TRYSTAR

HV SERIES

OWNERS MANUAL

7.5KVA - 25KVA UNINTERRUPTIBLE POWER SUPPLY

IMPORTANT - SAVE THESE INSTRUCTIONS - PLEASE READ THIS MANUAL BEFORE USING EQUIPMENT

ABOUT THIS MANUAL

When viewing electronically, click on the subject to jump to that page. Clicking the header on the front page will launch the Controlled Power web site. Clicking anywhere else on the front page will also jump to the Table of Contents. Clicking any blue text will take you to that section of our website.

⚠ CAUTION

The following symbol indicates that caution should be taken when performing the process required in this manual. Damage to the unit or personal harm could happen if proper precautions are not taken.

⚠ SHOCK HAZARD

The following symbol indicates that there is a risk of electrical shock if proper precautions are not followed. Only qualified personnel should perform the actions required in this manual.

TABLE OF CONTENTS

INTRODUCTION

INTRODUCTION

Trystar engineers and manufactures the industry's highest quality power conditioning and UPS equipment, capitalizing on 4 decades of expertise. We have an enviable reputation for quality, which is reflected in the design, workmanship, and performance of our products.

We provide the widest range of power equipment for regulating, conditioning, isolating, purifying, and distributing incoming electrical power. All products incorporate state-of-the-art technology, optimizing performance characteristics for various applications. Our products protect sensitive electronic systems from erratic operation and failure due to power line transients, noise, brownouts, sags, surges, and total power outages.

The overall function of the HV Series UPS's is to take polluted, fluctuating, and erratic electrical power that exists in all areas today and purify or replace it (in the case of complete power outages) with well-regulated, computer grade power. The HV Series UPS's maintain electrical power to the critical load for approximately 10 minutes to several hours. The backup time is a function of the amount of battery reserve that is purchased with the system.

Features & Benefits

The HV Series products are designed to maximize backup time, protect your computers or critical loads, and monitor all the key parameters of electrical power including a log of events.

Features Include:

- Steady, Regulated Voltage to ±3% Extends
- Equipment Life
- Highest Level Performance Sine Wave Output
- 100% Power Conditioning
- No-break, Continuous Power Provides Seamless Switching to Battery Backup
- Audible Noise 50 - 55dB (model dependent)
- Field Expandable Power Rating and Battery Run Time
- Eliminates Unwanted Harmonic Frequencies From Incoming Line
- 93% Typical Efficiency – Proven Performance
- K-Factor 30
- Optional Extended Backup Time
- Optional NetMinder UPS Communications Software and Hardware
- Optional Internal and External Bypass

System Power Analyzer (SPA)

The optional System Power Analyzer (SPA) is a user friendly, precise metering and data acquisition system analyzer, which provides adaptive diagnostics, true RMS metering, power analyzation, and all electrical parameters of the UPS. Single, well-defined pushbuttons access electrical parameters, alarm messages, operating set points, and log functions. A backlit, 40-character alphanumeric LCD provides extremely sharp visual resolution of data and titles.

HV Series Display Monitor & Diagnostics Provide System Status

LED's Provide System Status

- Line Power ON (Green)
- Battery Charging (Green)
- Reserve Battery Power – 10 Segment LED Bar Graph (Red)
- Conditioned Power ON (Green)

Alarms

- On Battery Power
- High Temperature
- Low Battery
- Bypass
- Charger Failure
- Alarm Silence (Pushbutton)

Shutdown

- Battery Discharged
- Manual Restart Required
- Remote / Emergency Power Of
- Manual Restart (Pushbutton)
- Over Temperature

User-Friendly Full Monitoring Features

The HV Series has a full complement of diagnostic indicators, including "Alarm" and "Shutdown". Status LED's include: Line Power ON, Battery Charging, Reserve Battery Power, and Conditioned Power ON.

Product Specifications:

Input

At 60 Hz: 208 or 240 VAC; 120 VAC available up to 9 kVA

At 50 Hz: Consult factory for nominal voltage

Operating Range: +10% to -15% of nominal voltage

Frequency Range: ±2.5 Hz

Power Factor: Self-correcting to >0.95 (approaching unity)

Input Harmonics: <10% ITHD (Input Total Harmonic Distortion)

Spike Attenuation: 3000:1

Performance

Overload Capability: 125% for ten minutes

Surge Capability: 150% of rated output

Frequency Stability: ±0.2 Hz

Inner Winding Capacitance: 0.01 picofarads (primary to secondary coupling)

Common Mode: 120 dB (106 : 1 ground noise attenuation)

Transverse Mode: 70 dB (3160 : 1 line noise attenuation) (-3 dB at 1 kHz; -20 dB per decade)

Reactive Power Correction: Typical non-linear load corrected to >0.95 at input (automatically self-correcting)

MTBF

Total System: 100,000 hours

Transformer: 200,000 hours

Mean Time to Repair: Less than one hour

Battery

Runtime: Listed at full and half load for each model number with extended runtimes available.

Type: Sealed, maintenance-free, gas recombinant, selfventing, suspended electrolyte with no gel contaminant

Charger: 5 amp, two stage

Recharge Time: Typically 3 hours to full charge

Factory Tested: With specific inverter before shipping

Projected Life: 5 years service

Capacity: Batteries are sized with the inverter to support the load at rated kVA with a 0.7 power factor

Output

Sine Wave Voltage: Typical 3% harmonic distortion, any single harmonic

At 60 Hz: 120 VAC; 120/208 VAC; 120/240 VAC

At 50 Hz: Consult factory for nominal voltage

Crest Factor: 3.5 : 1

K-Factor: 30

Power Factor: 0.7 switch mode rated

Harmonic Attenuation: Load generated harmonics are attenuated 400% at the input

Line Regulation: Typically ±3%

Load Regulation: Typically better than ±3%

Isolation: Galvanic isolation

Environmental

Isolation: NEC article 250; complies with this standard that specifies a separately derived power source

Operating Temperature: 0°C to 40°C without derating in any mode

Storage Temperature: -20°C to 50°C

Relative Humidity: 95% non-condensing

Elevation: 5,000 feet, 1500 meters

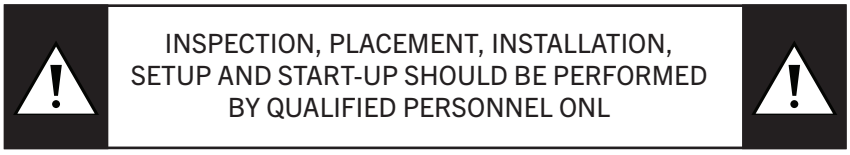
Agencies

- IEEE 587 Category B Guide for surge suppression; exceeds by 33%
- ANSI / IEEE C62.41 and .45 Category A and B
- FAA - G - 201e power factor specifications
- CBEMA and ANSI C84.1; exceeds specifications and recommendations
- IEEE 519

Safety

- UL 1778
- C-UL Listed to CSA C22.2 No. 107.1-21
- FCC Article 15, Section J, Class A, will not cause harmful interference with any other electronic devices.

RECEIVING THE UNIT



INSPECTION

Upon receipt of your UPS, visually inspect the unit for shipping damage. If shipping damage has occurred, the purchaser should promptly notify the carrier and file a claim with the carrier. The factory should be notified if the damages may impair the operation of the unit. Reference front cover or accompanying paper work for factory contact information.

Note: Remove the top panel of the UPS and inspect inside the unit for shipping damage.

Note: Remove the top panel of the UPS and inspect inside the unit for shipping damage.

IMPORTANT NOTICE

This shipment has been carefully inspected, checked and properly packaged at our company.

When it was delivered to the carrier it was in good condition and technically it became your property at that time. Thus, any damage, whether obvious or hidden, must be reported to the transportation company within FIVE days of receipt of the shipment at your premises to avoid forfeiting claims for damages.

FOR ALL SHIPMENTS DAMAGED IN TRANSIT

Leave the items, packing material and carton "AS IS". Notify your carrier's local office and ask for immediate inspection of the carton and contents.

After inspection has been made by the carrier, and you have received acknowledgment in writing as to the damage, notify our Customer Service Department to make any required repair arrangements.

It is your responsibility to follow the above instructions or the carrier will not honor any claims for damage. Also, if there are any shortages or questions regarding this shipment, please notify us within FIVE days.

Please note that we cannot be responsible for any service work or back-charges unless authorized by us in writing, before the work is performed.

STORAGE

WHILE IN STORAGE BATTERIES MUST BE CHARGED FOR 24 HOURS EVERY 6 MONTHS. WHILE IN STORAGE DISCONNECT THE BATTERY CONNECTOR AND TURN OFF THE DC CIRCUIT BREAKER FROM THE UPS.

If it is necessary to store the unit, be sure to place it in a clean dry area. **For extended storage, the batteries must be charged for 24 hours every 6 months. Failure to do so will result in weak or bad batteries which WILL NOT be covered under the warranty.** Charging is accomplished by connecting the batteries, turning the UPS on and allowing it to run. See *"Setup Procedure"* and *"Start-up Procedure"* for turning the UPS on. **While storing, disconnect the battery connector from the UPS and turn off the DC circuit breaker.** Make sure proper ventilation is available any time the inverter is on.

CAUTION

CABINETS AND BATTERIES ARE EXTREMELY HEAVY USE PROPER EQUIPMENT WHEN REMOVING THE UNITS FROM THE CONTAINER

LOCATION / PLACEMENT

The portability of the system allows the unit to be rolled into a convenient location. The minimum spacing required for service, ventilation, and accessibility to the circuit breakers is (2) two feet at the left, rear and front sides of the cabinet. Unit must be placed in a clean dry area, preferably in a climate controlled atmosphere. If flexible conduit is used for input power and distribution, the rear clearance can be reduced to ten inches. Allowance must be made in the length of the cable so that the unit can be rolled out forward for service and maintenance.

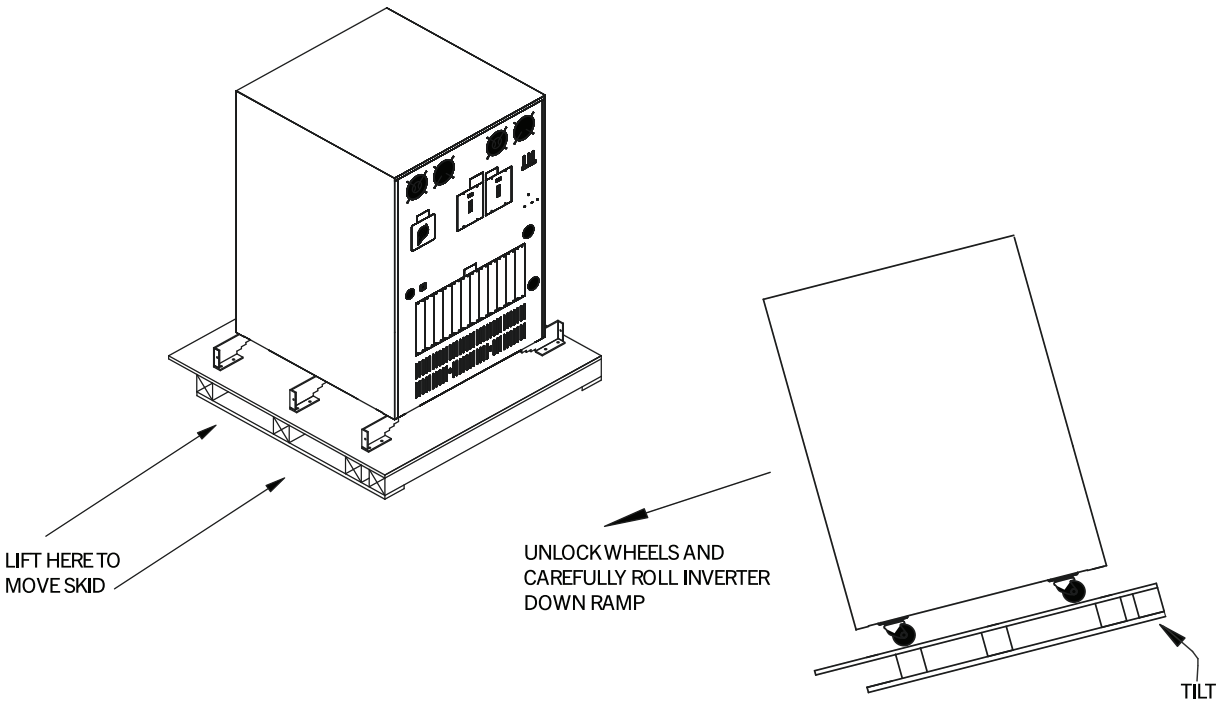
REMOVING THE UPS FROM THE PALLET

TOOLS REQUIRED.

1/2” Wrench, Hammer

STEPS TO REMOVE THE CABINET

1. Check to make sure the casters are locked.
2. Remove the bolts holding the brackets to the skid with a 1/2” Wrench.
3. Remove the brackets
4. With a hammer, knock out one end of the skid as shown below.
5. Unlock the casters and carefully roll the unit down the ramp.



SAFETY PRECAUTIONS

NOT INTENDED FOR LIFE SUPPORT APPLICATIONS

Unit is intended for installation in a temperature-controlled, indoor area free of conductive contaminants.

IMPORTANT SAFETY INSTRUCTIONS SAVE THESE INSTRUCTIONS

⚠ CAUTION ⚠

A BATTERY CAN PRESENT A RISK OF ELECTRICAL SHOCK AND HIGH SHORT CIRCUIT CURRENT. THE FOLLOWING PRECAUTIONS SHOULD BE OBSERVED WHEN WORKING ON BATTERIES:

- REMOVE WATCHES, RINGS, OR OTHER METAL OBJECTS.
- USE TOOLS WITH INSULATED HANDLES.
- WEAR RUBBER GLOVES AND BOOTS.
- DO NOT LAY TOOLS OR METAL PARTS ON TOP OF BATTERIES.
- DISCONNECT CHARGING SOURCE PRIOR TO CONNECTING OR DISCONNECTING BATTERY TERMINALS.

⚠ CAUTION ⚠

USE CAUTION WHEN HANDLING OR SERVICING BATTERIES. BATTERY ACID CAN CAUSE BURNS TO SKIN AND EYES. IF ACID IS SPILLED ON SKIN OR IN THE EYES, FLUSH WITH FRESH WATER AND CONTACT A PHYSICIAN IMMEDIATELY.

BATTERIES ARE VERY HEAVY. USE CAUTION WHEN LIFTING AND MOVING THEM. INSTALLATION SHOULD ONLY BE PERFORMED BY AUTHORIZED PERSONNEL.

WIRING SHOULD ONLY BE PERFORMED BY AUTHORIZED PERSONNEL.

- **FOLLOW ALL STANDARD AND LOCAL ELECTRICAL CODES.**
- **BE SURE INPUT POWER TO UPS IS PROPERLY GROUNDED.**
- **DO NOT ALLOW WATER OR FOREIGN OBJECTS TO GET INSIDE UPS.**
- **DO NOT PLACE OBJECTS OR LIQUIDS ON TOP OF THE UPS.**
- **DO NOT LOCATE UPS NEAR RUNNING WATER OR WHERE THERE IS EXCESSIVE HUMIDITY.**
- **DO NOT USE OUTDOORS.**

- **DO NOT MOUNT NEAR GAS OR ELECTRIC HEATERS.**
- **EQUIPMENT SHOULD BE MOUNTED IN LOCATIONS AND AT HEIGHTS WHERE IT WILL NOT READILY BE SUBJECTED TO TAMPERING BY UNAUTHORIZED PERSONNEL.**
- **THE USE OF ACCESSORY EQUIPMENT NOT RECOMMENDED BY THE MANUFACTURER MAY CAUSE AN UNSAFE CONDITION.**
- **DO NOT USE THIS EQUIPMENT FOR OTHER THAN INTENDED USE.**
- **SERVICING OF BATTERIES SHOULD BE PERFORMED OR SUPERVISED BY PERSONNEL KNOWLEDGEABLE OF BATTERIES AND THE REQUIRED PRECAUTIONS.**
- **KEEP UNAUTHORIZED PERSONNEL AWAY FROM BATTERIES.**
- **DO NOT SHORT BATTERY TERMINALS.**
- **DO NOT DISPOSE OF BATTERY OR BATTERIES IN A FIRE. THE BATTERY MAY EXPLODE.**
- **ONLY REPLACE BATTERIES WITH IDENTICAL SPECIFICATION OF ORIGINAL BATTERIES SUPPLIED WITH THE SYSTEM.**
- **DO NOT OPEN OR MUTILATE THE BATTERY OR BATTERIES. RELEASED ELECTROLYTE IS HARMFUL TO THE SKIN AND EYES. IT MAY BE TOXIC.**
- **READ AND FOLLOW ALL SAFETY INSTRUCTIONS. SAVE THESE INSTRUCTIONS.**

PRELIMINARY INSTALLATION

INSTALLATION CONSIDERATIONS

Prior to installing the HV Series UPS be sure to take into consideration the site you have selected. UPS's produce heat and therefore require ventilation as well as accessibility. Consider these factors.

- Ventilation
- Size of the UPS
- Weight Load
- Noise Requirements
- Audible
- Clearances
- Accessibility
- Excessively Long Power Runs
- Proper Ground Techniques
- Generator Applications
- Distribution of Power
- Communications (i.e...Early Power Warning Feature)

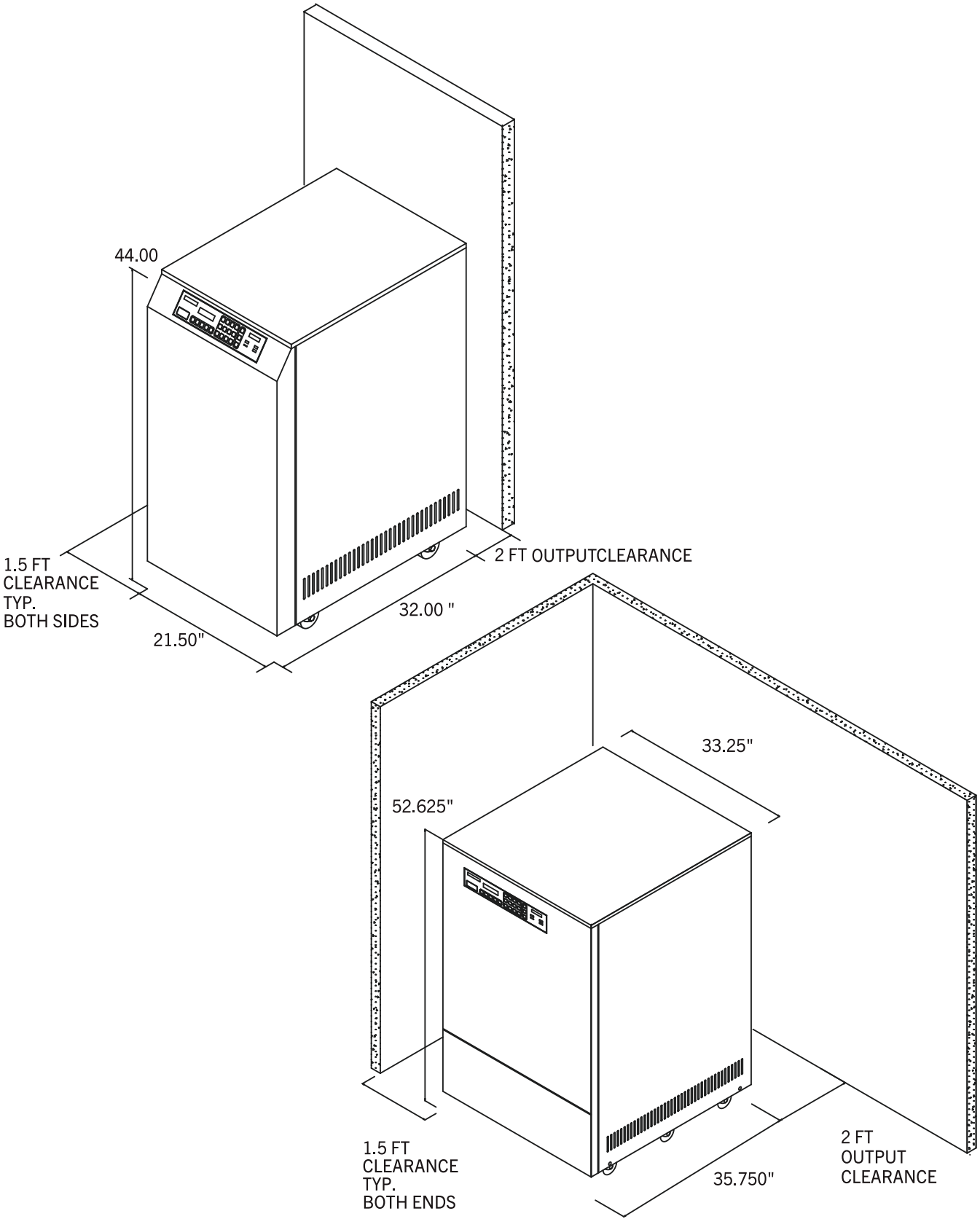
- Remote Emergency Power Off (REPO)
- Monitors
- Extended Battery Run Times
- Options
- Input Source Voltage
- Receiving Facilities
- Available Single Phase KVA
- Room Temperature
- Distance of Inverter to Critical Load

NOT INTENDED FOR LIFE SUPPORT APPLICATIONS

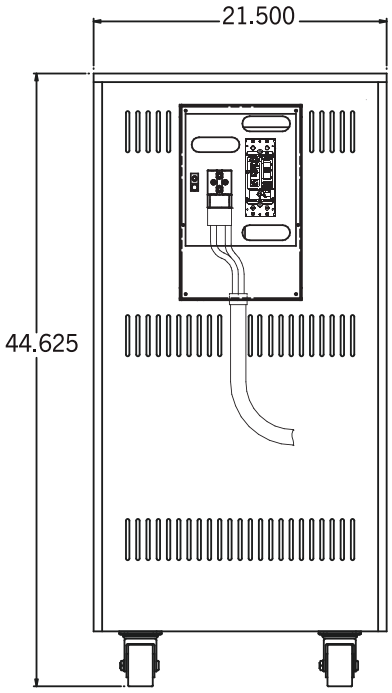
UNIT IS INTENDED FOR INSTALLATION IN A TEMPERATURE-CONTROLLED, INDOOR AREA FREE OF CONDUCTIVE CONTAMINANTS.

IMPORTANT SAFETY INSTRUCTIONS SAVE THESE INSTRUCTIONS

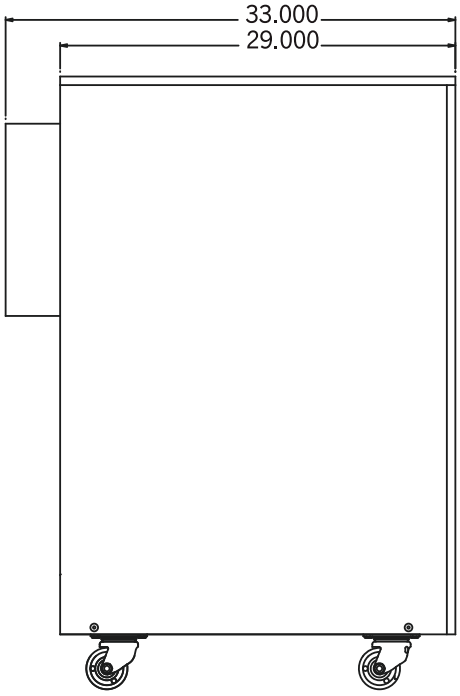
INVERTER CABINET DIMENSIONS, ACCESS AND CLEARANCES



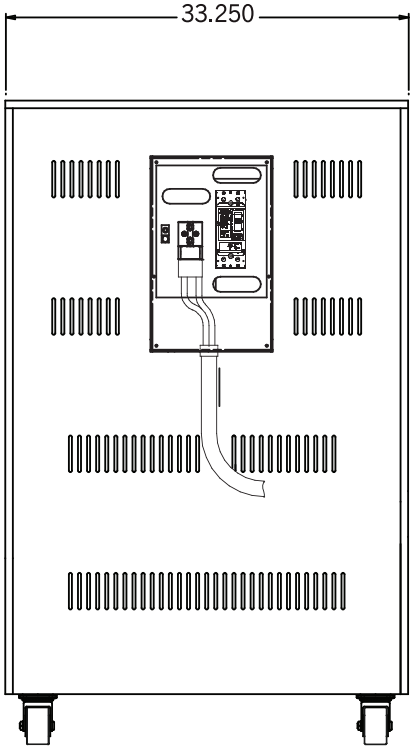
EXTERNAL BATTERY CABINET DIMENSIONS, ACCESS AND CLEARANCES



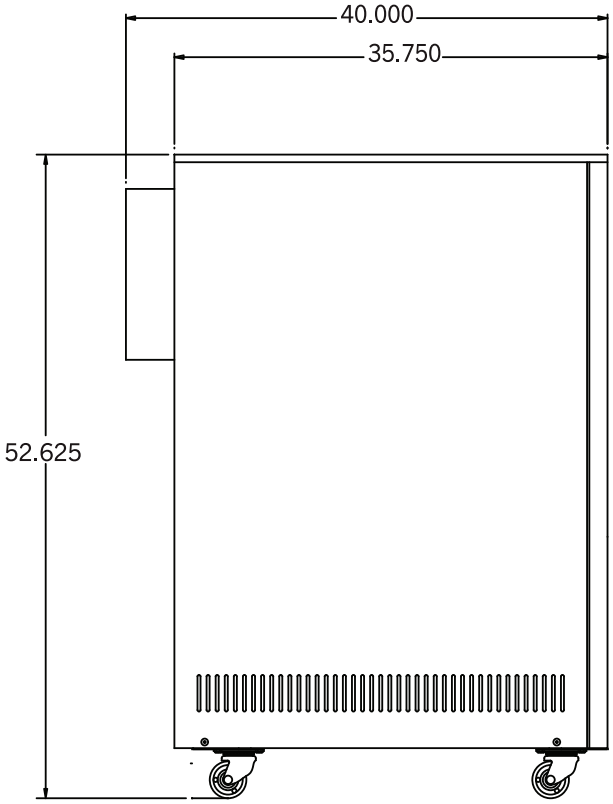
REAR VIEW



SIDE VIEW



REAR VIEW



SIDE VIEW

AC INPUT BREAKER, WIRING AND AMPERAGE MATRIX

KVA	INPUT VOLTAGE	INPUT CURRENT	OPTIONA LINE PLUG	SERVICE PANEL NON-EXPANDABL UPS	WIRE SIZE	SERVICE PANEL EXPANDABLE UPS	WIRE SIZE
	VOLTS	AMPS		BREAKER	AWG	BREAKER	AWG
7.5	120	67	N/A	90	4	90	4
7.5	208	38	6-50P	50	8	50	8
7.5	240	33	6-50P	50	8	50	8
8	120	71	N/A	90	4	90	4
8	208	41	N/A	50	8	50	8
8	240	36	N/A	60	8	60	8
9	208	46	N/A	50	8	50	8
9	240	41	N/A	60	8	50	8
10.5	208	54	N/A	70	6	80	4
10.5	240	47	N/A	80	6	80	4
11.5	208	59	N/A	80	4	80	4
11.5	240	51	N/A	80	6	80	4
13	208	68	N/A	100	2	100	2
13	240	60	N/A	90	2	90	2
14	208	72	N/A	100	2	100	2
14	240	62	N/A	100	2	100	2
16	208	82	N/A	100	2	100	2
16	208	71	N/A	110	2	110	2
17	208	87	N/A	100	2	100	2
17	240	79	N/A	110	2	110	2
18	208	92	N/A	125	2	125	2
18	240	83	N/A	125	2	125	2
20	208	103	N/A	125	2	150	2
20	240	90	N/A	150	2	150	2
20E	208	105	N/A	150	1	150	1/O
20E	240	90	N/A	150	1	150	1/O
25	208	116	N/A	150	1	150	1/O
25	240	107	N/A	150	1	150	1/O

When the optional panel breakers are not used it is required that Overcurrent Branch Protection (disconnect) be provided by others and marked that it is the UPS output.

Units with input plugs must have service panel protection. Sizes based on 75 degrees Celsius insulation type THHN wire, per N.E.C. Article 310, Table 310, Table 310-16, “Not more than three single insulated conductors rated 0 through 2000 volts, in a raceway in free air” (30 degrees C ambient).

AC OUTPUT NOMINAL RATINGS

The UPS supplies the following output voltages and currents:

KVA	7.5	8	9	10.5	11.5	13	14	16	17	19	20	25
VOLTS	120	120	120	120	120	120	120	120	120	120	120	120
	208	208	208	208	208	208	208	208	208	208	208	208
	240	240	240	240	240	240	240	240	240	240	240	240
AMPS	63	67	76	88	96	108	116	133	141	150 *	166 *	208 *
	36	38	43	50	55	63	67	77	82	91	96	120
	31	33	38	44	48	54	58	67	71	75	83	104

All outputs are single phase. When using 208V output, L1 to N is 120V, L2 to N is 88V, L3 to N is 120V, L1 to L2 is 208v, L1 to L3 is 240v.

* Full KVA can be taken at 120V, but must be divided using L1 to N and L3 to N.

INSTALLATION

⚠ WARNING ⚠

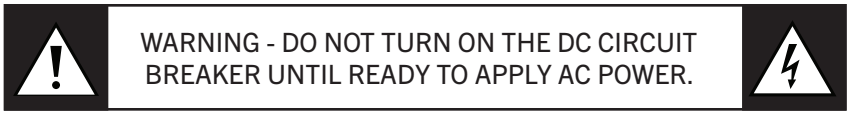
HIGH VOLTAGE EXISTS, CAUTION MUST BE TAKEN WHEN WORKING NEAR THE BATTERY TERMINALS. POWER IS SUPPLIED BY MORE THAN ONE SOURCE. MAKE SURE BOTH AC AND DC CIRCUIT BREAKERS ARE OFF BEFORE INSTALLING OR SERVICING THE UPS

- Remove the top cover of the inverter cabinet. The top is retained with three screws (Phillips head) at the rear of the unit, pull the top towards you to release. See *“Preliminary Installation - Cabinet Dimensions, Access and Clearances”.*
- Remove the left side panel (looking from the front). This panel is retained by two screws (Phillips head) at the top and two screws at the bottom of the panel. See *“Preliminary Installation - Cabinet Dimensions, Access and Clearances”.*
- The 7.5KVA through 13KVA units are provided with two 1” holes in the power distribution section for the input and output conduit. The 14KVA through 25KVA units are provided with two 2” holes at the right rear of the back panel.

MAKE SURE THE PRIMARY FEED IS OFF

- For 7.5KVA - 13KVA models, feed the input power wires L1 and L2 to the input terminals located at the top of the Input/Output panel on the left side of the unit. Be sure to follow the recommended torque printed on the cabinet frame next to the terminals. The ground terminal is mounted flush on the inside of the back panel. See *"Installation - AC Input and Output Wiring for 7.5KVA - 13KVA Models".*
- For 14KVA - 25KVA models, feed the input power wires L1 and L2 to the input terminals located at the bottom of the RFI Filter board. Be sure to follow the recommended torque printed on the cabinet frame next to the terminals. The ground terminal is mounted flush on the inside of the back panel. See *"Installation - AC Input and Output Wiring for 14KVA - 25KVA Models".*
- The system is designed to operate on the primary power you select. Verify that the available power source meets the voltage and current requirements. See *"Changing the Input Voltage".*
- The ground wire should be the same size as the input feed wires. The ground that feeds the UPS should be of good integrity and dedicated to the UPS. The run should be as short as possible.
- Conduit cannot be used for the grounding circuit.
- Never use the same conduit run for input and output cables.

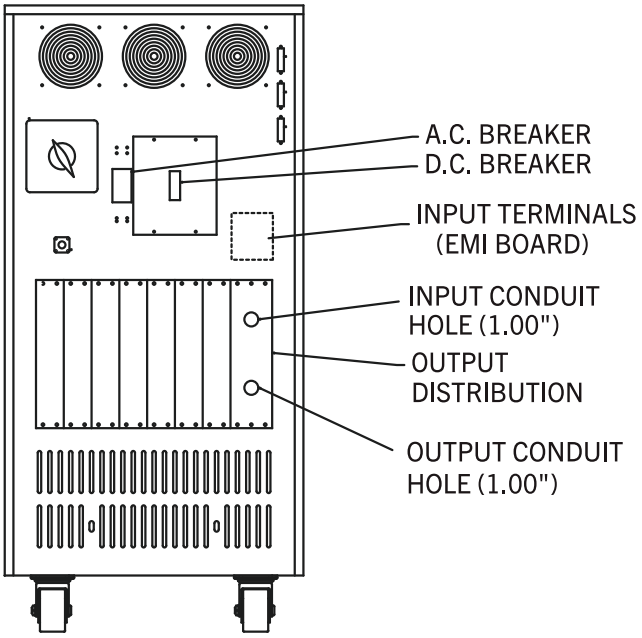
Reference: NEC Article 250



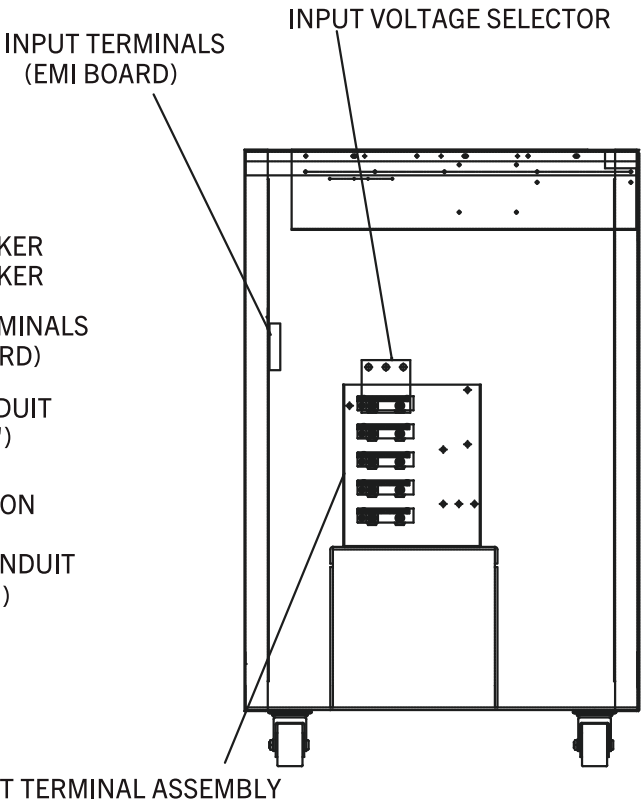
AC INPUT AND OUTPUT WIRING FOR 7.5KVA - 13KVA MODELS

WARNING

HIGH VOLTAGE EXISTS, CAUTION MUST BE TAKEN WHEN WORKING NEAR THE BATTERY TERMINALS. POWER IS SUPPLIED BY MORE THAN ONE SOURCE. MAKE SURE BOTH AC AND DC CIRCUIT BREAKERS ARE OFF BEFORE INSTALLING OR SERVICING THE UPS



BACK VIEW



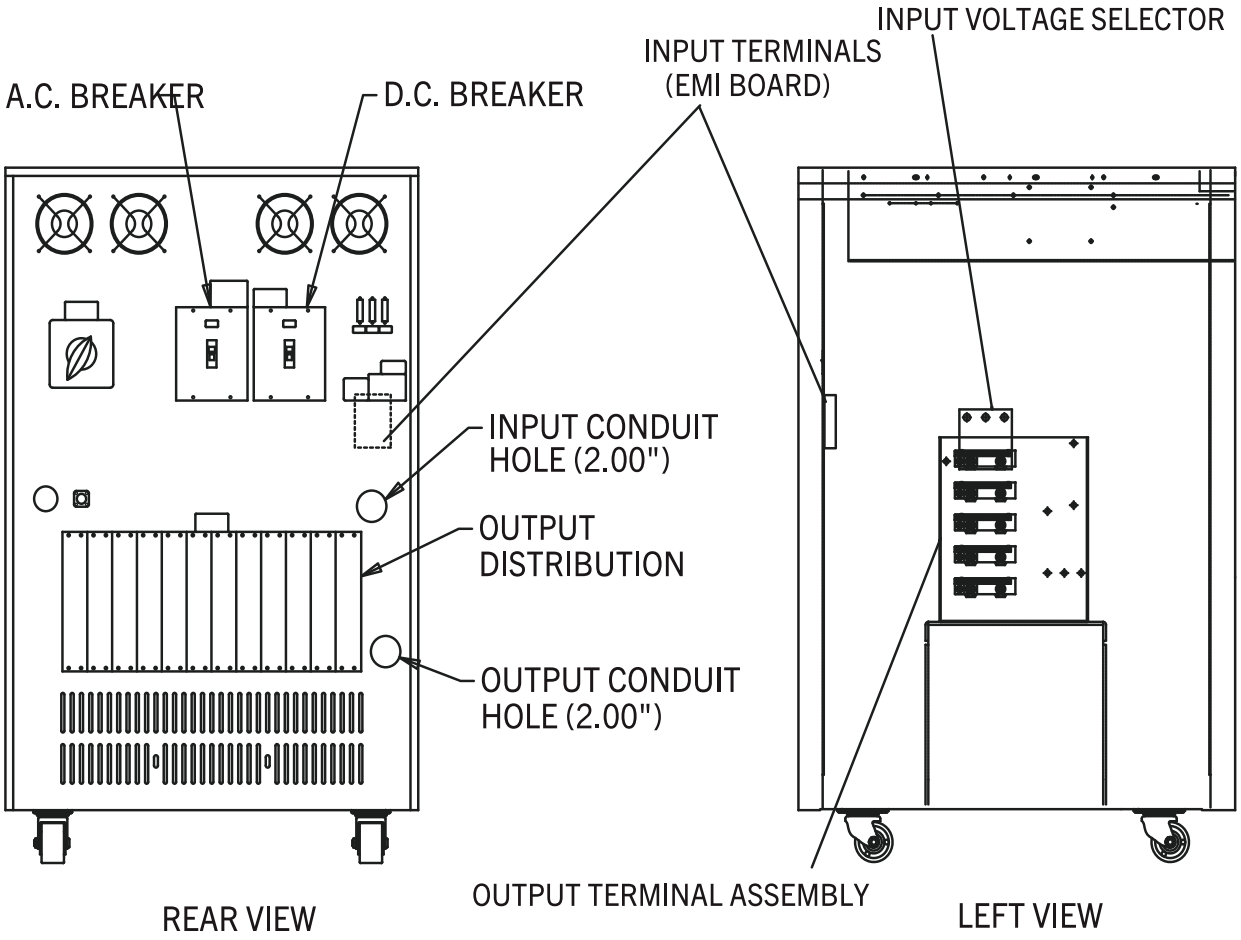
LEFT SIDE VIEW
PANEL REMOVED

Maximum UPS Current Rating	Branch Breaker Size	Minimum Wire Size (at room ambient)	Minimum Wire Size (at 40°C)
40A	50A	8	6
48A	60A	6	4
56A	70A	4	4
64A	80A	4	3
72A	90A	3	2
80A	100A	3	2
100A	125A	1	1/0
120A	150A	1/0	2/0

AC INPUT AND OUTPUT WIRING FOR 14KVA - 25KVA MODELS

⚠ WARNING

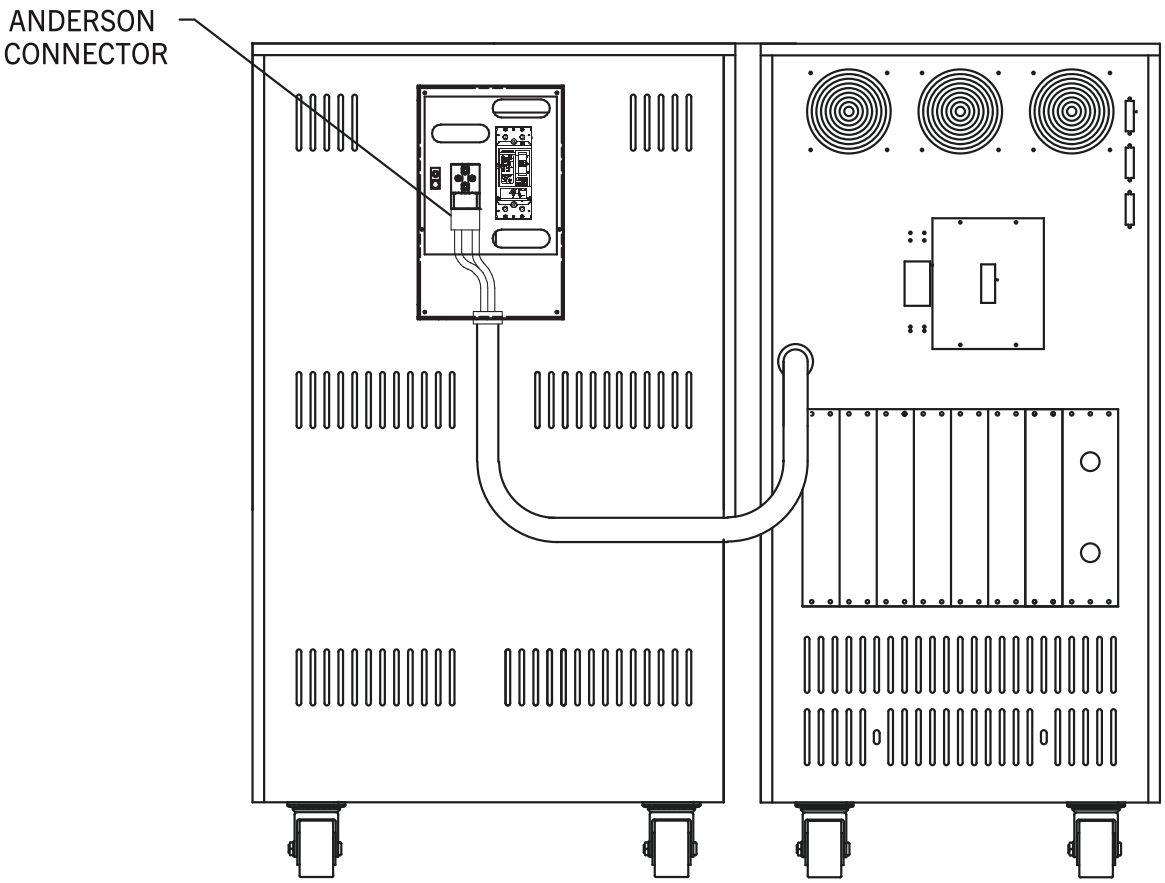
HIGH VOLTAGE EXISTS, CAUTION MUST BE TAKEN WHEN WORKING NEAR THE BATTERY TERMINALS. POWER IS SUPPLIED BY MORE THAN ONE SOURCE. MAKE SURE BOTH AC AND DC CIRCUIT BREAKERS ARE OFF BEFORE INSTALLING OR SERVICING THE UPS



Maximum UPS Current Rating	Branch Breaker Size	Minimum Wire Size (at room ambient)	Minimum Wire Size (at 40°C)
40A	50A	8	6
48A	60A	6	4
56A	70A	4	4
64A	80A	4	3
72A	90A	3	2
80A	100A	3	2
100A	125A	1	1/0
120A	150A	1/0	2/0

EXTERNAL BATTERY CABINET INSTALLATION

Be sure the DC circuit breaker is **OFF**. Then plug the battery connector form the inverter cabinet into the connector on the external battery cabinet. The connector is keyed and can only go in one way. All required battery connectors will be supplied with the inverter. **DO NOT** turn the DC breaker on until installation and set up are both complete.



STORAGE

WHILE IN STORAGE BATTERIES MUST BE CHARGED FOR 24 HOURS EVERY 6 MONTHS. WHILE IN STORAGE DISCONNECT THE BATTERY CONNECTOR AND TURN OFF THE DC CIRCUIT BREAKER FROM THE UPS.

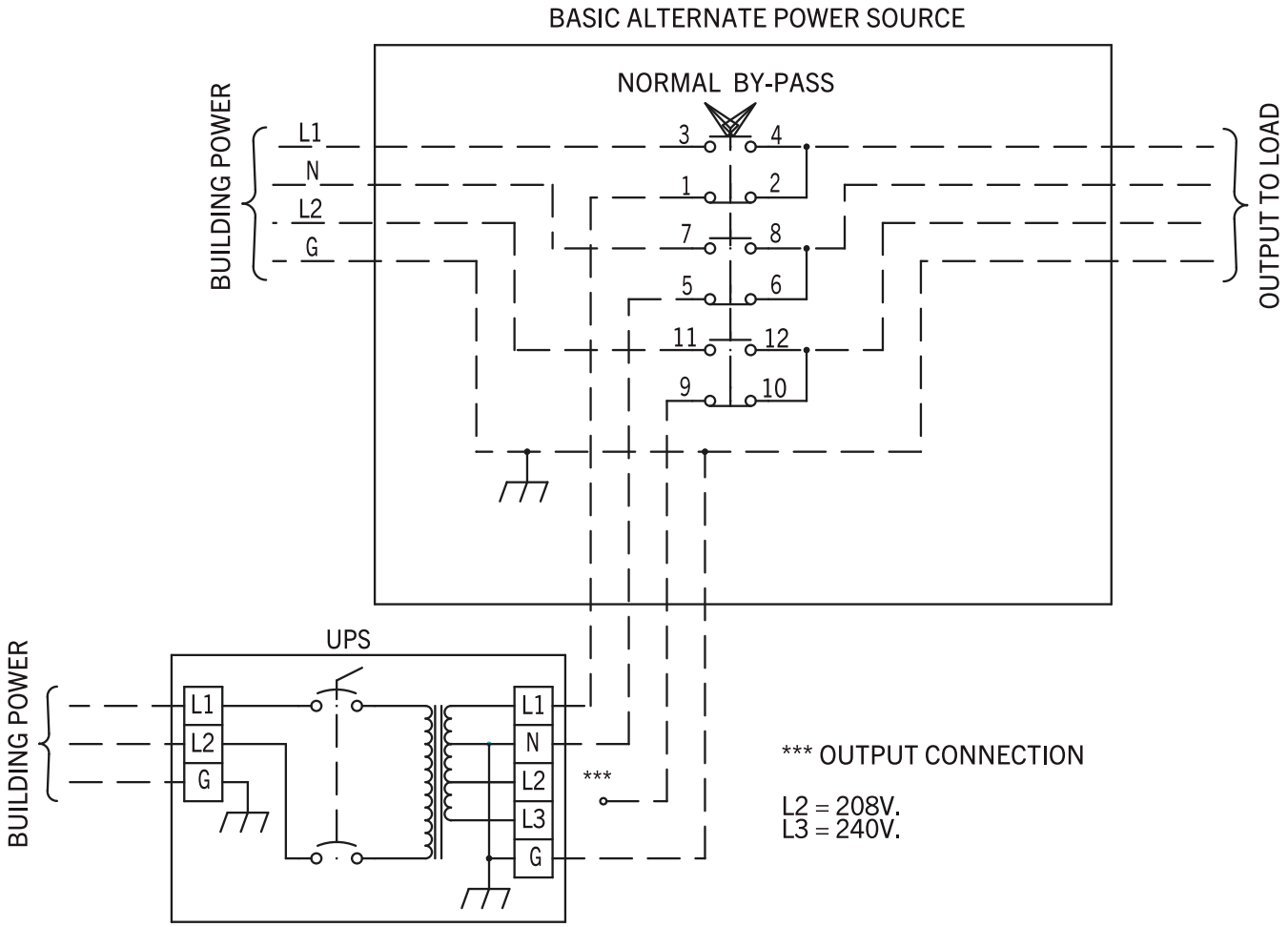
If it is necessary to store the unit, be sure to place it in a clean dry area. **For extended storage, the batteries must be charged for 24 hours every 6 months. Failure to do so will result in weak or bad batteries which WILL NOT be covered under the warranty.** Charging is accomplished by connecting the batteries, turning the UPS on and allowing it to run. See *"Setup Procedure"* and *"Start-up Procedure"* for turning the UPS on. **While storing, disconnect the battery connector from the UPS and turn off the DC circuit breaker.** Make sure proper ventilation is available any time the inverter is on.

BYPASS SWITCH INSTALLATION

See “Operation - Bypass Switch Operation”

IMBB - Internal Make Before Break Manual Bypass - The IMBB is located on back of the UPS and is pre-wired and requires no additional installation.

WMBBM - External, Wall Mounted, Break Before Make, Manual Bypass Assembly. Input and output wiring should be in accordance with the KVA size of the UPS. Refer to *“Preliminary Installation - AC Input Breaker, Wiring and Amperage Matrix” and “AC Output Nominal Ratings”.*



NOTE: MAKE-BEFORE-BREAK BYPASS SWITCH ASSEMBLIES ARE PHASE SENSITIVE. INSURE THAT THE BUILDING POWER (L1) AND THE UPS OUTPUT POWER (L1) ARE THE SAME PHASE RELATIONSHIP.

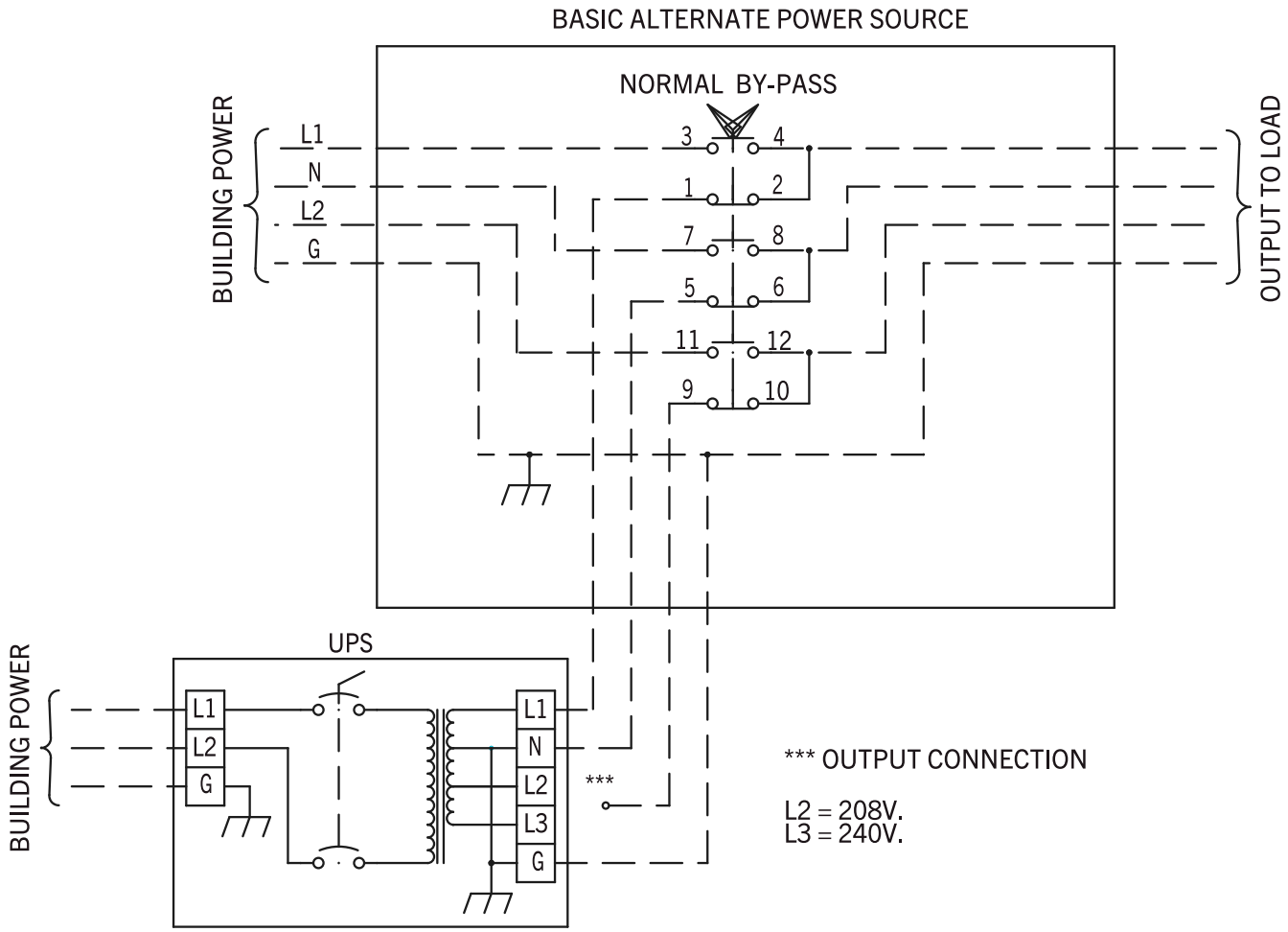
DO NOT OPERATE THIS SWITCH WHEN THE UPS IS OPERATING ON BATTERY POWER

NOTE: MAKE-BEFORE-BREAK BYPASS SWITCH ASSEMBLIES ARE PHASE SENSITIVE. INSURE THAT THE BUILDING POWER (L1) AND THE UPS OUTPUT POWER (L1) ARE THE SAME PHASE RELATIONSHIP.

BE SURE THAT ALL POWER IS OFFBEFORE WIRING THE SWITCH

See “Operation - Bypass Switch Operation”

WMMBB - External, Wall Mounted, Make Before Break, Manual Bypass Assembly. Input and output wiring should be in accordance with the KVA size of the UPS. Refer to *“Preliminary Installation - AC Input Breaker, Wiring and Amperage Matrix” and “AC Output Nominal Ratings”.*



NOTE: MAKE-BEFORE-BREAK BYPASS SWITCH ASSEMBLIES ARE PHASE SENSITIVE. INSURE THAT THE BUILDING POWER (L1) AND THE UPS OUTPUT POWER (L1) ARE THE SAME PHASE RELATIONSHIP.

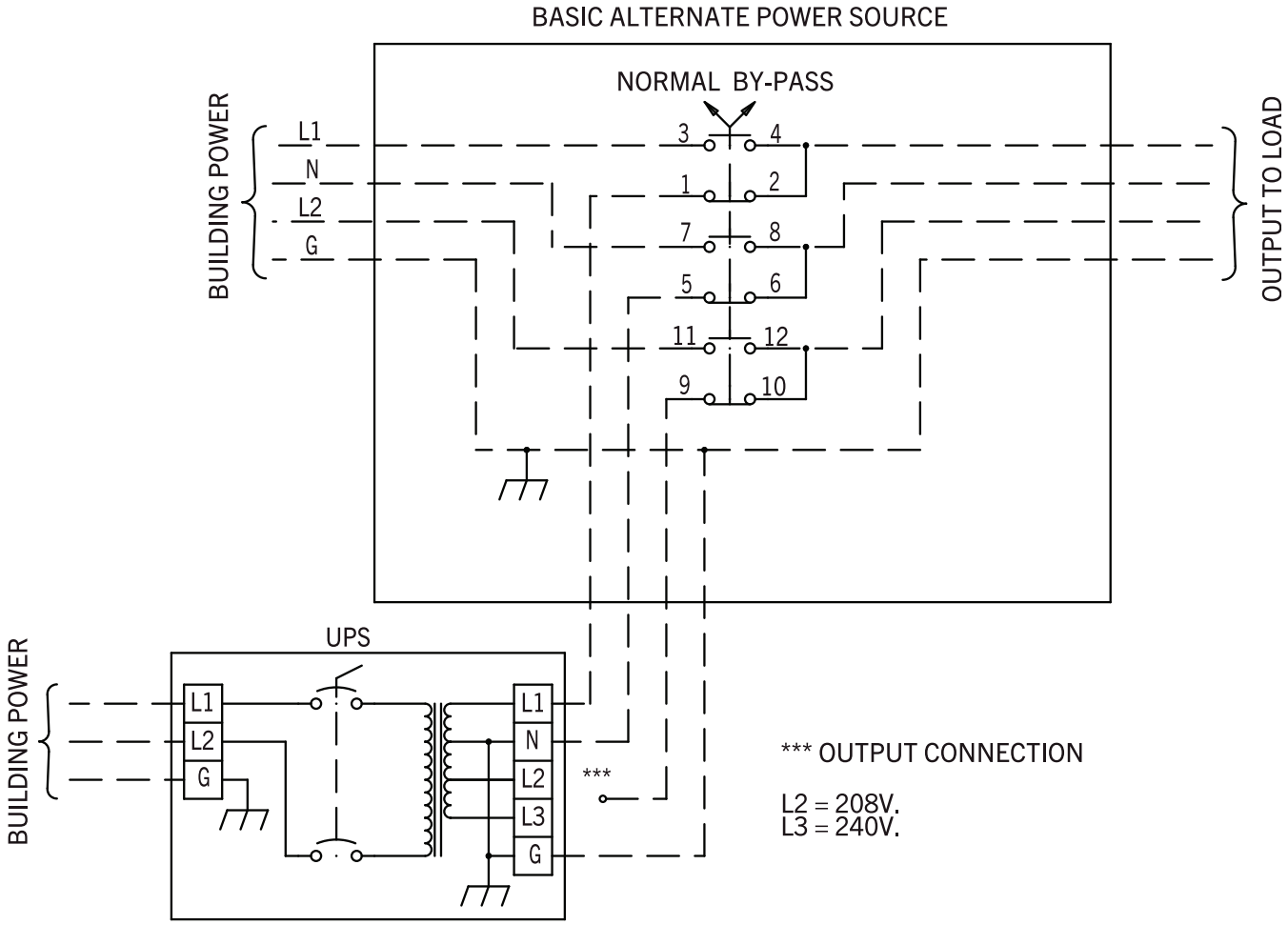
DO NOT OPERATE THIS SWITCH WHEN THE UPS IS OPERATING ON BATTERY POWER

NOTE: MAKE-BEFORE-BREAK BYPASS SWITCH ASSEMBLIES ARE PHASE SENSITIVE. INSURE THAT THE BUILDING POWER (L1) AND THE UPS OUTPUT POWER (L1) ARE THE SAME PHASE RELATIONSHIP.

BE SURE THAT ALL POWER IS OFFBEFORE WIRING THE SWITCH

See “Operation - Bypass Switch Operation”

EBBM - Roll In Cabinet, Break Before Make Manual Bypass with Power Distribution. Input and output wiring should be in accordance with the KVA size of the UPS. Refer to *“Preliminary Installation - AC Input Breaker, Wiring and Amperage Matrix” and “AC Output Nominal Ratings”.*



NOTE: MAKE-BEFORE-BREAK BYPASS SWITCH ASSEMBLIES ARE PHASE SENSITIVE. INSURE THAT THE BUILDING POWER (L1) AND THE UPS OUTPUT POWER (L1) ARE THE SAME PHASE RELATIONSHIP.

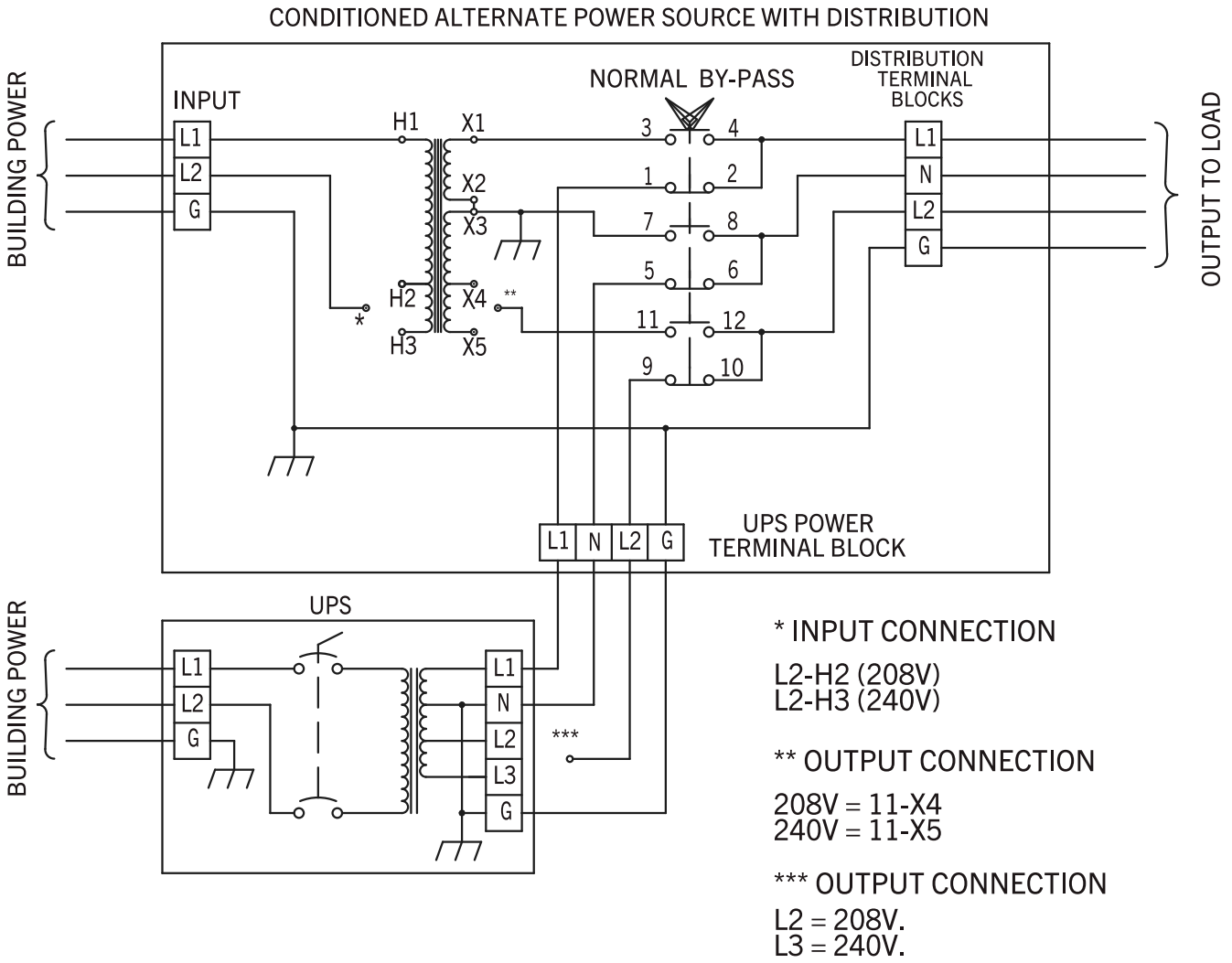
DO NOT OPERATE THIS SWITCH WHEN THE UPS IS OPERATING ON BATTERY POWER

NOTE: MAKE-BEFORE-BREAK BYPASS SWITCH ASSEMBLIES ARE PHASE SENSITIVE. INSURE THAT THE BUILDING POWER (L1) AND THE UPS OUTPUT POWER (L1) ARE THE SAME PHASE RELATIONSHIP.

BE SURE THAT ALL POWER IS OFFBEFORE WIRING THE SWITCH

See “Operation - Bypass Switch Operation”

CBBM - Conditioned, Roll In Cabinet, Break Before Make, Manual Bypass with Power Distribution. Input and output wiring should be in accordance with the KVA size of the UPS. Refer to *“Preliminary Installation - AC Input Breaker, Wiring and Amperage Matrix” and “AC Output Nominal Ratings”. Nominal Ratings”.*



NOTE: MAKE-BEFORE-BREAK BYPASS SWITCH ASSEMBLIES ARE PHASE SENSITIVE. INSURE THAT THE BUILDING POWER (L1) AND THE UPS OUTPUT POWER (L1) ARE THE SAME PHASE RELATIONSHIP.

DO NOT OPERATE THIS SWITCH WHEN THE UPS IS OPERATING ON BATTERY POWER

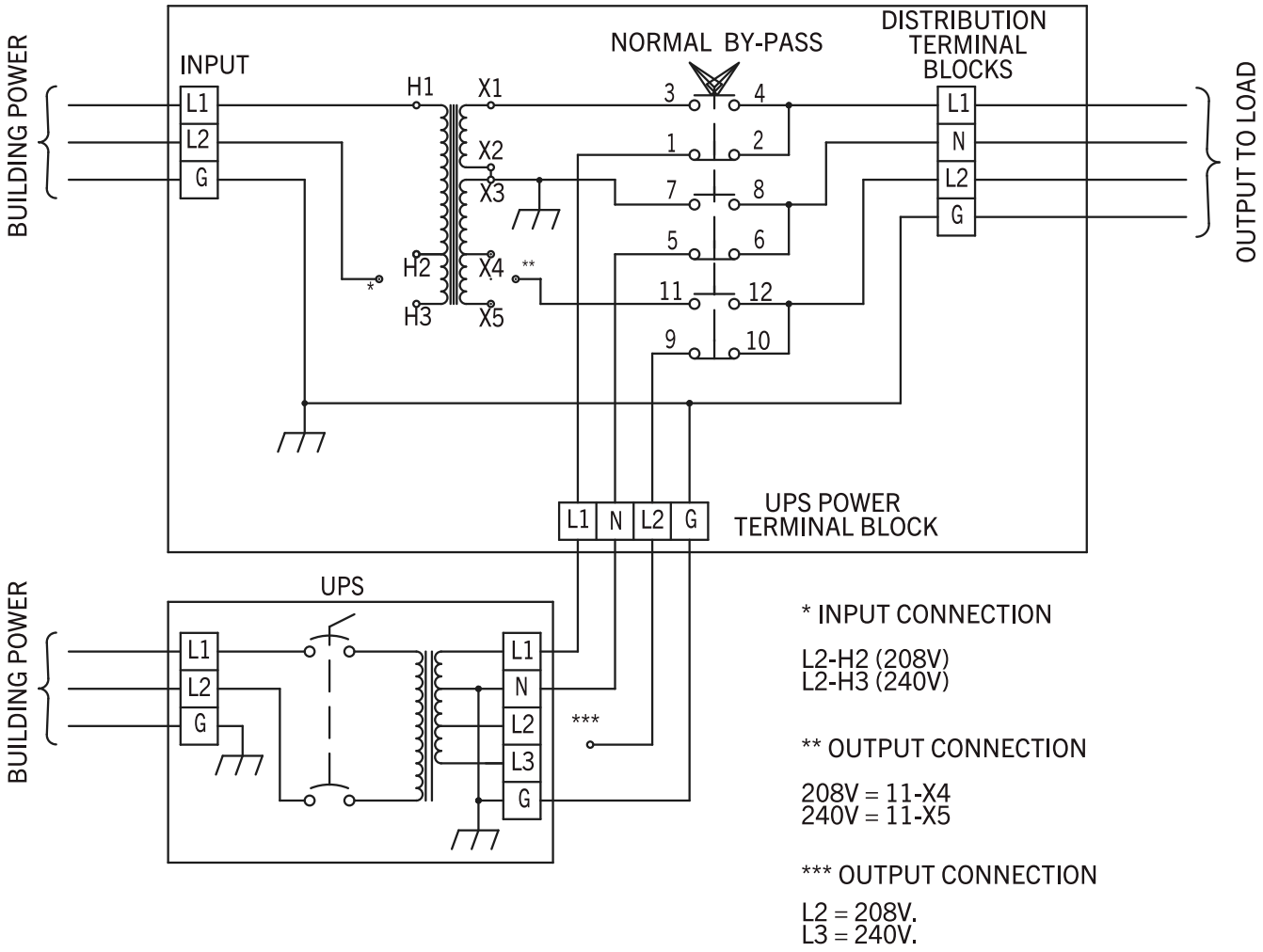
NOTE: MAKE-BEFORE-BREAK BYPASS SWITCH ASSEMBLIES ARE PHASE SENSITIVE. INSURE THAT THE BUILDING POWER (L1) AND THE UPS OUTPUT POWER (L1) ARE THE SAME PHASE RELATIONSHIP.

BE SURE THAT ALL POWER IS OFFBEFORE WIRING THE SWITCH

See “Operation - Bypass Switch Operation”

CMBB - Conditioned, Roll In Cabinet, Make Before Break, Manual Bypass with Power Distribution. Input and output wiring should be in accordance with the KVA size of the UPS. Refer to *“Preliminary Installation - AC Input Breaker, Wiring and Amperage Matrix” and “AC Output Nominal Ratings”. Nominal Ratings”.*

CONDITIONED ALTERNATE POWER SOURCE WITH DISTRIBUTION



NOTE: MAKE-BEFORE-BREAK BYPASS SWITCH ASSEMBLIES ARE PHASE SENSITIVE. INSURE THAT THE BUILDING POWER (L1) AND THE UPS OUTPUT POWER (L1) ARE THE SAME PHASE RELATIONSHIP.

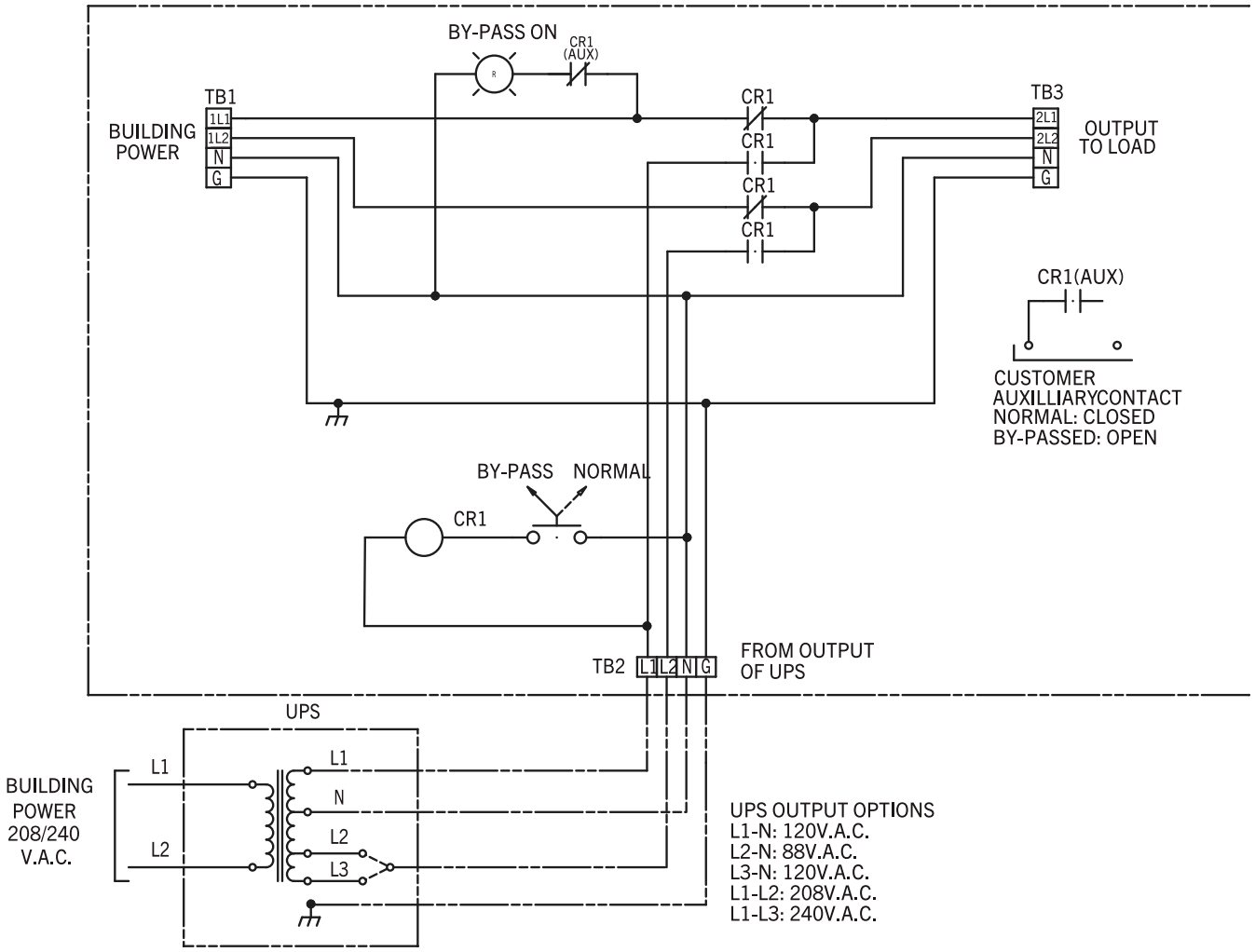
DO NOT OPERATE THIS SWITCH WHEN THE UPS IS OPERATING ON BATTERY POWER

NOTE: MAKE-BEFORE-BREAK BYPASS SWITCH ASSEMBLIES ARE PHASE SENSITIVE. INSURE THAT THE BUILDING POWER (L1) AND THE UPS OUTPUT POWER (L1) ARE THE SAME PHASE RELATIONSHIP.

BE SURE THAT ALL POWER IS OFFBEFORE WIRING THE SWITCH

See “Operation - Bypass Switch Operation”

WMABBM - External, Wall Mounted, Break Before Make, Automatic Bypass Assembly. Input and output wiring should be in accordance with the KVA size of the UPS. Refer to *“Preliminary Installation - AC Input Breaker, Wiring and Amperage Matrix” and “AC Output Nominal Ratings”.*



NOTE: MAKE-BEFORE-BREAK BYPASS SWITCH ASSEMBLIES ARE PHASE SENSITIVE. INSURE THAT THE BUILDING POWER (L1) AND THE UPS OUTPUT POWER (L1) ARE THE SAME PHASE RELATIONSHIP.

NOTE: MAKE-BEFORE-BREAK BYPASS SWITCH ASSEMBLIES ARE PHASE SENSITIVE. INSURE THAT THE BUILDING POWER (L1) AND THE UPS OUTPUT POWER (L1) ARE THE SAME PHASE RELATIONSHIP.

BE SURE THAT ALL POWER IS OFFBEFORE WIRING THE SWITCH

INSTALLING OTHER OPTIONS

Refer to *"Appendix A - Options Installation Diagram"*

The power supply for these options MUST be taken from the output of the inverter. A 120V receptacle (5-20R) on the output of the inverter is required.

REMOTE EMERGENCY POWER OFF PUSH-BUTTON

This option allows you to completely disable the UPS, which is required by many local safety codes. The push-button may mount near an entrance or exit and comes standard with 50 feet of cable terminated with a 4 pin connector. The 4 pin connector is used in conjunction with a DB25 gender changer that plugs into the UPS.

AUTOMATIC MESSAGE DIALER

Monitors when UPS is on battery power, when the batteries are low and the room temperature. Each of these conditions will automatically dial up to four pre-programmed phone numbers and delivers a voice synthesized warning message. The Automatic Message Dialer will continue to call until the message is acknowledged. Warning features may be added which are - moisture detection, unauthorized access and alarms pertinent to heating and cooling systems.

The "call in" feature allows you to call in from any outside telephone. You receive a report on monitored conditions and may listen for unusual sounds in the room.

It is recommended to plug the monophone into the UPS so you are assured the monophone is working during power outages. The Automatic Message Dialer has it's own battery and may be plugged into any 120 volt AC outlet, but the battery is not rechargeable and must be replaced annually. This option comes with 50 feet of cable terminated with a DB25 connector and a 10 foot telephone cord. **NOTE:** All auxiliary conditions are contact closure inputs.

REMOTE ANNUNCIATOR

This option provides a remote emergency power off push button and remotely monitors the UPS status with incandescent bulbs. The monitor function includes UPS On, System on Battery, Impending Shutdown, and By-Pass Active. The option comes with 50 feet of cable terminated with a DB25 connector and a 24 volt power supply that plugs into the output of the UPS. See *"Optional Remote Annunciator Installation".*

NOTE: If a 4X port expander is used the 24 volt power supply is not required. Remote annunciator may be connected directly to 4X expander.

Note: If a 4X port expander is used the 24 volt power supply is not required. Remote annunciator may be connected directly to 4X expander.

4X COMMUNICATIONS PORT EXPANDER

This option allows communication to the UPS by up to four separate peripherals. All ports are isolated eliminating mixed ground problems or incompatibility of signal style. The 4X Expander must be plugged into the UPS and comes with a interconnecting cable for the J1 port on the UPS.

Note: There is NO isolation between the two female connectors.

2X COMMUNICATIONS PORT EXPANDER

This option allows communication to the UPS by up to two separate peripherals. The option has one male DB25 connector and two female DB25 connectors one foot long.

Note: There is NO isolation between the two female connectors.

OPTIONAL REMOTE ANNUNCIATOR INSTALLATION

Please read this entire instruction set before installing!

Turn off all power before installing or servicing!

REMOTE ANNUNCIATOR

Trystar's Remote Annunciator is capable of displaying status conditions of an Uninterruptible Power Supply and alarming under critical conditions. The following installation instructions include operation, wiring, and mounting your Remote Annunciator.

OPERATION

During normal operation of the UPS, the Remote Annunciator will illuminate the green UPS On LED. During an alarm condition (unit over temperature, utility fail, etc.) the red General Alarm LED will illuminate along with other applicable LED's indicating the nature of the alarm and the audible alarm will sound. The audible alarm can be silenced by pressing the Alarm Silence button on the front of the unit. If another alarm condition occurs (i.e. low battery), the alarm will resound. The audible alarm can be altogether defeated by changing jumper J1 on the circuit board. See the back side of the Remote Annunciator for J1 jumper setting.

Figure 1: Remote Annunciator

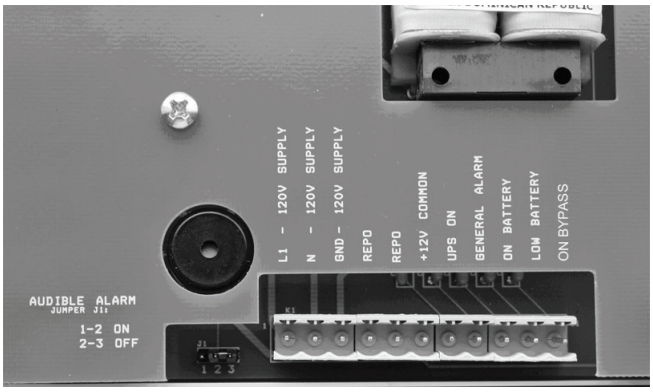
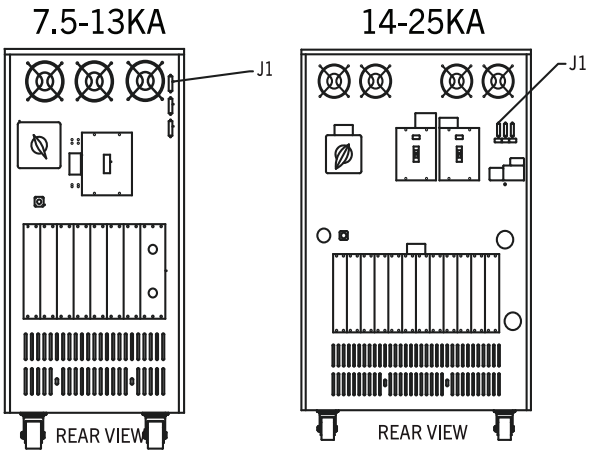
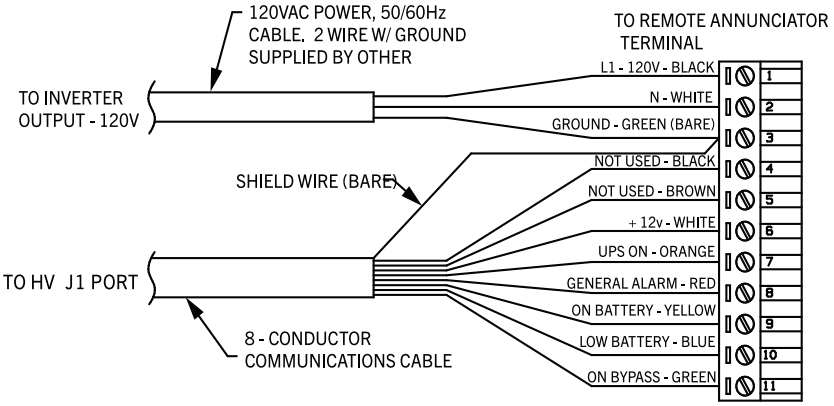


Figure 2: Rear of Remote Annunciator showing J1 and terminal header

WIRING

The wiring of the Remote Annunciator consists of two feeds. One being the communication cable supplied with the unit, and the other is 120Vac 50/60Hz from the output of the UPS it is monitoring. The power supply can be taken directly from an output breaker on the unit, a receptacle or panel that is fed by the UPS or a nearby circuit fed by the UPS. From the UPS, run the communication cable to the location of the Remote Annunciator. The cable may be run through conduit, walls or cable tray/raceway, but care must be taken not to pinch, cut or kink the cable. After the cable is run, trim excess cable or coil in a safe location. Both feeds, after entering the box, must be wired to the supplied connector as shown in Fig 3. Use standard 1/2" box connector clamps to anchor the wire to the box (not supplied).





NOTES:

1. All wires to connector must be stranded, maximum 12 AWG.
2. If using solid conductor for AC power, splice in length (minimum 4") of stranded wire to connector.
3. Strip outer sheathing and foil back minimum 2".
4. Strip all wires 0.25".
5. 120V supply must come from UPS output. Power must be present in event of utility failure.

6. Connector on other end of communication cable to be factory wired.

After all cable routing and connector wiring is complete, plug Remote Annunciator connector into the terminal header.

MOUNTING

The Remote Annunciator is designed to be wall mounted with wiring inputs through the rear or top/bottom (using conduit). Flipping out the side doors, remove the four screws fastening the cover to the box. The cover is attached to the box with two plastic retaining straps. Using the four holes in the back of the box and proper anchors (not supplied), mount the unit to drywall, masonry, paneling or any other type of wall. Holes are provided for rear cable entry. If top or bottom entry is desired, holes must be drilled in recommended location for (maximum 1/2") conduit (Fig. 4).

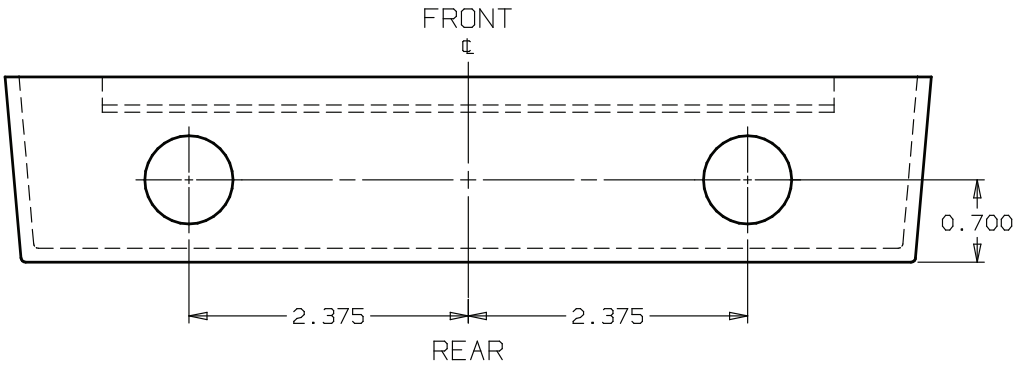


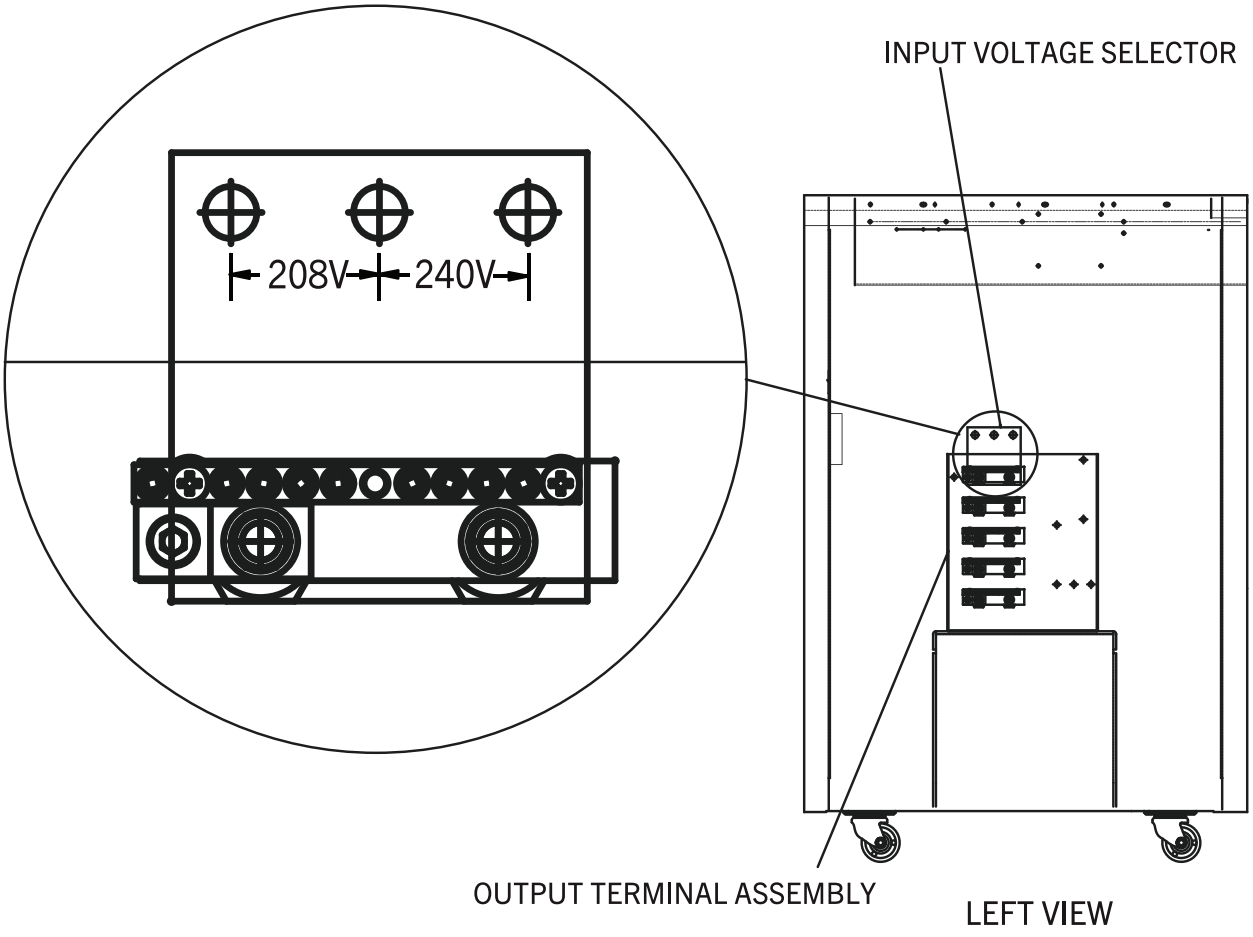
Figure 4: Drilling locations for top/bottom conduit entrance.

CHANGING THE INPUT VOLTAGE

⚠ WARNING

HIGH VOLTAGE EXISTS, BE SURE THE MAIN FEED IS DISCONNECTED PRIOR TO TAKING THE FOLLOWING STEPS. POWER IS SUPPLIED BY MORE THAN ONE SOURCE. MAKE SURE BOTH AC AND DC CIRCUIT BREAKERS ARE OFF BEFORE INSTALLING OR SERVICING THE UPS.

1. Loosen the input voltage selection shorting bar and strap it to the proper input voltage tap. See the Diagram below. Refer to *"Appendix A - Component Location Diagrams".*



2. Locate dip switch SW1 (Input Voltage Selection) on the microprocessor control card #404561. Select the proper switch corresponding to the input voltage. **Only one switch should be in the on position.** Refer to *"Appendix A - Component Location Diagrams"* for circuit board locations, and *"Appendix A - Control Board Layout"* for switch locations.

SELECTOR SWITCH #1 (SW1) - INPUT VOLTAGE SELECTION

INPUT	SWITCH POSITION			
VOLTAGE	1	2	3	4
120V	ON	OFF	OFF	OFF
208V	OFF	ON	OFF	OFF
220V	OFF	OFF	ON	OFF
240V	OFF	OFF	OFF	ON

3. If the UPS system has the standard monitor, no further steps are required. If the UPS is equipped with the optional S.P.A. Monitor, the following steps must be taken to insure proper monitor readout.

   A. Press the [Manufacturers Information] button. This button is located on the back side of the Display Board #404570 (located behind the front panel). Refer to *"Appendix A - Component Location Diagrams"* for circuit board locations.

   B. Repeatedly press the [Scroll] button on the keypad until you come to the Input Voltage screen.

   C. Use the numbers on the keypad to enter the new input voltage (Must be either 240 or 208).

   D. Press the [Manufacturers Information] button again to enter the new data into memory.

   E. Press [Input Volts] on the keypad to verify a correct display of the input voltage.

ADDING OUTPUT RECEPTACLES

WARNING

HIGH VOLTAGE EXISTS, CAUTION MUST BE TAKEN WHEN WORKING NEAR THE BATTERY TERMINALS. POWER IS SUPPLIED BY MORE THAN ONE SOURCE. MAKE SURE BOTH AC AND DC CIRCUIT BREAKERS ARE OFF BEFORE INSTALLING OR SERVICING THE UPS.

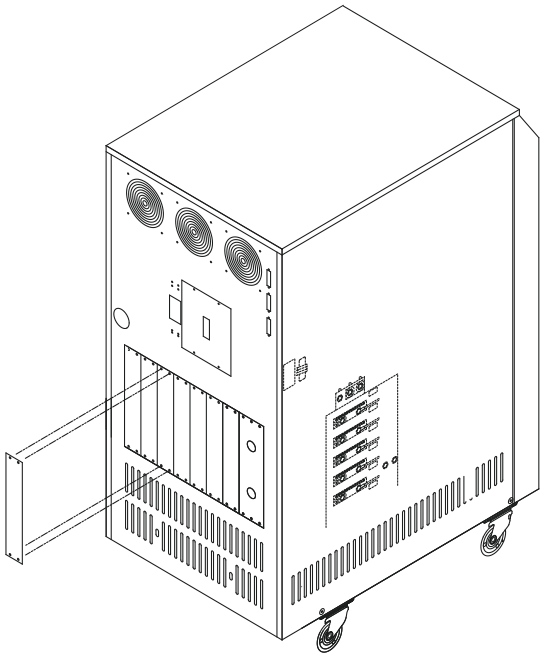
The following is a list of receptacles available that may be configured onto a patch panel and wired into the output of the UPS.

STRAIGHT BLADE		
NEMA NO.	CONFIG.	RATING
5-15R		15A 125V
5-20R		20A 125V
6-15R		15A 250V
6-20R		20A 250V
5-30R		30A 125V
6-30R		30A 250V
5-50R		50A 125V
6-50R		50A 250V

STRAIGHT BLADE		
NEMA NO.	CONFIG.	RATING
14-15R		15A 125/250V
14-20R		20A 125/250V
14-30R		30A 125/250V
14-50R		50A 125/250V
14-60R		60A 125/250V

LOCKING BLADE		
NEMA NO.	CONFIG.	RATING
L5-15R		15A 125V
L6-15R		15A 250V
L5-20R		20A 150V
L6-20R		20A 250V
L5-30R		30A 125V
L6-30R		30A 250V
L14-20R		20A 125/250V
L14-30R		30A 125/250V

CHANGING POWER DISTRIBUTION PANELS



INSTALLATION

1. Refer to the figure at the right.
2. Turn off both utility and battery breaker.
3. Unplug all items supplying power to the UPS and battery.
4. Remove the four screws that hold the patch panel in place.
5. Connect the new patch panel wires to the proper output terminals.
6. Mount the new patch panel into an empty slot.
7. Reinstall any other panels that were removed.
8. Turn on both the utility and battery breakers.
9. Verify proper voltage at the receptacles prior to plugging in critical loads.

SYSTEM SET UP AND START UP

⚠ WARNING ⚠

DO NOT ATTEMPT TO OPERATE THE UNIT UNTIL THE FOLLOWING STEPS HAVE BEEN COMPLETED.

Refer to *"Appendix A - Component Location Diagrams"* for circuit board locations, and *"Appendix A - Control Board Layout"* for switch locations.

Prior to turning on the power and starting the UPS it is very important to check out the mode in which you intend to operate the system.

All operating parameters are factory set to the standard operating mode.

Selector switches SW1 through SW5 on the microprocessor control board #404561 allows you to change the modes of operation to best suit your specific needs.

SELECTOR SWITCH #1 (SW1) - INPUT VOLTAGE SELECTION, **Note - Only one switch should be on at a time. Also see - "Changing the Input Voltage"**

INPUT VOLTAGE	SW1 SWITCH POSITIONS			
	POSTION 1	POSITION 2	POSITION 3	POSITION 4
120 VAC	ON	OFF	OFF	OFF
208 VAC	OFF	ON	OFF	OFF
220 VAC	OFF	OFF	ON	OFF
240VAC	OFF	OFF	OFF	ON

SELECTOR SWITCH #2 (SW2) - INVERTER SLEW RATE - The slew rate is how fast the inverter will correct phasing synchronization to the incoming line. The standard setting should be used unless the incoming lines are very unstable or the UPS will be connected to a generator.

INPUT VOLTAGE	SW2 SWITCH POSITIONS			
	1	2	3	4
STANDARD	ON	OFF	OFF	OFF
FAST	OFF	ON	OFF	OFF
GENERATOR	OFF	OFF	ON	OFF

SELECTOR SWITCH #4 (SW4) - OPERATING OPTIONS

Switch Position #1 - Factory Test Switch: This switch is for factory testing only and must remain in the off position.

Switch Position #2 - Battery Cutoff Voltage: Battery manufacturers specify the desired cutoff voltage for maximum life performance. Trystar recommends 1.75 VPC, this assures longer battery life. ON = 1.75 VPC

Cutoff

OFF = 1.67 VPC Cutof

Switch Position #3 - Manual Restart: During extended power outages the UPS automatically turns off to prevent total battery depletion. Upon return of utility power you have the option for the UPS to turn on automatically or manually by pushing the “Manual Restart” button on the front panel.

ON = Manual Restart

OFF = Auto Restart

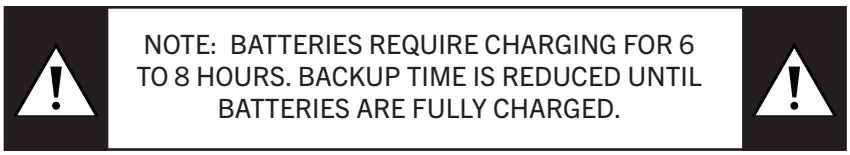
Switch position #4 - This switch remains on at all times. If an input shunt trip circuit breaker is installed in the system, low battery will cause it to trip when the manual mode is selected.

SELECTOR SWITCH #5 (SW5) - LOW BATTERY SET POINT - This is a rotary selector switch that allows you to select the percent of battery back up time at which the low battery alarm will activate.

SWITCH POSITION	%	DESCRIPTION
0	0%	NO WARNING
1	10%	TIME REMAINING
2	20%	TIME REMAINING
ETC.	ETC.	ETC.
7	70%	TIME REMAINING (MAXIMUM SETTING)

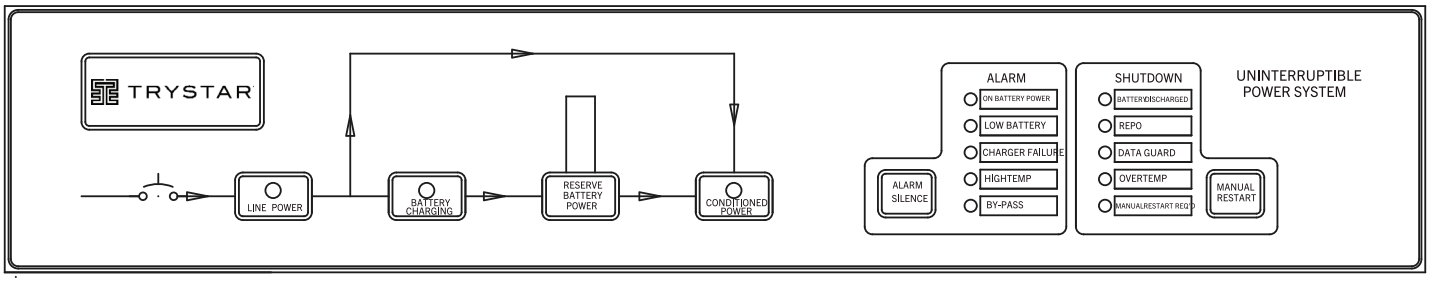
START UP

1. Verify all connections are correct, and that the batteries are properly connected.
2. Reinstall all panels that may have been removed during installation.
3. Connect the loads to the output.
4. Be sure all of the loads are turned off.
5. Turn on the DC breaker.
6. Turn on the AC breaker. If the manual restart LED is lit, press the manual restart button located on the front panel.
7. Check the output voltages with a voltmeter to verify that they are the proper value for the critical load.
8. Turn on the critical loads.



OPERATION

STANDARD MONITOR



SYSTEM OPERATION & DISPLAY FUNCTIONS

The HV Series display provides information on the mode of operation as well as audible and visual alarms and shutdown. The following is a description of each display function.

There are four L.E.D.'s that represent the power flow.

LINE POWER - This L.E.D. illuminated indicates the UPS is operating on utility power. The L.E.D. will turn off if utility or "Line" power is disabled.

BATTERY CHARGING - L.E.D. will illuminate when the batteries are charging. The units AC and DC circuit breakers must be on. Batteries will charge anytime utility power is on. Standard battery chargers are rated at 5 amps. The L.E.D. will turn off when the batteries are charging at about 1 amp or less. The L.E.D. will turn off anytime the unit is on battery power.

RESERVE BATTERY POWER - This is a bar graph style L.E.D. that will provide a percentage of reserve battery time remaining based on total back up time of the batteries. Example: If total back up time under full load is 10 minutes and the bar graph reads 40%, the remaining back up time will be about 4 minutes.

CONDITIONED POWER - L.E.D. illuminates anytime the main power transformer is energized, whether on utility power or battery power.

ALARMS

ON BATTERY POWER - L.E.D. illuminates with a intermittent audible alarm anytime utility power falls out of the input specifications and the UPS switches to battery power.

LOW BATTERY - L.E.D. illuminates with a intermittent audible alarm anytime the UPS is on battery power and falls below a user selectable percentage of battery time remaining. Select points begin at 70% battery remaining and decrement 10% for each selection down to 0% battery time remaining.

CHARGER FAILURE - L.E.D. illuminates with a intermittent audible alarm anytime there is a battery charger failure. A battery charger failure is determined by a lack of charger current while charger voltage is present.

HIGH TEMP - L.E.D. illuminates with a intermittent audible alarm when

the main transformer exceeds 180 degrees Celsius.

BY PASS - L.E.D. operational only on units equipped with an internal bypass switch. The L.E.D. illuminates when the switch is in the bypass mode.

SHUTDOWNS

MANUAL RESTART REQUIRED - This is a push-button that must be depressed anytime there is a shutdown alarm in order to restart the UPS.

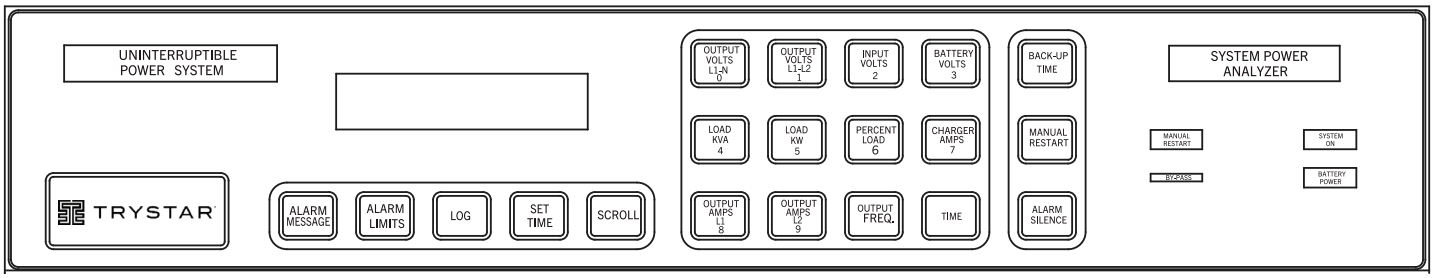
BATTERY DISCHARGED - L.E.D. illuminates with a continuous audible alarm if the batteries fall below their preset cutoff level. The UPS is disabled and requires the Manual Restart Button to be depressed before the UPS will operate. Note: Unit may start automatically dependent on a user selectable switch, See *"System Set Up"* for details.

Note: Unit may start automatically dependent on a user selectable switch, See "System Set Up" for details

REP0 - (Remote Emergency Power Off) - This function operates with a dry contact closure that connects to a RS232 connector on the UPS. The L.E.D. illuminates with a continuous audible alarm. The UPS is completely disabled and requires the Manual Restart Button to be depressed which will re-energize the UPS. As an option the REPO can be supplied with a mechanical shutdown that physically trips the main AC circuit breaker and disables the inverter. This is accomplished VIA a four pin plug connector on the rear of the UPS.

OVERTEMP - L.E.D. illuminates with a continuous audible alarm and disables the UPS anytime the inverter assembly exceeds 180 degrees Fahrenheit, or the main transformer exceeds 220 degrees Celsius. A Manual Restart push-button is required to re-energize the UPS.

SYSTEM POWER ANALYZER (SPA) MONITOR



The System Power Analyzer (SPA) is a user friendly, precision metering and data acquisition system analyzer. It provides diagnostics, true RMS metering, power analysis and display of all electrical parameters of the UPS. Single, well defined push buttons access electrical parameters, alarm messages, operating set points and log functions. A back lit LCD alpha numeric read out provides extremely sharp visual resolution of all data and titles.

Communication through a RS232 port provides a convenient remote display at the PC level. A simple **Hot Key Command** (Alt H) initiates a full screen display of all the electrical parameters and all functions as listed below.

LOG FUNCTIONS

• Number of overloads.	• Number of outages.
• Elapsed Days of Operation	• Inverter Hours

Note: Overload counter, outage counter, elapsed days and inverter hours will reset on final battery shutdown, pressing "clear log" or by turning off the main DC breaker.

The last 10 overloads or outages are permanently stored in memory with time and date of each occurrence.

Note: Overload counter, outage counter, elapsed days and inverter hours will reset on final battery shutdown, pressing "clear log" or by turning off the main DC breaker.

SHUTDOWN MESSAGE: When a shutdown occurs a continuous audible alarm sounds accompanied by a alphanumeric display that tells one of the four reasons the UPS shutdown. When the UPS restarts the memory will display the reason the UPS shutdown. To restart the UPS the "Manual Restart" button must be pressed with exception of the "Low Battery" shutdown which is user selectable to restart the UPS automatically or manually depending on the Auto/Manual reset dip switch. (Refer to *"System Set Up and Start Up"*.)

• Normal Shutdown	• High Temperature
• Low Battery	• Remote Emergency Power Off (REPO)

ALARM MESSAGE: Functions in real time and displays the type of alarm with an audible alarm. The alarm overrides all other display functions and clears automatically only when the alarm is corrected. If there is more than one alarm at the same time hit the SCROLL button to display any other alarm.

• Number of Alarms	• Frequency Fault
• Output Overload	• Alarm Silence
• Output Undervoltage	• Manual Restart Required/User Selective
• Low Battery Voltage Warning	• DC Battery Charger Failure
• Transformer High Temp Warning	• Heatsink High Temperature Warning

ALARM LIMITS: Allows viewing of factory alarm and shutdown set points of the following:

• Low Battery Voltage Warning	• Transformer High Temperature Warning
• Low Output Voltage	• Heatsink High Temperature
• High Output Voltage	• Output High Frequency
• Transformer Shutdown Temperature	• Output Low Frequency
	• Low Battery Shutdown

BACK LIT ANNUNCIATION

• System On	• Bypass
• On Battery Power	• Manual Restart

OPERATING THE SPA - All operating perimeters are easily obtained by pressing the appropriate push-button, any alarm message will automatically overwrite the existing display. Both log and alarm limits use the scroll function to display additional information. Each time the scroll button is pressed, it displays the next line of information automatically.

BUTTON	FUNCTION
[Output Volts L1 - N]	Displays output voltage between line 1 and neutral.
[Output Volts L1-L2]	Displays output voltage
[Input Volts]	Displays input voltage.
[Battery Volts]	Displays voltage across the batteries.
[Load KVA]	Displays KVA of load attached to UPS.
[Load KW]	Displays KW of load attached to the UPS.
[Percent Load]	Displays percentage of load on the UPS.
[Charger Amps]	Displays amount of charger current the batteries are drawing.
[Output Amps L1]	Displays output current between L1 and neutral.
[Output Amps L2]	Displays output current between L2 and neutral.
[Output Frequency]	Displays output frequency of the UPS.
[Time]	Displays time and date.
[Back up Time]	Displays (while in the “Battery Power” mode) battery time remaining.
[Manual Restart]	Press to re-start unit when “Manual Re-Start” is required.
[Alarm Silence]	Press to silence the alarm.
[Alarm Message]	Press this button to enter alarm message mode. Press [Scroll] button to view message.
[Alarm Limits]	Press this button to enter alarm limit function. Press [Scroll] to view alarm limits.
[Log]	Press this button to enter the Log Function.
	Press [Scroll] once to view total number of outages.
	Press [Scroll] again to see total number of overloads.
	Press [Scroll] again to see number of elapsed days of operation.
	Press [Scroll] again to view total hours of inverter.
	Press [Scroll] to view time of each outage.
	Press [Scroll] to view time of each overload.
	After going through this sequence you can either clear or leave the log intact. Display will say clear log 0 - Yes, 1 = No 0 entered clears log, 1 entered does nothing. You must hit SCROLL to move screen.
	Note 1: The last 10 overloads or outages are permanently stored in memory with time and date of each occurrence.
	Note 2: Total outages, total overloads, elapsed days and inverter hours will reset on final battery shutdown, pressing “Clear Log” or by turning off the main DC breaker.
[Set Time]	Press this button to set the time and date. Use the numbers on the keypad to enter time and date. Use military time, final digit entered locks in time and date.

BYPASS SWITCH OPERATION

WARNING

DO NOT OPERATE THE BYPASS SWITCH WHILE THE UNIT IS ON BATTERY POWER.

IMBB - Internal MAKE before BREAK manual bypass. The IMBB located on back of the UPS is pre-wired and requires no additional installation. There is **NO** break in output power when operating this switch. In the bypass mode the UPS provides regulated computer grade power, but the battery back up is bypassed.

WMBBM - External, wall mount, BREAK before MAKE manual bypass. This switch is only used if the input and output voltages of the UPS are the same. There **IS** a break in output power when operating this switch. In the bypass mode the WMBBM isolates the UPS input and output in order to perform maintenance. The load is then supplied by utility power.

WARNING

A BREAK BEFORE MAKE BYPASS SWITCH WILL CAUSE THE CRITICAL LOAD TO SHUTDOWN DURING TRANSFER.

WMMBBM - External, wall mount, MAKE before BREAK manual bypass. This switch is only used if the input and output voltages of the UPS are the same. There is **NOT** a break in output power when operating this switch. In the bypass mode the WMMBBM isolates the UPS input and output in order to perform maintenance. The load is then supplied by utility power.

EBBM - External roll in cabinet, BREAK before MAKE manual bypass with distribution. This switch is used only if the input and output voltages of the UPS are the same. There IS a break in output power when operating this switch. In the bypass mode the EBBM isolates the UPS input and output in order to perform maintenance. The load is then supplied by utility power. Included is (7) two inch panels for output distribution that may be configured with various receptacles and breakers.

CBBM - External roll in cabinet, conditioned BREAK before MAKE manual bypass with distribution. These switches are used for a UPS with different input and output voltages. In the bypass mode the UPS is isolated in order to perform maintenance. The load is then supplied by utility power. Included is (7) two inch panels for output distribution that may be configured with various receptacles and breakers. Also included is a triple shielded computer grade isolation transformer, so even in the bypass mode your computers receive conditioned power. There **IS** a break in output power when operating this switch.

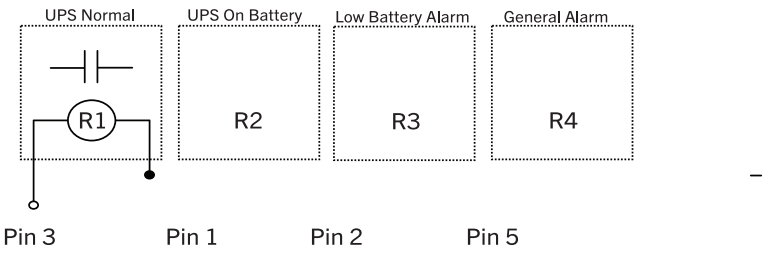
CMBB - External roll in cabinet, conditioned MAKE before BREAK manual bypass with distribution. These switches are used for a UPS with different input and output voltages. In the bypass mode the UPS is isolated in order to perform maintenance. The load is then supplied by utility power. Included is (7) two inch panels for output distribution that may be

configured with various receptacles and breakers. Also included is a triple shielded computer grade isolation transformer, so even in the bypass mode your computers receive conditioned power. There is **NOT** a break in output power when operating this switch.

After switching to bypass mode, it is recommended that the DC circuit breaker be turned to the "OFF" position. This will prevent battery discharge and possible battery damage if left in bypass mode for extended periods of time. Be sure to turn the DC circuit breaker back "ON" before returning to normal mode operation.

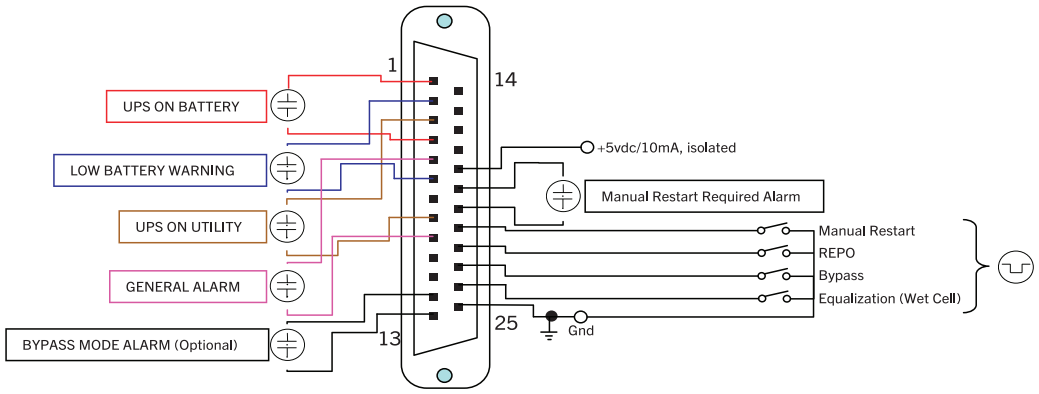
COMMUNICATIONS

Slave Relays for alternate voltage/c urrent and isolation requirements
(Recommended to insure pr oper interface without operational interference)



R1-R4 contact and coil specifications to match customer alarm interface and DC Power Source requirements.

HV UPS
J1 Port / DB25



Cold contact output, closes upon Alarm.
Isolated contacts
Contacts rated at 24vdc/ac, 0.5 amps.

Cold contact input, close to activate.
One side reference to ground.
Internal isolated 5vdc supply.

Serial Communication
TX/RX RS232 (ASCII 8 BIT) 9600 BPS
Available via J3, ONLY if SPA Monitor is Installed

J1 PORT (ALARM CONTACT) COMMUNICATIONS

The HV Series input and output communications provides complete diagnostic and operating status. The signals, available at the rear of the inverter cabinet, can be obtained through a DB25 pin female connector marked J1. Refer to *"Appendix A - Component Location Diagrams"* .

INPUT SIGNALS

Customer supplied inputs can be used to perform the following functions:

Input contacts must be normally open dry contacts; function activates on close. *

PINS	SIGNAL	FUNCTION
21 AND 25	MANUAL RESTART	Momentary closure allows a system restart from a remote location.
22 AND 25	REPO	Momentary closure electronically performs a complete UPS shutdown via a Remote Emergency Power Off button.
23 AND 25	BYPASS	Dry contacts on pins 12 and 13 that system has been bypassed externally.
24 AND 25	EQUALIZE	Performs an Internal equalization **

* The power for these functions is supplied internally by an isolated +5 Volts DC power supply (Pin 25 is common). All inputs are optically coupled. Open collector or emitter transistor logic can also be used to drive the inputs active. Each input is current limited to 10ma.

* Do not exceed 8 hours. Equalization is only needed when using wet cells, extensive backup time or during yearly preventative maintenance.

OUTPUT SIGNALS

PINS	SIGNAL	FUNCTION
3 AND 8	UPS ON	Whenever conditioned power is available at the output
1 AND 4	UTILITY FAILURE	Whenever the input voltage exceeds the specified range of +10% to -15%
2 AND 6	LOW BATTERY	Whenever the battery reaches a user critical level; used to warn personnel of impending shutdown or initiate an unattended computer shut down.
12 AND 13	BYPASS ON	Whenever the system is in the bypass mode.
19 AND 20	MANUAL RESTART	Whenever the system requires a manual restart.
5 AND 9	GENERAL ALARM	For any of the following conditions:
		a. On battery power.
		b. Low battery.
		c. Transformer high temp.
		d. Battery charger failure.

* Contacts are rated: AC/DC 24 Volts, 1/2 Amp

* +5 Volts DC is available at pin 18. Ground at pin 25. This voltage can be used to interface the contact closure to TTL logic. The 5 Volt power source is fully isolated from the internal battery power and chassis ground. The output current is limited to 10 ma.

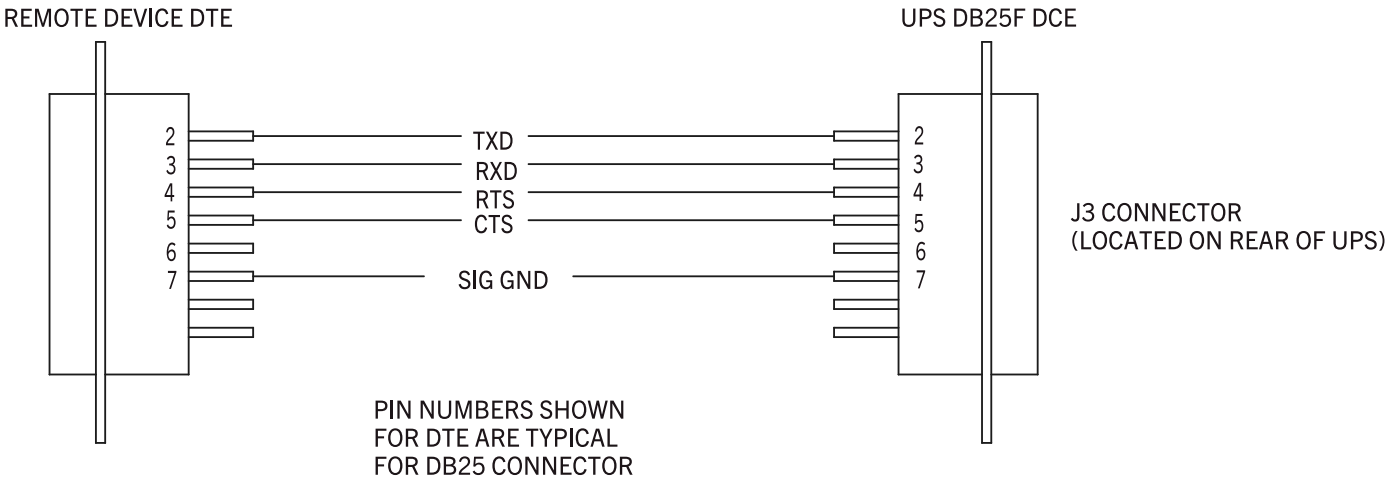
SYSTEM POWER ANALYZER MONITOR (S.P.A.) COMMUNICATIONS

RS-232 WIRING INFORMATION FOR S.P.A. COMPUTER INTERFACE

This section describes how to hook up and use the UPS RS-232 port (J3) to begin communication with the UPS from your computer. The RS-232 interface should be connected to your computer (Comm 1 port) according to the connection diagram. We recommend a soldered connection using a high grade shielded type wire. The computer must have serial communication capability which may require an interface card. Baud rate is 9600. Refer to *"Appendix A - Component Location Diagrams"* .

CAUTION

DO NOT CONNECT TO J1 ALARM PORT ON THE UPS.



INSTALLING THE REMOTE OPERATION SOFTWARE V 1.0

The installation procedure for remote operation is quite simple. The following instructions describes the installation procedures for a stand alone personal computer.

Remember to make a back up copy of REMOTE OPERATION V 1.0 diskette and check your system requirements before starting the installation process.

___ Stand alone personal computer with minimum 512 KB RAM

___ PC/MS-DOS 2.0 or later

___ UPS interface cable

___ UPS with output signal connector J3 (DB-25 pin)

___ REMOTE OPERATION V 1.0

PROCEDURES FOR MS-DOS

Step 1 - Enter the root directory on the C: drive

Step 2 - Place the REMOTE OPERATION disk in drive A:

Step 3 - Type COPY A: *.* C: [Return]

Files Copied Are: REMOTE.EXE

Step 4 - Type EDLIN AUTOEXEC.BAT [Return]

Type 1I (at the * prompt) [Return]
Type c:\remote.exe [Return]
Pressing ALT H will execute the program. [Return]

The computer will now display the SPA information and update it every 20-30 seconds. This is an effective way to remotely monitor the UPS System.

With this command added to your autoexec.bat the program will run automatically each time the system is booted.

OPTIONAL REMOTE COMMUNICATIONS

NETMINDER REMOTE COMMUNICATIONS

Optional network communications provide the status and condition of the HV Series UPS and the incoming electrical power, as well as protect the LAN / WAN from unwanted downtime and unnecessary maintenance costs when the NetMinder™ RCCMD (see below) is installed on the network computers. Contact the factory for additional product details.

NetMinder™ CS141 Series of Ethernet Adapters

The NetMinder CS141 series of adapters integrate the HV Series UPS into an Ethernet TCP/IP, MODBUS TCP/IP, or MODBUS RS485 network. These adapters provide remote monitoring of UPS status and alarm conditions via a web browser. Remote notification of alarms and battery status are available via SNMP and e-mail; and are also viewable on a webpage.

Used with NetMinder RCCMD (a separate client-side software application to perform an orderly, unattended shutdown of servers), all CS141 adapters provide added network protection from downtime, and prevent unnecessary maintenance costs that result from data corruption and server crashes. RCCMD receives its shutdown instructions from either a CS141 web server or a “UNMS II” (UPS Network Management System) server.

The NetMinder CS141 Ethernet Adapter is available in (3) unique versions:

CS141B: Basic Ethernet / SNMP / TCP/IP / MODBUS TCP/IP communications used in UPS applications.

CS141L: Advanced version, includes all functionality of the basic version, plus the addition of temperature and humidity sensing capability, and 4 auxiliary contact closure inputs.

CS141L-485: Adds MODBUS RS485 communications to the advanced version of the NetMinder CS141L. However, temperature and humidity sensing is not available in this version.

NetMinder CS141 Features & Benefits

- Real-time Remote UPS Monitoring
- Web Server Based
- MODBUS ASCII and RTU
- Graphic Event and Data Trending
- Exportable Data and Event Logging for Trending Analysis and Troubleshooting

BACnet Communications Capability

The NetMinder CS141 adapters are able to communicate over a BACnet/IP or MS/TP network with the addition of customized external hardware. Consult factory for details.

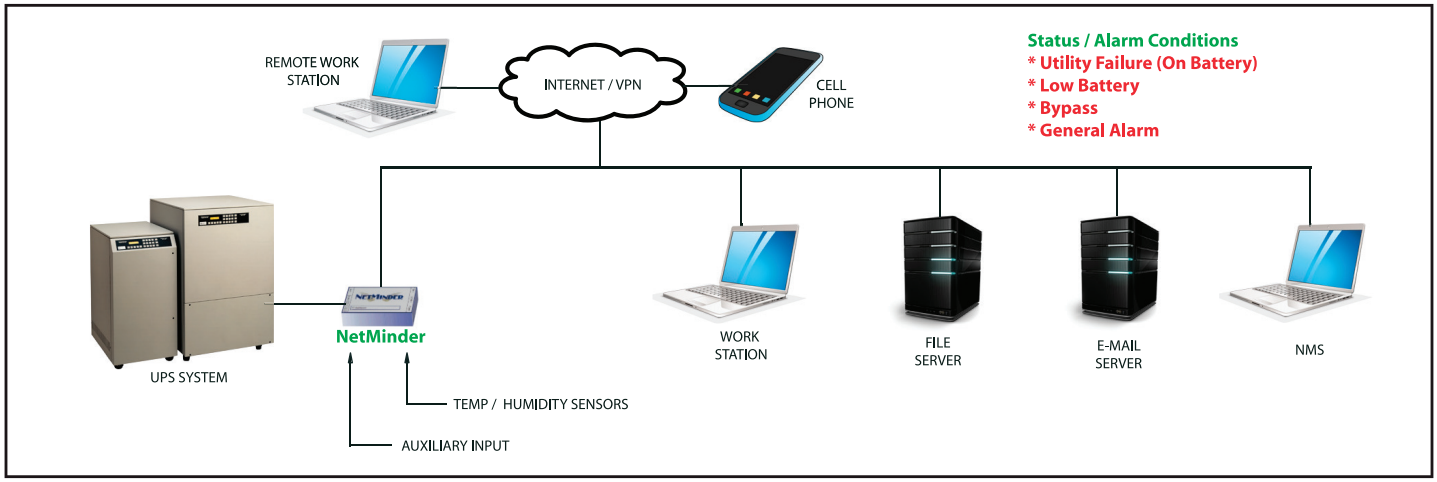
Optional "UNMS II" Software

The "UNMS II" (UPS Network Management System) software is a centralized monitoring package that will reside on a Windows-based network server, and provide users with the ability to monitor multiple UPS's from a single network device (e.g., desktop computer, tablet, laptop, or smartphone). Besides reporting via the home screen display, the "UNMS II" can be programmed to send an e-mail or SNMP message that reports the alarm or status condition. Additionally, "UNMS II" keeps a history log of all alarms and system events, classified according to severity. These log files can be viewed on the device, and also be exported as a CSV file and saved for future trend and data analysis.

The "UNMS II" is offered in Basic and Advanced versions. Both versions perform the functionality noted above, with a few significant differences.

Basic Version: Can monitor up to (9) Trystar UPS's with NetMinder CS141 Ethernet adapters, from one device (e.g., desktop computer, tablet, laptop, or smartphone).

Advanced Version: Can monitor up to an unlimited number of UPS's, and has a customizable user interface screen which can be modified to reflect all of the UPS's and additional facility equipment being monitored.



Alarm and event notification via local and remote monitoring, e-mail, and cell phone text messaging.

PREVENTIVE MAINTENANCE

WARNING

*** INSPECTION, PLACEMENT, INSTALLATION, SETUP, ***

START-UP AND MAINTENANCE SHOULD BE PERFORMED

BY QUALIFIED PERSONNEL ONLY.

WARNING

HIGH VOLTAGE EXISTS, CAUTION MUST BE TAKEN WHEN WORKING NEAR THE BATTERY TERMINALS. POWER IS SUPPLIED BY MORE THAN ONE SOURCE. MAKE SURE BOTH AC AND DC CIRCUIT BREAKERS ARE OFF BEFORE INSTALLING OR SERVICING THE UPS.

GENERAL MAINTENANCE

The best preventive maintenance is to operate the HV Series UPS in a clean environment with proper ventilation and no restriction on air intakes and cooling fan outputs.

Battery connections should be tightened annually by qualified electrical personnel. Batteries should be replaced every 5 years.

The UPS should be checked monthly on battery operation. Take precautions to have computers in a mode that could tolerate a shut down. To simulate a utility power loss, simply turn off the AC circuit breaker located on the UPS. Observe the battery bar graph. A properly functioning system will show 90 - 100% on battery bar graph and should decrement slowly.

COMPLETE MAINTENANCE CHECK

PREPARATION

A shutdown period must be scheduled to perform maintenance unless the system is equipped with a “Maintenance Bypass” switch. A computer load should be available to test the UPS with a loss of power simulation.

EQUIPMENT

Digital multimeter, wire brush or other cleaning device (for battery connections), insulated tools (for battery connections), battery tester, and safety glasses.

SYSTEM OPERATION

1. With the power on, check the display functions of the unit for proper operation.
2. Turn both the AC and DC breakers off.

Note: Larger units do not have a front door.

VISUAL INSPECTION

1. Remove any load from the unit's output.
2. Remove the top panel, left side panel (facing front panel) and open the front door. **CAUTION:** Open the front door gently, interconnections could be damaged. NOTE: Larger units do not have a front door.
3. Disconnect the battery connector. On 7.5 KVA - 13 KVA the battery connection is located behind the front door. Above 13KVA, the battery connector is located near the output terminals on left side of the unit when facing the front.
4. Check for loose connections; burnt, frayed or broken wires. Look closely in following areas:

• Input Terminals	• Inverter components
• Output Terminals	• Power Semiconductors connections
• Circuit Breaker	• Capacitor connections
• Transformer connections	• Fan connections
• Bypass Switch and electronic connections	

5. Correct any loose connections etc....replace any physically burned or broken components. Use extreme care when replacing components to assure correct installation.
6. Check off all items on the Performance Checklist. See "Performance Checklist".

BATTERY TEST

⚠ WARNING ⚠

HIGH VOLTAGE EXISTS, CAUTION MUST BE TAKEN WHEN WORKING NEAR THE BATTERY TERMINALS. POWER IS SUPPLIED BY MORE THAN ONE SOURCE. MAKE SURE BOTH AC AND DC CIRCUIT BREAKERS ARE OFF BEFORE INSTALLING OR SERVICING THE UPS.

1. Visually inspect all of the battery connections, if there is any sign of corrosion, disconnect that battery and clean it with a wire brush. Tighten all other battery connections. Make sure batteries are not swollen or cracked, if they are contact the factory.
2. Re-connect the DC battery connector.
3. Roll the battery tray back into place if it has been pulled out.
4. Check that all circuit board connections are securely plugged in.
5. Turn off all loads.
6. Turn both the AC and DC breakers on. Let the unit run for a minute.

NOTE: The battery charging light may be on or off depending on how deep the batteries are discharged.

Note: The battery charging light may be on or off depending on how deep the batteries are discharged.

7. Verify the battery float voltage in Table A at terminals K1, pin 3 (common) and pin 1 on the Switch Mode Power Supply Board # 404563. **NOTE:** Check the battery charging current by placing a DC voltmeter across K2, pin 3 (A1) common and pin 4 (A2) on circuit board #404567. The signal must be 30 millivolts DC or less to verify the battery float voltage in Step 7. If not, allow the batteries to charge and recheck the float voltage. If the float voltage is incorrect adjust potentiometer P3 on control board #404561.

KVA	DC VOLTAGE (CHARGER OFF)	NUMBER OF BATTERIES	BATTERY FLOAT VOLTAGE (CHARGER ON)
7.5KVA - 13KVA	96V	8	109V
14KVA - 20KVA	120V	10	136V
25KVA	144V	12	165V

8. Turn the AC breaker off only, the unit should go to battery power. Note the battery bar graph level. The rate at which the bar graph decreases is related to the actual load on the output and battery back up time. If back up time is very short, contact the factory.
9. Complete a NO LOAD INVERTER test and record the readings on the Performance Checklist.
10. Turn the AC breaker on, the unit will return to line power, complete a NO LOAD ON LINE test and record the readings on the Performance Checklist.
11. Check any emergency power off devices and any options: ie - system power analyzer, bypass switch, REPO, remote monitor, computer interface, etc.....
12. Test the unit ON LINE with loads and record the readings on the Performance Checklist.
13. Invert the unit with loads and record the readings on the Performance Checklist.

Note: Observe the battery bar graph. The rate at which the graph decreases is related to output load and battery back up time. If battery back up time is very short, contact the factory.

NOTE: Observe the battery bar graph. The rate at which the graph decreases is related to output load and battery back up time. If battery back up time is very short, contact the factory.

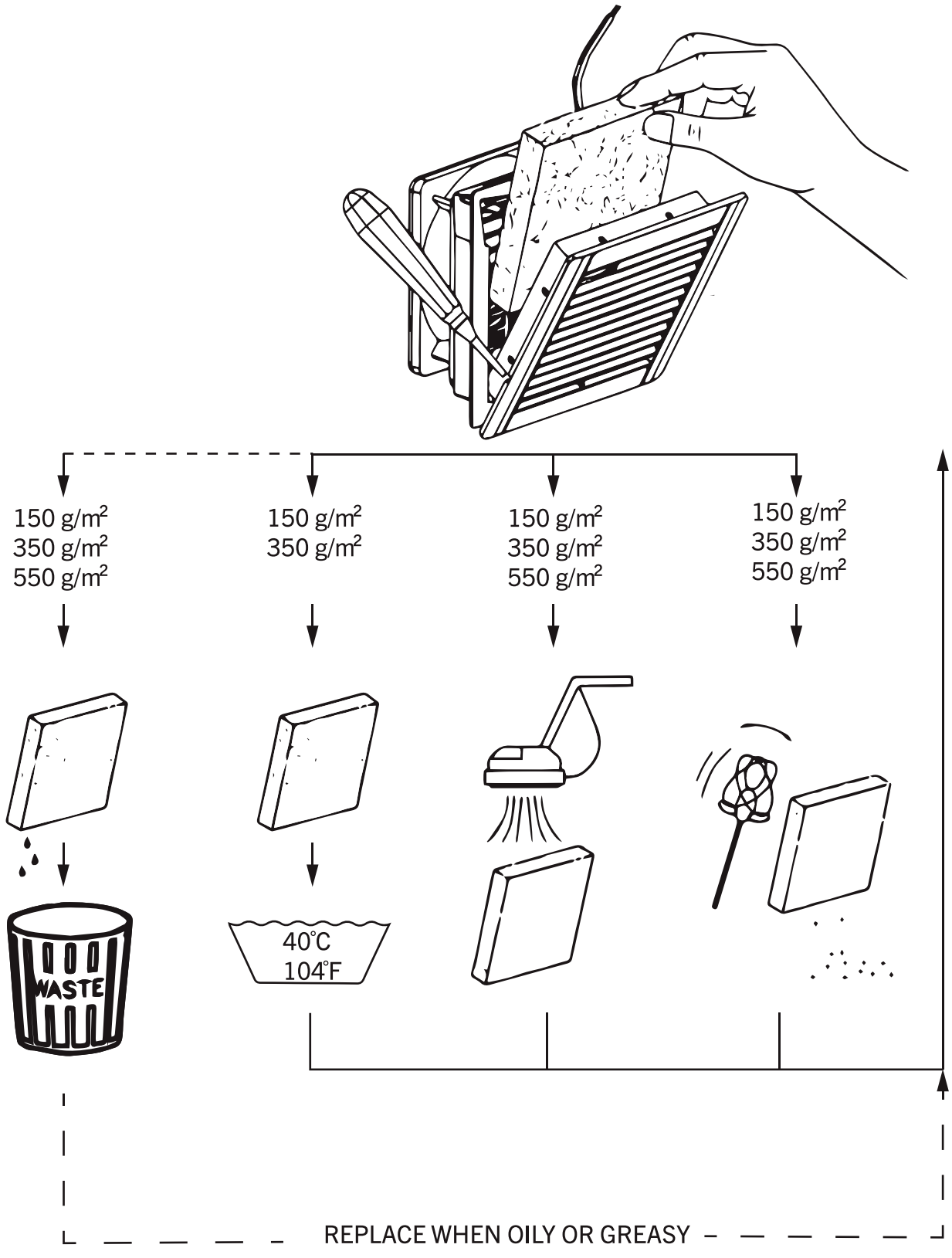
GENERATOR TEST

1. If a generator is backing the UPS, check to be sure the UPS operates properly with the generator.

A. Check generator operation with no load. The unit should switch to inverter when the generator turns on. After a minute or so the UPS should switch back to normal mode and run off of the generator. Record the UPS output voltage on the Performance Checklist.

B. Check generator with loads. Follow the same steps stated above and record readings on the Performance Checklist.

FILTER MAINTENANCE



PERFORMANCE CHECKLIST

TRYSTAR

UPS PERFORMANCE CHECKLIST AND BATTERY CHECKLIST

SRO # : _____ Date : _____

Customer Name : _____

Model Number : _____ Serial Number : _____

System Location : _____

	OK	NOT OK	N/A	EXPLANATION OF ITEMS CHECKED "NOT OK"
ENVIRONMENTAL CHECKS				
CLEANLINESS				
VENTILATION				
ROOM TEMP (Record Actual)				
***BATTERY CHECKS**				
BATTERY CONNECTIONS				
BATTERY VOLTAGE				
ELECTRICAL CONNECTION CHECKS				
BYPASS SWITCH (SEE BELOW)				
INPUT CONNECTIONS				
OUTPUT CONNECTIONS				
CIRCUIT BREAKERS				
CIRCUIT BOARD CONNECTIONS				
HEATSINK CONNECTIONS				
MAIN BATTERY CONNECTOR				
INTERNAL FAN MOTORS				
EXTERNAL FAN MOTORS				
FUSES				
CAPACITORS				
SYSTEM CHECKS				
DISPLAY FUNCTIONS				
STATIC BYPASS				
MANUAL BYPASS				
FAN MOTORS				
ON INVERTER / BATTERY				
REPO TEST				

SW Settings

SW1 (CLOSED / OPEN) SW2 (CLOSED / OPEN) SW4 (CLOSED / OPEN)

IF LOADS ARE NOT AVAILABLE AT TIME OF STARTUP, LEAVE THE UNIT IN BYPASS MODE.

Default settings should be set to Auto Restart if customer is unavailable to verify

INPUT	NO LOAD	W/ LOAD
L1 - N VOLTS*		
L2 - N VOLTS*		
L3 - N VOLTS*		
L1 - L2 VOLTS*		
L1 - L3 VOLTS*		
L2 - L3 VOLTS*		
L1 Current*		
L2 Current*		
L3 Current*		
LN Current		
Freq Hz		
N to GND		

OUTPUT	NO LOAD	W/ LOAD	ON BATT
L1 - N VOLTS*			
L2 - N VOLTS*			
L3 - N VOLTS*			
L1 - L2 VOLTS*			
L1 - L3 VOLTS*			
L2 - L3 VOLTS*			
L1 Current*			
L2 Current*			
L3 Current*			
LN Current			
Freq Hz			
N to GND			

Battery Voltage

Charger Voltage

Charger Current

* WHERE APPLICABLE

TRAINING

_____ On/Off Procedure _____ Use of Bypass _____ Manual Battery Test _____ Battery Maintenance

_____ Use of Monitor _____ Manual vs. Auto Restart _____ Annual Battery Check _____ Annual Maintenance

TRAINING SIGN UP: COMMENTS:

CUSTOMER SIGNATURE _____ DATE: _____

TITLE _____

QAF #: 19.23	SUBJECT: UPS PERFORMANCE CHECKLIST AND BATTERY CHECKLIST	Revision #: 4
Effective Date: 8/23/21	APPROVED BY: Service Department	Page #:1 of 2

TRYSTAR

UPS PERFORMANCE CHECKLIST AND BATTERY CHECKLIST

SRO # _____ DATE: _____

Battery Mfg. & Model# _____ # of Batteries _____

(1) BATTERY INSPECTION

Torque _____ Terminal Connections _____ Battery Connector _____

Any damaged batteries?: YES ☐ NO ☐

If Yes, please explain:

(2) BATTERY VOLTAGE

Start Up (Record actual voltage of each battery with and without load on Inverter Power)

Preventive Maintenance (Record actual voltage of each battery with no load and after 5 minutes of rundown)

	No Load	W/ Load		No Load	W/ Load		No Load	W/ Load		No Load	W/ Load
1			2			3			4		
5			6			7			8		
9			10			11			12		
13			14			15			16		
17			18			19			20		
21			22			23			24		
25			26			27			28		
29			30			31			32		
33			34			35			36		
37			38			39			40		

(3) BATTERY RUNDOWN (ON PREVENTATIVE MAINTENANCE ONLY)

What is the UPS rated back up time? _____

How many minutes did the UPS run on battery before shutting off? _____

(4) GENERATOR TESTS

No load on GEN output _____ Inverter on GEN output _____

Does UPS return to line power when on GEN? YES ☐ NO ☐ Generator Frequency _____

COMMENTS:

Technician Signature : _____

Customer Signature : _____

EMAIL: _____ DATE: _____

QAF #: 19.23	SUBJECT: UPS PERFORMANCE CHECKLIST AND BATTERY CHECKLIST	Revision #: 4
Effective Date: 8/23/21	APPROVED BY: Service Department	Page #:2 of 2

BATTERY REQUIREMENTS

Batteries of a specific manufacturer and model are required to maintain the system's UL listing. Use of batteries not recognized in the product's UL report will void its listing.

APPROVED BATTERIES				
MANUFACTURER	A/H	BATTERY MODEL NUMBER	INTERNAL	EXTERNAL
CSB	26	GP12260	All	All
CSB	40	GP12400	All	All
CSB	37.5	HRL12150W	All	All
CSB	50	HRL12220	14-20kva	All
CSB	70	HRL12280W	no	All
CSB	100	HRL12330W	no	All
Leoch	26	LP12-26	All	All
Leoch	33	XP12-150	All	All
Leoch	55	XP12-210	14-20kva	All
Leoch	80	XP12-300	no	All
Leoch	90	XP12-350	no	All
East Penn	22.4	45HR2000	14-20kva	All
East Penn	41.4	HR3000	no	All
East Penn	49.5	HR3500	no	All

BATTERY REPLACEMENT

WARNING

HIGH VOLTAGE EXISTS, CAUTION MUST BE TAKEN WHEN WORKING NEAR THE BATTERY TERMINALS. POWER IS SUPPLIED BY MORE THAN ONE SOURCE. MAKE SURE BOTH AC AND DC CIRCUIT BREAKERS ARE OFF BEFORE INSTALLING OR SERVICING THE UPS.

Batteries of a specific manufacturer and model are required to maintain the system's UL listing. Use of batteries not recognized in the product's UL report will void its listing.

IMPORTANT SAFETY INSTRUCTIONS SAVE THESE INSTRUCTIONS

CAUTION

A BATTERY CAN PRESENT A RISK OF ELECTRICAL SHOCK AND HIGH SHORT CIRCUIT CURRENT. THE FOLLOWING PRECAUTIONS SHOULD BE OBSERVED WHEN WORKING ON BATTERIES:

- REMOVE WATCHES, RINGS, OR OTHER METAL OBJECTS.
- USE TOOLS WITH INSULATED HANDLES.
- WEAR RUBBER GLOVES AND BOOTS.
- DO NOT LAY TOOLS OR METAL PARTS ON TOP OF BATTERIES.
- DISCONNECT CHARGING SOURCE PRIOR TO CONNECTING OR DISCONNECTING BATTERY TERMINALS.

CAUTION

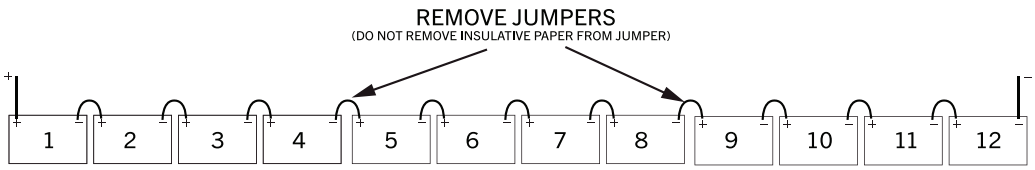
USE CAUTION WHEN HANDLING OR SERVICING BATTERIES. BATTERY ACID CAN CAUSEBURNS TO SKIN AND EYES. IF ACID IS SPILLED ON SKIN OR IN THE EYES, FLUSH WITH FRESH WATER AND CONTACT A PHYSICIAN IMMEDIATELY.

BATTERIES ARE VERY HEAVY. USE CAUTION WHEN LIFTING AND MOVING THEM. INSTALLATION SHOULD ONLY BE PERFORMED BY AUTHORIZED PERSONNEL.

BATTERY ORIENTATION IS IMPORTANT. BE SURE TO WIRE BATTERIES PROPERLY. IMPROPER WIRING CAN CAUSE DAMAGE TO THE BATTERIES. WIRING SHOULD ONLY BE PERFORMED BY AUTHORIZED PERSONNEL.

BATTERY CHANGE PROCEDURE

1. Shut Down all loads connected to the UPS.
2. Shut off the DC Breaker on the UPS.
3. Shut off the AC Breaker on the UPS.
4. Using Electrical Code Lockout procedures, shut off the Main feed to the UPS.
5. Remove the panels on the UPS and/or the External battery cabinet(s) to access the batteries.
6. Battery orintation is important. Its a good idea to take a picture of the batteries and how they are oriented and wired on EACH shelf. Contact the factory if you need a battery wiring diagram.
7. Disconnect the Anderson battery connector.
8. Using insulated tools, disconnect the battery jumpers on every set of four batteries. Do not remove the paper insulation from the jumpers, it has to be re-installed. This will leave you with (X) number of strings of four batteries each. This is to keep the overall voltage for each string at a safe 48V in case something gets shorted during this procedure. Repeat as needed if the system has parallel sets of batteries.



(12) BATTERY EXAMPLE

9. Using insulated tools, disconnect the main negative battery cable.
10. Using insulated tools, disconnect the main positive battery cable.
11. Using insulated tools, continue to remove the rest of the jumpers from battery to battery.
12. Remove any battery brackets that may still be in place. Some systems have banding holding down the batteries, this can be cut off. There is no need to reband the batteries down as long as the system is not going to be moved. It is required if it resides in an earthquake zone.
13. At this point the batteries can be removed. **CAUTION: BATTERIES ARE HEAVY.**
14. Set the spent batteries off to the side in a safe protected location. Dispose of the batteries in accordance with local environmental hazerdous material regulations.
15. Install the new set of batteries in the EXACT orientation as the original set.
16. (Optional) Re-install any battery brackets that were removed. This is not really necessary as long as the system is not going to be moved. It is required if it resides in an earthquake zone.
17. Install all battery jumpers exactly as the original set.
18. Re-connect the main positive battery cable.

19. Re-connect the main negative battery cable.
20. Verify each string of batteries for the proper bus voltage.

8 BATTERY STRING	10 BATTERY STRING	12 BATTERY STING
96V PER STRING	120V PER STRING	144V PER STING

21. Reconnect the Anderson Battery connectors.
22. Re-Install the outer panels on the UPS and/or extrernal battery cabinet.
23. Follow the Start up procedure to re-energize the system.

GENERAL TROUBLESHOOTING

PROBLEM	PROBABLE CAUSE	SOLUTION
NO OUTPUT WHEN UTILITY POWER FAILS	DEFECTIVE CONTROL CIRCUITS.	REPLACE CONTROL BOARD.
	DEFECTIVE BATTERY OR ASSOCIATED WIRING.	CHECK WIRING AND TEST BATTERIES. REFER TO MAINTENANCE PROCEDURES.
	UNIT IN “BY PASS” MODE.	CHECK “BY PASS” SWITCH.
	DC BREAKER TRIPPED.	RESET DC BREAKER.
	BATTERIES WEAK.	ALLOW BATTERIES TO CHARGE 24 HOURS AND TEST INVERTER.
INVERTER SHUTS OFF OR OVERTEMPS	AIR INTAKE BLOCKED.	CLEAN INTAKES.
	EXHAUST FANS BLOCKED.	CHECK FOR PROPER CLEARANCE , CLEAN EXHAUST.
	DEFECTIVE FANS	REPLACE DEFECTIVE FANS.
	ROOM TEMPERATURE TO HOT.	CHECK OPERATING SPECIFICATIONS.
	UNIT OVERLOADED.	VERIFY OUTPUT RATINGS.
NO OUTPUT AT START UP	OUTPUT BREAKER OPEN OR OUTPUT FUSE OPEN.	CHECK BREAKER OPERATION AND TEST OR REPLACE FUSE.
	WRONG INPUT VOLTAGE.	VERIFY INPUT VOLTAGE AND SELECTOR SWITCH SW2.
	DEFECTIVE FANS.	VERIFY SOURCE FEEDING THE INVERTER.
	DEFECTIVE BATTERY.	TEST BATTERIES. REFER TO MAINTENANCE PROCEDURES.
	SHORTED OUTPUT.	DISCONNECT OUTPUTS AND RESTART UNIT.
	DEFECTIVE INVERTER COMPONENTS.	TEST / REPLACE INVERTER COMPONENTS
	DEFECTIVE CONTROL CIRCUITS.	REPLACE CONTROL BOARD
	AC OR DC BREAKER OFF.	TURN ON BOTH AC AND DC BREAKERS.
	BATTERY CABLE NOT CONNECTED.	CONNECT ANDERSON CONNECTOR.
INVERTER WILL NOT RETURN TO UTILITY POWER	INPUT VOLTAGE OR FREQUENCY OUT OF SPEC. (GENERATOR APPLICATION).	VERIFY INPUT SPECS., SELECT DIFFERENT SLEW RATE. (REFER TO SET UP PROCEDURES ~INSTALLATION SECTION).
	DEFECTIVE CONTROL CIRCUITS.	REPLACE CONTROL BOARD
	INADEQUATE SOURCE.	VERIFY SOURCE FEEDING INVERTER IS ADEQUATE.
	AC BREAKER TRIPPED.	RESET AC BREAKER.

PROBLEM	PROBABLE CAUSE	SOLUTION
SHORT BATTERY BACK-UP TIME	BATTERY DISCONNECTED.	CHECK BATTERY CONNECTIONS (REFER TO MAINTENANCE PROCEDURES).
	BATTERY NOT CHARGING.	CHECK BATTERY FLOAT VOLTAGE (REFER TO MAINTENANCE PROCEDURES).
	OPEN CHARGER FUSE.	CHECK FUSE F1 ON CHARGER BOARD .
	DEFECTIVE BATTERY.	TEST BATTERIES. (REFER TO MAINTENANCE PROCEDURES).
	BATTERY NOT CHARGED.	ALLOW BATTERIES TO CHARGE 24 HOURS.
	UNIT OVERLOADED.	CHECK % LOAD DISPLAY AND REDUCE LOAD.
INVERTER ALARMS OCCASIONALLY	NORMAL.	INVERTER IS PROTECTING EQUIPMENT FROM MOMENTARY SAGS AND SURGES.
	INTERMITTENT ALARM.	MONITOR TYPE AND FREQUENCY OF ALARM, TAKE ACTION ON PARTICULAR ALARM.
UNIT OPERATES BUT DROPS LOADS	COMMUNICATIONS ERROR.	CHECK INTERFACE CABLES FOR CONTINUITY TEST COMMUNICATION SIGNALS.
	OUTPUT BREAKER TRIPPED OR FUSE OPEN.	RESET OUTPUT BREAKER AND TEST OUTPUT FUSE.
	UNIT OVERLOADED.	CHECK % LOAD DISPLAY AND REDUCE LOAD.

WARRANTY

This Warranty applies only to the original purchaser who must properly register the product within thirty (30) days of receipt.

https://www.trystar.com/services/warranty-information/

Trystar warrants that our products and their components will remain free from defects in material and workmanship for the duration of the respective warranty period* from the date of shipment and agrees to replace, F.O.B. its factory, any parts which fault through defect in material or workmanship during such period. Non payment for the product to either the reseller, rep, distributor or the factory direct will result in revocation of warranty, technical support and service contracts. **Warranty begins from date of shipment unless a factory Start-Up Plus is purchased, then the warranty begins from date of Start Up or 90 days from ship date; whichever comes first.**

If a Start-Up Plus is purchased with the unit(s) or within 30 days from original ship date, the 1st year warranty is upgraded to include onsite labor and expenses during normal business hours (Monday - Friday, 8AM - 4PM). StartUp Plus includes all travel and living expenses. Start-Up Plus description: Testing all emergency circuitry - Calibration - Inspection - Exercising all circuit breakers - Cooling fan check - Input and output parameter check - Air intake / exhaust check - Complete battery inspection and testing (where applicable) - Re-torque all high current terminals - Battery certification report (where applicable) - Input/Output verification - Written report. User training to be done at time of start up (no return visits). Product installation is required to be complete before start up can be scheduled.

Products:

- Uninterruptible Power Supplies (HV) / 1 Years parts only*, Batteries are warranted with a 1 year full replacement warranty and an optional 4 year (48 month) pro-rate, when enrolled in a customer support plan.

* From original shipment date / Excludes on site labor and expenses unless otherwise noted.

---

1. This Warranty shall be effective only if and so long as the system is installed and operated in the manner specified in the manual which accompanied the product, and is operated within the ratings on the nameplate of the system.
2. This Warranty shall be effective provided the purchaser pays the cost of transporting the faulty component(s) to and from Trystar's factory at the purchaser's own expense, unless the item covered under service contract with Trystar. There is no cost for installation of the replacement component(s) when done at the factory. Otherwise installation of the replacement component(s) are the responsibility of

the purchaser, unless the item is covered under service contract with Trystar. If after inspection the faulty component has been caused by misuse or abnormal conditions in the judgment of Trystar, the purchaser will be charged for repairs based on parts and labor required. This Warranty does not cover fuses, light bulbs, and other normally expendable items. Trystar service personnel are not included in this warranty unless covered by a Trystar service contract.

3. This Warranty shall be void if any alteration is made to the system, or any of its components are altered by anyone other than an authorized Trystar service person, without the written permission of Trystar.
4. This Warranty is in lieu of all other warranties, expressed or implied. Trystar neither assumes, nor authorizes any person to assume for it, any liability other than that specifically set forth in this Warranty. Except for its obligations, Trystar assumes no liability or responsibility for personal injury, loss of life, consequential or other damages resulting from defects in, or failure of, the system or any of its components.

https://www.trystar.com/services/warranty-information/

CUSTOMER SUPPORT

TRYSTAR NATIONWIDE CUSTOMER SUPPORT

Trystar offers total customer support that assures your critical equipment is maintained properly for trouble free operation.

WHAT A CUSTOMER SUPPORT PLAN OFFERS:

HOTLINE: 24 hour toll free 1-800-521-4792.

REMEDIAL MAINTENANCE : Covers all on-site repairs, parts, freight, labor and travel expenses.

RESPONSE: Immediate 24 hour phone support. If problem is not solved Controlled Power will make every effort to have your system running within 48 hours.

BATTERIES: Battery changes, installation, freight, travel and disposal are covered under a 48 month pro-rate schedule when enrolled in a customer support plan, beginning from the original date of shipment or battery installation date. Batteries are not covered if they were not supplied by Trystar.

PREVENTIVE MAINTENANCE: Optional preventive maintenance includes the following:

- Testing all emergency circuitry
- Inspection
- Exercising all circuit breakers
- Input and output parameter check
- Complete battery inspection and testing
- Re-torque all high current terminals
- Calibration

- Clean internal and external

- Cooling fan check

- Air intake / exhaust check

- Written report

START UP: Includes installation inspection (wired properly, location, environment), Unit inspection (internal and external), Unit power up, Operation verification including options. One visit, includes all travel expenses.

PLAN	ON SITE COVERAGE	PARTS COVERED	FIELD REPAIR LABOR COVERED	FACTORY REPAIR LABOR COVERED	FREIGHT COVERED	TRAVEL EXPENSES COVERED
SILVER	NONE	YES	NO	YES	NO	NO
GOLD	M-F 8AM-4PM	YES	YES	YES	YES	YES
PLATINUM	24-7	YES	YES	YES	YES	YES

TRAINING AND PARTS

For Customers who maintain their own equipment, Controlled Power offers hands on training at our training facility and part kits. For more information, contact Controlled Power Customer Support Department at 1-800-521-4792.

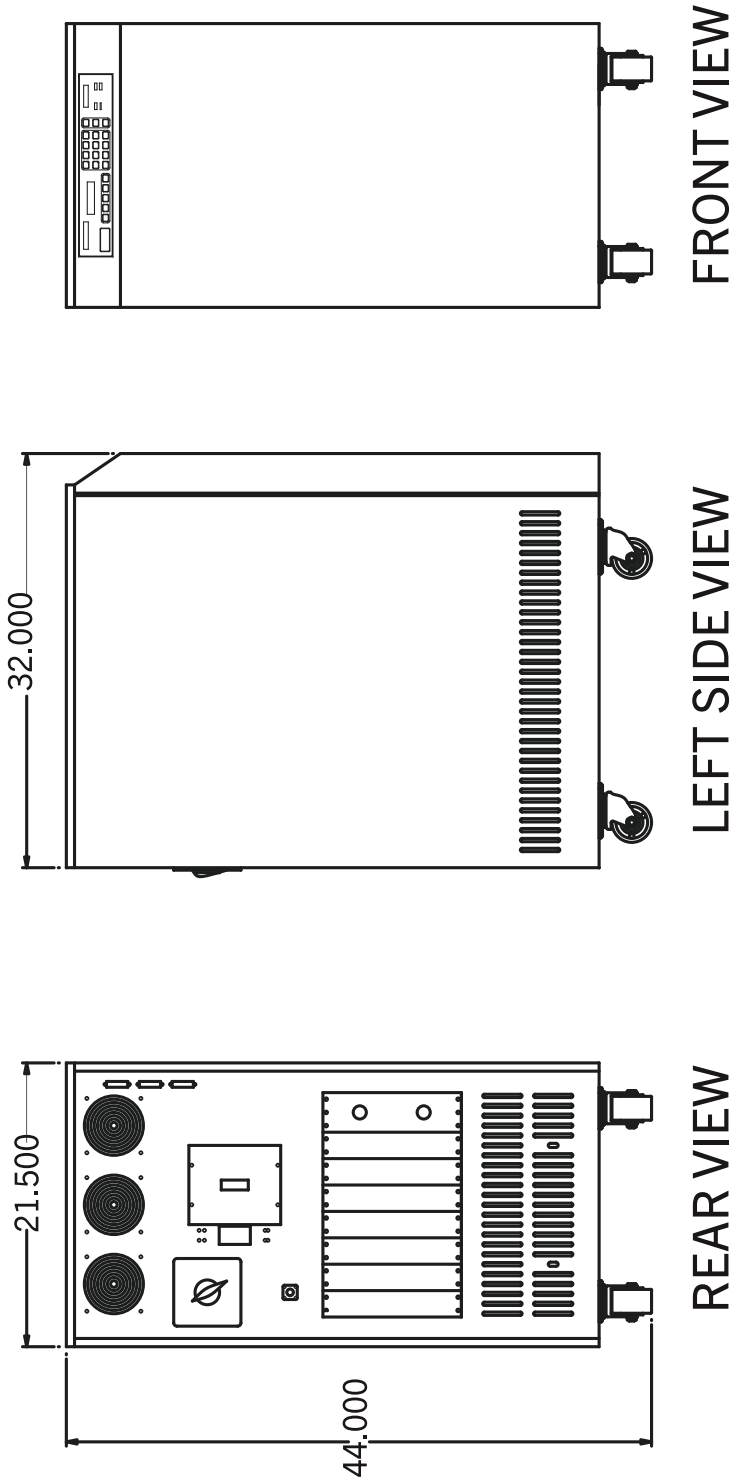
Individual components are available upon request, please contact the factory for specific part numbers and prices. See *"Appendix A - Component Location Diagrams"* for component location and description. When contacting the Parts Department, please have the unit's full model number and serial or system number. Call 1-800-521-4792.

APPENDIX A

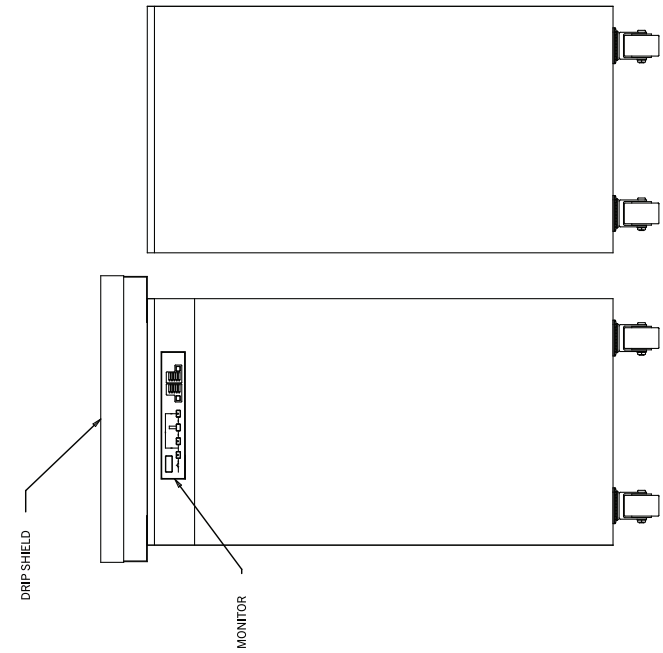
APPENDIX A
RELATIVE DRAWINGS
&
SCHEMATICS

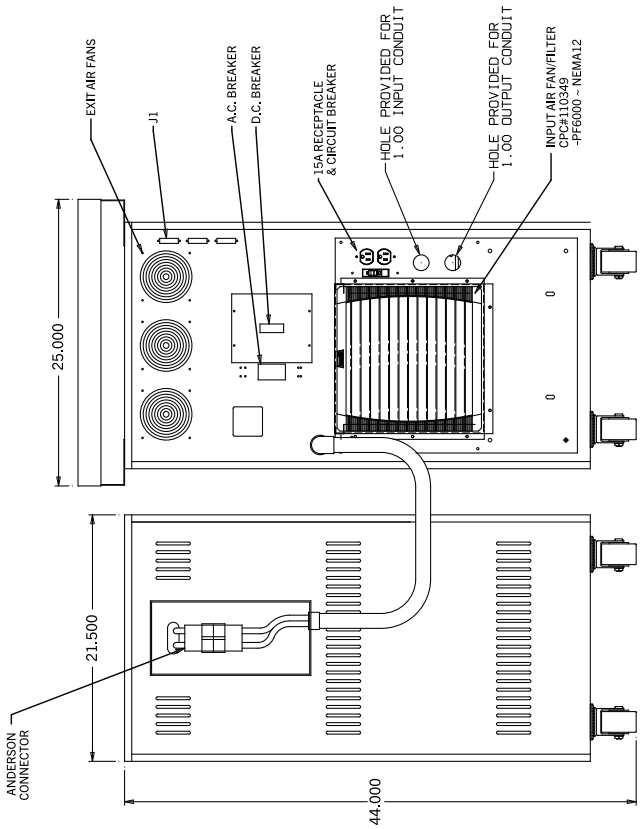
CABINET OUTLINE

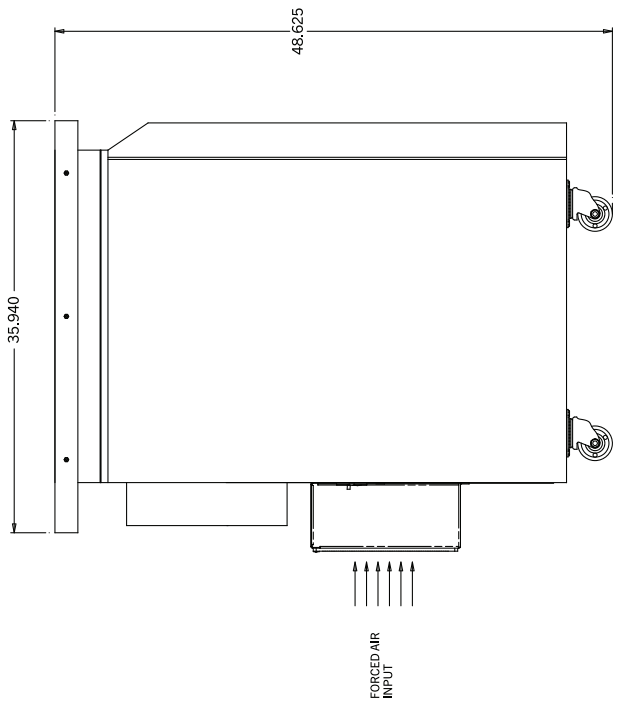
7.5KVA - 13KVA INVERTER CABINET OUTLINE



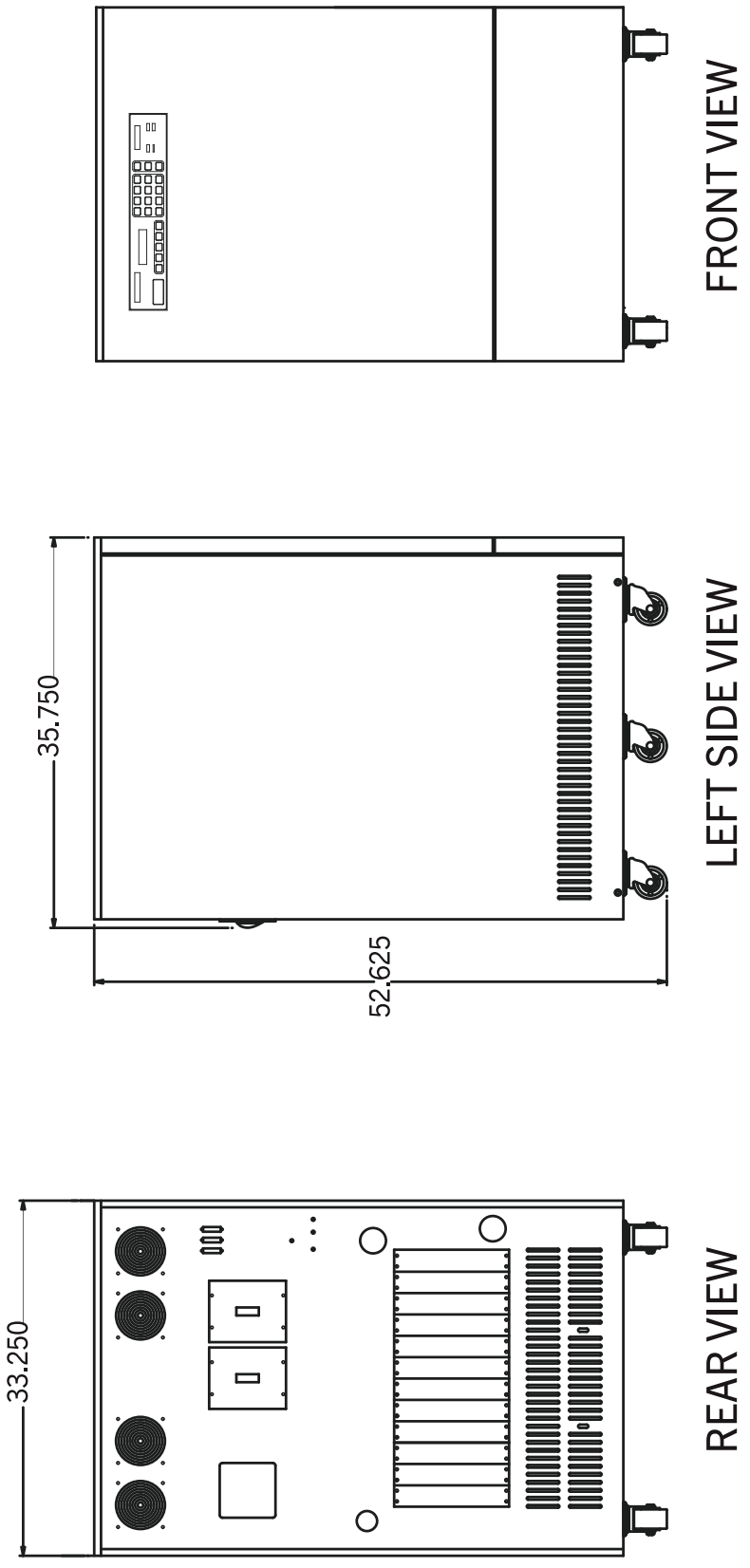
7.5KVA - 13KVA INVERTER WITH DRIP SHIELD AND EXTENDED FILTERED COOLING - CABINET OUTLINE



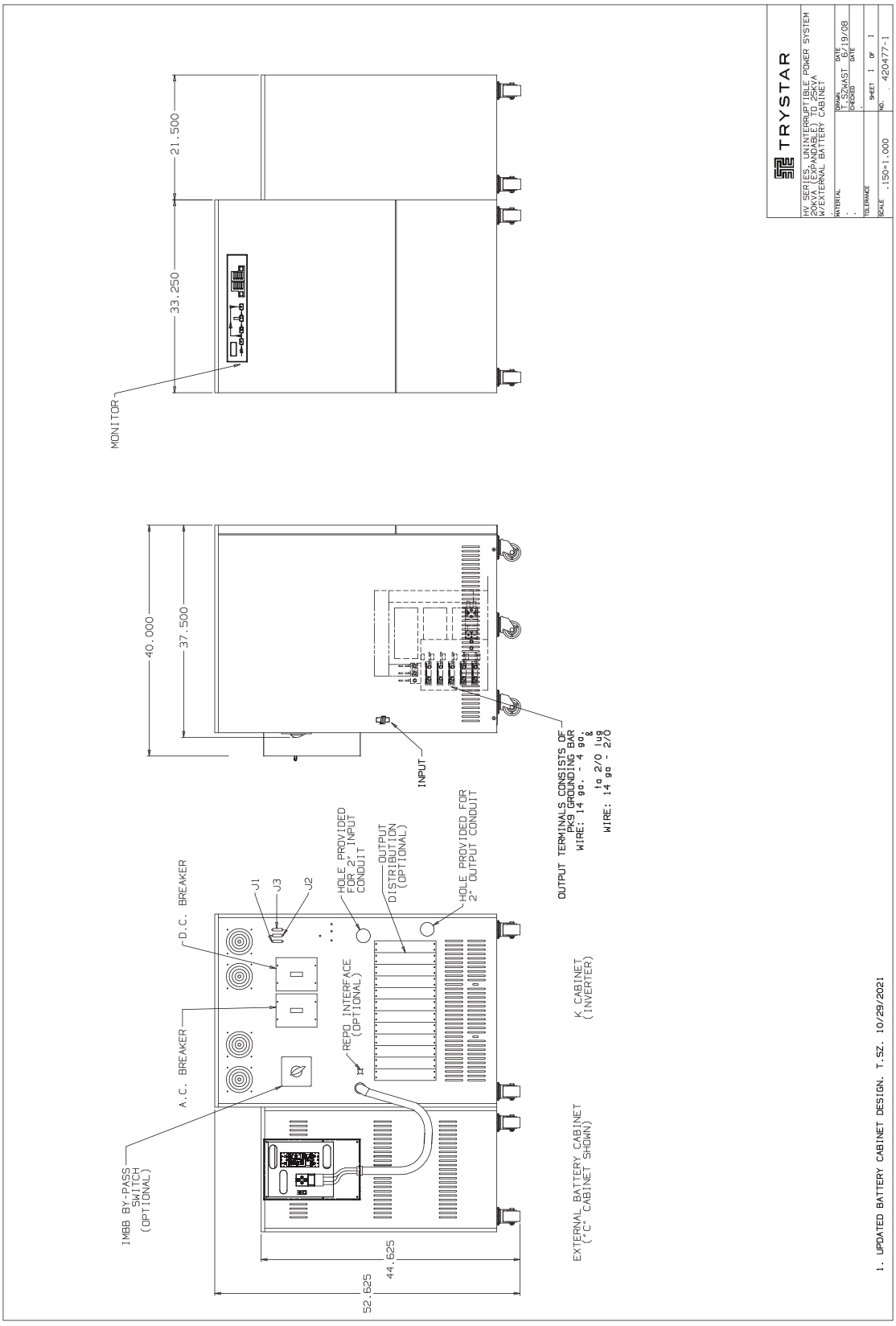




14KVA - 25KVA INVERTER CABINET OUTLINE

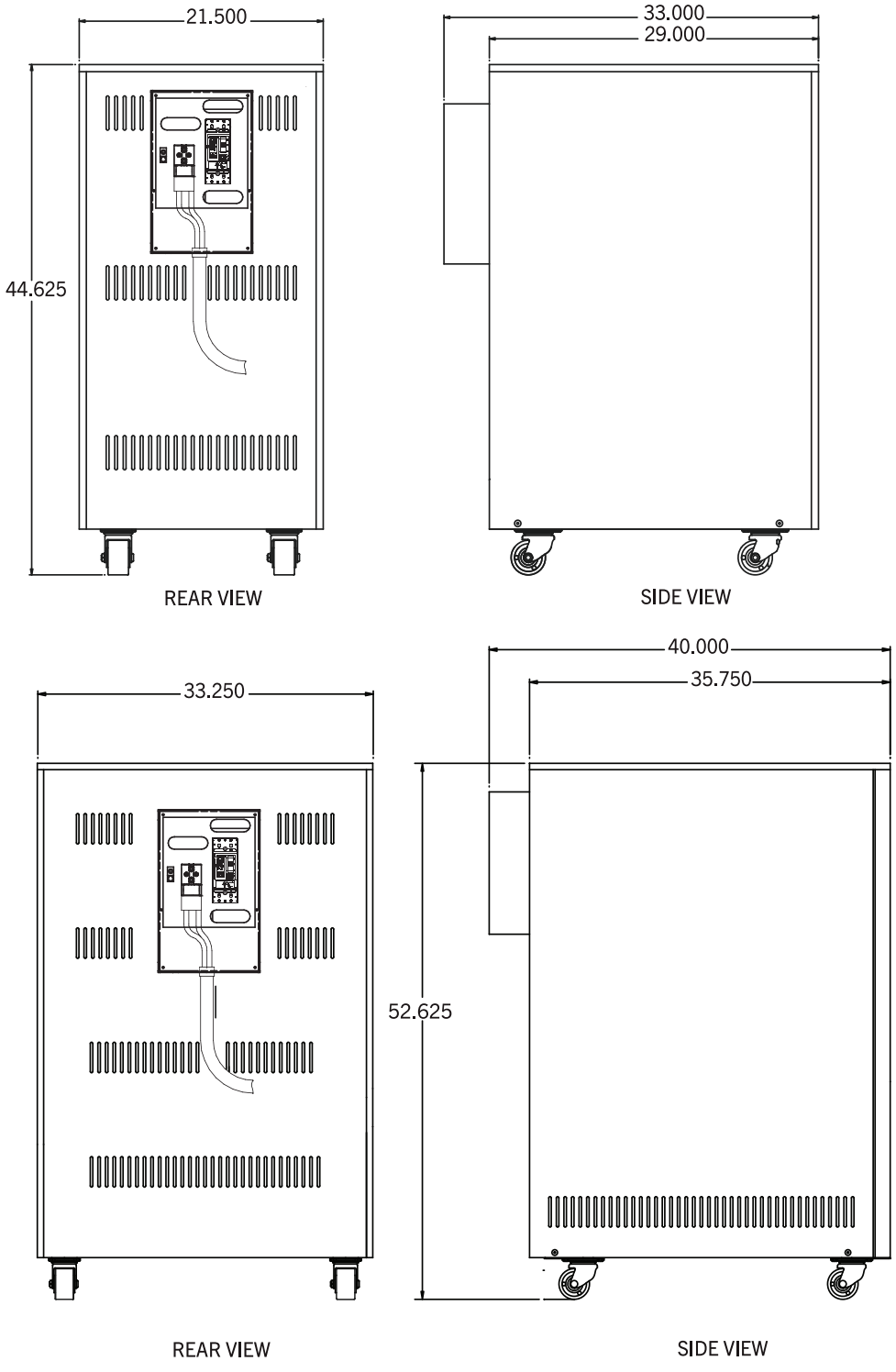


20KVA - 25KVA INVERTER WITH EXTERNAL BATTERY CABINET OUTLINE



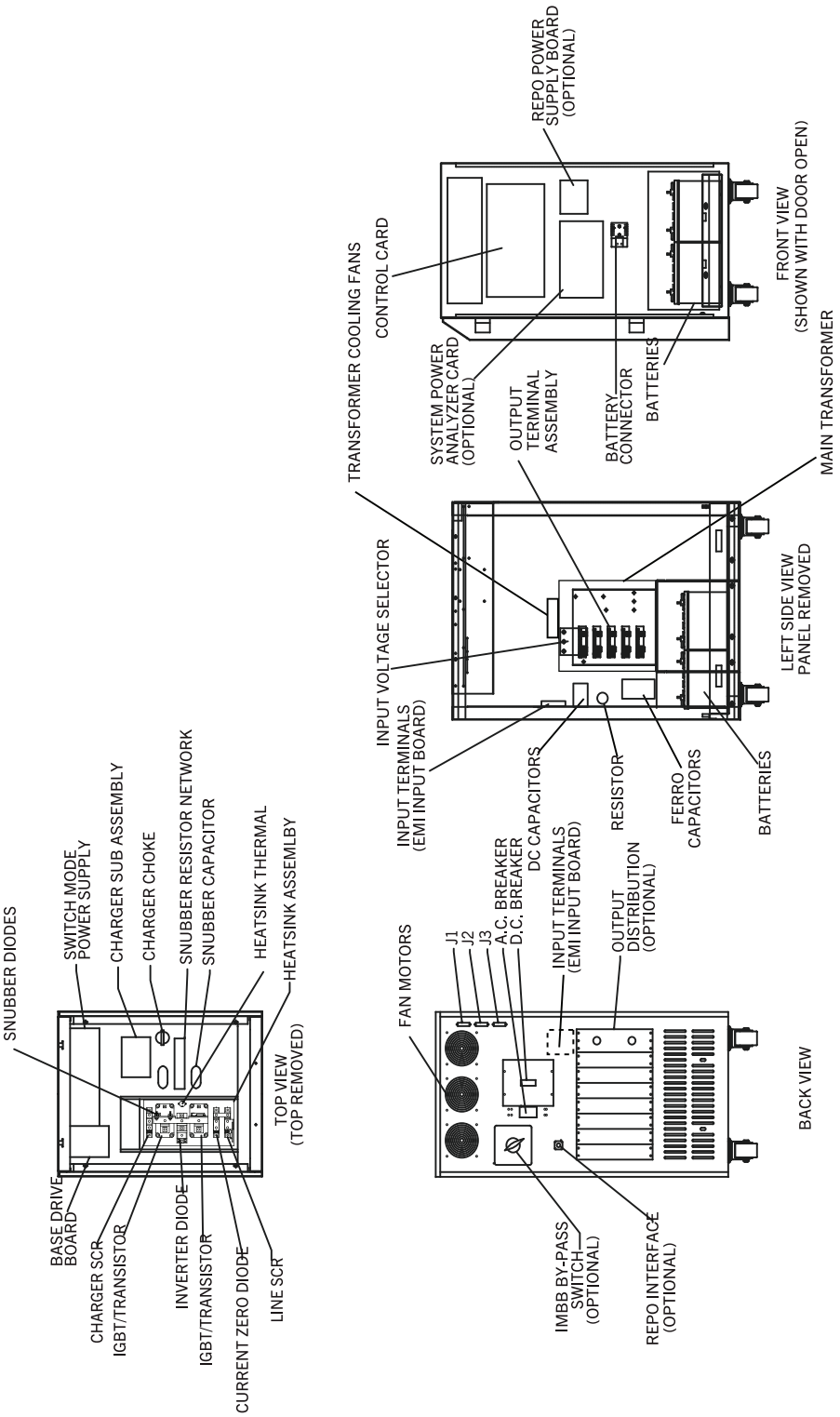
BATTERY CABINET OUTLINES

EXTERNAL BATTERY CABINET OUTLINES

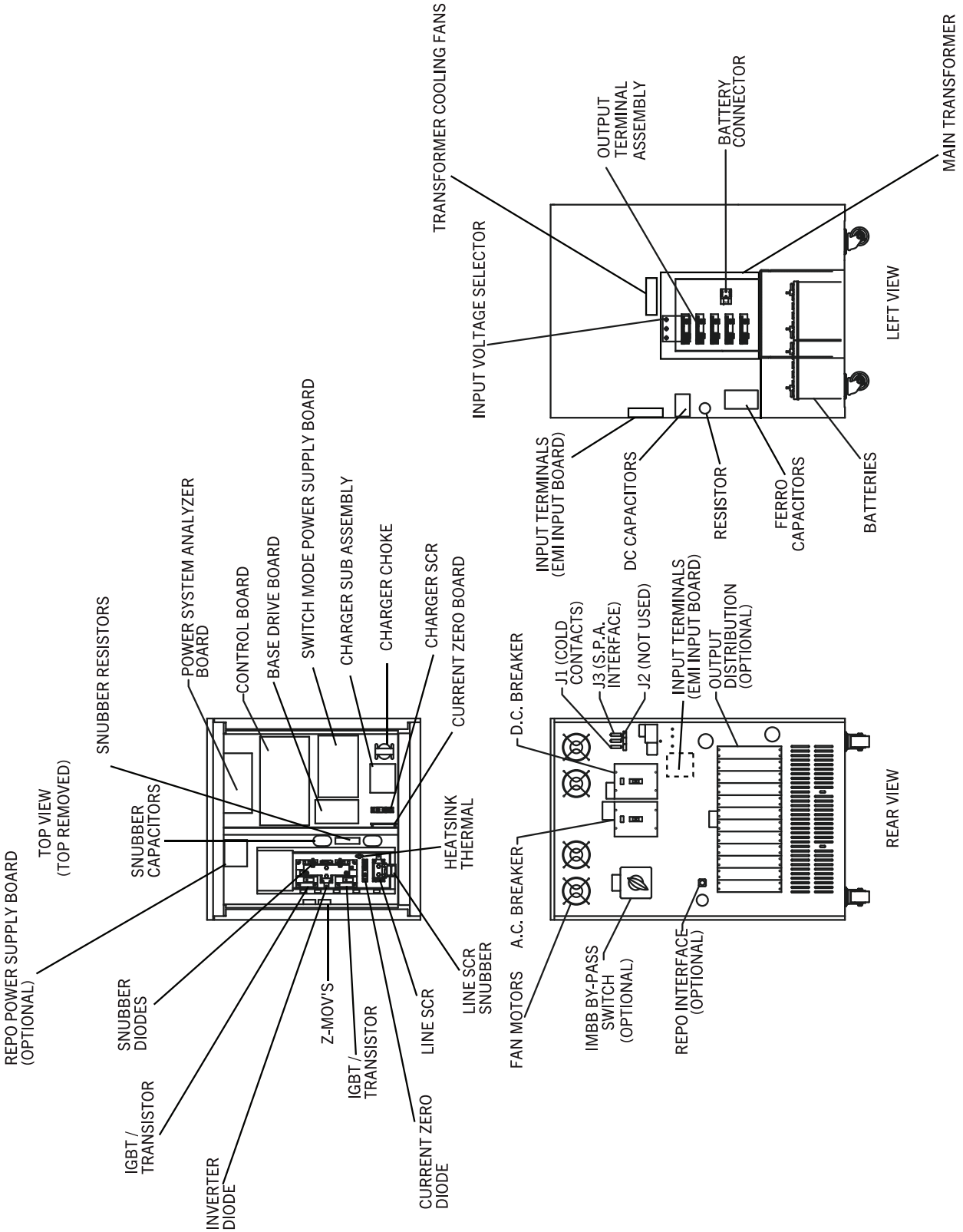


COMPONENT LOCATION DIAGRAM

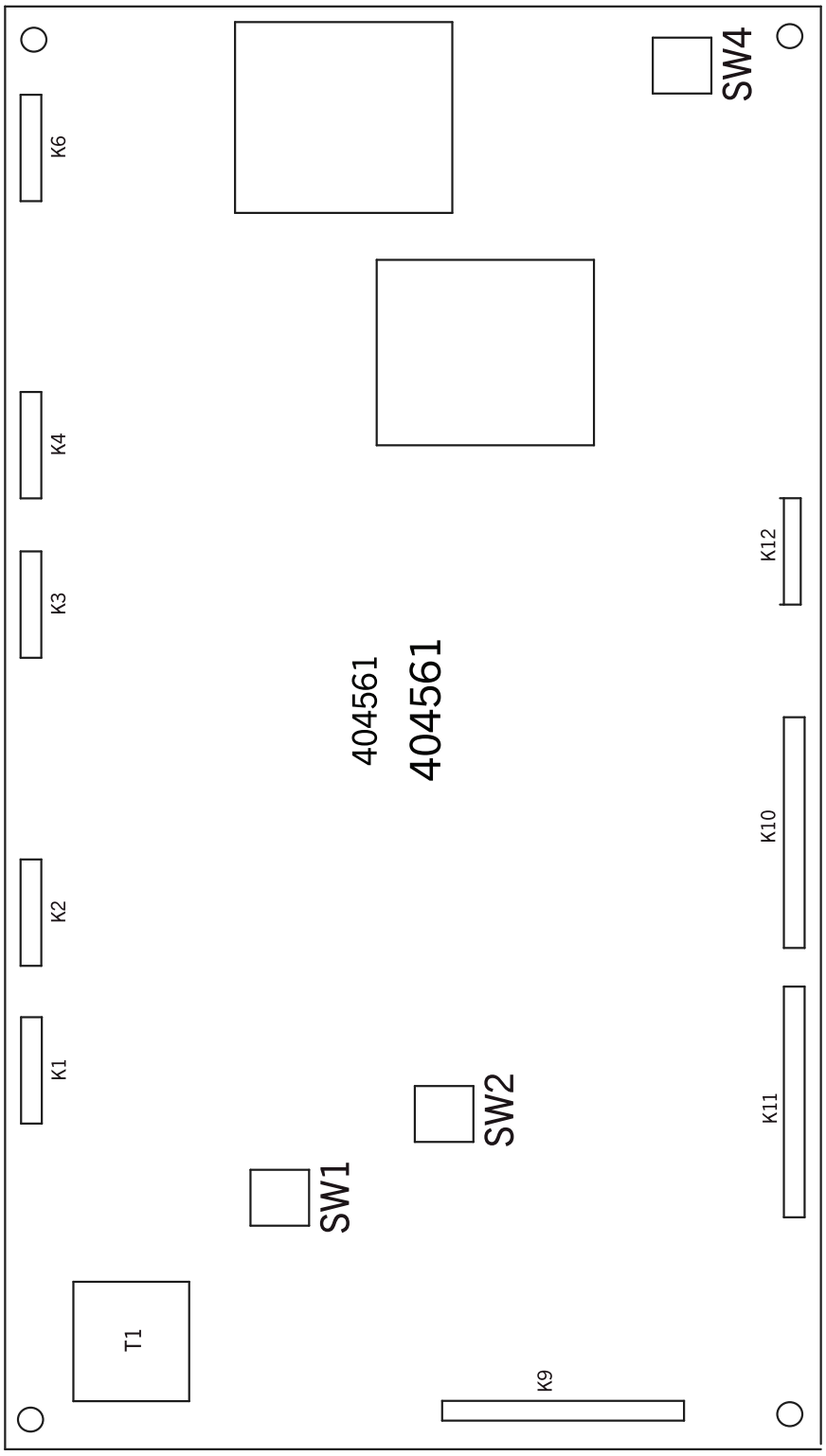
7.5KVA - 13KVA COMPONENT LOCATION DIAGRAM



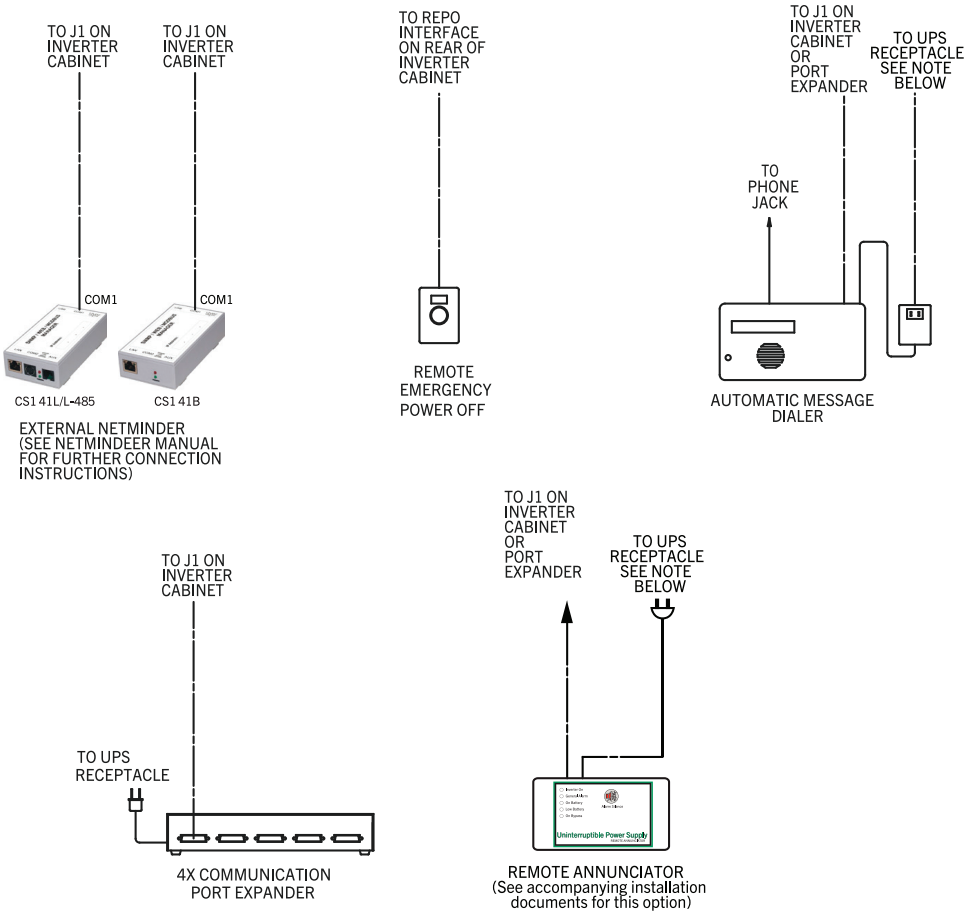
14KVA - 25KVA COMPONENT LOCATION DIAGRAM



CONTROL BOARD LAYOUT DIAGRAM



OPTIONS INTERCONNECTION DIAGRAM



NOTE: THE POWER SUPPLY FOR DEVICES, EXCLUDING THE REMOTE EMERGENCY POWER OFF, MUST BE TAKEN FROM THE OUTPUT OF THE INVERTER. A 120V RECEPTACLE (5-20R) WHOSE SUPPLY IS TAKEN FROM THE OUTPUT OF THE INVERTER MUST BE INSTALLED ON THE OUTPUT OF THE INVERTER.

NOTE: THE POWER SUPPLY FOR DEVICES, EXCLUDING THE REMOTE EMERGENCY POWER OFF, MUST BE TAKEN FROM THE OUTPUT OF THE INVERTER. A 120V RECEPTACLE (5-20R) WHOSE SUPPLY IS TAKEN FROM THE OUTPUT OF THE INVERTER MUST BE INSTALLED ON THE OUTPUT OF THE INVERTER.

J1 OUTPUT SIGNALS

PINS	SIGNAL	TP
3 AND 8	UPS ON	Whenever conditioned power is available at the output
1 AND 4	UTILITY FAILURE	Whenever the input voltage exceeds the specified range of +10% to -15%
2 AND 6	LOW BATTERY	Whenever the battery reaches a user critical level; used to warn personnel of impending shutdown or initiate an unattended computer shut down.
12 AND 13	BYPASS ON	Whenever the system is in the bypass mode.
19 AND 20	MANUAL RESTART	Whenever the system requires a manual restart.
5 AND 9	GENERAL ALARM	For any of the following conditions:
		a. On battery power.
		b. Low battery.
		c. Transformer high temp.
		d. Battery charger failure.

NOTES

TRYSTAR®

15765 Acorn Trail / Faribault, MN 55021 / 507.333.3990
Document Number: 0703IB0126 / January 2026