

UNITY/I™

UT3K, UT4K, UT5K and UT8K
Single-Phase Uninterruptible Power Systems

Installation Manual



IMPORTANT SAFETY INSTRUCTIONS!

SAVE THESE INSTRUCTIONS!

This manual contains important instructions for your UNITY/I™ UPS.

The installation and use of this product must comply with all national, federal, state, municipal, or local codes that apply.

If you need help, phone Best Power's Worldwide Service at 1-800-356-5737 (U.S.A. or Canada) or call the nearest Best Power office. Customers anywhere can call 1-608-565-2100 to reach Best Power's Worldwide Service.



CAUTION!

FOR UNITS WITH HARDWIRED OUTPUT:

The output AC circuit is considered a separately derived source. **A QUALIFIED ELECTRICIAN MUST PROPERLY CONNECT THE NEUTRAL-TO-GROUND (NEUTRAL-TO-EARTH) WIRE BEFORE INSTALLING THE UPS.** This installation manual contains instructions for properly grounding the circuit. Refer to the installation wiring diagrams for your application.

Best Power reserves the right to change specifications without prior notice.



Who needs to use this installation manual?

This manual contains instructions for the installation of **hardwired units** (units that do not have an input line cord or output receptacles).

The installation and wiring instructions in this manual are for use by a qualified electrician only.

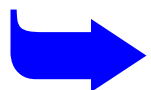
Who does not need to use this installation manual?

If your UNITY/I has *all* of the following, you do **not** need to use the installation instructions in this manual, though you may find Sections 102 and 103 helpful in finding a location for your UPS.

- an input line cord and plug
- receptacles on the back panel

The *UNITY/I User Manual* explains how to plug in and start your UPS.

August 8, 1997



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Introduction

This UNITY/I™ Installation Manual is for models that do not have an input plug. A qualified electrician must install the AC wiring for these models.

The end-user may wish to read this manual, especially Section 100 and the Appendix. However, a qualified electrician must install hardwired units.

In the step-by-step instructions, boxes are provided so that the electrician can check off each step as it is completed.

If you have any questions about the installation or operation of the UPS, call Best Power's Worldwide Service at 1-800-356-5737 (U.S.A. or Canada) or call the nearest Best Power office. Customers anywhere can call 1-608-565-2100 to reach Best Power's Worldwide Service.

Section 100: Before Installing the UPS

101 Pre-Installation Check

Find the following information. Use the labels on the equipment.

UPS:

- kW rating (see UPS model #): _____ kW
- AC volts in (range): 200 - 240 VAC (standard)
 380 - 415 VAC (optional)
- AC volts out (range): 100 - 127 VAC, 200 - 240 VAC (all models)
- Frequency: 50/60 Hz. On line, input frequency is the same as output frequency.

Load equipment:

- Combined kW rating: _____ kW
- AC voltage(s): _____ VAC and _____ VAC
- Frequency: _____ Hz

Utility service available on site (AC input to UPS):

- Voltage provided to UPS: _____ VAC
- Frequency: _____ Hz

External bypass switch (optional):

- Best Power model number: _____
- Break-Before-Make (BBM) or BBM
Make-Before-Break (MBB)? MBB

- 1. Verify that the total kW rating of the load equipment does not exceed the kW rating of the UPS.
- 2. Verify that the service panel will supply the proper voltage to the UPS.

NOTE: 480 VAC service may be used if the proper step-down transformer is placed between the service panel and the UPS. See [Table 1](#), note 4.

- 3. Find your frequency, UPS input voltage, and UPS output voltage combination in [Table 1](#). Call Best Power if you do not find your application in the table.
- 4. Use [Table 1](#) and [Table 2](#) to verify that you have the correct model and type of bypass switch.
- 5. Verify that the frequency supplied at the service panel (UPS input) matches the frequency required by the loads.

Table 1: UNITY/I Frequency, Voltage, and Bypass Switch Combinations

Frequency	UPS Input Voltage	UPS Output Voltage(s) to Load Equipment	External Bypass Switch Type ¹
50 Hz	380, 400, or 415 ²	220, 230, or 240	BBM only
60 Hz	220	127/220 ³	BBM only
	220	127	BBM only
	208 or 480 V source ⁴ 240 V input	120 and/or 240	BBM or MBB
50 Hz or 60 Hz	200	100 and/or 200	BBM or MBB
	220	110 and/or 220	BBM or MBB
	230	115 and/or 230	BBM or MBB
	208	208	BBM only
	208	120/208 ^{3,5}	BBM only
	208	120 and/or 240	BBM only
	240	208	BBM only
	240	120/208 ^{3,5}	BBM only
	240	120 and/or 240	BBM or MBB

¹ BBM = Break-Before-Make, MBB = Make-Before-Break. See the [Appendix](#) for more information.

² 380, 400 or 415 volt input requires optional internal transformer.

³ To install 127/220 out or 120/208 out, call Best Power's Worldwide Service or the nearest Best Power office for assistance.

⁴ With a step-up or step-down transformer. Use an isolation transformer with a 120/240 grounded center-tapped neutral output. Do **not** use a buck/boost transformer.

⁵ For 120/208 output, if the 208 volt loads can run at 240 volts, it is preferable to use 240 volts. The 120/240 volt output combination provides greater loading flexibility.

Table 2: Best Power External Bypass Switch Ratings and Applications

Bypass Model Number	Used with UPS Model(s)...	Maximum Operating Voltage	Amps Continuous (UL/cUL)	Amps Continuous (TÜV)	Maximum Amps	Frequency	Weight (lbs/kg)
BPE-02	UT3K, UT4K, UT5K	300	40	50	50	50/60 Hz	19.75/9
BPE-04	UT3K, UT4K, UT5K, UT8K	300	80	80	100	50/60 Hz	30/13.6

102 Equipment Dimensions

Figure 1: UPS Dimensions

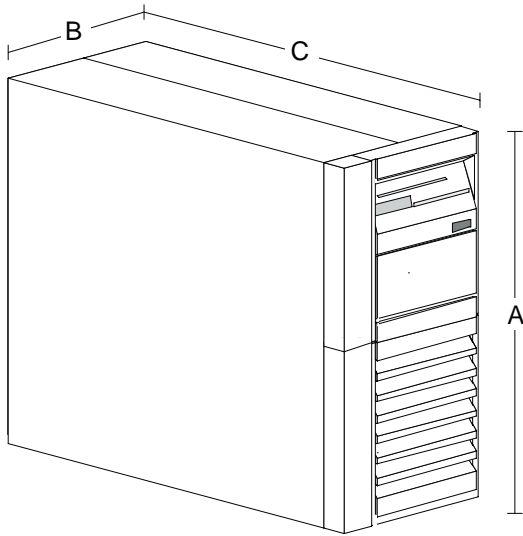


Table 3: UPS Dimensions

UPS Model	Height (A)	Width (B)	Depth (C)
UT3K UT4K UT5K	29 in. 737 mm	10.5 in. 267 mm	25.75 in.* 654 mm*
UT8K	31.5 in. 800 mm	12.75 in. 374 mm	32.5 in.* 826 mm*

*If the UPS has an external battery cabinet, add the depth of the battery connection box. For the 3K, 4K, and 5K, add 2.75 in. (70 mm); for the 8K, add 3.25 in. (83 mm).

Required Clearances:

Ventilation: 4 in. (102 mm) at the rear and top.
Service: 36 in. (910 mm) at the front.

Best Power recommends an additional service clearance of 36 in. (910 mm) at each side.

Table 4: Battery Cabinet Dimensions

Model	Height	Width	Depth
EBPUT1 EBPUT2 EBP1W EBP2W EBP3W	29 in. 737 mm	10.5 in. 267 mm	25.75 in. 654 mm
EBPUT6 EBPUT7 EBPUT21 EBPUT22	31.5 in. 800 mm	12.75 in. 324 mm	32.5 in. 826 mm

Required Clearances:

Ventilation: 4 in. (102 mm) at the rear and top.
Service: 36 in. (910 mm) at the front.

Best Power recommends an additional service clearance of 36 in. (910 mm) on the right side.

Figure 2: Battery Cabinet



Figure 3: External Bypass Switch Dimensions

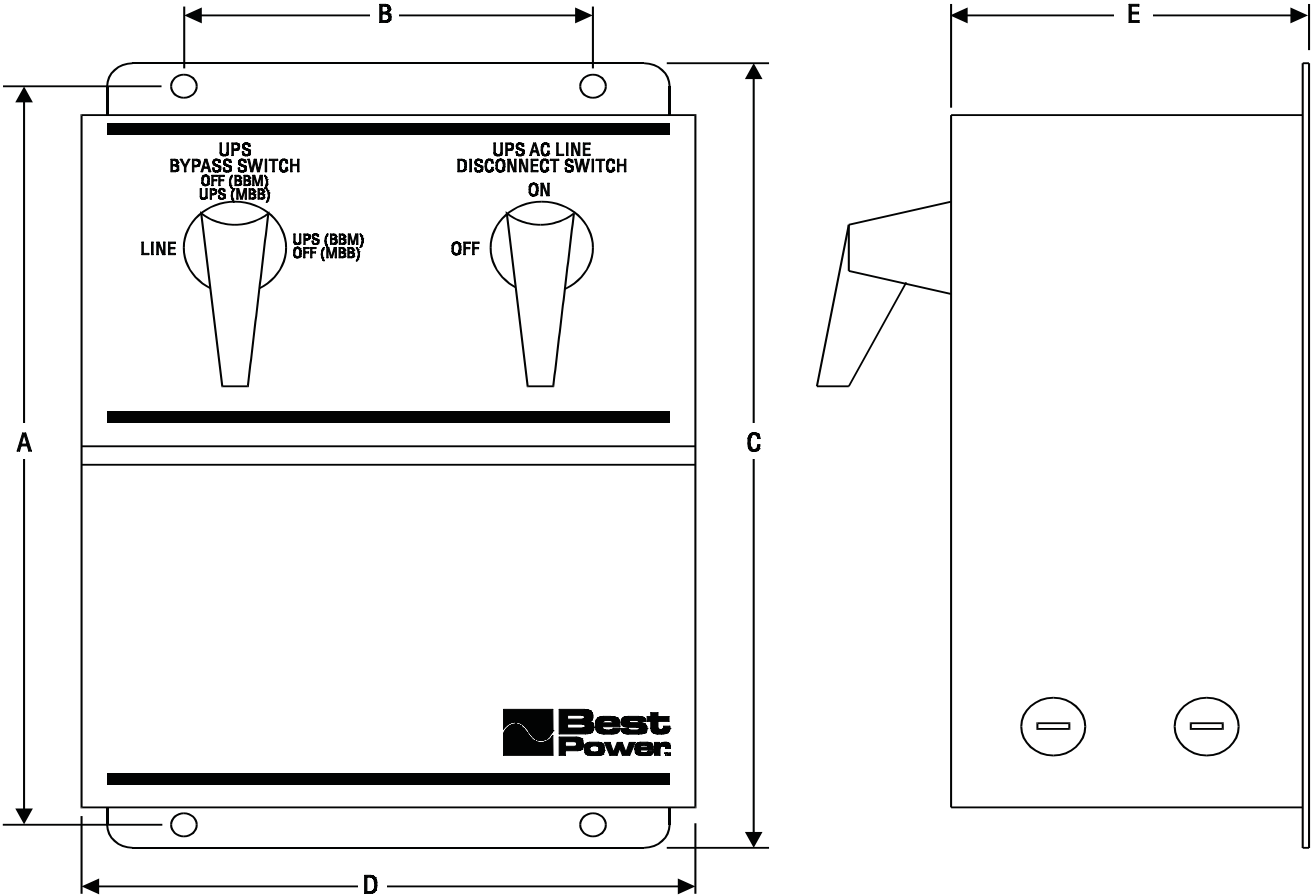


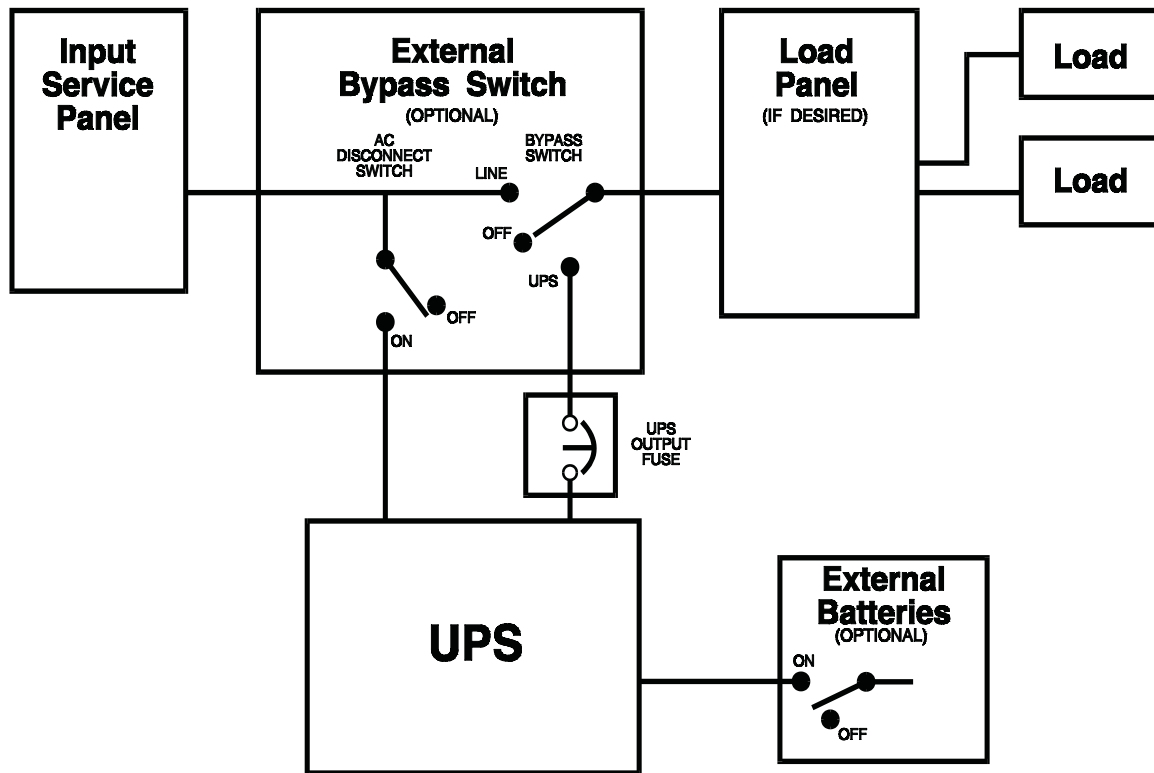
Table 5: External Bypass Switch Dimensions

External Bypass Switch	A	B	C	D	E
BPE-02	16 in. 406 mm	8 in. 203 mm	17 in. 432 mm	12 in. 305 mm	7 in. 178 mm
BPE-04	17 in. 432 mm	12 in. 305 mm	18 in. 457 mm	16 in. 406 mm	9 in. 229 mm

103 Finding a Location for the UPS

Figure 4 shows an overview of a typical installation for a hardwired UPS.

Figure 4: Typical Hardwired UPS Installation



- ❑ 1. Survey the site and locate the following:
 - Input service panel. The installing electrician should install the UPS on a dedicated circuit.
 - Load panel (if desired).
 - Load equipment.
- ❑ 2. Find an appropriate location for the UPS (and external bypass switch and battery cabinet, if applicable). Keep the following guidelines in mind.
 - Locate the UPS as close as possible to the load panel and loads. If there is more than 25 feet (7.6 m) of wiring between the UPS and the loads, noise and spikes can reappear in the electrical distribution system.
 - See [Section 102](#) for equipment dimensions.

- Provide proper UPS ventilation clearance and service clearance.
 - **Required ventilation clearance:** 4 inches (100 mm) at the rear and top.
 - **Required service clearance:** 36 inches (910 mm) at the front.
 - **Recommended additional service clearance:** 36 inches (910 mm) at each side, especially the left.
- Place the UPS in the proper environment.
 - **Ambient temperature:** 0° to 40° C (32° to 104° F). Battery life is longer if the temperature stays below 25° C (77° F).
 - **Relative humidity:** 0 to 95%.
 - **Maximum elevation:** 10,000 feet (3050 meters). Operating temperature drops 1° C per 1000 feet (305 meters) above sea level.
 - **Ventilation:** Air must be clean, dust-free, and free of corrosive chemicals and other contaminants. Air must be free to circulate around the UPS. Do not place the UPS in a sealed room or container.
- The external bypass switch must be mounted **within sight of the UPS**.
- The external battery pack(s) should be as close as possible to the UPS. See the information that came with your external battery pack(s).

Section 200: Starting the AC Installation

The UPS must be installed by a qualified electrician.

201 Positioning the Equipment

- ❑ 1. Put the UPS in place. Follow the guidelines in [Section 103](#).
- ❑ 2. If applicable, mount the external bypass switch **within sight of the UPS**.
- ❑ 3. An AC disconnect device must be located within sight of the UPS. The AC disconnect device should be one of the following:
 - An external bypass switch with an AC disconnect switch.
 - A separate AC disconnect switch.
 - The incoming AC line fuse box or panel, *if located within sight of the UPS*.

202 Sizing the Overcurrent Protection Devices and Wires

- ❑ 1. Table 6 provides the input current and the recommended U.S. circuit breaker size for each model, battery charger, and input voltage. Outside of the U.S., size the UPS input circuit breaker according to local codes. *If you might add the optional 15 amp battery charger in the future, you may wish to size the input circuit breaker and the wires accordingly now.*

NOTE: If you are installing a 120/208 or 127/220 output voltage combination, call Best Power’s Worldwide Service or the nearest Best Power office for instructions on sizing the input circuit breaker.

Table 6: Recommended Input Circuit Breaker*

UPS Model	Battery Charger	200V		208V		220V		230V		240V	
		Input Current	Circuit Breaker	Input Current	Circuit Breaker	Input Current	Circuit Breaker	Input Current	Circuit Breaker	Input Current	Circuit Breaker
UT3K	Standard	17 amps	25-amp	17 amps	25-amp	16 amps	20-amp	15 amps	20-amp	14 amps	20-amp
UT3K/15C	15 amp	21 amps	30-amp	21 amps	30-amp	20 amps	25-amp	19 amps	25-amp	18 amps	25-amp
UT4K	Standard	22 amps	30-amp	22 amps	30-amp	20 amps	25-amp	20 amps	25-amp	19 amps	25-amp
UT4K/15C	15 amp	27 amps	35-amp	26 amps	35-amp	24 amps	30-amp	23 amps	30-amp	22 amps	30-amp
UT5K	Standard	28 amps	35-amp	27 amps	35-amp	25 amps	35-amp	24 amps	30-amp	23 amps	30-amp
UT5K/15C	15 amp	32 amps	40-amp	31 amps	40-amp	29 amps	40-amp	28 amps	35-amp	27 amps	35-amp
UT8K	Standard	45 amps	60-amp	43 amps	60-amp	41 amps	60-amp	39 amps	50-amp	38 amps	50-amp
UT8K/15C	15 amp	49 amps	70-amp	47 amps	60-amp	45 amps	60-amp	43 amps	60-amp	41 amps	60-amp

* For optional 380/400/415 VAC input, see [Table 10](#) on page 21.

- 2. Size the UPS output overcurrent protection device (fuse or circuit breaker) per local code requirements. Do not exceed the ratings in Table 7. See [Table 11](#) on page 25 for UPS output current ratings. The table below shows the maximum permitted overcurrent protection device ratings; these are also the ratings recommended for U.S. applications.

Table 7: Maximum* Permitted UPS Output Overcurrent Protection Device Rating

Nominal UPS Output Voltage(s)	Maximum Overcurrent Protection Device Rating per Phase (Leg)			
	UT3K	UT4K	UT5K	UT8K
100 and/or 200	20 A	25 A	35 A	50 A
110 and/or 220	20 A	25 A	30 A	45 A
115 and/or 230	20 A	25 A	30 A	45 A
120 and/or 240	20 A	25 A	30 A	45 A
127 only	15 A	20 A	25 A	40 A
208 only	20 A	25 A	30 A	50 A
127/220	Call Best Power's Worldwide Service or the nearest Best Power office.			
120/208				

* Refer to [Table 11](#) on page 25 for UPS output current ratings and size the UPS output fuse or circuit breaker per local code requirements. **Do not exceed** the ratings listed in Table 7.

- 3. Size the circuit conductors.
- Table 8 lists the AWG and mm² wire size for each input circuit breaker shown in Table 6. The conductor size shall be no smaller than the 75° C wire size based on the ampacities given in Table 310-16 of the NEC, ANSI/NFPA 70-1993, and article 220.
 - All circuit conductors, including the neutral and equipment grounding (earth) conductors, must be the same size (ampacity) wire. **Code may require a larger wire size than shown in Table 8 because of temperature, number of conductors in the conduit, or long service runs.** Follow local code requirements.

Table 8: Minimum Recommended Wire Sizes

For this input circuit breaker size (amps)...	...use this size 75° C Copper Wire	
	AWG	mm ²
15, 20	12	3.31
25, 30	10	5.26
35, 40, 45, 50	8	8.36
60	6	13.30
70	4	21.15

- ❑ 4. Determine the correct wire size for the grounding electrode conductor.
 - The grounding electrode conductor must be a minimum of #8 AWG (8.36 mm²) 75° C wire, even if the circuit conductors are smaller, per NEC Table 250-94.
 - If the circuit conductors are #8 AWG (8.36 mm²) or larger, **Best Power requires** that the grounding electrode conductor be the same size (ampacity) as the UPS input circuit conductors.

- ❑ 5. Determine the wire lengths needed and the sizes, lengths, and types of conduit needed. Refer to the proper installation wiring diagram for your application (see Table 9). **Read the notes under the wiring diagram.**

Table 9: Choosing an Installation Wiring Diagram

If you have these...					..Use this Installation Wiring Diagram (and Output Wiring Diagram)
Frequency	UPS Input Voltage	UPS Output Voltage(s)	Output Wires	Bypass Type ¹	
50 Hz	220	220	L - N	BBM or MBB	Figure 7 (Figure 9K)
	220	110/220	L1, L2, N	BBM or MBB	Figure 5 (Figure 9G)
	240	240	L - N	BBM or MBB	Figure 7 (Figure 9M)
	380, 400, or 415 ²	220, 230, or 240	L - N	BBM only	Figure 8 (Figure 9K, 9L, or 9M)
60 Hz	220	127	L1, L2, N	BBM only	Figure 5 (Figure 9F)
	220	127/220 ³	L1, L2, N	BBM only	Call Best Power.
	220	220 (Mexico)	L1, L2, N	BBM only	Figure 5 (Figure 9D)
	220	110/220	L1, L2, N	BBM or MBB	Figure 5 (Figure 9E)
	220	220	L - N	BBM or MBB	Figure 7 (Figure 9J)
	208 or 480 source ⁴ , 240 input	120/240	L1, L2, N	BBM or MBB	Figure 6 (Figure 9A)
50 Hz or 60 Hz	200	200	L - N	BBM or MBB	Figure 7 (Figure 9I)
	200	100/200	L1, L2, N	BBM or MBB	Figure 5 (Figure 9C)
	208	208	L1, L2, N	BBM only	Figure 5 (Figure 9B)
	208	120/208 ^{3,5}	L1, L2, N	BBM only	Call Best Power.
	208	120/240	L1, L2, N	BBM only	Figure 5 (Figure 9A)
	230	230	L - N	BBM or MBB	Figure 7 (Figure 9L)
	230	115/230	L1, L2, N	BBM or MBB	Figure 5 (Figure 9H)
	240	208	L1, L2, N	BBM only	Figure 5 (Figure 9B)
	240	120/208 ^{3,5}	L1, L2, N	BBM only	Call Best Power.
	240	120/240	L1, L2, N	BBM or MBB	Figure 5 (Figure 9A)

¹ BBM = Break-Before-Make, MBB = Make-Before-Break. See the [Appendix](#) for more information.

² 380, 400 or 415 volt input requires optional internal transformer.

³ To install the 127/220 output or 120/208 output voltage combination, call Best Power's Worldwide Service or the nearest Best Power office for assistance.

⁴ With a step-up or step-down transformer. Use an isolation transformer with a 120/240 grounded center-tapped neutral output. Do **not** use a buck/boost transformer.

⁵ For 120/208 output, if the 208 volt loads can run at 240 volts, it is preferable to use 240 volts. The 120/240 volt output combination provides greater loading flexibility.

Section 300: AC Installation

The UPS must be installed by a qualified electrician.

 **CAUTION!**

- A. All UPS units contain hazardous AC and DC voltages. Because of these voltages, a qualified electrician must install the UPS and AC line service. The electrician must install AC line according to local and national codes.
- B. Before installing, maintaining, or servicing the UPS, always remove or shut off all sources of AC and DC power and shut off the UPS. Disconnect AC line input at the service panel, turn the main DC switch on the battery pack(s) to “OFF” (if you have external batteries), and turn the UPS key switch to “OFF” to make sure it will not supply output voltage.
- C. Whenever AC and/or DC voltage is applied, there will be AC voltage at the UPS terminals. The UPS can supply power from AC line or from its batteries. To avoid equipment damage or personal injury, always assume that there may be voltage at the UPS terminals.
- D. Before you install the external bypass switch, make sure that both the UPS Bypass Switch and the AC Line Disconnect Switch are turned to “OFF.”
- E. To reduce the risk of fire or electric shock, install the UPS and the batteries in a temperature-controlled and humidity-controlled indoor area free of conductive contaminants. See Section 103 for operating environment specifications.

301 Removing the Covers and Knock Outs

 **CAUTION!**

To prevent electrical shock or damage to your equipment, make sure the key switch inside the front door of the UPS is “OFF” before you remove the UPS cover. The circuit breaker or AC disconnect switch must be turned off at the AC input service panel.

- 1. Remove the UPS side covers. To do this, remove the seven screws at the sides and top of the UPS. Then, lift each cover *straight up* and off.
- 2. At the UPS back panel, remove knock outs for AC Input and AC Output.
- 3. Remove the *lower* cover from the external bypass switch (if applicable).
- 4. At the external bypass switch, remove knock outs for AC Line Input, AC to UPS Input, AC from UPS Output, and AC to Loads.

302 Installing the Conduit and Wiring

- ❑ 1. Install the conduit and conduit adapters. Refer to the proper installation wiring diagram for your application (see [Table 9](#), page 10). Read the notes under the wiring diagram.
 - **The AC Line Input and AC Line Output conductors must be run through separate conduits.**
 - All UPS output circuits must be installed in dedicated conduit systems and not shared with other electrical circuits.



CAUTION!

Before installing the external bypass switch, make sure that the UPS Bypass Switch and the UPS AC Line Disconnect Switch are both in the “OFF” position.

- ❑ 2. Make all of the terminal connections inside the external bypass switch (if applicable).
 - Refer to the label on the back of the bypass switch’s lower cover.
 - Refer to the proper installation wiring diagram for your application (see [Table 9](#), page 10).
 - Tighten all connections securely.



CAUTION!

Make sure that the keyswitch inside the front door of the UPS is in the “OFF” position.

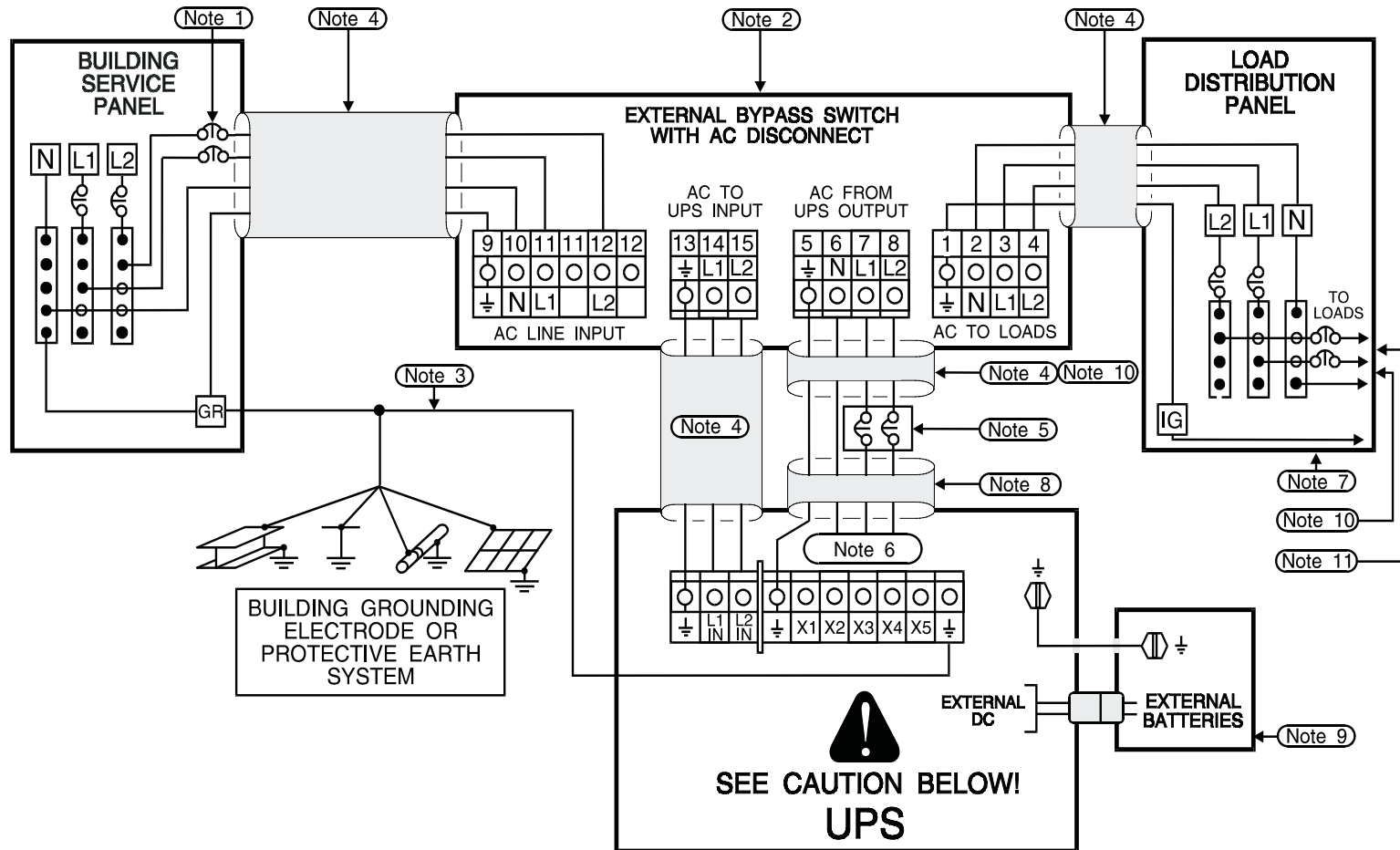
Make sure that all sources of AC power are shut off (including AC power to the load distribution panel, if applicable).

- ❑ 3. **At the UPS terminal strip, connect the neutral-to-ground (neutral-to-earth) wire to the proper output terminal before making any other connections to the UPS.**
 - For the proper neutral-to-ground (neutral-to-earth) output terminal connection, find your UPS output configuration in [Figure 9](#).
 - The neutral-to-ground (neutral-to-earth) wire is a green and yellow wire labeled WIA-0424. One end of the wire is already connected to ground (earth) on the UPS terminal strip.

- 4. Make the UPS terminal strip connections and all other AC wiring connections.
 - Refer to the proper installation wiring diagram for your application (see [Table 9](#), page 10). **Read the notes below the wiring diagram carefully.**
 - See [Figure 9](#) for proper UPS output terminations.
 - Make all terminal strip connections as shown on the proper wiring diagrams.
 - Good grounding (earth) connections are necessary to reduce electrical noise and for safe operation of the UPS and loads. Follow the grounding guidelines on the installation wiring diagram.
 - **The loads must be balanced on the UPS output.** See [Table 11](#) on page 25, for maximum output current per phase (leg).

**Figure 5: Wiring Diagram for UT3K, UT4K, UT5K, and UT8K UPS
with External Bypass Switch (L1, L2, N)**

- 50 or 60 Hz: 200 Input - 100/200 Output
- 50 or 60 Hz: 208 Input - 120/240 Output
- 50 or 60 Hz: 208 Input - 208 Output
- 50 or 60 Hz: 220 Input - 110/220 Output
- 60 Hz: 220 Input - 220 Output (Mexico)
- 60 Hz: 220 Input - 127 Output
- 50 or 60 Hz: 230 Input - 115/230 Output
- 50 or 60 Hz: 240 Input - 120/240 Output
- 50 or 60 Hz: 240 Input - 208 Output



 **CAUTION!**

The AC output circuit is considered as a separately-derived source. To ground this circuit, the installing electrician **MUST** connect the neutral-to-ground wire (the green and yellow wire labeled WIA-0424) to the proper output terminal before making any other connections to the UPS; for the proper output terminal connection, find your output configuration in [Figure 9](#) on pages 22 - 24.

Notes for Figure 5

NOTE 1: See [Table 6](#) on page 8 for the recommended input circuit breaker size. The customer must provide overcurrent protection per National Electrical Code (NEC) Article 240 or local code requirements.

NOTE 2: The UPS bypass switch/AC disconnect must be installed within sight of the UPS. To properly install, complete the voltage and phase check procedure in [Section 304](#).

NOTE 3: The customer must provide and install this ground (earth) connection per NEC Sections 250-5(d), 250-26, 250-91 and 250-92, or local code requirements. This grounding electrode conductor must be at least #8 AWG (8.36 mm²) per NEC table 250-94. If the UPS input circuit conductors are larger than #8 AWG (8.36 mm²), Best Power requires the grounding electrode conductor to be the same size (ampacity) as the largest UPS input circuit conductor. See NEC Section 110-3(b). Conduit is not considered an acceptable grounding electrode conductor. Best Power recommends that you do **not** route the grounding electrode conductor through metallic conduit. This conductor may require protection from physical damage according to local code requirements.

NOTE 4: All AC circuit conductors, including the neutral and equipment grounding conductors, must be the same size (ampacity) and have the same rating (75° C copper wire) and be sized according to the input protection device. The UPS input and UPS output conductors must be run through separate conduits.

NOTE 5: The customer must provide output overcurrent protection. See NEC Section 240-21 or local requirements. See [Table 7](#) on page 9 for maximum output overcurrent protection device rating and [Table 11](#) on page 25 for maximum output current per phase (leg).

NOTE 6: See [Figure 9](#) for proper output wiring termination and neutral-to-ground (neutral-to-earth) connection.

NOTE 7: For maximum protection against electrical noise, use isolated ground receptacles. See NEC Section 250-74, Exception #4, or local code requirements.

NOTE 8: See [Section 102](#) in this manual for installation dimensions before installing the UPS. Use flexible metal conduit on the UPS or the external battery cabinet if either must be moved.

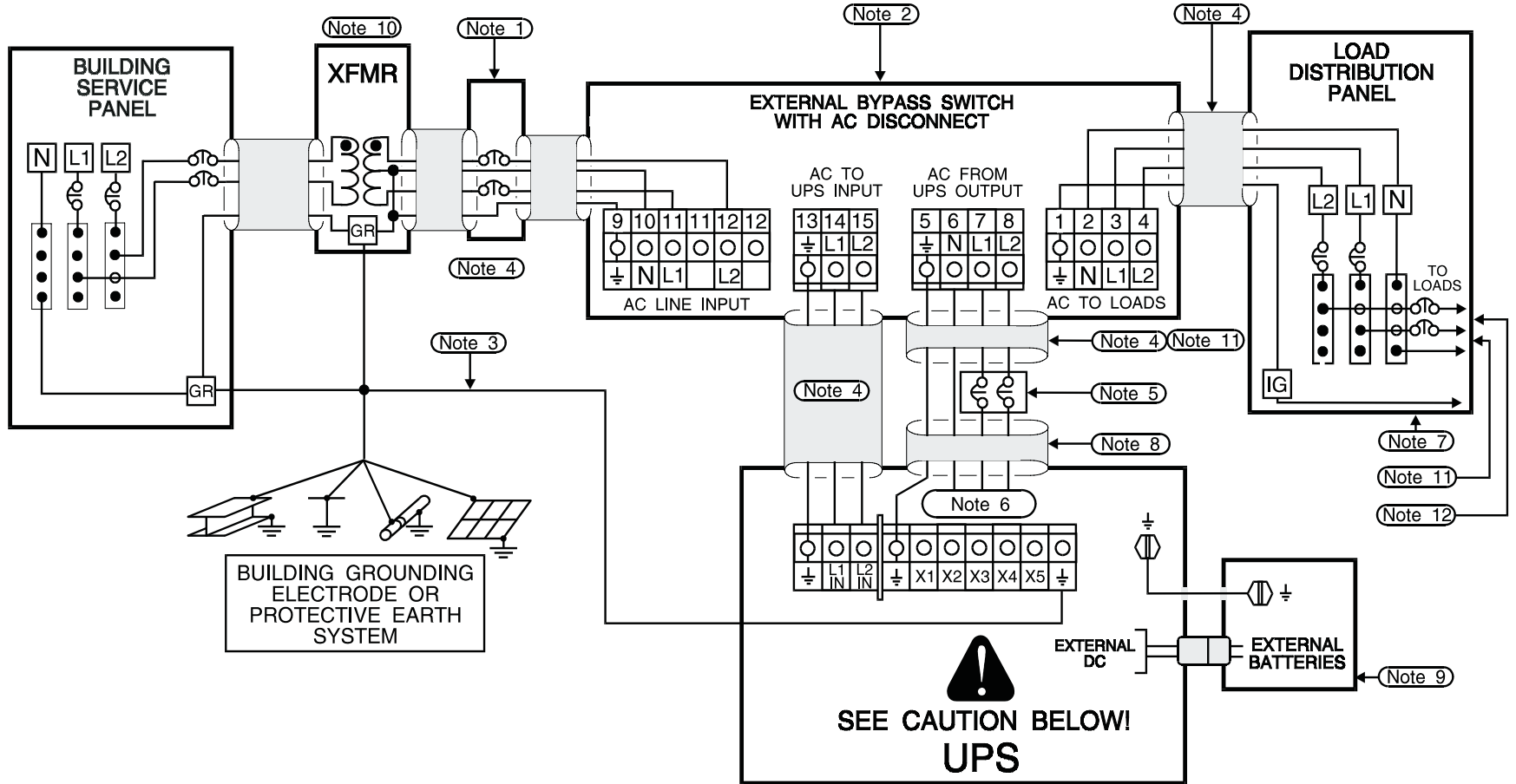
NOTE 9: External UPS batteries are optional. See the information that came with your battery pack for installation procedures.

NOTE 10: UPS output circuits shall be installed in dedicated conduit systems and not shared with other electrical circuits.

NOTE 11: The output load current must be balanced. See [Table 11](#) on page 25 for the maximum output current per phase (leg). The load fuse or circuit breaker should be sized to match the load current requirements.

Figure 6: Wiring Diagram for UT3K, UT4K, UT5K, and UT8K UPS with External Bypass Switch and External Input Isolation Transformer

60 Hz: 208 or 480 VAC Source with Input Step-Up or Step-Down Isolation Transformer
 240 UPS Input - 120/240 UPS Output



CAUTION!

The AC output circuit is considered as a separately-derived source. To ground this circuit, the installing electrician **MUST** connect the neutral-to-ground wire (the green and yellow wire labeled WIA-0424) to the proper output terminal before making any other connections to the UPS; for the proper output terminal connection, see [Figure 9](#) on pages 22 - 24.

Notes for Figure 6

NOTE 1: See Table 6 on page 8 for the recommended input circuit breaker size. The customer must provide overcurrent protection per National Electrical Code (NEC) Article 240 or local code requirements.

NOTE 2: The UPS bypass switch/AC disconnect must be installed within sight of the UPS. To properly install, complete the voltage and phase check procedure in [Section 304](#).

NOTE 3: The customer must provide and install this ground (earth) connection per NEC Sections 250-5(d), 250-26, 250-91 and 250-92, or local code requirements. This grounding electrode conductor must be at least #8 AWG (8.36 mm²) per NEC table 250-94. If the UPS input circuit conductors are larger than #8 AWG (8.36 mm²), Best Power requires the grounding electrode conductor to be the same size (ampacity) as the largest UPS input circuit conductor. See NEC Section 110-3(b). Conduit is not considered an acceptable grounding electrode conductor. Best Power recommends that you do **not** route the grounding electrode conductor through metallic conduit. This conductor may require protection from physical damage according to local code requirements.

NOTE 4: All AC circuit conductors, including the neutral and equipment grounding conductors, must be the same size (ampacity) and have the same rating (75° C copper wire) and be sized according to the input protection device. The UPS input and UPS output conductors must be run through separate conduits.

NOTE 5: The customer must provide output overcurrent protection. See NEC Section 240-21 or local requirements. See [Table 7](#) on page 9 for maximum output overcurrent protection device rating and [Table 11](#) on page 25 for maximum output current per phase (leg).

NOTE 6: See [Figure 9](#) for proper output wiring termination and neutral-to-ground (neutral-to-earth) connection.

NOTE 7: For maximum protection against electrical noise, use isolated ground receptacles. See NEC Section 250-74, Exception #4.

NOTE 8: See [Section 102](#) in this manual for installation dimensions before installing the UPS. Use flexible metal conduit on the UPS or the external battery cabinet if either must be moved.

NOTE 9: External UPS batteries are optional. See the information that came with your battery pack(s) for installation procedures.

NOTE 10: For 208 VAC, use a step-up transformer. For 480 VAC, use a step-down transformer. Use an isolation transformer with a 120/240 grounded center-tapped neutral output. *Do not use a buck/boost transformer.*

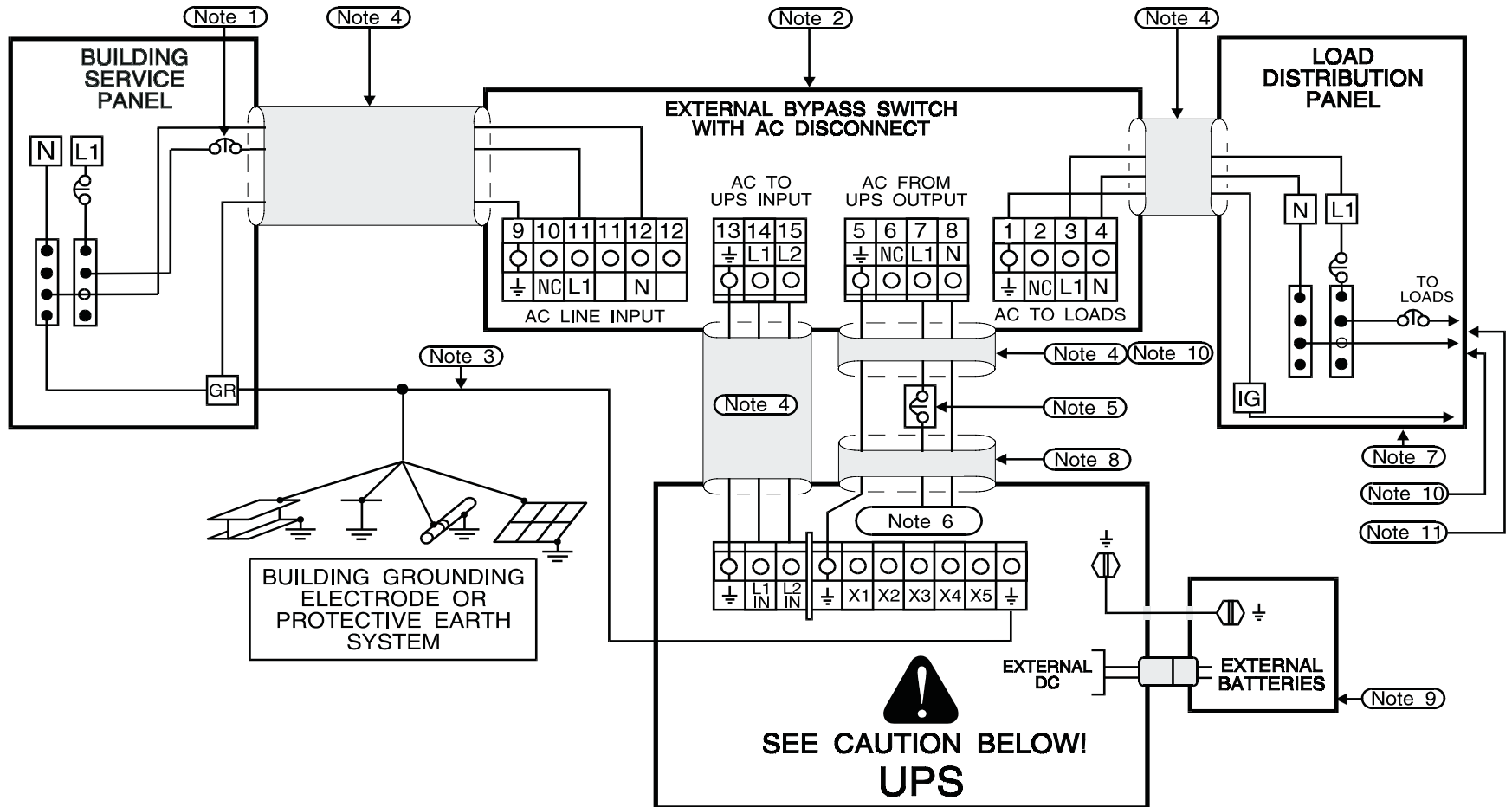
NOTE 11: UPS output circuits shall be installed in dedicated conduit systems and not shared with other electrical circuits.

NOTE 12: The output load current must be balanced. See [Table 11](#) on page 25 for the maximum output current per phase (leg). The load fuse or circuit breaker should be sized to match the load current requirements.

Figure 7: Wiring Diagram for UT3K, UT4K, UT5K, and UT8K UPS with External Bypass Switch (L - N High Voltage Only)

- 50 or 60 Hz: 200 Input - 200 Output
- 50 or 60 Hz: 220 Input - 220 Output

- 50 or 60 Hz: 230 Input - 230 Output
- 50 Hz: 240 Input - 240 Output



CAUTION!

The AC output circuit is considered as a separately-derived source. To ground this circuit, the installing electrician **MUST** connect the neutral-to-ground (neutral-to-earth) wire (the green and yellow wire labeled WIA-0424) to the proper output terminal before making any other connections to the UPS; for the proper output terminal connection, find your output configuration in [Figure 9](#) on pages 22 - 24.

Notes for Figure 7

NOTE 1: See [Table 6](#) on page 8 for the recommended input circuit breaker size. The customer must provide overcurrent protection per National Electrical Code (NEC) Article 240 or local code requirements.

NOTE 2: The UPS bypass switch/AC disconnect must be installed within sight of the UPS. To properly install, complete the voltage and phase check procedure in [Section 304](#).

NOTE 3: The customer must provide and install this ground (earth) connection per NEC Sections 250-5(d), 250-26, 250-91 and 250-92, or local code requirements. This grounding electrode conductor must be at least #8 AWG (8.36 mm²) per NEC table 250-94. If the UPS input circuit conductors are larger than #8 AWG (8.36 mm²), Best Power requires the grounding electrode conductor to be the same size (ampacity) as the largest UPS input circuit conductor. See NEC Section 110-3(b). Conduit is not considered an acceptable grounding electrode conductor. Best Power recommends that you do **not** route the grounding electrode conductor through metallic conduit. This conductor may require protection from physical damage according to local requirements.

NOTE 4: All AC circuit conductors, including the neutral and equipment grounding conductors, must be the same size (ampacity) and have the same rating (75° C copper wire) and be sized according to the input protection device. The UPS input and UPS output conductors must be run through separate conduits.

NOTE 5: The customer must provide output overcurrent protection. See NEC Section 240-21 or local requirements. See [Table 7](#) on page 9 for maximum output overcurrent protection device rating and [Table 11](#) on page 25 for maximum output current per phase (leg).

NOTE 6: See [Figure 9](#) for proper output wiring termination and neutral-to-ground (neutral-to-earth) connection.

NOTE 7: For maximum protection against electrical noise, use isolated ground receptacles. See NEC Section 250-74, Exception #4, or local code requirements.

NOTE 8: See [Section 102](#) in this manual for installation dimensions before installing the UPS. Use flexible metal conduit on the UPS or the external battery cabinet if either must be moved.

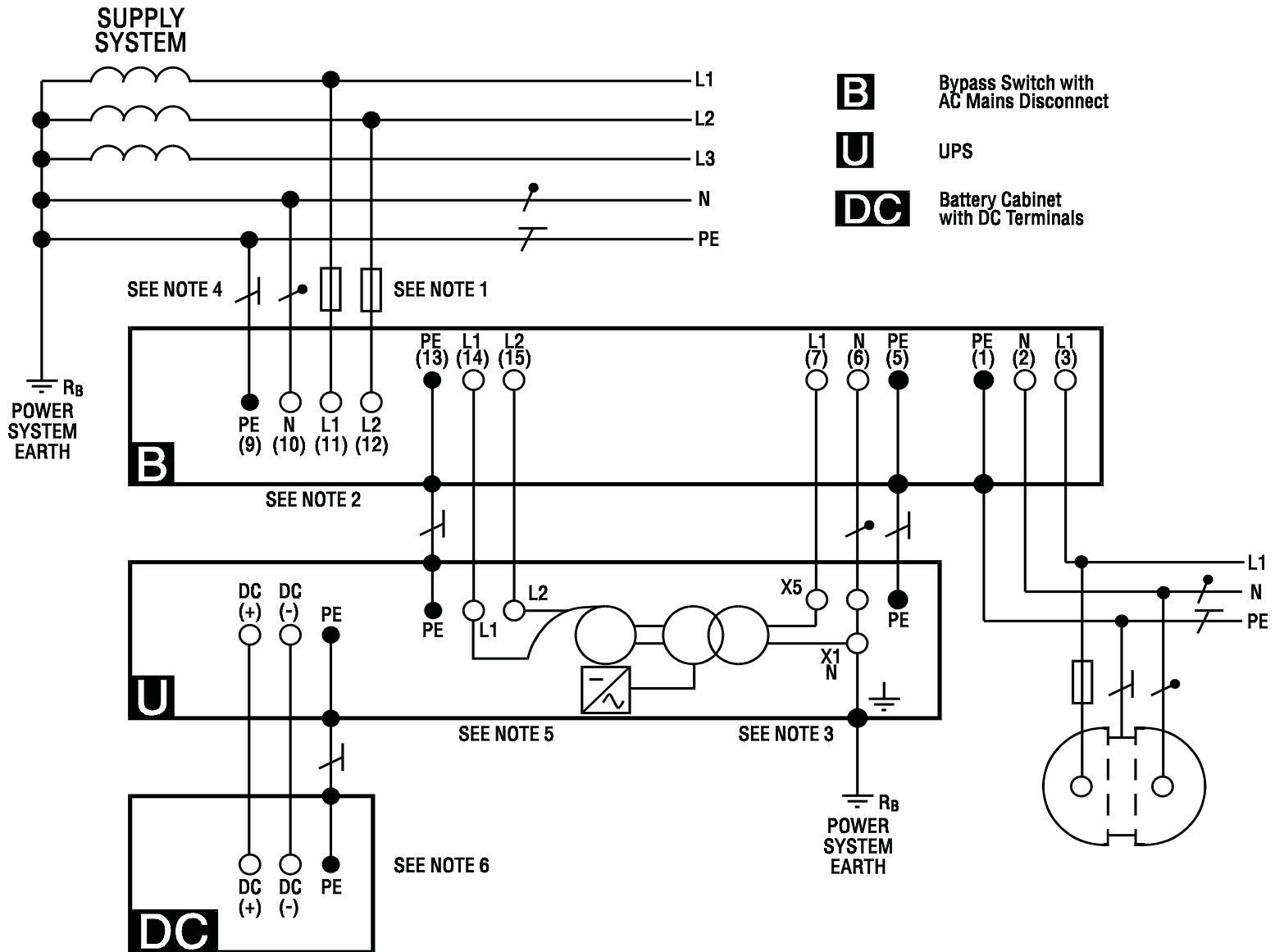
NOTE 9: External UPS batteries are optional. See the information that came with your battery pack(s) for installation procedures.

NOTE 10: UPS output circuits shall be installed in dedicated conduit systems and not shared with other electrical circuits.

NOTE 11: The output load current must be balanced. See [Table 11](#) on page 25 for the maximum output current per phase (leg). The load fuse or circuit breaker should be sized to match the load current requirements.

Figure 8: Wiring Diagram for UT3K, UT4K, UT5K and UT8K UPS with Optional 380/400/415 VAC Input

50 Hz: 380 or 400 or 415 Input - 220 or 230 or 240 Output



CAUTION!

The AC output circuit is considered as a separately-derived source. To ground this circuit, the installing electrician **MUST** connect the neutral-to-ground (neutral-to-earth) wire (the green and yellow wire labeled WIA-0424) to the proper output terminal before making any other connections to the UPS; for the proper output terminal connection, find your output configuration in [Figure 9](#) on pages 22 - 24.

Notes for Figure 8:

NOTE 1: Provide input protection per local code requirements. See Table 10 below for input current ratings.

NOTE 2: The UPS bypass switch/AC disconnect must be installed within sight of the UPS. To properly install, see [Section 300](#) of this manual.

NOTE 3: The customer must provide and install the power system earth connection per local code requirements. The power system earth conductor must be at least #8 AWG (8.36 mm²). If the UPS input circuit conductors are larger than #8 AWG (8.36 mm²), Best Power requires the power system earth conductors to be the same size (ampacity) as the largest UPS input circuit conductor. Conduit is not considered an acceptable power system earth conductor. Best Power recommends that you do not route the power system earth conductor through metallic conduit. The power system earth conductor may require protection from physical damage per local code requirements.

NOTE 4: All AC circuit conductors, including the neutral and equipment grounding conductors, must be the same size (ampacity) and have the same rating (75° C copper wire) and be sized according to the input protection device. AC-to-UPS input and AC-from-UPS output conductors must be run through separate conduits.

NOTE 5: The UPS requires 102 mm (4 inches) clearance at the top and rear. A service clearance of 910 mm (36 inches) is required at the front of the UPS and is recommended at the sides. Use flexible metal conduit on the UPS or external battery cabinet if either must be moved to obtain required service clearance.

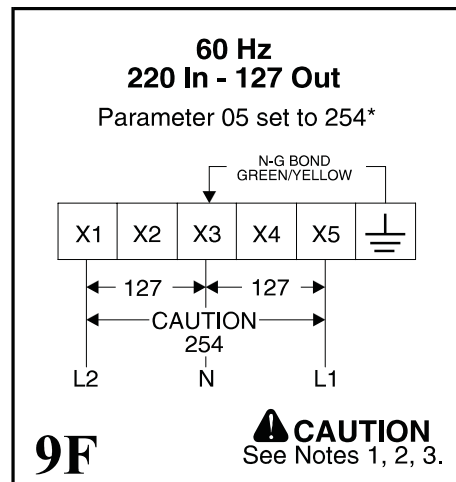
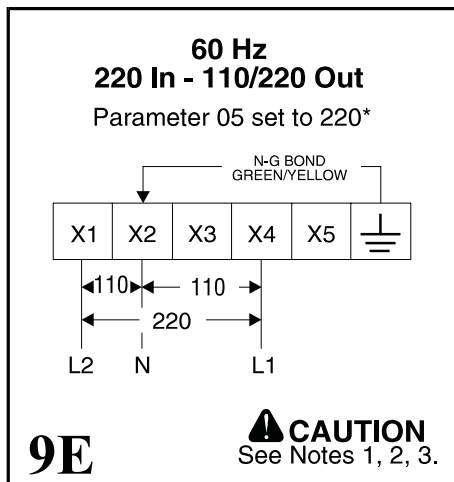
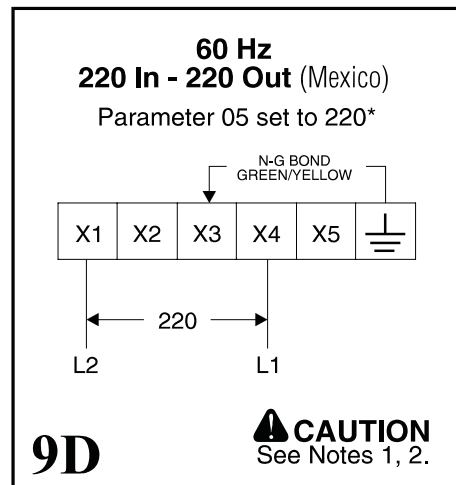
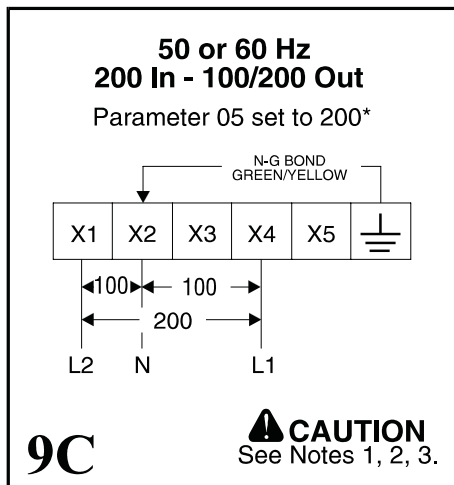
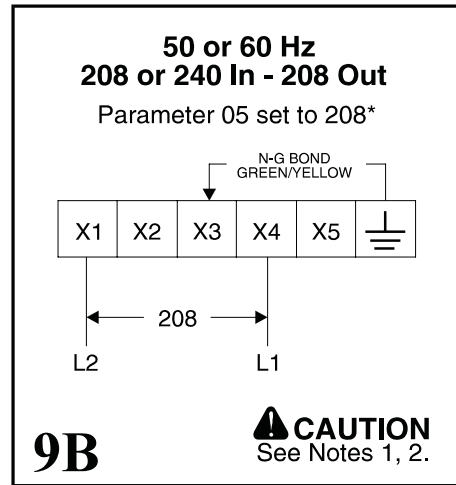
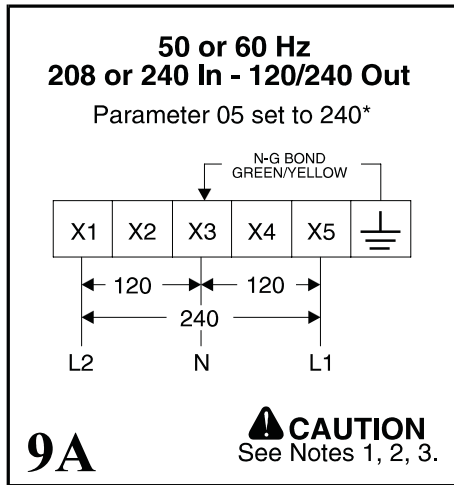
NOTE 6: External UPS batteries are optional. See the information that came with your battery pack(s) for installation procedures.

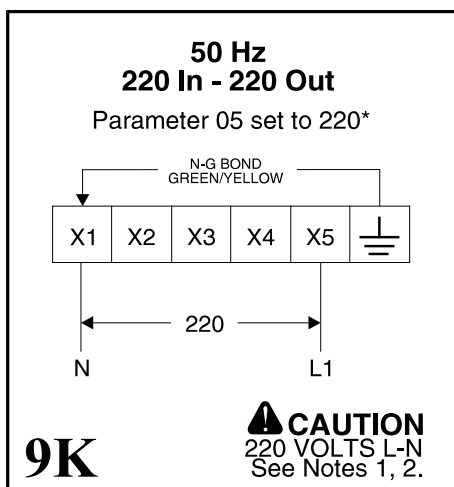
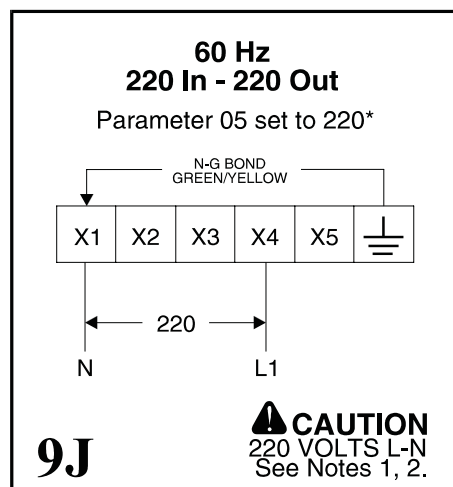
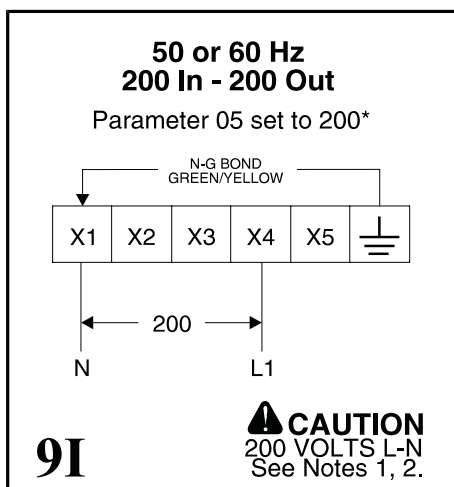
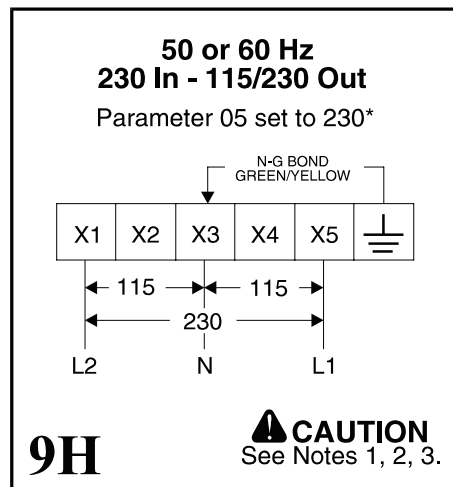
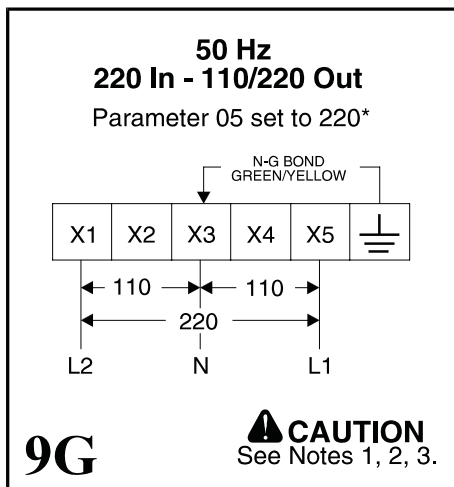
Table 10: Recommended Input Fuse for Models with Optional 380/400/415 VAC Input

UPS Input VAC	Battery Charger	UT3K		UT4K		UT5K		UT8K	
		Input Amps	Fuse	Input Amps	Fuse	Input Amps	Fuse	Input Amps	Fuse
380	Standard	9.1	10 A	12	16 A	15	16 A	24	25 A
	15 Amp	11	16 A	14	16 A	17	20 A	26	32 A
400	Standard	8.6	10 A	11	16 A	14	16 A	23	25 A
	15 Amp	11	16 A	13	16 A	16	16 A	25	25 A
415	Standard	8.3	10 A	11	16 A	13	16 A	22	25 A
	15 Amp	10	10 A	13	16 A	15	16 A	24	25 A

Figure 9: UPS Output Wiring Connections

Find the output wiring configuration (Figure 9A - 9P) for your UPS input voltage and frequency and UPS output voltage(s). Make the neutral-to-ground (neutral-to-earth) connection first, then wire the output from the UPS as shown.

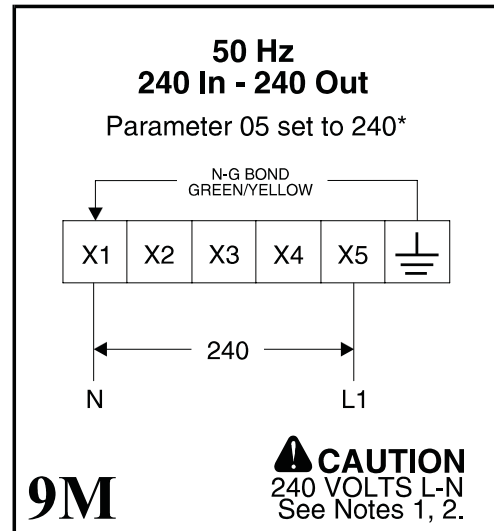
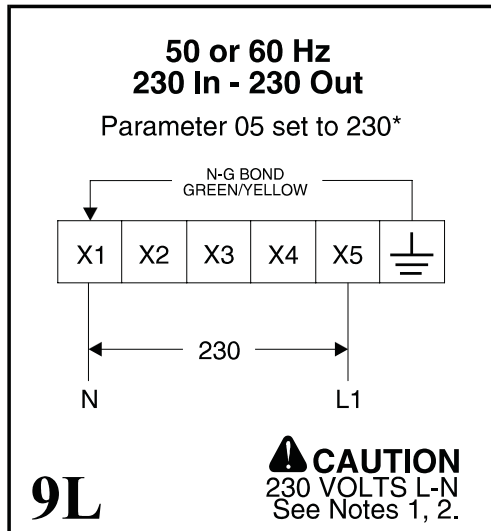




Notes for Figures 9A - 9K

- NOTE 1:** Connect the UPS' green and yellow neutral-to-ground (neutral-to-earth) wire (N-G bond) to the UPS output terminal indicated.
- NOTE 2:** See [Table 11](#), page 25 for maximum output current ratings.
- NOTE 3:** For dual-phase outputs with the same voltage, balance the load current between phases (legs). See [Table 11](#), page 25 for output current ratings.

* See [Section 304, step 5](#), for instructions on setting the Output Voltage Reference parameters.



Notes for Figure 9L and 9M

NOTE 1: Connect the UPS' green and yellow neutral-to-ground (neutral-to-earth) wire (N-G bond) to the UPS output terminal indicated.

NOTE 2: See [Table 11](#) on page 25 for maximum output current ratings.

* See [Section 304, step 5](#), for instructions on setting the Output Voltage Reference parameter.

303 Installing the Overcurrent Protection Devices

1. Install the UPS input circuit breaker at the service panel. See [Table 6](#) on page 8 and your installation wiring diagram.
2. Install the UPS output overcurrent protection device at the UPS output. See [Table 7](#) on page 9 and your installation wiring diagram.
3. Install the load current circuit breakers or fuses.
 - The load current per phase (leg) must not exceed the value listed in [Table 11](#).
 - Size per local code requirements.

Table 11: Maximum Output Current per Phase (Leg)

Nominal UPS Output Voltage(s)	Maximum Output Current per Phase (Leg) in Amperes			
	UT3K	UT4K	UT5K	UT8K
100 and/or 200	15 A	20 A	25 A	40 A
110 and/or 220	14 A	18 A	23 A	36 A
115 and/or 230	13 A	17 A	22 A	35 A
120 and/or 240	13 A	17 A	21 A	33 A
127 only	12 A	16 A	20 A	31A
208 only	14 A	19 A	24 A	38 A
120/208	Call Best Power's Worldwide Service or the nearest Best Power office.			
127/220				

304 Voltage and Phase Check

NOTE: If the UPS has external batteries, see the instructions that came with your external battery pack before doing the voltage and phase check.

When you have made all of the terminal strip connections, complete this voltage and phase check. During the voltage and phase check, you will also set the Output Voltage Reference parameter.



CAUTION!

Before you switch the UPS BYPASS SWITCH from “UPS” to “LINE,” follow the steps below to check for correct operation.

- 1. Make sure that the load equipment is switched off.
- 2.
 - a. Make sure that the main circuit breaker at the load service panel is off, or make sure that the load equipment cannot receive power from the UPS.
 - b. Turn the UPS Bypass Switch to “UPS.”
 - c. At the service panel, switch on AC input power to the UPS.
 - d. Turn the UPS AC Line Disconnect switch to “ON.”
- 3. If you have one or more external battery pack(s) with a main DC switch, hold down the precharge switch on each cabinet for five seconds. Then pull the main DC key switch(es) out, as indicated in Section 101 of the User Manual.
- 4. Turn the key switch inside the UPS front door to “AUTO.”

- 5. **In order for the UNITY/I to provide the desired output voltage(s), you must program the Output Voltage Reference parameter (Parameter 05).**

The Output Voltage Reference parameter programs the output voltage that the UPS will provide at its output terminals. To program Parameter 05, follow the steps below.

- a. Determine the proper Output Voltage Reference parameter setting for your application. See Table 12.

Table 12: Output Voltage Reference Settings

If you have wired the UPS for this output voltage...	...set Parameter 05 (Output Voltage Reference) to this setting:
100 and/or 200	200
110 and/or 220	220
115 and/or 230	230
120 and/or 240	240
208 or 120/208	208
127	254
127/220	220

- b. Simultaneously hold down the [CANCEL] and [RUNTIME] keys on the unit’s front panel for two seconds; release the keys when the four-digit display reads *P-00*.
- c. Press [CANCEL]. The display should read *0*.
- d. Change the display reading to *377*. Use the [%LOAD] key to increase the value and the [VOUT] key to decrease the value.
- e. Once the display reads *377*, press [RUNTIME]. The display should read *!*.
- f. Press [CANCEL]. The display should read *P-00*.
- g. Press [%LOAD] until the display reads *P-05*. If you inadvertently step past *P-05*, press [VOUT] to step back.
- h. Once the display reads *P-05*, press [CANCEL]. If the number displayed is the correct output voltage setting for your application (see Table 12), skip to step “k” below. If not, continue with step “i.”
- i. To change the output voltage setting, press [%LOAD] to increase the setting and [VOUT] to decrease the setting.
- j. Once the display shows the proper output voltage setting for your application, press [RUNTIME] to enter the new value. The new setting will remain on the display.
- k. To escape parameter mode, press [VLINE] twice.

- 6. At the external bypass switch, make sure that the voltage from AC line to the bypass switch is close to the voltage from the UPS to the loads. Use a true RMS voltmeter to measure the voltage between the points on the bypass switch terminal strip that are listed below.

The voltages written in the first column should be similar to the voltages written in the second column. **If the voltages are more than a few volts apart, check the connections at the terminal strip and correct any wiring problems** (exceptions: applications noted below, applications where UPS input and output voltages differ, such as 208 in - 240 out). If you need assistance, call Best Power’s Worldwide Service or the nearest Best Power office.

<u>AC Line Input</u>	<u>AC from UPS Output</u>
• L1 - L2 11 to 12 _____	7 to 8 _____
• N - L1 10 to 11* _____	6 to 7* _____
• N - L2 10 to 12* _____	6 to 8* _____

* For some installations, there is no connection at terminal 10 or terminal 6.

- 7. If you have a Break-Before-Make (BBM) bypass switch, go to step 10.
- 8. If you have a Make-Before-Break (MBB) bypass switch, make sure that the AC voltages from the UPS output and the AC line input are in phase. Measure the AC voltage between the points on the bypass switch terminal strip listed below.

These readings must not be more than 15 VAC. If they are, call Best Power’s Worldwide Service or the nearest Best Power office.

• L1 - L1 7 to 11 = _____ VAC	
• L2 - L2 8 to 12 = _____ VAC	(some applications)

- 9. Measure the AC voltage between the following points on the bypass switch terminal strip.

This reading must not be more than 1 VAC. If it is, call Best Power’s Worldwide Service or the nearest Best Power office.

• N - N 6 to 10 = _____ VAC	(if you used wiring diagram Figure 5, 6, or 8)
• N - N 8 to 12 = _____ VAC	(if you used wiring diagram Figure 7)

- 10. Once all of your readings in the voltage and phase check are acceptable, do the following:
 - a. Turn the UPS key switch to “OFF.”
 - b. Turn the UPS AC Line Disconnect Switch to “OFF.”
 - c. Turn the UPS Bypass Switch to “OFF.”
 - d. If you have one or more external battery cabinet(s), push in the main DC key switch(es).
 - e. Reattach the covers to the UPS and bypass switch.

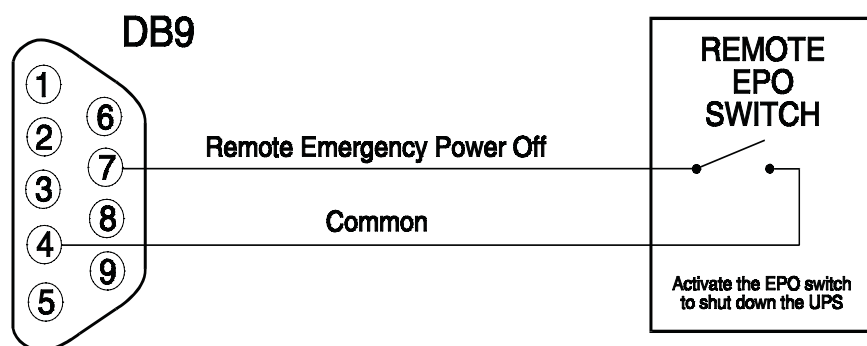
You have finished installing the UNITY/I. Read [Section 400](#), “Additional Requirements.” To start the unit, see Section 100 in the *UNITY/I User Manual*.

Section 400: Additional Requirements

NOTE: The remote Emergency Power Off (EPO) switch and service panel warning label described below are required to meet TÜV, per EN 50091-1 and EN 60-950.

- **Remote Emergency Power Off (EPO)** - The EPO switch is a *requirement* for most 50 Hz installations (see the **NOTE** above). The UPS must have a remote Emergency Power Off (EPO) switch which can shut off the UPS **output** in an emergency, de-energizing the loads. The EPO switch must have a set of dedicated contacts that can short pin 7 to pin 4 on the UPS DB9S communication port. To activate an EPO shutdown, short pin 7 to pin 4 (see Figure 10). To reset the UPS after an EPO shutdown, use the EPO reset button located inside the unit's front door. See the Appendix of the *UNITY/I User Manual* for more information.

Figure 10: Remote Emergency Power Off (EPO) Switch



- **Service Panel Warning Label** - A warning label like the one shown in Figure 11 has been supplied with your installation manual. For most 50 Hz installations (see the **NOTE** above), you must place the warning isolation label next to the input circuit supplying power to the UPS. It should be seen on the building service panel. This label is necessary for units without automatic backfeed isolation. It warns electricians that the circuit feeds a UPS remote from the area.

Figure 11: Service Panel Warning Label

WARNING: ISOLATE UNINTERRUPTIBLE POWER SUPPLY (UPS) BEFORE WORKING ON THIS CIRCUIT.

Appendix: External Bypass Switches

If your UPS does not have output receptacles, you may have an external UPS Bypass Switch with an AC Line Disconnect Switch. [Figure 3](#) on page 5 shows a Best Power bypass switch.

The UPS Bypass Switch has three positions: Line, Off, and UPS (see [Table 13](#)).

Table 13: External Bypass Switch Positions

UPS Bypass Switch Position	Explanation
LINE	Connects AC input power (line) directly to the load equipment.
OFF	Disconnects the load equipment from both UPS output power and AC input power (line).
UPS	Connects the UPS output to the load equipment.

NOTE: In all three UPS Bypass Switch positions, AC input power may still be connected to the input terminals inside the UPS. To disconnect AC input power to the UPS, you must use the AC Line Disconnect Switch.

An external bypass switch may be “Make-Before-Break” (MBB) or “Break-Before-Make” (BBM).

- **A Make-Before-Break (MBB) switch** makes a new connection before it breaks the present connection. If you turn the switch from “UPS” to “Line,” the bypass switch connects the load equipment to AC input power before disconnecting the equipment from UPS output power. In other words, there is no break in power to the load equipment during the switch from UPS output power to AC input power.
- **A Break-Before-Make (BBM) switch** breaks the present connection before it makes the new one. When you turn the switch from “UPS” to “Line,” the switch moves through the “Off” position. The bypass switch disconnects the load equipment from UPS output power before connecting it to AC input power.



CAUTION!

Before switching an external make-before-break (MBB) bypass switch, the BYPASS light on the UPS front panel must be lit. If you operate an external MBB bypass switch while the UPS is operating on line power or on battery power, equipment damage may result. Refer to Best Power publication TIP 410 for proper bypass switch operating instructions.

For external bypass switch models and ratings, see [Section 101](#).

For external bypass switch dimensions, see [Section 102](#).