

# DEPENDABLE POWER SYSTEMS

## INVERTER, STATIC SWITCH, AND MANUAL BYPASS SWITCH

Installation, Operating, And Maintenance  
Instructions

### WARRANTY

Dependable Power Systems warrants, FOB factory, that the power system delivered will be of the kind and quality described in the order or contract. In connection with the power system sold, Dependable Power Systems agrees to correct any defect(s) in workmanship or normal use (excluding the batteries, which are warranted by the manufacturer) during the period of one year from date of shipment, by repair or replacement of defective part(s). Such correction shall constitute a fulfillment of all Dependable Power Systems liabilities in respect to the power system sold. In no event shall Dependable Power Systems be liable for consequential damage.

### DANGER

**HAZARDOUS VOLTAGES EXIST INSIDE HIS UNIT EVEN WHEN THE UNIT NOT CONNECTED.** Do not use uninsulated tools or touch before uninsulated wires. Check for voltage on terminals handling, and disconnect the AC input at the service panel before making any connections.

### WARNING

**DO NOT OPERATE THE "MANUAL BYPASS SWITCH" (LOCATED NEXT TO THE CIRCUIT BREAKERS) UNLESS THE STATIC SWITCH "LOAD ON BYPASS" INDICATOR IS ON.** Failure to follow this instruction could cause damage to the equipment and/or injury to the operator.

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## Section 1 INTRODUCTION

### 1-1. GENERAL

The Dependable Power Systems' Inverter is a solid-state, double conversion unit that provides continuous, clean, regulated sine wave power to sensitive electronic equipment.

### 1-2. OPERATION

The inverter system consists of three major components; the inverter, the static switch, and the manual (maintenance) bypass switch. During normal operation, the inverter changes the DC power to clean, regulated, sine wave power which is supplied through the static switch and the manual bypass switch to the critical load.

Should there be a loss of utility power, the inverter draws the DC power from the batteries without switching to continue providing AC power. An alarm will sound to alert operating personnel of that the battery is discharging allowing for an orderly shutdown of the critical load. A second alarm will sound when the batteries are near exhaustion, warning that shutdown is imminent. After the batteries are discharged, the Inverter shuts itself off.

The static switch is a make-before-break electronic switch which transfers the critical load to the bypass or alternate power source without interruption should the Inverter experience a failure or if an overload should occur. If the transfer is due to an overload, the static switch automatically retransfers the critical load back to the inverter after the overload condition ends.

The manual (maintenance) bypass switch, hereon called MBS, is a manually operated make-before-break switch. When maintenance is to be performed on the Inverter, while still supplying power to the critical load, the MBS is placed in the "LOAD ON BYPASS" position. This transfers the load to the bypass AC power source without interruption, allowing all power to be shut down in the Inverter. **CAUTION: THE STATIC SWITCH MUST BE IN THE "LOAD ON BYPASS" POSITION BEFORE THE MBS IS THROWN.** Switching the MBS to the TEST position allows the static switch to be tested while maintaining the load safely on bypass source.

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## Section 2 INSTALLATION

### 2-1. INSPECTION, HANDLING, AND ASSEMBLY

The INVERTER should be checked for shipping damage immediately upon receipt and all damage reported to the carrier. Internal damage must also be reported to Dependable power systems.

Units must be stored in an upright position and in a dry location (0 to 50 degrees C, at 0 to 95% humidity). The storage location must not be exposed to the outside elements. Due to the possibility of battery deterioration, the INVERTER should not be stored longer than 6 months.

Although the INVERTER is a large, ruggedly constructed unit, it must be handled with reasonable care to avoid damage. Severe bumps and jolts must be avoided. Only personnel experienced in the installation of equipment of this size and weight should be used. The unit's size and weight can be found on the Outline and Interconnect drawing.

No Assembly is required, with the exception of the very large systems. With the large units, two or more modules may have to be bolted together and interconnected. On these units, refer to the Outline and Interconnect drawing for details. To facilitate moving a unit equipped with fans, the entire top fan panel may be removed. However, great care must be taken to avoid damaging the fan assembly.

The unpacked unit may be moved on it's wheels, when provided, or by a forklift or pallet jack. Due to the weight of the unit, ramps or sloping floors should be avoided when using the wheels or pallet jack.

### CAUTION

The balance points of the INVERTER are typically not centered. The heavy side of the unit is noted on the outside of the packing material.

### 2-2. ENVIRONMENTAL CONSIDERATIONS

As with all electrical wiring, long runs of the AC wires or the battery wires, if required, should be avoided to reduce noise pickup and line drops. If batteries are mounted outside the unit, long runs can reduce battery run time.

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## Section 2 INSTALLATION

The INVERTER generates some heat (see Outline and Interconnect drawing for BTU's), and therefore, should be in a well ventilated area. The temperature range for the standard INVERTER is 0 to 40 degrees C.

The primary ventilation is through the top and bottom of the INVERTER. Restricting the air flow by placing objects near, on top of, or under the unit could reduce the operating life of the unit. The clearance above the unit should be no less than 12". Primary access is obtained by the front door(s). In cases where adequate clearance is not possible, a minimum of 4" to the rear of the unit must be maintained for proper air flow.

### 2-3. ELECTRICAL REQUIREMENTS

Refer to the Outline and Interconnect drawing for the required electrical connections and the current requirements. All connections to the INVERTER, including an adequate earth ground connection, are to conform to local codes. If there is a conflict between the local electrical code and wiring diagrams provided, contact the Dependable power systems service department.

Areas are provided in the floor and at the top rear of the unit for cable and/or conduit entry. Connections are made to terminal strips located inside the front door (panel). See Outline and Interconnect drawing for exact location.

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## Section 3 CONTROLS AND INDICATIONS

### 3-1. GENERAL

A thorough understanding of all the controls and indicators will assure the proper operation of the INVERTER. This section discusses the front panel and remote panel indicators and controls.

### 3-2. DC INPUT

METER: The meter is pushbutton selectable to read either rectifier/charger volts or amps, or battery volts.

VOLTS and AMPS Indicators and Pushbutton: The operator can select which meter readout, either rectifier/charger voltage or current, or battery voltage by depressing this pushbutton.

### 3-3. INVERTER

METER: The meter is pushbutton selectable to read either inverter output volts or frequency. On three phase units, the phase (A-B, B-C, or C-A) to be read is also pushbutton selectable.

VOLTS and AMPS, Indicators and Pushbutton: The operator can select which meter readout, either inverter voltage or frequency.

OVER TEMPERATURE: This LED indicates that there is an over temperature problem or a fan failure (if so equipped) in the UPS. If the room ambient is within the limits, 0 to 40 degrees C, Dependable Power Systems should be called immediately.

INVERTER FAILURE: This LED indicates that there the inverter is not operating properly. Dependable Power Systems should be called immediately.

### 3-4. STATIC SWITCH

IN SYNC: When the inverter is synchronized to the bypass, this LED will be illuminated.

LOAD ON INVERTER Indicator and Push-button: This LED indicates when the static switch is in the "LOAD ON INVERTER" position and the load is being powered by the inverter. The push-button allows you to change the static switch to the "LOAD ON INVERTER" position if conditions are proper.

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**LOAD ON BYPASS Indicator and Push-button:** This LED indicates when the static switch is in the "LOAD ON BYPASS" position and the load is being powered by the bypass power source. The push-button allows you to change the static switch to the "LOAD ON BYPASS" position if conditions are proper.

**OVERLOAD:** When the load exceeds the rating of the Inverter, this LED will be illuminated.

**BYPASS NOT AVAILABLE:** This LED indicates when there is no bypass power available to the static switch.

## **3-5. OUTPUT**

**METER:** This meter reads the output current to the load. On three or two phase units, the phase to be read is selected by a switch.

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## Section 4

### STARTUP AND VERIFICATION OF OPERATION

#### 4-1. GENERAL

Once the INVERTER is in position and all connections have been made per the Outline and Interconnect drawing, you are ready to proceed to the startup and test stages. At this point, all breakers should be in the off position and the MBS should be in the "LOAD ON BYPASS" position.

#### 4-2. POWER VERIFICATION

At your power panel, switch on the AC power feeding the INVERTER. With a voltmeter, check the voltage level present at the bypass input terminals and verify that they are the same as shown on the Outline and Interconnect drawing. If the levels are different, shut down the power to the INVERTER and contact Dependable power systems. NOTE: On 240V Delta systems, the B-C leg is the grounded center tapped leg. On three phase units, the rotation is A, B, C.

If external batteries are used, connect the batteries to the unit and close the external battery breaker if available. With a voltmeter, check the **VOLTAGE AND POLARITY** at the battery input terminals and verify that they are the same as shown on the Outline and Interconnect Drawing. If the polarity is wrong, reverse the input battery cabling and recheck with a voltmeter. If the voltage levels are different, shut down the power to the INVERTER and contact Dependable power systems.

**NOTE: The positive battery must connect to input terminal #12 and the negative connects to #11.**

#### 4-3. STARTUP

Using the startup procedure located on the circuit breaker panel, start the INVERTER. When the inverter starts, there will be a distinct buzzing sound from inside the cabinet. The front panel meters should be functioning. Check the inverter voltage using the inverter voltmeter, on three and two phase units check all phases.

After about 30 seconds, the "IN SYNC" LED should be illuminated. The failure of this LED to light on three phase units is usually the result of the BYPASS input AC power being of a different rotation than the inverter output. To correct this, follow the shutdown procedure located on the front of the unit, then turn off all input power to the INVERTER cabinet. Now reverse the B and C AC lines connected to the bypass input. If a 3 phase load has been connected to the output and was operating properly during the previous startup, it is likely, due to changing the bypass input rotation, that the B and C output lines will also have to be reversed.

Repeat the power verification and startup procedure. This time, after the inverter has started, the "IN SYNC" LED will be lit.

Press the "LOAD ON INVERTER" pushbutton and the "LOAD ON INVERTER" LED will illuminate. At this point, all green LED's should be lit and no red LED's should be on. The system is now ready for the operational mode.

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## Section 5 OPERATIONAL TESTING

### 5-1. GENERAL

As previously described, the INVERTER is designed to protect your critical load from brownouts, blackouts, and transient conditions, all of which are common in the normal AC power environment. In this section, you will follow through the steps necessary to test the major functions of your INVERTER to ensure the system is operating properly and will be functional when needed. Before performing the steps in this section, confirm that the preceding sections are completed.

### **DANGER**

A INVERTER is designed to supply power even when the AC input is off. To avoid equipment damage or personal injury, assume the INVERTER terminals and components may have voltage present at any time.

### 5-2. POWER FAILURE SIMULATION

If either the AC input power is lost or the rectifier/charger fails, the DC input to the inverter will drop in voltage as the unit operates off of the batteries. To simulate either of these failures, shut down the chargers supplying the inverter battery. The inverter will continue to run until the battery reaches 1.75V per cell. At this time the inverter will shutdown. In the unlikely event the system does not perform as specified, follow the shutdown procedure and contact the Dependable power systems service department.

### 5-3. LOSS OF BYPASS INPUT POWER

The loss of the bypass input will cause the "IN SYNC" LED to go out. The system will continue providing clean, regulated power to run the critical load indefinitely. However, any action that may result in a system overload, i.e., the starting up of equipment or motors, should be avoided.

## Section 6 MAINTENANCE

The maintenance schedule is as follows:

1. Once a year, more often in extremely dusty areas, blow out the unit to remove any dust and dirt from the circuit boards, heat sinks, and transformers. The fans should be checked for proper operation.
2. Every ten years the DC electrolytic capacitors should be replaced.
3. Every twenty years the AC oil capacitors should be replaced.