TRYSTAR

MEDPOWERX UPS Model LT/M

OWNERS MANUAL

700VA - 2.1KVA

PATIENT VICINITY SERIES
UNINTERRUPTIBLE
POWER SUPPLY



15765 Acorn Trail / Faribault, MN 55021 / 507.333.3990

TRYSTAR.com

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

NOT RECOMMENDED OR INTENDED FOR LIFE SUPPORT APPLICATIONS

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 Trystar web site. Clicking any where 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 web site.

⚠ 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.

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INTRODUCTION

Trystar engineers and manufactures the industry's highest quality electrical power solutions, capitalizing on 40 years of expertise. We have an enviable reputation for quality, which is reflected in the design, workmanship, and performance of our products.

The "MedPoweRx, Model LT/M" medical-grade UPS is the ideal power quality solution for patient vicinity PC's and medical systems.* The voltage regulation and performance characteristics of the LT/M offer a significant advantage over competing products. As a single phase power protection system, the LT/M assures steady, regulated voltage of ± 3% (typical) which provides proven performance and extends the life of your medical equipment.

SYSTEM FEATURES AND BENEFITS

- Continuous, uninterrupted sinewave output with less than 3% harmonic distortion, any single harmonic.
- Less than 300 micro-amps leakage current reduces the electric shock hazard in case of a loss of ground condition.
- (3) NEMA 5-20R2 (5-15R2 for Canada) duplex medical-grade output receptacles.
- Built-in isolation protects the load from damaging power disturbances.
- "Hot start" feature for mobile operations.
- Numeric, 3-digit LED, display panel identifies system status and alarm conditions.
- Serial communication and contacts for remote monitoring of system status and alarms.
- Optional "DataGuard Advanced" software for remote monitoring of electrical parameters, system status and alarms, as well as unattended shutdown of system computer or network server.
- Optional specially-designed wheeled cart enables UPS portability.

STANDARDS & SAFETY

- IEEE 62.41 Category B, for surge suppression
- IEC 555
- C-UL Listed:

  UL 60601 Listed (patient vicinity)

  C-UL CSA C22.2, No. 601.1-M90

  UL 1778

  C-UL CSA C22.2, No. 107.1-M91

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PRODUCT SPECIFICATIONS

- Medical-grade input plug / output receptacles
- Input Operating Voltage: 120V AC
- Input Operating Voltage Range: +10%, -30% typical, load-dependent, without battery usage
- Input Frequency: 60 Hz, ± 2.5 Hz
- Input Power Factor: Self-correcting to >.95
- Input Current Harmonics: < 3% total harmonic distortion
- Leakage Current: < 300 micro-amps
- Load Crest Factor 3:1
- Load Voltage Regulation: ± 3% or better
- Line Voltage Regulation: ± 3% or better
- Standard Unit Operating Temperature: 0º C to 40º C (32º to 104º F) without derating in any mode, at elevations up to 1500 meters (5000 feet)
- Total System MTBF: Approx. 100,000 hours (11 years), excluding batteries MTTR: Less than 1 hour

EMERGENCY OPERATION

Upon failure of commercial AC power, battery power is converted by the PWM inverter and filtered through the online power purification system. There is no interruption of regulated and conditioned power to critical loads upon failure or restoration of the commercial AC power. The entire UPS operates from the front panel with status signals available through a bidirectional RS232 port.

Battery sensory circuits warn you if your batteries are in need of attention and disconnect the batteries when discharge reaches a critical level.

BATTERY AND CHARGER

Valve regulated, sealed lead calcium, high discharge rate batteries are supplied as part of the system. The batteries are non-gassing, maintenance free with no gel contaminate.

Batteries are shipped separately and should only be installed by authorized personnel. Batteries are contained within the unit or in an external rack or enclosure.

A precision controlled to 1%, highly filtered, current limited and voltage regulated battery charger sustains float charge on the battery continuously affording maximum battery life.

PROTECTION

INPUT - Integrally mounted molded case AC Input and output breakers protect against abnormal current overloads and provides a convenient means of disconnecting utility or AC output power.

OUTPUT - An output isolation transformer with current limiting characteristics provides inherent overload protection. Factory provided or field installed circuit breakers are also utilized for added protection.

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BENEFITS OF THE MedPowerX SERIES UPS	
• Environmental Adaptive Control	• Priced to be Affordable
• True On-Line Protection	• 200,000 Hour MTBF Transformer
• Power Factor Correction	• Extremely High Surge Capability
• Line Harmonic Filtering	• 3:1 Crest Factor for Non Linear Loads
• Small Physical Size	• Simple Operation
• Simple and Inexpensive Installation	• Full RS232 Communication of Operating Parameters
• Quiet Operation	• Input and Output Circuit Breakers
• Low BTU Output	• Nation Wide Customer Support Service
• Microprocessor Control and Diagnostics	• Automatic Synchronized Retransfer
• UL1778	

RECEIVING THE UNIT

WARNING

Inspection, placement, installation, set-up

And start-up should be performed By qualified personnel

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

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.

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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

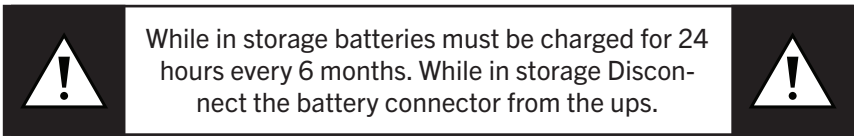
Leave the items, packing material and carton "AS IS". Notify your carrier's local office and ask for immediate inspection of the carton and contents.

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



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 installing the batteries, turning the UPS on and allowing it to run. See *"Installation"* for details on installing batteries and *"System Setup"* for turning the UPS on. **While storing, disconnect the battery connector from the UPS.** ake sure proper ventilation is available any time the UPS is on.

LOCATION / PLACEMENT

The UPS is designed for office environments. To extend battery life it is recommended to locate the UPS and the external batteries (when applicable) in a controlled environment. To minimize risk of over heating avoid placing the UPS in direct sunlight, near heat registers, or any other type of heat generating source.

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Allow a minimum of 2” clearance on all sides of the UPS.

CAUTION

Cabinets and batteries are extremely heavy Use proper equipment when removing The units from the container

SAFETY PRECAUTIONS

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

IMPORTANT SAFEGUARDS, READ AND FOLLOW ALL 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.

Diagrams for wiring batteries are shown on the following pages. Be sure to wire Batteries properly. Improper wiring can cause damage to the batteries. Wiring Should only be performed by authorized personnel.

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- 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.

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PRELIMINARY INSTALLATION

INPUT/OUTPUT BREAKER/PLUG AND CURRENT MATRIX - ALL MODELS

From building power source (see voltage of unit for specification) run wires into rear of unit and attach with “wire nuts” according to the chart below.

If using conduit: wire size for input and / or output should be 14 guage wire, for all conductors.

If using S.O. Cable: wire size for input and / or output should be 12 guage for all conductors.

Wire size based on 90° Celsuis insulation type THHN wire per the latest version NEC.

VA OUT	WATT OUT	AC LINE VOLTAGE	NOMINAL INPUT LINE CURRENT	LINE PLUG	SERVICE PANEL BREAKER (NON EX-PANDABLE UPS)	SERVICE PANEL BREAKER (EXPAND-ABLE UPS)	AVAILABLE OUTPUT VOLTAGE	AVAILABLE OUTPUT CURRENT @.7PF
700	500	120 208 240	5.2 3.0 2.6	5-15P 6-15P 6-15P	1P-15A 2P-15A 2P-15A	1P-15A 2P-15A 2P-15A	120 208 240	5.80 3.40 2.90
850	600	120 208 240	6.3 3.7 3.2	5-15P 6-15P 6-15P	1P-15A 2P-15A 2P-15A	1P-15A 2P-15A 2P-15A	120 208 240	7.10 4.10 3.50
1000	700	120 208 240	7.4 4.3 3.7	5-15P 6-15P 6-15P	1P-15A 2P-15A 2P-15A	1P-15A 2P-15A 2P-15A	120 208 240	8.30 4.80 4.20
1200	850	120 208 240	8.6 5.0 4.3	5-15P 6-15P 6-15P	1P-15A 2P-15A 2P-15A	1P-15A 2P-15A 2P-15A	120 208 240	10.00 5.80 5.00
1400	1000	120 208 240	10.0 5.8 5.0	5-15P 6-15P 6-15P	1P-15A 2P-15A 2P-15A	1P-15A 2P-15A 2P-15A	120 208 240	11.70 6.70 5.80
1600	1200	120 208 240	11.9 6.9 6.0	5-15P 6-15P 6-15P	1P-15A 2P-15A 2P-15A	1P-15A 2P-15A 2P-15A	120 208 240	13.30 7.70 6.70
1800	1300	120 208 240	13.0 7.5 6.5	5-20P 6-15P 6-15P	1P-20A 2P-15A 2P-15A	1P-20A 2P-15A 2P-15A	120 208 240	15.00 8.70 7.50
2100	1500	120 208 240	14.9 8.6 7.5	5-20P 6-15P 6-15P	1P-20A 2P-15A 2P-15A	1P-20A 2P-15A 2P-15A	120 208 240	17.50 10.10 8.80

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INSTALLATION AND START UP

Note: Batteries require charging for 4 to 6 hours. Backup time is reduced until batteries are fully charged.

WARNING

Do not plug your computer equipment in to the ups Until the following instructions are complete

SETTING UP

Make sure the input wall receptacle voltage matches the UPS specification tag input voltage. Plug in the line cord.

TURNING ON, CHARGING THE BATTERIES

Turn on the UPS on/off switch. The on/off switch is located on the back of the UPS. Wait a few seconds and check the front display panel. The digital display and “System On” LED will illuminate. Scroll to the “Output Volts” function and make sure the output voltage is correct. DO NOT PLUG YOUR EQUIPMENT IN IF OUTPUT VOLTAGE IS OUT OF SPECIFICATION, CONTACT FACTORY.

Note: Batteries require charging for 4 to 6 hours. Backup time is reduced until batteries are fully charged.

TESTING THE UPS

Simulate a power loss by unplugging the line cord from the wall outlet. Observe the display panel. An “Audible Alarm” and the following LED’s will illuminate.

- System On - System On Battery - Alarm

The digital display will monitor 1 of 4 functions selectable by the “Display Select” push-button. Select the “Output Volts” function and make sure output voltage is correct. Reconnect the UPS line cord to the wall outlet. Wait a few seconds and the display panel should indicate “System On” LED and the digital display.

WARNING

Do not simulate a power outage to the ups by removing the ups’s line Cord with your equipment plugged in. This action removes the safety Ground and may damage the equipment

PLUG IN YOUR EQUIPMENT

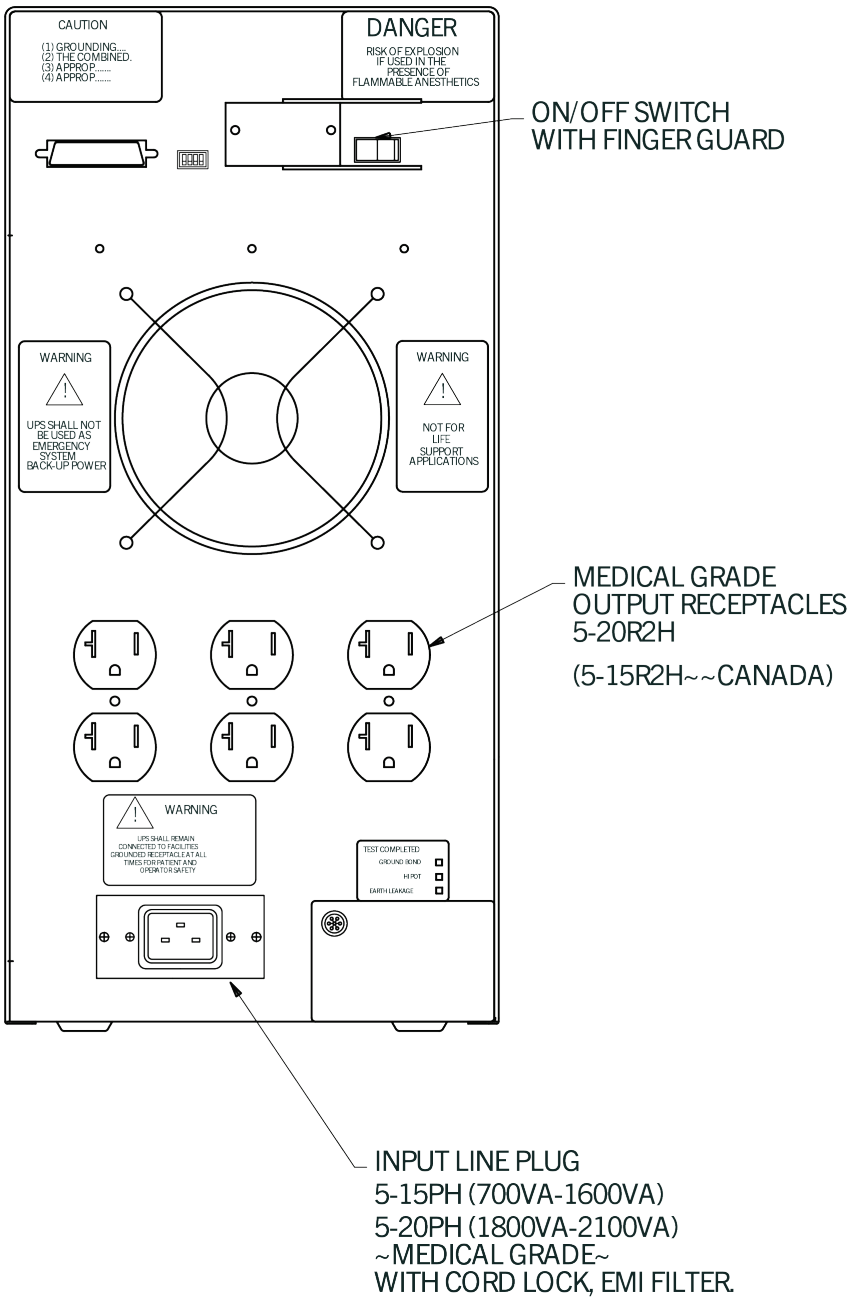
Plug your equipment into the UPS and turn it on. DO NOT PLUG IN LASER PRINTERS OR COPIERS TO THE UPS. Printers and copiers draw considerable power and may cause overload, and reduce backup time.

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REAR VIEW

REAR VIEW



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SYSTEM SET UP

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 standard operating modes.

Selector switch SW1 at the rear of the UPS allows you to change the mode of operation that best suits your specific needs.

SELECTOR SWITCH SW1 (DIP SWITCH SELECTING) - See "Appendix A - Cabinet Outlines" - for dip switch location.

Operating Mode

Note: "ON" is down.

Position #1 - ON = Slew rate fast - this selection typically used when UPS must track rapidly changing input frequency. i.e. engine generators (do not change this switch with UPS on).

Position #2 - ON = Slew rate normal (do not change this switch with UPS on). Note: Only 1 switch may be on at a time for position 1 and 2. Turn position 1 on and 2 off if UPS switches to batteries often.

Position #3 - ON = Audible alarm on, OFF = Alarm silence.

Position #4 - During extended power outages the UPS will automatically turn off to prevent total battery depletion. Upon return of utility power you have the option for the UPS to turn on automatically ormanually by resetting the on/off switch. ON = Auto Restart OFF = Manual Restart

GENERATOR APPLICATIONS

If your UPS is going to operate with a generator system, the following changes will be needed.

1. Slew Rate Change – You will need to change selector switch SW1 on the back of the UPS from "normal" to "fast" slew rate.
2. System Set Point Changes – Change the system set points as noted below. Refer to the "Communications" section for instructions on how to change the set points.

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SYSTEM SET POINTS – GENERATOR APPLICATIONS ONLY

Description	Value entered w/ no al input voltage = 120V	Value entered w/ nominal input voltage = 208V	Value entered w/ nominal input voltage = 240V
High Line Switch Point	% = 115	% = 115	% = 115
Low Output Frequency Alarm Set Point	57	57	57
High Output Frequency Alarm Set Point	63	63	63
Low Line Sample Accumulation Set Point	Available (1-2) = 2	Available (1-2) = 2	Available (1-2) = 2
Frequency Accumulation Buffer	Available (2-9) = 9	Available (2-9) = 9	Available (2-9) = 9

Note: All other parameters remain at Factory Preset Levels – refer to the "Communications" section for remaining parameters.

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OTHER OPTIONAL DEVICES

OPTIONAL AUTOMATIC MESSAGE DIALER

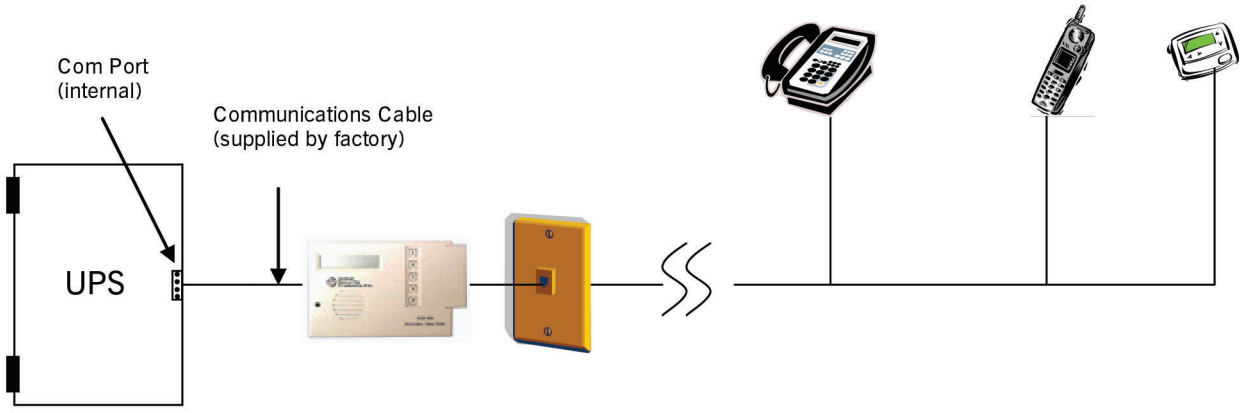
An Automatic Message Dialer is available on the Trystar line of Inverters. The Automatic Message Dialer is a device that notifies certain personnel if there is a problem with the inverter via an analog phone line. The Automatic Message Dialer is a small box that plugs into the communications port of the inverter. All that is required for the device is an analog phone line and it is ready to go!

Here's how it works: If in the event that there is an alarm condition, the Automatic Message Dialer will dial up to 4 numbers; these can be landline phones or cell phones. When a call is answered or sent to voice mail, the Automatic Message Dialer will play a customer-recorded, voice message.

Here are some features of the Automatic Message Dialer:

- Dials up to 4 numbers
- Custom voice message
- Programmable delay prevents nuisance dialing
- Internal or external battery backup for memory retention
- Power supply included

Here is how it is connected:



NOTE: The power supply for these options MUST be taken from the output of the UPS. A 120V receptacle (5-20R) whose supply is taken from the output of the UPS must be installed near the location of the Automatic Message Dialer. A standard phone receptacle and phone cord is also required to complete the circuit.

Refer to the manual that accompanied these devices for features, function, use and installation Instructions.

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OPTIONAL REMOTE ANNUNCIATOR INSTALLATION

WARNING

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 On Bypass LED is inactive for LTM Systems. 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

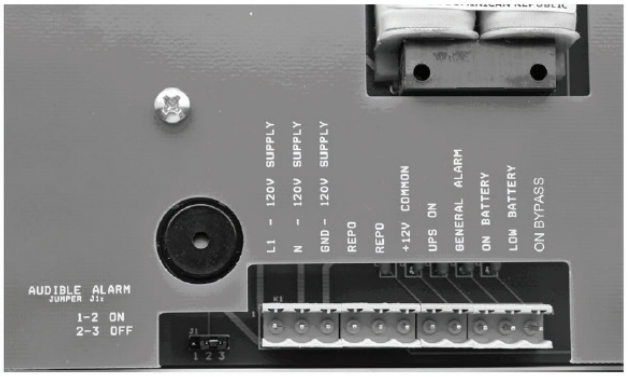


Figure 2: Rear of Remote Annunciator showing J1 and terminal header

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

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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).

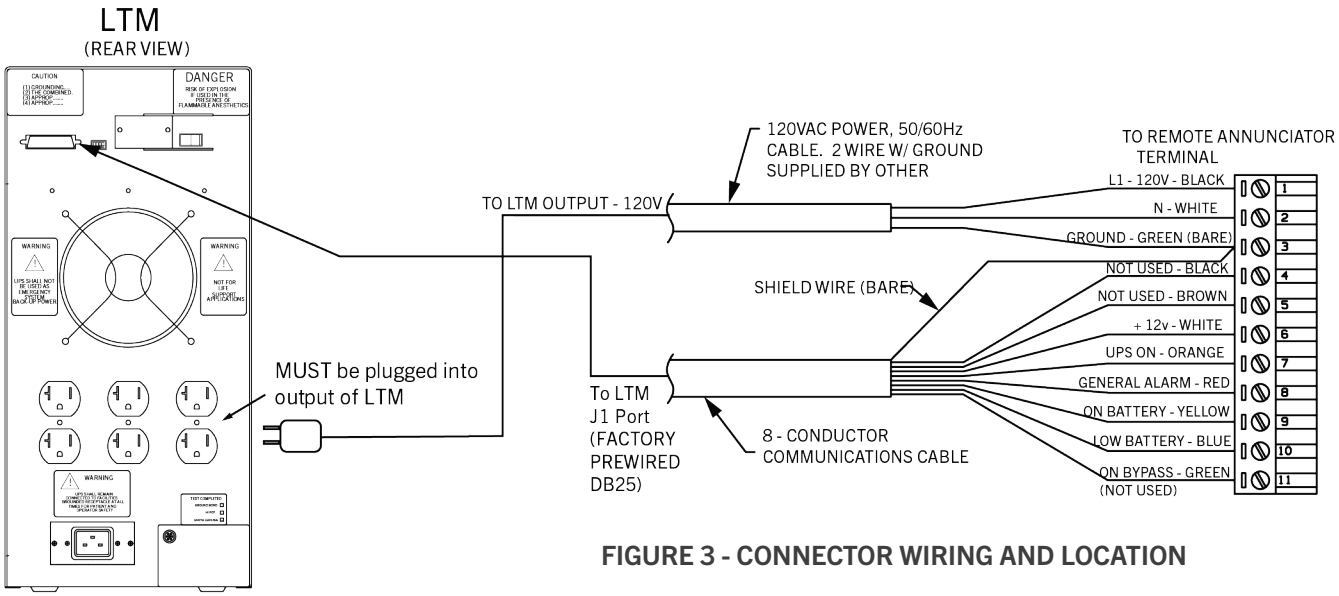


FIGURE 3 - CONNECTOR WIRING AND LOCATION

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),

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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).

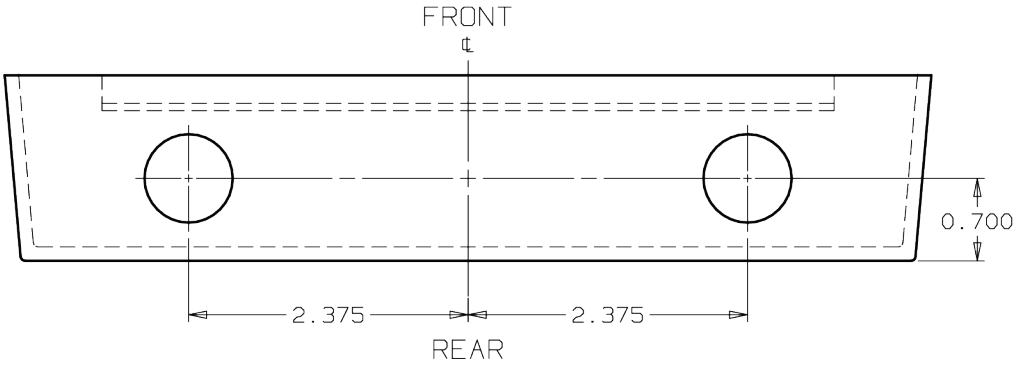


Figure 4: Drilling locations for top/bottom conduit entrance.

OPTIONAL REMOTE COMMUNICATIONS

NETMINDER REMOTE COMMUNICATIONS

The NetMinder UPS Management Suite and NetMinder CS141 Series of Ethernet Adapters inform of the status and condition of the UPS and the incoming electrical power, as well as protect the LAN / WAN from unwanted downtime and unnecessary maintenance costs. NOTE the CS121 has been discontinued and replaced by the CS141. The CS121 is still supported.

NetMinder UPS Management Suite Programs (CD).

NetMinder UPSMAN

Performs all UPS monitoring and data logging. Executes all alarm notifications, network configurations, and server shutdown requests.

NetMinder UPSMON

Works in conjunction with UPSMAN to give a visual display of UPS status, electrical parameters, alarm conditions, and system logs.

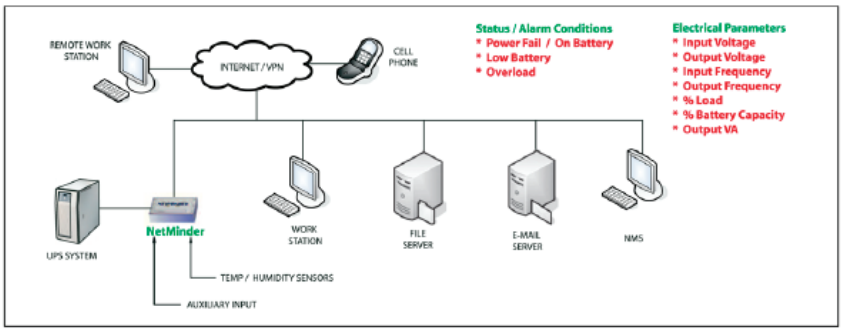
NetMinder RCCMD

Client-side application that performs an orderly, unattendedshutdown of s ervers. RCCMD can receive its shutdown instructions from either a UPSMAN server, a UNMSII server, or a CS141 web server.

NetMinder UNMSII (basic version)

Server-side application that centralizes monitoring and e-mail alarm reporting of up to (9) Trystar UPS's, from a single terminal. Note that the full version of UNMSII includes SNMP notification, as well as the ability to monitor up to an unlimited number of UPS's. Contact Trystar for additional details.

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

NetMinder CS141 Series of Ethernet Adapters

The NetMinder CS141 series of adapters provide complete integration of the UPS into an Ethernet or RS485 network, and thereby provide 24 / 7 monitoring of UPS status, electrical parameters, and notification of alarm conditions. With the ability to communicate in Ethernet TCP/IP, MODBUS TCP, and MODBUS RS485 network environments, the CS141 adapters keep system personnel informed and alerted to any critical condition. When used with NetMinder RCCMD, all CS141 adapters provide added network protection from downtime, and prevent unnecessary maintenance costs that result from data corruption and server crashes.

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

CS141B: Ethernet / SNMP / TCP/IP Adapter

CS141L: Advanced Ethernet / SNMP / TCP/IP /

MODBUS TCP Adapter with facilities monitoring I/O and auxiliary contact closure inputs.

CS141L-485: Advanced Ethernet / SNMP / TCP/IP / MODBUS TCP / MODBUS RS485 Adapter with auxiliary contact closure inputs.

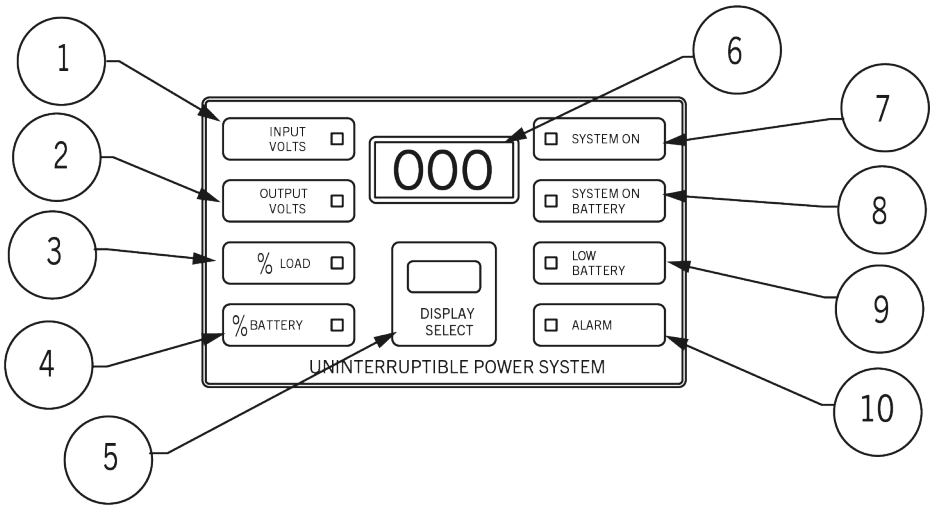
NetMinder CS141 Features & Benefits

- 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

See the accompanying communications manual for setup instructions.
See “Communications Description” for port locations.

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OPERATION



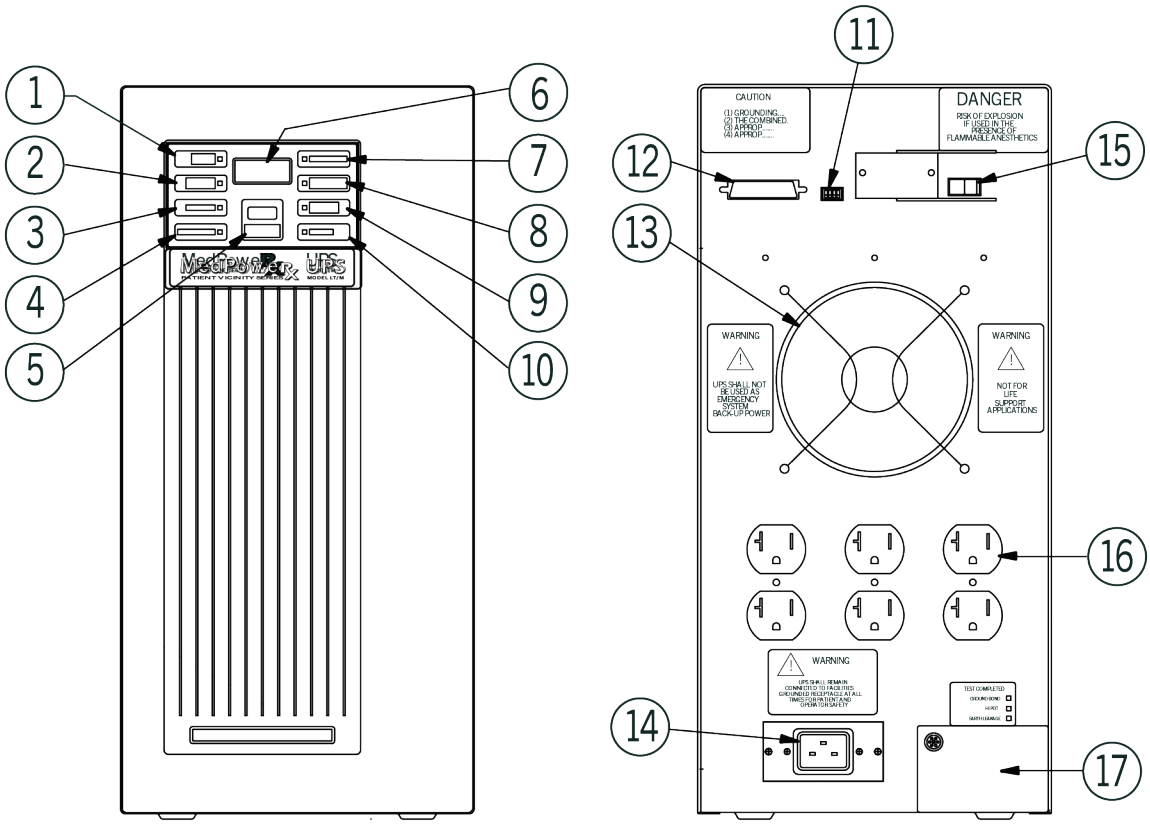
DISPLAY PANEL

1. **Input Volts -** LED ON indicates unit is monitoring the input voltage via the digital display. This function is activated by pushing the display select button.
2. **Output Volts -** LED ON indicates unit is monitoring the output voltage via the digital display. This function is activated by pushing the display select button.
3. **Percent Load -** LED ON indicates unit is monitoring the output load capacity relative to maximum watts via the digital display. This function is activated by pushing the display select button.
4. **Percent Battery -** LED ON indicates unit is monitoring the percentage of battery charge via the digital display. When operating on battery power the digital display monitors percentage of battery time remaining.
5. **Display Select -** This push-button selects 1 of 4 monitor functions mentioned above and displays the results on the digital display.
6. **Digital Display -** Three digit display monitoring the four previous functions. This display monitors one function at a time and is selected by the “Display Select” push-button.
7. **System On -** LED ON indicates the on/off switch is on and AC power is available at the input. LED will remain on when unit is on battery power.
8. **System On Battery -** LED ON indicates the UPS is on battery power accompanied by an audible alarm. The UPS may switch to battery power even when it appears there are no power outages. The reason is that the UPS detects input sags and surges and does not necessarily require a total power loss to switch to battery power. The UPS will

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remain on battery power for a few seconds after normal AC power is restored.

9. **Low Battery -** LED ON indicates batteries are low and a total UPS shutdown is imminent unless AC power returns. This alarm setpoint is user selectable via the communications port (see “Communications” to turn on at a predetermined percentage of battery time remaining. Percentage is selectable from 10% to 90% of battery remaining. Standard selection is 40%.
10. **Alarm -** LED ON is accompanied by an audible alarm for a number of alarm functions (see “Communications”). Alarm will clear automatically once the alarm condition is resolved.



11. **SW1 - This is a selector switch with the following functions: Note: “ON” is down.**

Position #1 - ON = Slew rate fast - this selection typically used when UPS must track rapidly changing input frequency. i.e. engine generators (do not change this switch with UPS on).

Position #2 - ON = Slew rate normal (do not change this switch with UPS on). Note: Only 1 switch may be on at a time for position 1 and 2. Turn position 1 on and 2 off if UPS switches to batteries often.

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Position #3 - ON = Audible alarm on, OFF = Alarm silence.

Position #4 - During extended power outages the UPS will automatically turn 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 resetting the on/off switch. ON = Auto Restart OFF = Manual Restart

12. **J1 Port -** Used for communications between the UPS and your computer (see "Communications").
13. **Cooling Fans -** Allow minimum of 2" clearance for airflow.
14. **Line Cord -** Input power is connected here.
15. **ON/OFF Switch -** Turns the UPS OFF or ON.
16. **Output Receptacles -** Equipment to be protected is connected here.
17. **Spec Tag -** Indicates units specifications.
18. **Optional external battery pack connector.**

COMMUNICATIONS DESCRIPTION

Three methods can be used to communicate with the UPS:

- Direct connect to a terminal.
- Direct connect to a PC that is operating as a terminal emulator or a communication software that will emulate a terminal.
- Modem operation.

Once the communication link is established, system set points, system parameters, system status and memory modification is attainable.

Any system status change will automatically cause the UPS to send an alert warning signal. The signal sent is "?". User software can be written to identify this signal and initiate automatic unattended action.

J1 PORT - DB25 PIN FUNCTION

Pin #	Name	Description
1	UPS On (Battery Operation)	Closes on battery operation
2	Receive Data	RS/232
3	Transmit Data	RS/232
6	(+) 10 VDC Supply	Limited to 1 mA
7	Signal Ground	Communication signal ground
8	UPS On (Ready)	Closes when UPS is ready
11	Low Battery Alarm (Shutdown Pending)	Closes when low battery
14	General Alarm	Closes on alarm condition
20	(+) 10 VDC Supply	RS/232
21	(-) 10 VDC Supply	Limited to 1 mA
23	Remote Emergency Power Off	Positive DC input w / reference to ground shuts unit off
25	Signal Ground	Communication signal ground

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Pins 8, 1, 11 and 14 are open collector transistor, 40V Max. requiring a pull up resistor, 300mA Max. The contacts are referenced to pins 7 or 25 which is chassis ground.

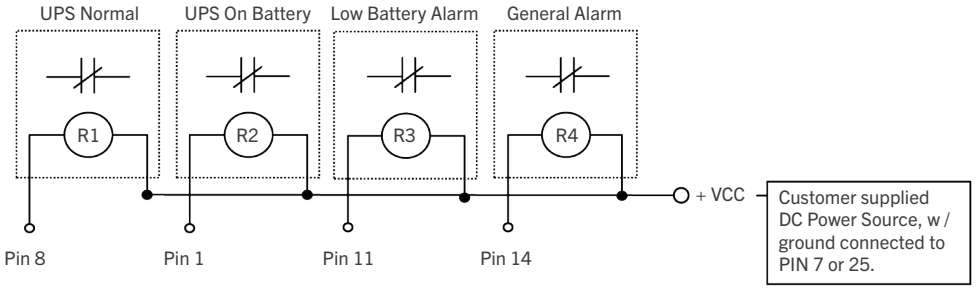
Pin 23 requires a high input limited to 20 VDC with reference to pin 7 and 25 (ground) or the +10 VDC signal at pin 6 may be utilized with an external contact.

RS232 TECHNICAL SPECIFICATION SUMMARY

Connector	25 Pin, Type D, Female
Format	ASCII 8 bit, One Start Bit, One Stop Bit
Parity	None
Duplex	Full
Delimiters	Carriage Return per Block

Baud Rate – 1200 BPS. Standard SNMP operation is 9600 BPS. Default is 1200 BPS.

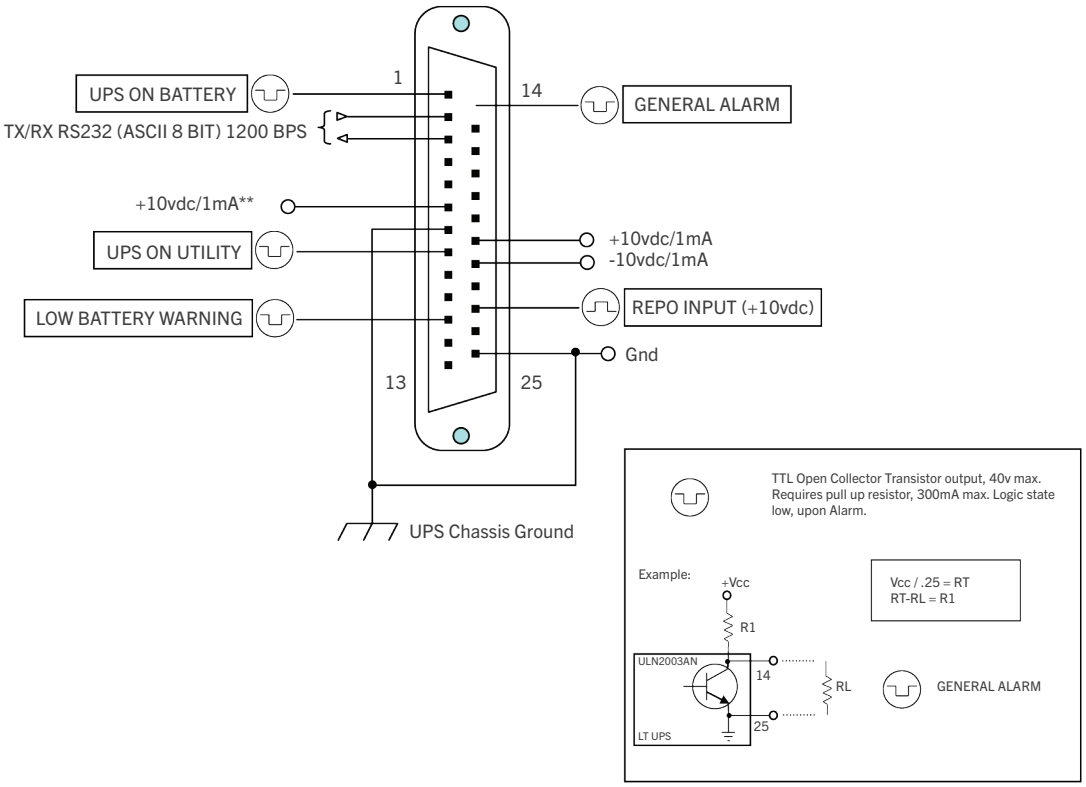
Customer Supplied Slave Relays for alternate voltage/current and isloation requirements (Recommended to insure proper interface without operational interference)



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

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LT UPS
J1 Port / DB25



**Note: 1mA is not enough to drive most discrete relay devices Use only for REPO control or TTL Logic control.

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COMMUNICATIONS

COMMUNICATING WITH THE UPS

There are alarm and operation set points that will alter the behavior of the UPS. It is not recommended that these be modified without a complete understanding of the function. Consult Customer Support at 1-800-521-4792 prior to modifying set points.

MINIMUM SYSTEM REQUIREMENTS:

1. Computer/Laptop with Windows 3.1 or later.
2. “Hyperterminal” (Windows 3.1, Windows XP) or “PuTTY” for Windows Vista and Windows 7 or later. (download at http://www.putty.org/).
3. 3. USB Port and a DB25 to USB Null Modem Conversion Cable - for use with all Windows operating systems and “Hyperterminal” or “PuTTY” emulation programs.

PROCEDURE

1. Connect the DB25 to USB Null Modem Conversion cable from J1 on the rear of the UPS to the USB port on a computer.
2. Make sure the UPS in ON and running.
3. Start Windows on the computer, access “All Programs” then “Accessories” then “Communications” then “Hyper Terminal” for Windows 3.1 or Windows XP. Or launch “PuTTY” for Windows Vista and Windows 7 or later.
4. In the Hyperterminal “Connection Description” window, enter any name then choose any icon - Click OK. For “PuTTY” users, Connection type = Serial, Serial Line = Com Port of computer being used, Speed = 1200. “PuTTY” users can name and save the session for later use. “PuTTY” users skip to step 7.
5. In the Hyperterminal “Connect To” window, choose “Connect Using” and select the comport you are using, Click OK.
6. In the Hyperterminal “COM Port Settings” window, set the following parameters: 1200 Baud, 8 data bits, 0 parity, 1 stop bit, flow control = xon/xoff, then click OK.
7. To enter into the “Memory Modification Group” type a lower case “m” and hit “ENTER”.
8. The response will be: PASSWORD=
9. Enter a lower case “sps-92”. then hit “ENTER”
10. Upon entering the correct password, one line item will be displayed at a time, i.e.,

Min AC Start = 204

Min AC Start = If the value is to remain unchanged press ENTER and the next parameter will appear or else type the new value. After entering the new value press “ENTER” to scroll to the next parameter. To end the

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process type a lower case “e”.

11. After making the desired changes, send a lower case “p” and the System Parameters will appear on the screen. Verify the changes that you have made. If further changes are required, go back to step 7.
12. At this point you are already out of the “Memory Modification Group” (after entering the lower case ”e” in step 10).
13. Disconnect the communications cable.

SYSTEM PARAMETERS

The following lists parameters the UPS monitors and also system status of the UPS while operating.

To access System Parameters and Status send the lower case “s” to the UPS from the terminal.

You must hit the “s” key each time to update system status.

Description	Sample Display	Description
AC Volts In	Input Line Voltage = 240	The voltage the UPS is receiving
AC Volts Out	Output Voltage = 240	The voltage the UPS is delivering to the load
Battery Volts	Batter Voltage % = 98	Percentage of full charge of the battery
AC Amps Out	Output Current = 2.4	Amperage the load draws from the UPS
% of Full Load	Load % = 90	The percentage of total capacity that the load is using
Watts Out	KW = .54	The total real power the UPS is delivering to the load
Volt Amps Out	KVA = .77	The total apparent power the UPS is delivering to the load
Power Factor	Power Factor = 0.70	The power factor of the load (KW/KVA)
Incoming Line Frequency	Frequency = 60.0	Displays the input frequency when on line, output frequency when on inverter
Crest Factor	Crest Factor	Peak Current / RMS Current
Outages	Outage	The number of outages recorded from the last clear function
Overloads	Overload	The number of overloads from the last clear function

SYSTEM STATUS

Description	Sample Display	Description
Synchronization	Synchronization	When the UPS is in sync with the line frequency
UPS On	UPS On	When the UPS is producing an output voltage
Low Battery Warning	Low Battery Warning	When the battery level reaches the preset value of alarm condition
On Battery	On Inverter	When the UPS is supplying output power from the batteries
Overload Alarm	Overload Alarm	When the UPS is supplying more power than its rated capacity
Low Output	Low Output	When the output voltage goes lower than the preset alarm condition

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High Output	High Output	When the output voltage exceeds the preset alarm condition
Check Battery	Check Battery	When the battery discharge is greater then normal
Frequency Fault	Frequency Fault	When the fault exceeds the preset range of alarm conditions
Overtemp Warning	Overtemp Warning	When the UPS temperature reaches a critical level. Immediate shutdown.
Shorted SCR Shut-down	Shorted SCR Shut-down	When the power electronic switch is shorted
Low Battery Shutdown	Low Battery Shutdown	When the batteries are depleted the UPS shuts off
Output Shutdown	Output Shutdown	If selected, the UPS will shutdown when the output exceeds set points
Output Warning	Output Warning	If selected, UPS will alarm when output exceeds set points

SYSTEM SET POINTS

To access System Set Points send the lower case “p” to the UPS from the terminal. Note: This allows monitoring of system set points only.

Description	Sample Display	Password	Explanation
Minimum AC Start Voltage	204	Required	Minimum AC voltage required before the UPS will start.
Maximum AC Start Voltage	Max AC Start = 264(+15% Max)	Required	If the input voltage exceeds this value, the UPS will not start
Low Output Alarm Set points	Low Output = 210	Required	Alarm or shutdown if the output voltage dips to this set value.
High Output Alarm Set points	High Output = 264	Required	Alarm or shutdown if the output voltage reaches this set value.
Low Battery Warning Set Point	Low Battery (%) - Min = 010 Max = 070	No Access	Percent of battery capacity alarm set value.
High Battery Warning Set Point	High Battery (%) = 105	No Access	Manufacturer set point for diagnostics and charger control.
Low Frequency Alarm Set Point	Low Frequency = 059 Max = 057	Required	Alarm or shutdown if the output frequency dips to this set value.
High Frequency Alarm Set Point	High Frequency = 061 Max = 063	Required	Alarm or shutdown if the output frequency reaches this set value.
Over Temperature Set Point	Over Temperature = 160	No Access	Manufacturer set point.
Nominal Input Voltage	Input Nominal = 240	Required	Nominal input voltage. Switch set points are calculated from this value.
Nominal Output Volt-age	Output Nominal = 240	Required	Nominal output voltage. Value from which other calculations are derived.
Maximum KVA Rating	Output VA = 850	Required	Maximum KVA rating of the UPS.
Low Line Switch Point. NOTE: Fuzzy Logic is entered as shown	Sag Switch Point (%) = 065 Fuzzy Logic = 000 Fuzzy Plus = 001	Required	Percent below nominal AC input when the UPS will switch to battery operation
High Line Switch Point	Surge Switch Point (%) = 110 (%) = 115 Max	Required	Percent above nominal AC input when the UPS will switch to battery operation.

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Low Line Sample Accumulation Buffer	Sensitivity (1-2) = 1	Required	Averaging factor for low line voltage. 1 = least averaging (greater sensitivity).
Frequency Accumulation Buffer	Frequency Delay (2-9) = 8	Required	Number of AC cycles required to be out of set frequency range prior to switching to inverter mode.
Power Grid Stability Check	Transfer Delay (Sec) = 20	No Access	Amount of time in seconds the UPS will wait before accepting the AC input
System ID Number	System ID = Units 8 Digit Serial #	Required	System identification serial number.
System Shutdown Enable	Output Shutdown Enable (1/0) = 0	Required	If enable set = 1, the UPS will shut-down when alarm set points are exceeded. 0 = audible alarm only.
Hot Start or AC Start	Hot Start = 1 AC Start = 0	Required	Hot Start - Unit turns on with no AC input power. AC Start - AC power required for unit to turn on.

SYSTEM SET POINTS - FACTORY PRESET LEVELS

Description	Value entered w/ nominal input voltage = 120V	Value entered w/ nominal input voltage = 208V	Value entered w/ nominal input voltage = 208V
Minimum AC Start Voltage	102	177	204
Maximum AC Start Voltage	132	229	264
Nominal Input Voltage	120	208	240
Nominal Output Voltage	Refer to unit Spec tag	Refer to unit Spec tag	Refer to unit Spec tag
Low Output Alarm Set points	105	182	210
High Output Alarm Set points	132	229	264
Low Line Switch Point. NOTE: Fuzzy Logic is entered as shown	Fuzzy Logic = 00.	Fuzzy Logic = 00.	Fuzzy Logic = 00.
High Line Switch Point	% = 110	% = 110	% = 110
Low Output Frequency Alarm Set Point	59	59	59
High Output Frequency Alarm Set Point	61	61	61
Low Line Sample Accumulation Set Point	Available (1-2) = 1	Available (1-2) = 1	Available (1-2) = 1
Frequency Accumulation Buffer	Available (2-9) = 8	Available (2-9) = 8	Available (2-9) = 8
System Shutdown Enable	Audible Only = 0	Audible Only = 0	Audible Only = 0
Maximum KVA Rating	Enter actual KVA Rating - See units spec tag	Enter actual KVA Rating - See units spec tag	Enter actual KVA Rating - See units spec tag
Hot Start or AC Start	AC Start = 0	AC Start = 0	AC Start = 0

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MAINTENANCE PROCEDURES

⚠ WARNING

Inspection, placement, installation, set-up and start-up should be performed By qualified personnel

⚠ 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 UPS in a clean environment with proper ventilation and no restrictions on air intakes and cooling fan outputs.

Battery connections should be tightened annually by qualified electrical personnel. Batteries should be replaced every 4-5 years or as indicated by battery testing.

The UPS should be checked monthly on battery operation. Take precautions to have the loads in a mode that could tolerate a shut down.

COMPLETE MAINTENANCE CHECK

PREPARATION

A shutdown period must be scheduled to perform maintenance. The loads should be available to test the UPS with a loss of power simulation.

EQUIPMENT

Wire brush or other cleaning device (for battery connections), insulated tools (for battery connections) and safety glasses.

SYSTEM OPERATION

1. With power on, check display functions of unit for proper operation.
2. Turn input source and input AC breaker off.

VISUAL INSPECTION

1. Remove any load from the units output.
2. CAREFULLY remove the top panel.
3. Check for burnt, frayed, broken or loose connections. Look closely in the following areas: Input, output connections, circuit breakers and battery connections.

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4. Correct any loose connections, replace any physically burned or broken components. Use extreme care when replacing components to assure correct installation. Reassemble the UPS as required.

GENERATOR TEST

1. If generator is backing the UPS, check to be sure the UPS oper ates properly with the generator.

A. Check generator operation with no load. Unit should switch to inverter when generator turns on. After a minute or so the Inverter should switch back to normal mode and run off the generator.

B. Check generator with customers loads. Follow same steps stated above.

BATTERY MAINTENANCE - Authorized Personnel Only

Accidental shorts will cause severe arcing, burning or battery explosion - wear eye protection and use insulated tools when servicing batteries. Remove all jewelry.

NOTE: Never mix batteries with a different brand or size. Never mix old and new batteries. Dispose of batteries properly. Do not open, mutilate or dispose in a fire.

Note: Never mix batteries with a different brand or size. Never mix old and new batteries. Dispose of batteries properly. Do not open, mutilate or dispose in a fire.

1. Visually inspect all battery connections,. If there is any sign of corrosion - disconnect that battery and clean with wire brush. Tighten all other battery connections. Make sure batteries are not swollen or cracked. If they are, contact factory.

2. If batteries must be replaced, contact factory.

BATTERY TESTING

Battery testing should be performed periodically to ensure efficient operation.

PREPARATION

Proper precautions must be taken when performing battery testing. The load(s) should be available to test on inverter, in a loss of power simulation. Be sure also to take precautions to have the loads in a mode that could tolerate a shut down. If the battery test fails the system may shutdown and all of the critical loads connected to it will lose power.

It is recommended that batteries are inspected for corroded and lose connections before performing the battery test. Battery connections should be tightened annually by qualified electrical personnel. Standard batteries should be replaced every 4-5 years or as indicated by monthly battery testing.

Annual Battery Test - (full load run time).

1. On the front display select battery percentage, be sure that it is 100%. If it is not 100%, allow batteries to charge until it reads 100%.

2. Turn the AC input breaker off only, unit should run on inverter. Allow batteries to completely discharge. If the batteries do not complete the full load run-time of the unit, they may need to be replaced. Contact factory for service.

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EXTERIOR CLEANING INSTRUCTIONS

WARNING

Appropriate steps should be taken to avoid placement of materials on this device which may drip, fall, and the like, and increase the risk of fire or electrical shock.

The UPS should be completely shut off and disconnected from power prior to cleaning. To clean exterior, use a clean damp cloth with a mild detergent. Be careful not to drip liquids into the vents. Dry thoroughly. If liquids get into venting areas open the cabinet and carefully dry affected areas.

CAUTION

High voltage exists, caution must be taken when Working near the battery terminals. Power is supplied by more than One source. Make sure ac circuit breaker is off and the input plug Is disconnected from building power before opening the enclosure

GENERAL TROUBLESHOOTING

PROBLEM	PROBABLE CAUSE	SOLUTION
UPS will not turn on.	Enable switch is off.	Turn on.
	Internal shipping damage.	Call factory.
	Wrong input voltage or no voltage.	Verify input voltage.
	Bad battery.	Have batteries tested.
	Trips buildings circuit breaker.	Remove other equipment on the same circuit.
UPS shuts off.	Overcurrent condition.	Restart UPS by turning Enable Switch OFF and then ON. Monitor % load, if it exceeds 100% reduce output loads.
	Bad cooling fan.	Replace cooling fan.
	Cooling fan blocked.	Check for proper clearance or for dirt and dust build up.
	Room temperature to hot.	Verify operating specs.
UPS alarms occasionally.	Normal.	UPS is protecting your equipment from momentary sags and surges.
	Intermittent Alarm.	Monitor type of alarm and frequency, take action on particular alarm.

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UPS switches to batteries more then 3 to 4 times per hour or will not return to utility power.	Chronic input fluctuations.	Have input voltage monitored.
	UPS to sensitive.	Turn SW1 position 1 OFF and position 2 ON.
No output when utility power fails.	Bad battery connection.	Have batteries tested and connections checked.
	Batteries discharged.	Allow batteries to recharge for 6 to 8 hours.
Short battery backup time.	Batteries not charged.	Allow batteries to charge 6 to 8 hours.
	Unit overload.	Check % load display and reduce load.
	Defective battery.	Have batteries tested and connections checked.
UPS operates but drops load.	Communication error.	Check interface cables for continuity, test communications signals.

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 is purchased, then the warranty begins from date of Start Up or 90 days from ship date; whichever comes first.**

If a Start-Up 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). Start up includes all travel and living expenses. Start up description: Testing all emergency circuitry - Calibration - Inspection - Exercising all circuit breakers - Cooling fan check - Input and output parameter check - Air intake / exhaust check - Re-torque all high current terminals - 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.

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Products:

- Uninterruptible Power Systems (LT) / 1 Years parts only*, Batteries 1 Year full.

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

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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/

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CUSTOMER SUPPORT

Contact Trystar.

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: 507-333-3990..

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

RESPONSE: Immediate 24 hour phone support. If problem is not solved Trystar 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 service 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.

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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, Trystar offers hands on training at our training facility and part kits. For more information, contact Trystar Customer Support Department at 507-333-3990.

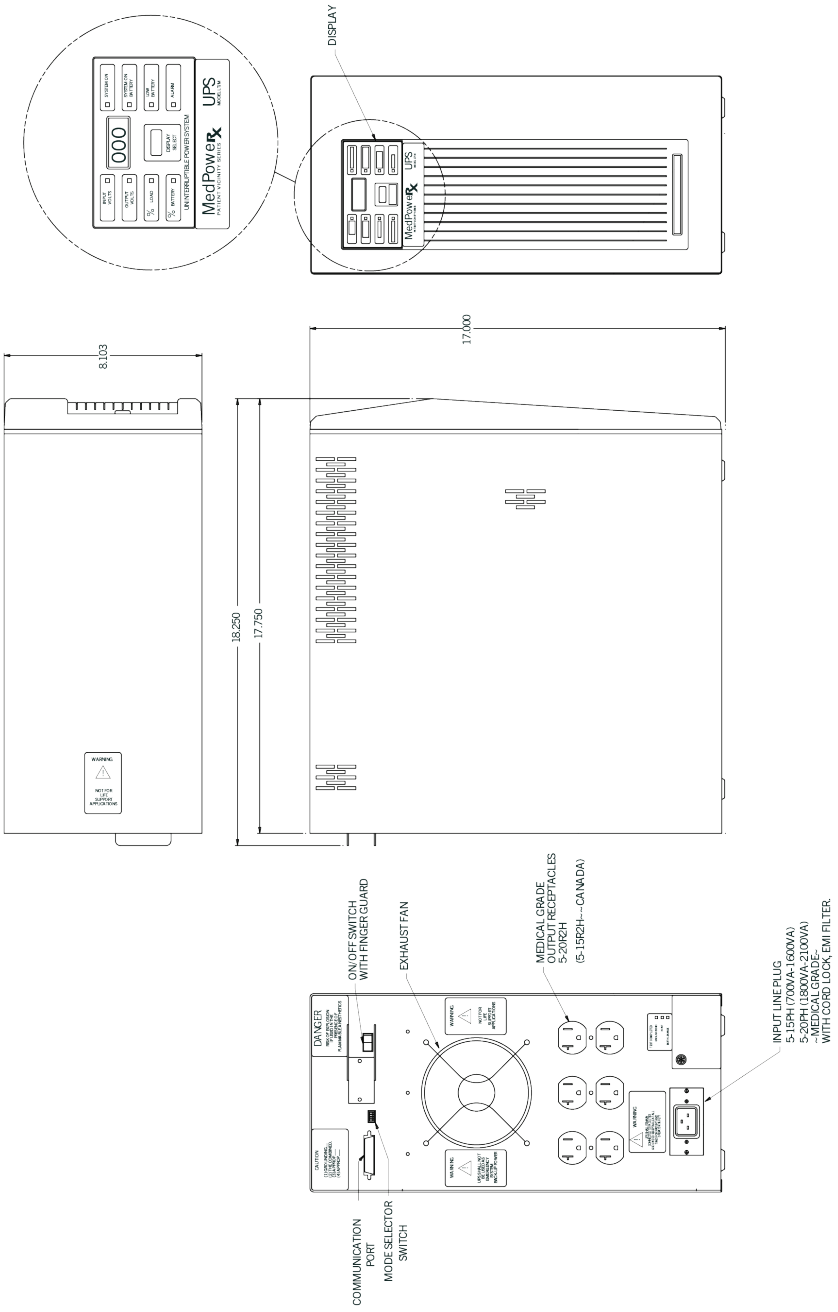
Individual components are available upon request, please contact the factory for specific part numbers and prices. See “Appendix A - Component Location Diagrams” for component location and description. When contacting the Parts Department, please have the unit’s full model number and serial or system number. Call 507-333-3990.

APPENDIX A

RELATIVE DRAWINGS & SCHEMATICS

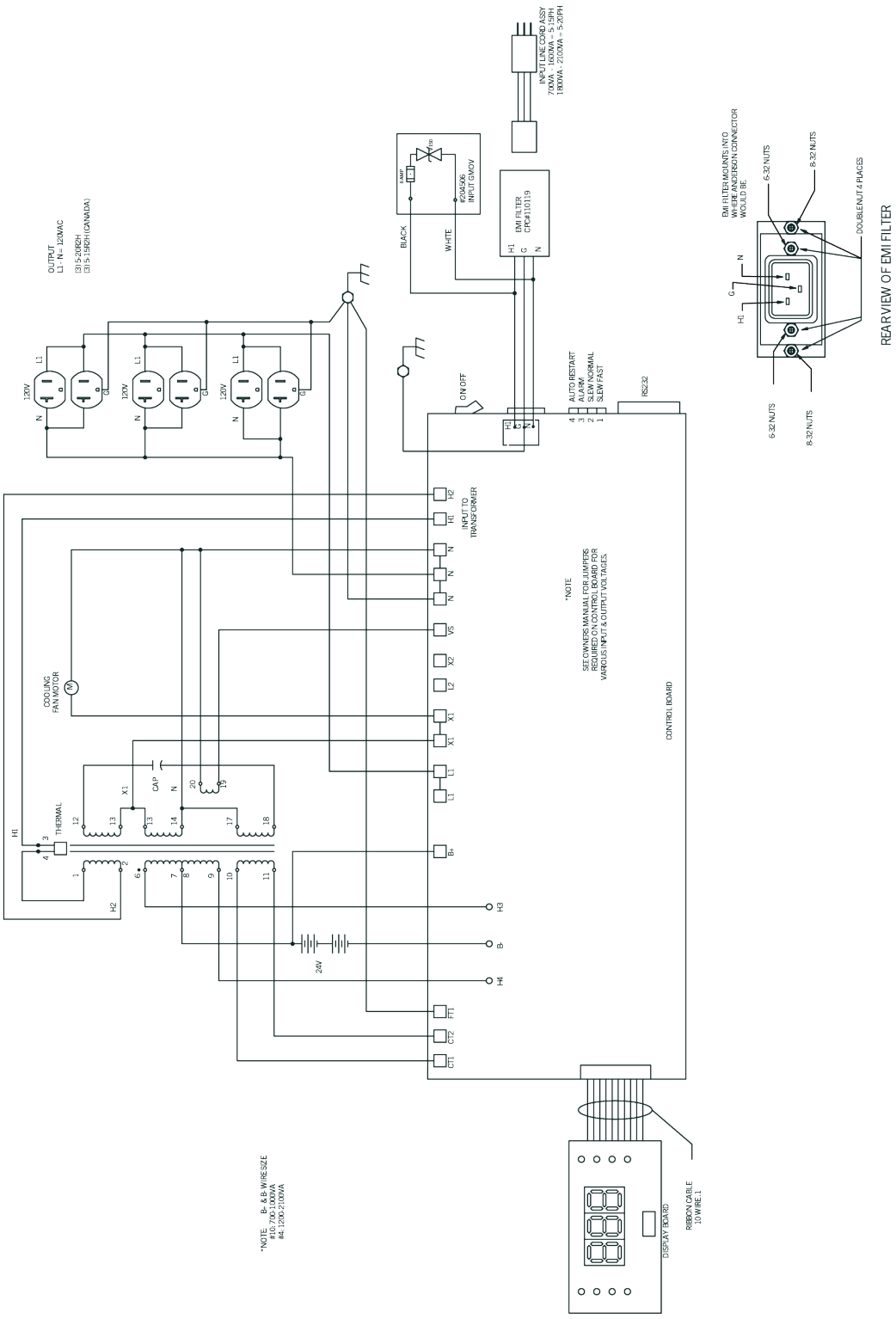
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CABINET OUTLINE



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CIRCUIT DIAGRAM



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