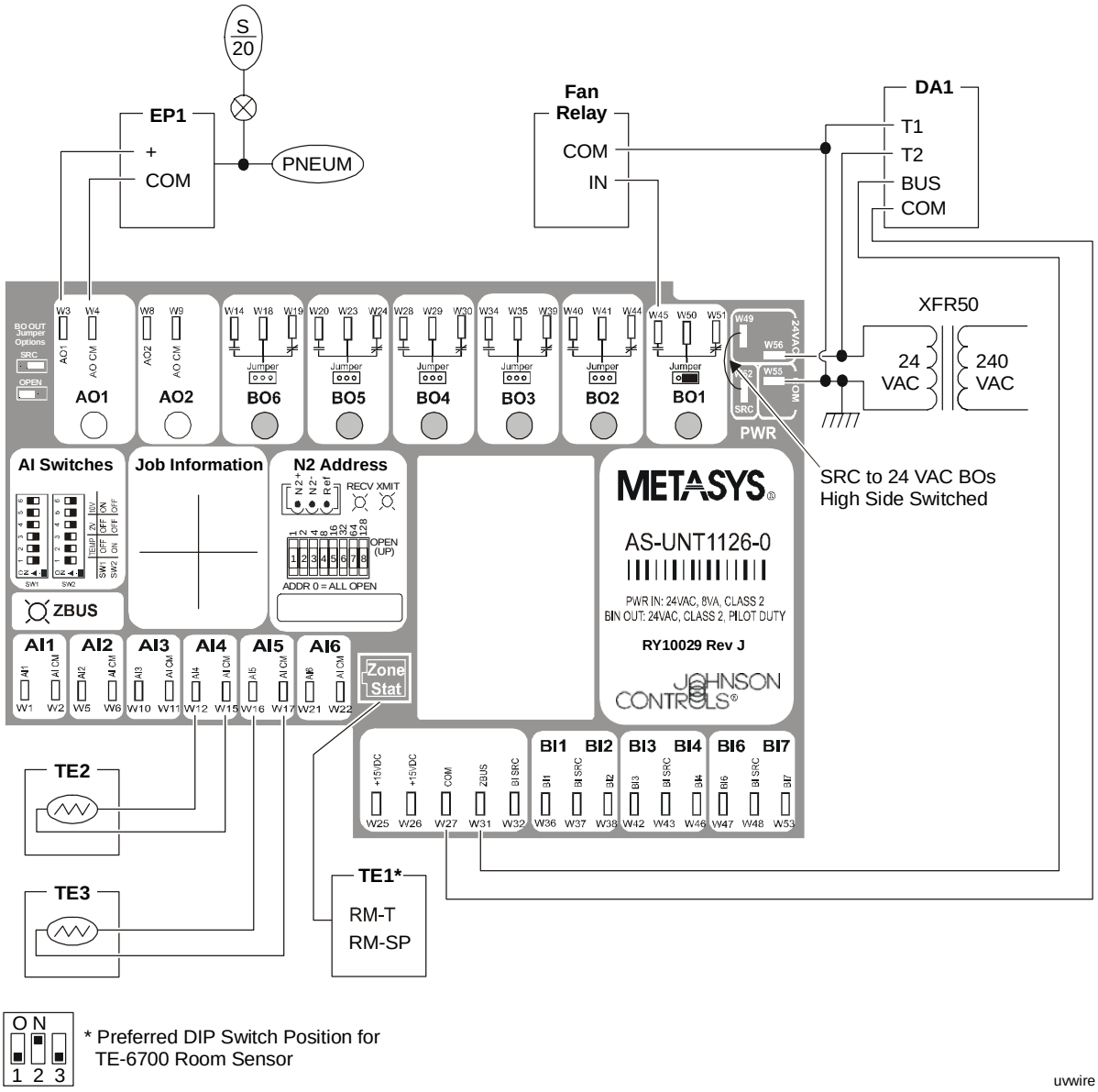


Figure A-4: Unit Vent Wiring Example

Bill of Materials

Table A-4: Unit Vent Bill of Materials

Component Description		Part Number
C1	**Digital Controller**	AS-UNT11xx-0
TE1	**Zone Temperature Sensor**	TE-6700 Series
TE2	**Outdoor Air Sensor**	TE-6300 Series
TE3	**Discharge Air Sensor**	TE-6300 Series
EP1	**Electric to Pneumatic Interface**	EP-8000 Series
DA1	**Zone Damper Actuator**	M100CGA-2*

* Set AO2 to Zone Bus.

Packaged Rooftop

Table A-5 lists the selections made through HVAC PRO software for the example in Figure A-5. We recommend that packaged rooftop applications have separate transformers for controller and loads. Sharing of transformers for controller and loads for packaged rooftop wiring is not recommended.

Table A-5: Packaged Rooftop Parameters and Configuration Selections

HVAC PRO Parameters	Configuration Selections
Economizer Output Type	Zone Bus Output (Address 22)
Economizer Changeover Type	Dry Bulb
Heating Type	Two Stages
Cooling Type	Two Stages
Outdoor Air Lockout of Heating/Cooling	Yes
Zone Reset from Humidity	No
Heating/Cooling Diagnostics	Yes
Lighting Interface	No
Air Flow Interlock	Yes

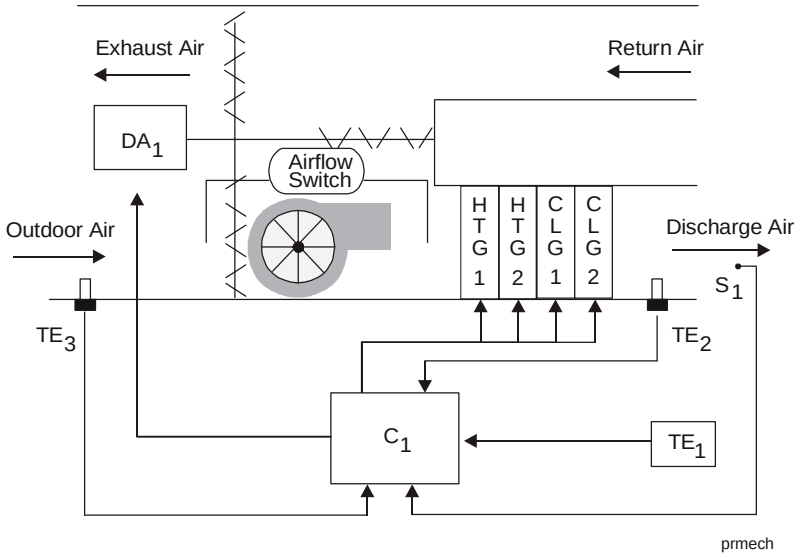


Figure A-5: Packaged Rooftop Mechanical Flow Diagram

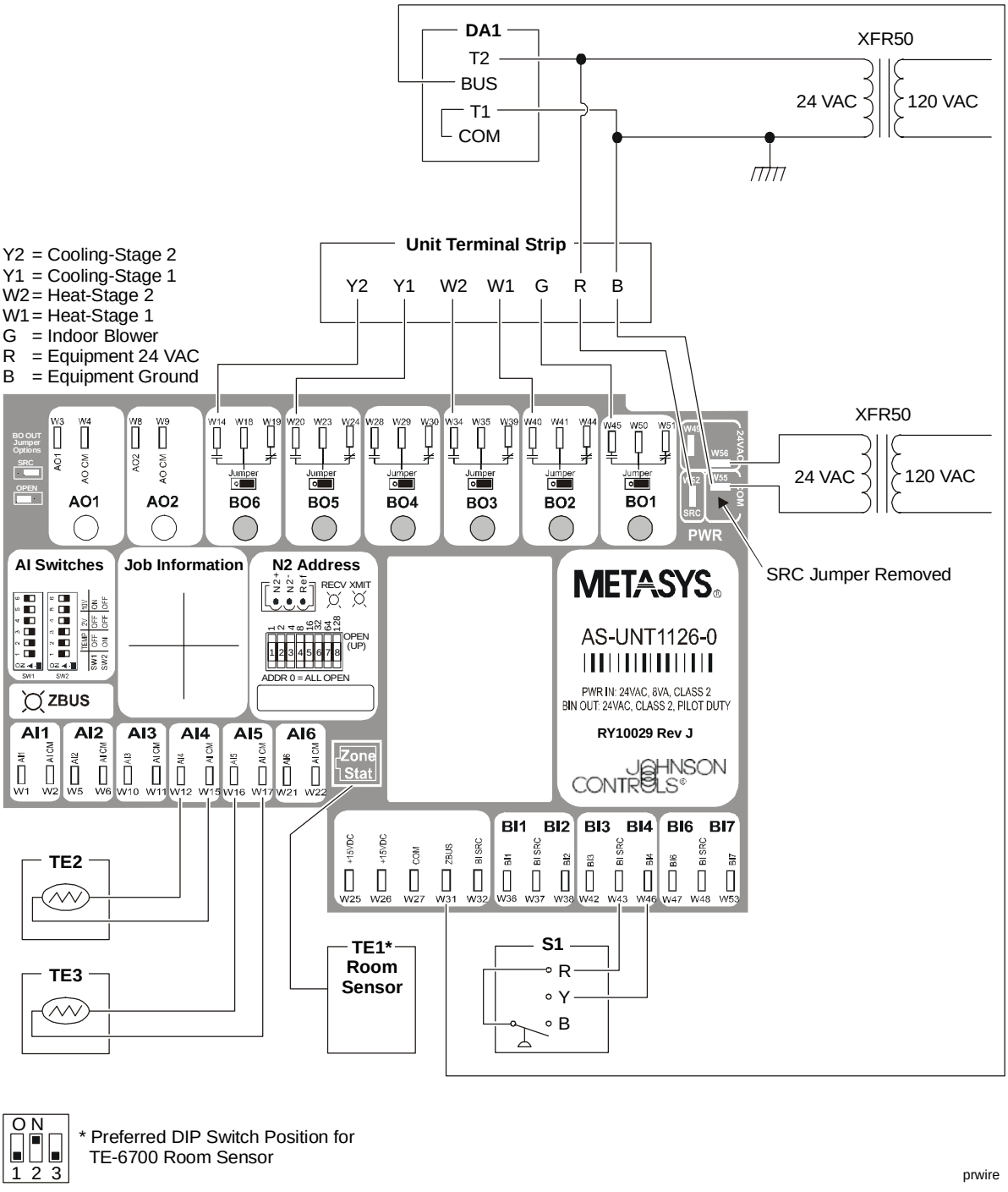


Figure A-6: Packaged Rooftop Wiring Example with Separate Transformers for Controller and Loads

Bill of Materials

Table A-6: Packaged Rooftop Bill of Materials

Component		Part Number
C1	**Digital Controller**	AS-UNT11xx-0
TE1	**Zone Temperature Sensor**	TE-6700 Series
TE2	**Discharge Air Sensor**	TE-6300 Series
TE3	**Outdoor Air Sensor**	TE-6300 Series
S1	**Air Flow Switch**	P32 Series
DA1	**Damper Actuator**	M110CGA-2

For more information on rooftop installations, refer to *Appendix B Precautions for Rooftop Installations6363081apndxaenviron* in this user's guide.

Heat Pump

Table A-7 lists the selections made through HVAC PRO software for the example in Figure A-7.

Table A-7: Heat Pump Parameters and Configuration Selections

HVAC PRO Parameters	Configuration Selections
Heat Pump Type	Water to Air
Reversing Valve Action	On for Heating
Supplemental Heat	Two Stages
Lighting Integration	No

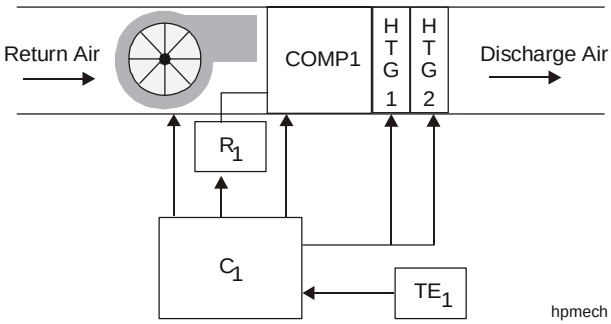


Figure A-7: Heat Pump Mechanical Flow Diagram

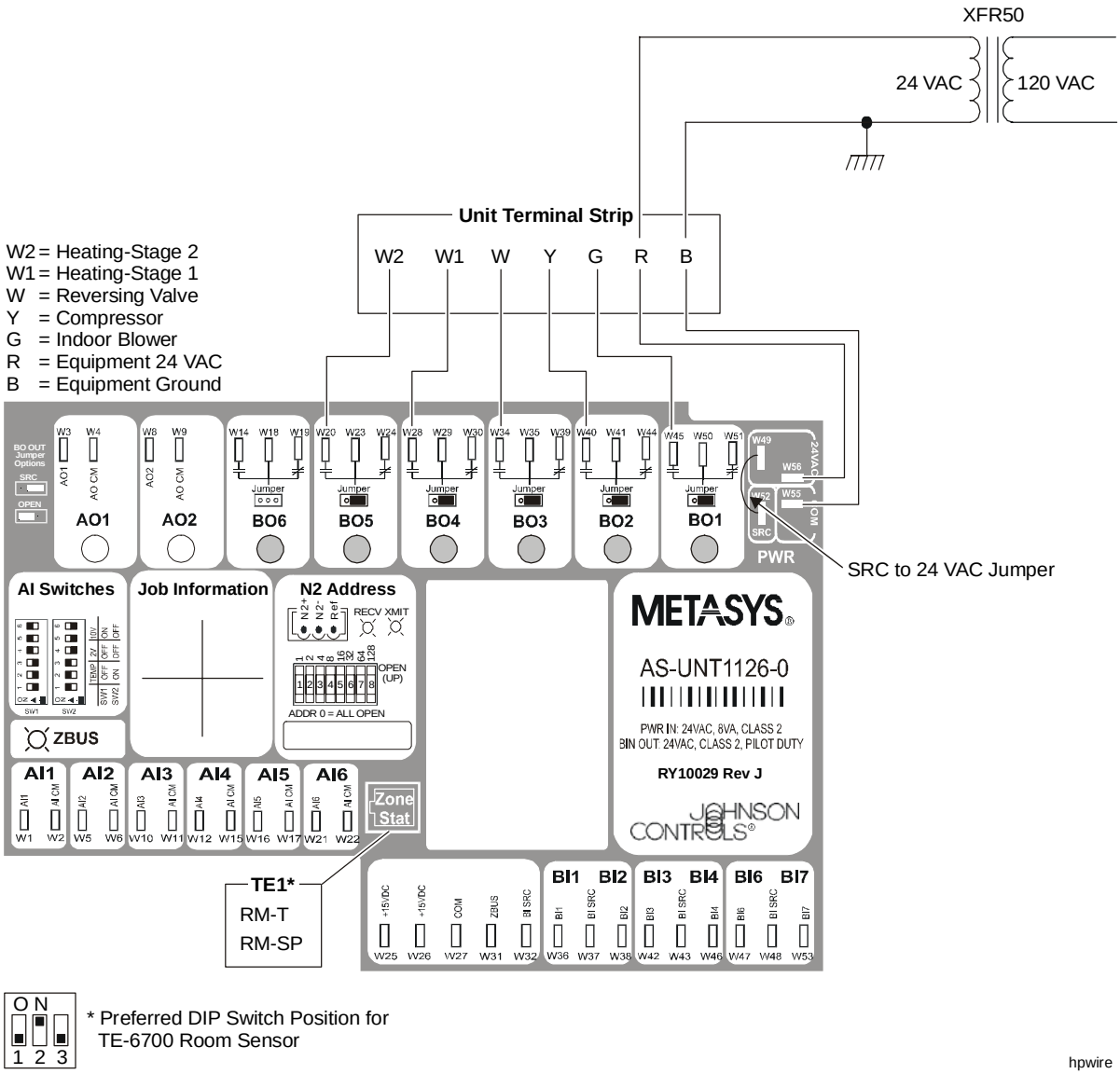


Figure A-8: Heat Pump and External Transformer Wiring Example

Bill of Materials

Table A-8: Heat Pump Bill of Materials

Component		Part Number
C1	**Digital Controller**	AS-UNT1108-0 or AS-UNT1126-0
TE1	**Zone Temperature Sensor**	TE-6700 Series

Lead/Lag Pump Sequence

Table A-9 lists the selections made through HVAC PRO software for the example in Figure A-9.

Table A-9: Lead/Lag Pump Sequence Parameters and Configuration Selections

HVAC PRO Parameters	Configuration Selections
Pump Enable Strategy	Binary Input
Lead Pump Selection	Hardware
Pump Status Monitoring	Common
Alarm Output Types	Hardware
Type of Hardware Alarm	Common

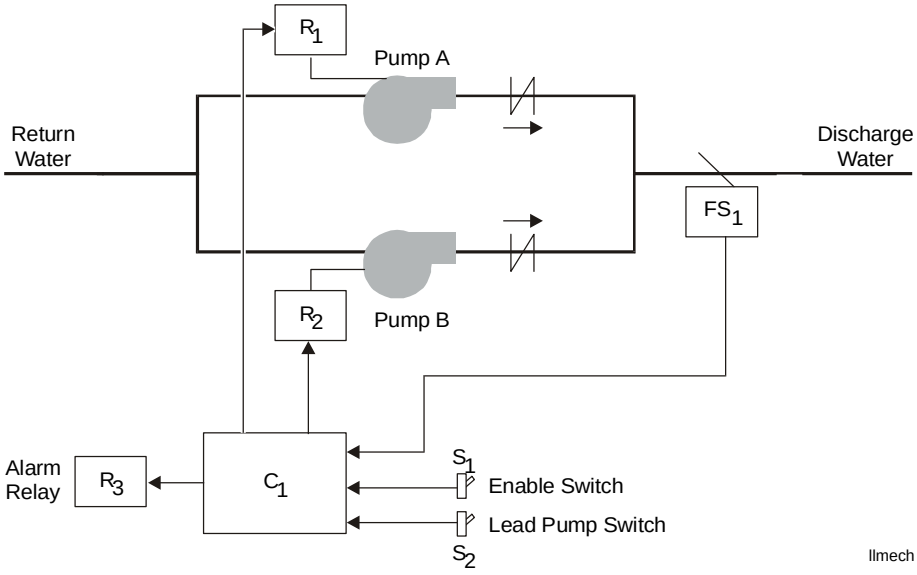


Figure A-9: Lead/Lag Pump Sequence Mechanical Flow Diagram

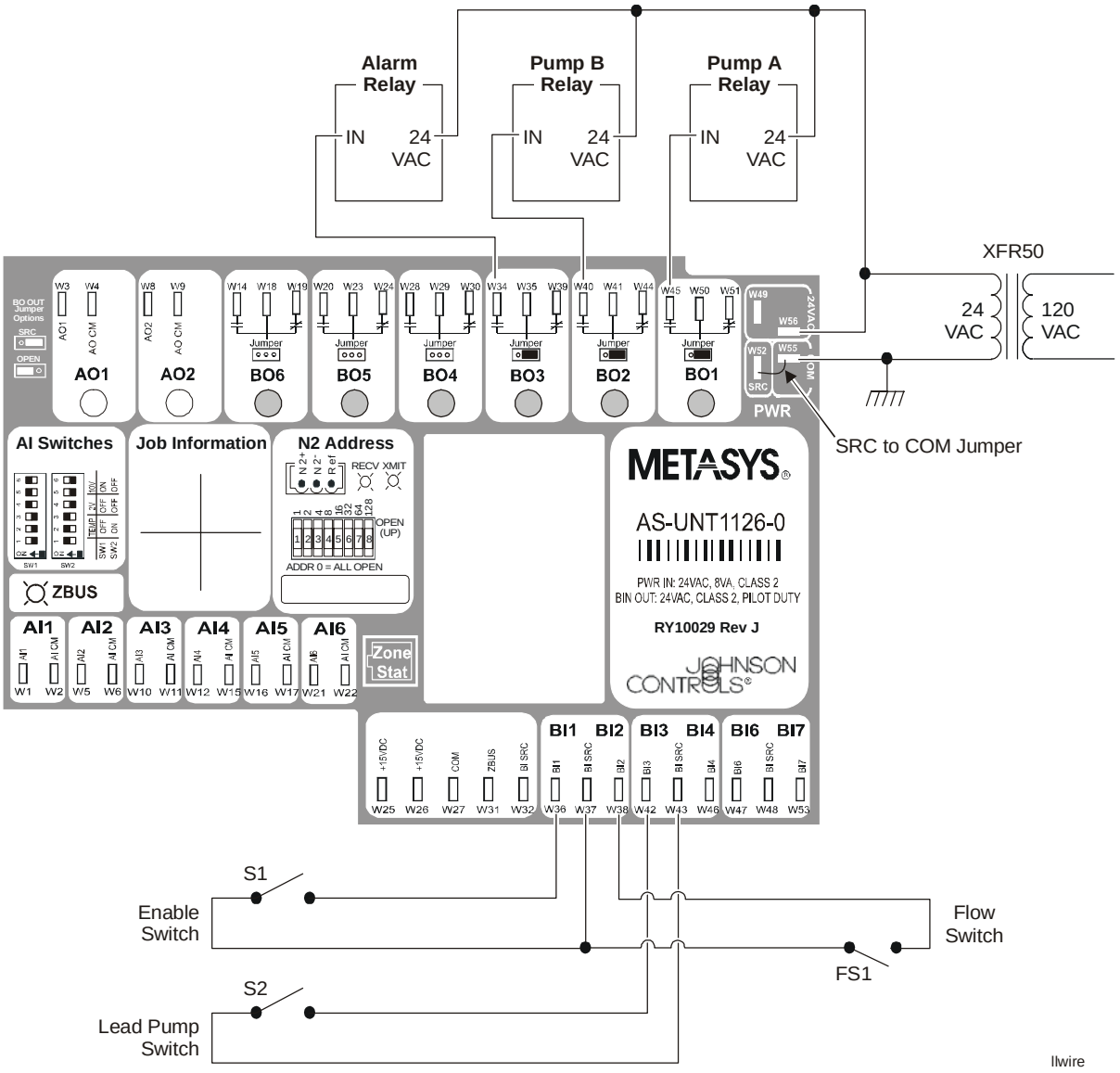


Figure A-10: Lead/Lag Pump Sequence Wiring Example

Bill of Materials

Table A-10: Lead/Lag Pump Sequence Bill of Materials

Component		Part Number
C1	**Digital Controller**	AS-UNT11xx-0
FS1	**Flow Switch**	Paddle Flow Switch
S1	**Toggle Switch**	Toggle Switch
S2	**Toggle Switch**	Toggle Switch
R1	**Relay**	Relay
R2	**Relay**	Relay
R3	**Relay**	Relay

Appendix B

Precautions for Rooftop Installations

Introduction

This appendix includes information about precautions for installing the UNT1100 Series controller on a rooftop. It also describes how to install a UNT1100 in a rooftop unit.

Code No. LIT-63630839

Key Concepts

Environmental Information

Mount the UNT within the rooftop unit or some other enclosure to protect it from rain, snow, etc. We recommend venting for small enclosures in environments that regularly exceed 32°C (90°F). The installation site of the UNT must meet the following environmental standards:

- The atmosphere must be free of explosive gases, or corrosive chemical or salt vapors.
- The relative humidity (non-condensing) must be between 10 and 90%.
- The temperature for the UNT1100 controllers must be between -40 and 70°C (-40 and 158°F).

The UNT1100 series controllers have conformally coated circuit assemblies.

Electrical Noise in Rooftop Units

Rooftop air handling units may be very noisy from an electrical standpoint. This is due to contacts switching inductive loads and electrical spark ignition devices. You must take precautions to prevent electrical noise from causing false BO triggering, resetting of controllers, or interference with any network communication.

There is wide noise variation in relays, contactors, and gas ignition control devices. Electromagnetic fields can radiate from wires carrying spark or coil current, as well as from the spark or contact arc itself. Electromagnetic fields are also present around wires carrying power to the ignition control. These are noisy wires.

Considerations for Gas Ignitions

When using Rooftop Units containing Gas Ignition Control (see Figure B-1), keep the following things in mind.

- You must filter any wires connected to the gas valves that you route with other wires leaving the gas heating section. An individual line filter can filter two wires, but it is acceptable to use only half of it if you need to filter a single wire. Mount the filters on the metal wall between the ignition chamber and the fan chamber. We recommend the filters listed in Table B-1.

Table B-1: Recommended Filters

Vendor	Type	Newark Stock Number
Corcom	3VB1	81F4523
Corcom	3B1	81F4523
Corcom	3VK1	81F4542
Corcom	3K1	81F4542

Note: These filters are all rated 3A, 120/250V, and are available from Newark Electronics. These models are specified for derating with an unbalanced load. No other models are authorized.

- Keep the length of the high voltage wire from the ignition control to the spark bundled, and as **short** as possible. Bundle the spark wire to itself if it is too long. Keep the ignition control and the UNT1100 as **far apart** as possible. Route the power wires to the ignition control along the metal mounting surface.
- Ensure that you physically separate the wires on the line side of the filter from those on the load side of the filter. Route noisy wiring so that its path is as short as possible, and **always avoid routing noisy wires close to quiet wires**. We recommend a 30 cm (1 ft) or greater separation between parallel noisy and quiet wires.
  - **Never** mount the UNT1100 in the same compartment as the ignition device.
  - If you must install noisy wiring near quiet wiring, have the wires cross at right angles and as far apart as possible. Route both near the metal mounting surface.

Note: For specific information regarding noisy and quiet wiring, refer to the *ASC and N2 Bus Networking and Troubleshooting Guide Technical Bulletin (LIT-6363003)* in the *Application Specific Controllers Technical Manual (FAN 636.3)*.6363003toc

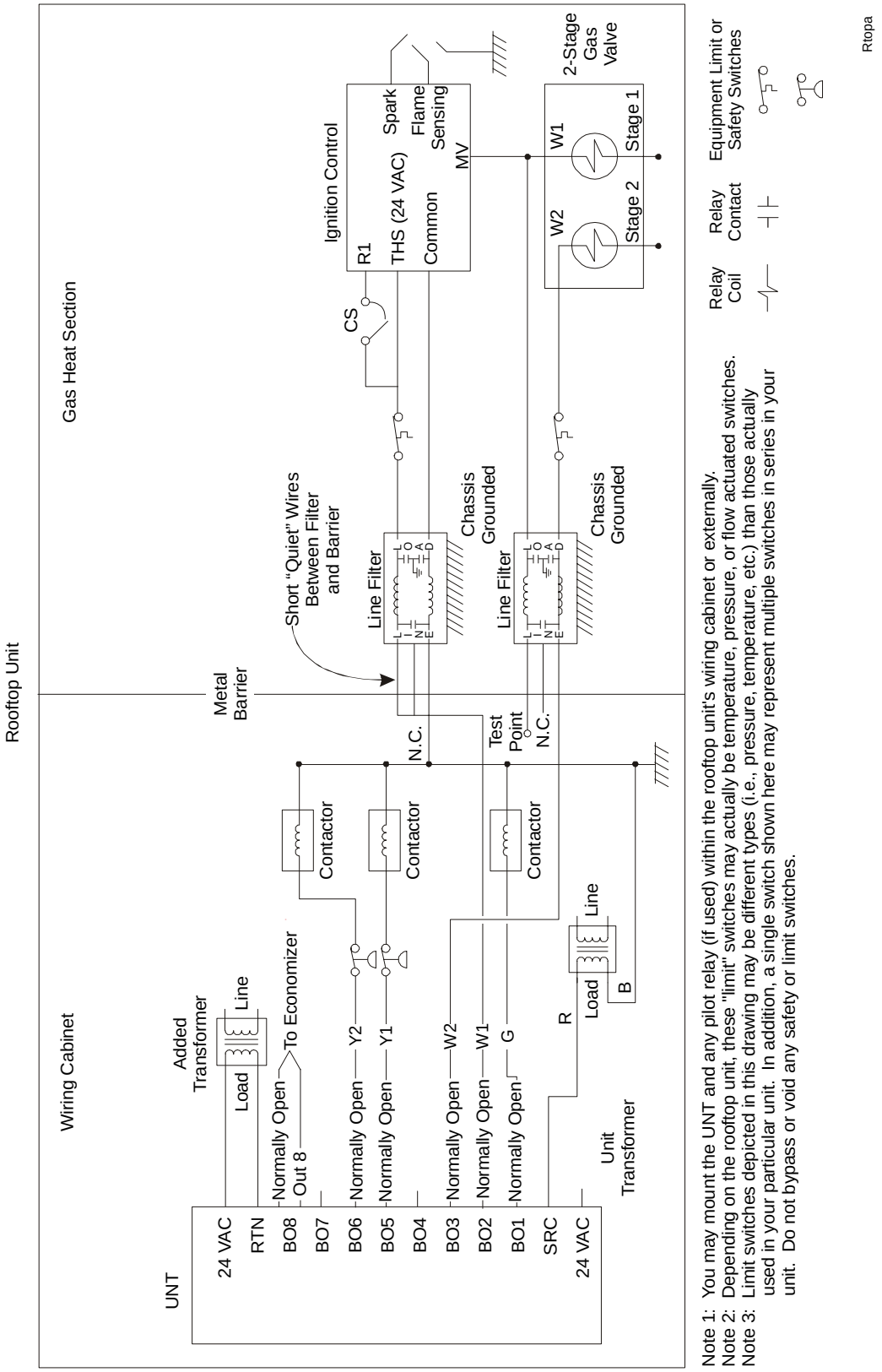


Figure B-1: UNT Directly Driving Loads

Considerations for Specific Rooftop Units

Take the following information into consideration for specific rooftop units.

Lennox GCS16 Series Rooftop Units

For Lennox GCS16 series rooftop units, bypass the K25 blower/fan delay relay (TDR) by disconnecting the K25 coil power wire. Lennox provides K25 blower control for use with electromechanical thermostats. The reason for disconnecting this when a UNT provides the blower control functions is that the K25 causes unnecessary contactor cycling. This creates additional electrical noise. On some Lennox models, it may also cause blower fan dropout or cycling that appears as abnormal operation to the customer. Lennox has authorized bypassing K25 blower control when you use Johnson Controls UNTs.

York® Rooftop Units

UNT1100 controllers, when installed in rooftop units, may experience nuisance resets. This is evidenced by numerous unexplained offline conditions with durations of less than one minute. To alleviate this situation in York rooftop units, bypass or disable the supply fan relay according to the following procedure:

Notes: These modifications apply only to those units described below. Units built after the dates indicated have already been modified by York and do not require this change.

The date of manufacture of York rooftop units can be determined from the second and third digits of the serial number, as shown in Table B-2.

- **On 3 to 6 ton units built before February 17, 1997**, the K3 relay must be disabled by disconnecting the wire that connects the time delay relay contacts to the relay board. This is typically the 234/BLUE wire.
- **On 3 to 6 ton units built between February 17, 1997 and May 30, 1997**, York implemented a different relay interface board. On this new relay board, the K5 relay must be bypassed by moving the wire currently connected to the G terminal on the York relay board to the A2 terminal.
- **On 7 to 25 ton units built before February 28, 1997**, the K5 relay must be bypassed by moving the wire currently connected to the G terminal on the York relay board to the A2 terminal.

Table B-2: York Rooftop Unit Serial Number/Date Conversion

Second Digit	Month	Third Digit	Year
A	1	**A**	92
B	2	**B**	93
C	3	**C**	94
D	4	**D**	95
E	5	**E**	96
F	6	**F**	97
G	7	**G**	98
H	8	**H**	99
K	9	**K**	00
L	10	**L**	01
M	11	**N/A**	N/A
N	12	**N/A**	N/A

Procedure Overview

Table B-3: Installing a UNT1100 in a Rooftop Unit

To Do This	Follow These Steps:
Install a UNT1100 in a Rooftop Unit	Mount the controller inside the rooftop unit or another enclosure. Install a transformer. Isolate any especially noisy outputs with a pilot relay.

Detailed Procedures

Installing a UNT1100 in a Rooftop Unit

To install a UNT1100 in a rooftop unit:

1. Mount the controller inside the rooftop unit or some other enclosure to protect it from outside elements, such as rain or snow.
2. Install a transformer to provide 24 VAC power to the controller and all the loads. We recommend using one of the following transformer types:

Table B-4: Recommended Transformers

Transformer Type	Power	Description
Johnson Controls Y65 Series	40 VA	120 VAC to 24 VAC
Johnson Controls AS-XFR050-0	50 VA	120 VAC to 24 VAC (insulated windings, high noise immunity, resettable breaker)

3. You may drive rooftop unit contactor/relay loads directly (see Figure B-1) if **all** of the following conditions exist:
   - Under normal operation, the UNT1100 binary outputs directly drive all contactor/relay coils within the rooftop unit.
   - Individual BO loads exceed 10 mA.
   - Individual BO loads do not exceed two amperes, sealed current.
   - The UNT and all its loads together draw less than the main power transformer's VA when mounted in a well-vented open area.

Note: Connect the UNT1100 binary outputs (relays) to the rooftop unit terminal strip.

4. If other than 24 VAC power must be switched, install pilot relays for isolation between the controller and the rooftop unit contactors/relays.