



## OPERATION & SERVICE MANUAL



### 28.5 VDC Ground Power Unit

Models:

|             |                |                |                |
|-------------|----------------|----------------|----------------|
| 112850S0000 | 112850S0100    | 112850S0200    | 112850D0200    |
| 112850D0000 | 112850D0100    | 112850D0100AV  | 112850D0100-A5 |
| 112860S0000 | 112860S0100    | 112860S0200    | 112860S0200    |
|             | 112860S0100-A4 | 112860S0100-A6 |                |
| 112860D0000 | 112860D0100    | 112860D0200    |                |
|             | 112860D0100-A5 | 112860D0200-A5 |                |



11/2021 - Rev. 04

| REVISION | DATE    | TEXT AFFECTED   |
|----------|---------|---|
| 01       | 01/2009 | Original Release  |
| 02       | 03/2009 |   |
| 03       | 06/2013 | Modified 5.2.3 Converter Commissioning and 5.3 Switching On |
| 04       | 11/2021 | Modified parts list   |



| Models      | 112850S0000    | 112850S0100    | 28.5 VDC Ground Power Unit |
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| 112850D0000 | 112850D0100/AV | 112850D0100-A5 | 112850D0200                |
| 112860S0000 | 112860S0100    | 112860S0100-A4 | 112860S0200                |
| 112860D0000 | 112860D0100    | 112860SD100-A5 | 112860SD200-A5             |

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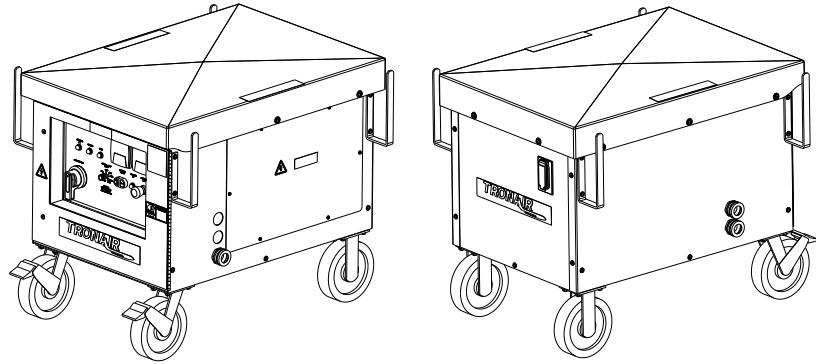
|             | Models      | 112850S0000    | 112850S0100    | 28.5 VDC Ground Power Unit |
|-------------|-------------|----------------|----------------|----------------------------|
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|             | 112860D0100 | 112860SD100-A5 | 112860D0200    | 112860S0200                |

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## 1.0 INTRODUCTION

Many systems and devices in the aerospace industry, and other fields, require a DC voltage of 28 volts. As this cannot be supplied by the utility directly, converters are employed which supply the necessary voltage and eliminate supply irregularities to a limited extent.

Normally these units are used to supply smaller aircraft with electric power. There are special reasons why aircraft need a 28V DC voltage for internal supply. To save costs in maintenance and operation, and also for environmental reasons, aircraft are supplied by external electrical power supplies when they are parked at airport terminal stands with their engines shut down.



This manual describes the Tronair 28V Ground Power Unit (GPU). If you follow these instructions you will be able to handle the equipment with confidence and utilize all its facilities.

- NOTE**
1. Naturally an operating manual cannot cover every conceivable installation, operating, maintenance or servicing situation. Should problems arise, or if the data in this manual is not sufficiently detailed, please contact your local Tronair representative who will be pleased to give further assistance.
  2. If the equipment is installed for use as an aircraft ground power system, please pay particular attention to Section 10, which summarizes the special features of this type of application.

## 1.1 MODEL DISCTIPTIONS

| Model Number   | Output Cable | Input Frequency | Input Voltage | Input Cable ft (m) | Remarks  |
|----------------|--------------|-----------------|---------------|--------------------|--|
| 112850D0000    | Dual         | 50(HZ)          | 200-415       | NA                 | No input cable<br>One 20ft 4/0(AWG) & one 50ft 2/0(AWG) non-engine starting DC output cable                                    |
| 112850D0100    | Dual         | 50(HZ)          | 200-415       | 50 (15.2)          | 50ft input cable<br>One 20ft 4/0(AWG) & one 50ft 2/0(AWG) non-engine starting DC output cable                                  |
| 112850D0100AV  | Dual         | 50(HZ)          | 200-415       | 50 (15.2)          | 50ft input cable with external adjustable voltage<br>One 20ft 4/0(AWG) & one 50ft 2/0(AWG) non-engine starting DC output cable |
| 112850D0100-A5 | Dual         | 50(HZ)          | 208-480       | 50 (15.2)          | 50ft input cable, two 50ft 4/0(AWG) DC output cables   |
| 112850D0200    | Dual         | 50(HZ)          | 200-415       | 100 (30.5)         | 100ft input cable with one 20ft 4/0(AWG)<br>One 50ft 2/0(AWG) non-engine starting DC output cable                              |
| 112850S0000    | Single       | 50(HZ)          | 200-415       | NA                 | No input cable, one 20ft 4/0(AWG) DC output cable  |
| 112850S0100    | Single       | 50(HZ)          | 200-415       | 50 (15.2)          | 50ft input cable, one 20ft 4/0(AWG) DC output cable  |
| 112850S0200    | Single       | 50(HZ)          | 200-415       | 100 (30.5)         | 100ft input cable, one 20ft 4/0(AWG) DC output cable   |
| 112860D0000    | Dual         | 60(HZ)          | 208-480       | NA                 | No input cable<br>One 20ft 4/0(AWG) & one 50ft 2/0(AWG) non-engine starting DC output cable                                    |
| 112860D0100    | Dual         | 60(HZ)          | 208-480       | 50 (15.2)          | 50ft input cable<br>One 20ft 4/0(AWG) & one 50ft 2/0(AWG) non-engine starting DC output cable                                  |
| 112860D0100-A5 | Dual         | 60(HZ)          | 208-480       | 50 (15.2)          | 50ft input cable, two 50ft 4/0(AWG) DC output cables   |
| 112860D0200    | Dual         | 60(HZ)          | 208-480       | 100 (30.5)         | 100ft input cable<br>One 20ft 4/0(AWG) & one 50ft 2/0(AWG) non-engine starting DC output cable                                 |
| 112860D0200-A5 | Dual         | 60(HZ)          | 208-480       | 100 (30.5)         | 100ft input cable<br>Two 50ft 4/0(AWG) DC output cables  |
| 112860S0000    | Single       | 60(HZ)          | 208-480       | NA                 | No input cable, one 20ft 4/0(AWG) DC output cable  |
| 112860S0100    | Single       | 60(HZ)          | 208-480       | 50 (15.2)          | 50ft input cable, one 20ft 4/0(AWG) DC output cable  |
| 112860S0100-A4 | Single       | 60(HZ)          | 208-480       | 50 (15.2)          | 50ft input cable with Crouse-Hinds plug installed<br>One 20ft 4/0(AWG) DC output cable   |
| 112860S0100-A6 | Single       | 60(HZ)          | 208-480       | 50 (15.2)          | 50ft input cable, one 20ft 4/0(AWG) DC output cable, AP20468 plug  |
| 112860S0200    | Single       | 60(HZ)          | 208-480       | 100 (30.5)         | 100ft input cable, one 20ft 4/0(AWG) DC output cable   |
| 112860S0200SP  | Single       | 60(HZ)          | 208-480       | 100 (30.5)         | 100ft input cable, one 20ft 4/0(AWG) DC output cable, special paint color  |



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|             | 112860D0100 | 112860SD100-A5 | 112860D0200                |
|             |             |                | 112860SD200-A5             |

## 1.2 SAFETY NOTES

The 28V DC GPU is a piece of electrical equipment which carries voltages and currents that are hazardous to personnel. The following advice must therefore be observed at all times:

- Installation, operation and maintenance of this equipment must be carried out according to the instructions in this manual.
- Ensure that the equipment is handled only by well-trained and authorized personnel.
- Take suitable measures to ensure that only trained operating and maintenance personnel have access to the interior of the system; the doors should be kept locked and the keys retained by authorized persons.
- System installation, service and maintenance must be performed by trained staff.
- The relevant regulations of the local codes and standards, and other safety instructions should be observed.
- All personnel who have to work on the equipment should be familiar with first-aid procedures relating to electrical accidents.
- Even when the equipment is switched off, a few internal parts remain "live" while they are connected to the incoming supply.
- Work on the equipment must only take place with the unit switched off and isolated. Proper Lockout/Tagout procedures must be followed at all times.
- Built-in capacitors can remain charged, even when the complete system is "de-energized". They should be suitably discharged by trained personnel before contact is made with the connections.
- Fuses must not be rewired or shorted out and rewired fuses must not be used. When replacing fuses, only the same or lower current ratings and the same types (slow-blow, quick-acting, very quick-acting) should be used.
- The system environment should be kept as clean as possible and metallic or other electrically-conducting dust particles in particular must be prevented from being sucked in through the air inlet.
- The warning and hazard notices inside the equipment must be observed.

Explanation of the warning symbols used in these operating instructions are as follows:



**WARNING** Appears alongside all instructions which must be followed exactly in order to eliminate personal injury and corruption/destruction of data

**IMPORTANT** Appears alongside all instructions which must be followed in order to eliminate damage to equipment and/or malfunctions

**NOTE** Indicates important information or advice, which must be followed during installation, operation, service or maintenance.



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## 2.0 TECHNICAL DATA

**Length:** 42 in (107 cm)  
**Width:** 31 in (79 cm) Single  
33 in (84 cm) Dual  
**Height:** 33 in (84 cm)

| 28V DC GPU 600A                       |  |
|---------------------------------------|--|
| <b>Input Data</b>                     |  |
| Input power                           | 25 kVA                                     |
| Nominal voltage 3ph                   | 208V/60 Hz, 400V/50 Hz, 480V/60Hz ±10%     |
| Nominal frequency                     | 50 Hz or 60 Hz ±5%                         |
| Nominal input current at<br>208V 60Hz | 56 A                                       |
| 400V 50Hz                             | 29 A                                       |
| 480V 60Hz                             | 24 A                                       |
| 575V 60Hz                             | 21A  |
| <b>Output Data</b>                    |  |
| Output power                          | 16.8 kW                                    |
| Nominal voltage                       | 28V  |
| Nominal current                       | 600 A                                      |
| Voltage adjustment range              | Nominal 20 – 31V (other values on request) |
| DC ripple voltage (without filter)    | < 1V                                       |
| DC ripple voltage (with filter)       | < 786 mv                                   |
| Voltage characteristics:              |  |
| – static                              | ±1%  |
| – dynamic (100% load step)            | MIL-Std. 704, Fig. 5                       |
| Recovery time                         | < 200 ms                                   |
| Output frequency                      | DC   |
| Overload capability                   | Max 2000A for up to 2sec                   |
| Option                                |  |
| <b>General Data</b>                   |  |
| Total efficiency                      | > 90%                                      |
| Maximum losses                        | 4 kW                                       |
| Audible noise                         | < 70 dB(A)                                 |
| Temperature range                     | -4 – +104° F (-20 - +40°C)                 |
| Humidity                              | max. 95%                                   |
| Paint finish                          | RAL 7032                                   |
| Protection type                       | IP54/Nema 3R                               |



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|             | 112860D0100 | 112860SD100-A5 | 112860D0200    | 112860S0200                |

### 3.0 SYSTEM DESCRIPTION

#### 3.1 INTRODUCTION

The 28V GPU is manufactured using the latest state-of-the-art technology. The design concept and the selected components utilize the latest trends in power electronics, and represents the best solution for the different problems of Ground Power Supplies. The 28V GPU is built with output voltage regulation and load current limiting. The following block diagram shows the principle.



#### WARNING!

**Even when the 28V GPU is switched off, a few internal parts still remain "live".**

The transformer converts the mains supply to a voltage suitable for supplying the load via the rectifier. The transformer is a two winding transformer which provides galvanic isolation between the mains and the load. The rectification is achieved by using a 6-pulse SCR. The output filter network limits the ripple at the output voltage to a low level.

An integrated control panel with push buttons and an LED's operate the unit is located on the front door of the unit.

#### 3.2 DETAILED DESCRIPTION

An integrated interface board contains a micro controller to control and monitor all functions of the system. Depending on the measurement values, the input voltage of the transformer is regulated in order to obtain the correct output voltage. All functions are digitally controlled.

The following functions are built in:

- Measurement and evaluation
- Output voltage regulation and current limiting
- System control (PLC function)

**Measurement** values from the input are collected via the interface board, and from the output direct to the controller board, where they are evaluated and monitored.

Normally the overload and short circuit protection is provided by the interface board. Protection, by the input circuit breaker CB1, takes place in case of malfunctions of the electronics.

The measurement values are also used for **voltage regulation**. The output voltage regulation consists of a voltage regulator plus a current regulator, which is the main regulator. This means if a current limit has been set in the setup menu, this current regulator will limit the output voltage to a value at which the set current is reached. If the current is less than the set maximum, the voltage regulator will limit the output voltage to obtain the set value. In this case, the current regulator is turned off. The output of these regulators is converted to a pulse pattern, which is transmitted to the firing board to fire the SCR modules.

The complete unit is operated via the **system control**. This works similar to a standard PLC. This means that particular input events will generate particular output events.

There is a Control Panel on the front of the cabinet which contains the main disconnect switch with LED (light emitting diodes) indications and on/off buttons. The Control Panel gives the user a comprehensive status indication of the unit. The LED's on the control panel show the status of each logical section of the unit, displaying green, yellow or red, and flashing or steady state to show various normal, available, warning and abnormal states of the unit. The push buttons allow the user to switch the DC output on and off and adjust unit settings. Output voltage and current are displayed on the control panel.

#### 3.3 PERFORMANCE UNDER UNUSUAL CONDITIONS

**Overload** - The converter can deliver up to a maximum of 2000 A for 3 sec. At higher overloads the output current is limited.

**Short-circuit on the load busbar** - In principle, a short-circuit occurring on the output side is handled similar to an overload, except that the output voltage is very low. The output power will be limited as described above for an overload. The rectifier itself has short-circuit protection.

**Mains fault** - If the mains supply is outside permissible tolerances, it is not possible to start the system. If the converter is running and the mains supply goes out of the permissible tolerances, the converter will switch off within 50ms.

**Output fault** - The converter monitors the output voltage continuously. If it exceeds the permissible tolerances the unit is switched off.

**Over-temperature** - In the event of a fan failure, the system continues to run normally until the over-temperature protection cuts in.



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|             | 112860D0100 | 112860SD100-A5 | 112860D0200    | 112860SD200-A5             |

### 3.4 SYSTEM CONTROL

System control consists of one System Interface Board, a firing board, one Operator Panel.

The System Interface Board handles the master system control function. Control commands from the Control Panel CP are transmitted to this controller, evaluated and converted into the appropriate actions. Current operating parameters (measured values etc.) are also evaluated by the System Interface Board. The following measure values are not displayed, but are also monitored for deviations from the specification:

- Input under & over-voltage
- Output under & over-voltage
- Output overload
- Over-temperature

### 3.5 SAFETY AND PROTECTION

The design philosophy for the 28V DC GPU is that it will endeavor to protect itself at all times. Self-protection is incorporated in both the hardware and software designs. Where situations arise that could either cause damage to the converter, or endanger the output load, the general rule is to disconnect and/or shutdown.

For safety of personnel, an Emergency Stop button is fitted local to the Control Panel on the front of the converter cubicle.

### 3.6 CONTROL AND MONITORING

#### 3.6.1 Power Supplies for Controls & Monitoring

All the electronic cards within the converter receive their power via transformers.

#### 3.6.2 Internal System Control

**System Interface Board** has the function of complete system control.

**Control Panel** consists of control and display elements for the user. Commands are analyzed by the system controller and interpreted into actions. Measurement values for the input and output circuits are processed and displayed.

#### 3.6.3 Converter Operation

As soon as mains incoming power is applied to the control logic the microprocessors commence operating and the internal function becomes active. Initially their only function is a 'watchdog operation' checking for faults within the converter and monitoring the incoming supply for voltage and frequency deviations. Any faults or deviations detected are reported internally at the System Interface Board.

### 3.7 VOLTAGE REGULATION MODE

#### 3.7.1 General

The unit supplies a load which requires a supply voltage with very little deviation. (Normally 28V DC +/- 1%). If a very long cable is used between the converter and the aircraft (load), a voltage drop will be created which might be greater than the acceptable voltage tolerance of the aircraft. If this happens, it is no longer possible for many units on the market to provide an acceptable voltage supply to the aircraft especially under all load conditions.

To overcome this problem, two possibilities are available:

1. The cable between the converter and the load could be designed in such a way that the voltage drop will be decreased so that the supply voltage is within tolerance range. The amount of copper wires and/or size can be increased or parallel cables can be used. However there comes a point where the size of the copper wires required could become too heavy or costly, or if the length of run is so long, that increasing the amount or wire size will still not be enough to keep the tolerance within the voltage range, for all load conditions.
2. The converter must incorporate a LDC (Line Drop Compensation) system that can provide active compensation so as to automatically compensate for the voltage drop.

With very long cable runs, parallel cables will increase the wire investment costs dramatically and if flexible aircraft cables are also used, then parallel cabling might not be possible or practical.

To ensure that the proper voltage is delivered to the aircraft plug under all load conditions, there must be a means of measuring the voltage at the aircraft plug, and sending those voltage signals back to the converter, so they can be analyzed and responded to. This requires that signal wires be run between the plug and the converter unit, where again cost and practicality must be considered.



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|             |             |                | 112860SD200-A5             |

### 3.8 CONTROL PANEL

There is a local Control Panel on the cubicle door of the converter which contains a light emitting diode (LED) indications, E-Stop, and meters

The LED's on the control panel are red, green and yellow. They are also bi-functional, able to display as steady state or flashing. With combinations it is possible to display healthy state, non-operational, abnormal and fault conditions.

- Green steady state ..... Running or switched on
- Yellow flashing ..... Warning
- Red flashing ..... Hardware fault (circuit breaker, contactor, etc.)
- Red steady state ..... Abnormal condition (e.g. mains fault, overload, etc)

The Red indicating LED is for fault conditions that are recoverable, such as overload. These faults are displayed as a Steady Red light. Faults requiring maintenance attention, such as CB open, are displayed as a Flashing Red light.

#### 3.8.1 Operator Controls

Push buttons "ON" and "OFF" control the converter operations.

#### 3.8.2 Emergency Stop

In an emergency, to immediately open the unit's input and output contactors, the large red button on the Control Panel must be pressed.

**IMPORTANT** Bear in mind, however, that the mains in feed is still "live". The converter can only be isolated by using suitable external means such as padlocking the supply breakers of the incoming distribution board.

### 3.9 OVERVIEW OF 28V DC GPU COMPONENTS

The modules and components of the individual sizes of the 28V DC GPU are shown in the outline drawings in this section. The sizes and arrangement of the modules and components shown vary slightly according to the power rating and version of the 28V DC GPU sets.

| Abbreviation | Description of Component                   |
|--------------|--|
| MOD 1        | Rectifier SCR                              |
| PCB 2        | Firing board                               |
|              | Interface board                            |
| K-1          | 28V Relay                                  |
| K-2          | 28V Relay                                  |
| T2           | Power supply transformer                   |
| T2           | Power supply transformer                   |
| T3           | Power supply transformer                   |
| PAN 1        | Control panel                              |
| CAPS         | Filtering capacitors                       |
| FAN 1        | Cooling Fan                                |
| R 1          | Load resistor                              |
| CB 1         | Input circuit breaker                      |
| CB 2-6       | Protective circuit-breaker control voltage |
| SW 5         | Current limit POT                          |
| T 1          | Isolated 3 phase input transformer         |
| AUX 1        | Transformer auxiliary voltage              |
| AUX 2        | Transformer auxiliary voltage              |
| CONT 1       | DC output contactor                        |
| CONT 2       | DC output contactor                        |



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|             |             |                | 112860D0200                |
|             |             |                | 112860SD200-A5             |

## 4.0 INSTALLATION AND CONNECTIONS

### 4.1 GOODS INSPECTION

Before leaving the factory, the correct mechanical and electrical state of the 28V DC GPU is checked in a final inspection. As soon as the equipment has arrived check whether any freight damage has occurred and if necessary, bring this to the attention of the freight operator. **In no circumstances put a damaged converter into service** without consulting your Tronair representative first.

### 4.2 HANDLING

The converter can be rolled into place or moved by means of a forklift or pallet lift truck

**IMPORTANT** Moving by crane should only be used in exceptional circumstances using load-spreading rails above the unit.

Please pay attention to the following handling advice:

- Equipment should only be transported in an upright position
- The equipment must not be tilted or turned over
- Always avoid sharp impacts
- Where possible, leave the equipment in its original packing when moving it, this provides the best possible protection against damage
- When moving the equipment on raised floors, it could be necessary to use a means of load distribution in order to avoid damage to the floor

### 4.3 PROTECTION

During installation and cabling it is absolutely essential that the equipment is protected from the ingress of water, concrete or metal particles, and dust etc. Protection of the equipment is particularly important when other trades or construction is taking place in the same vicinity. All inlets and parts of the equipment not being worked on should be covered, at the least with heavy-duty polyethylene, and preferably with more substantial packing.

It is also important to ensure that people working overhead do not stand on the equipment or use it as a convenient platform for other work.

On completion of any work requiring the opening of the equipment doors or panels or removal of cover plates or gland plates, the unit should be thoroughly vacuumed out and re-packed or protected. Tronair accepts no liability for any damage to equipment caused by physical mal-treatment or by ingress of foreign material.

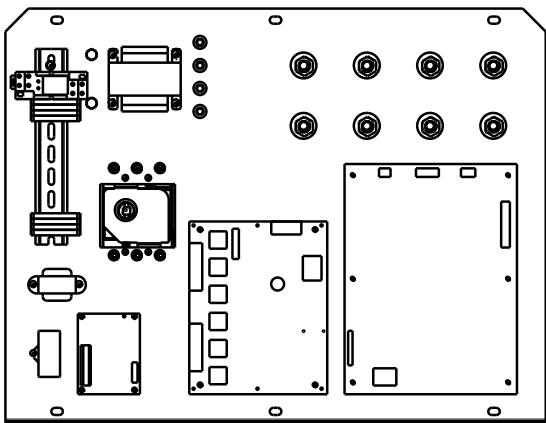
### 4.4 STORAGE

If it is necessary to store the converter for any length of time than it should be stored in a dry, well-ventilated room that is free of corrosive materials. Where possible, the original packing should not be removed during storage.

**IMPORTANT** In no circumstances must the converter be stacked, or stored outside.

#### 4.4.1 Floor Loading Capacity

The weight of the equipment is distributed over a relatively small area; special care must therefore be taken to ensure that the floor loading capacity is adequate. The exact value can be obtained from the Technical Data. If necessary, the supporting surface can be reinforced by interposing a suitable steel plate. Please consult your architect or Tronair representative if you require assistance.

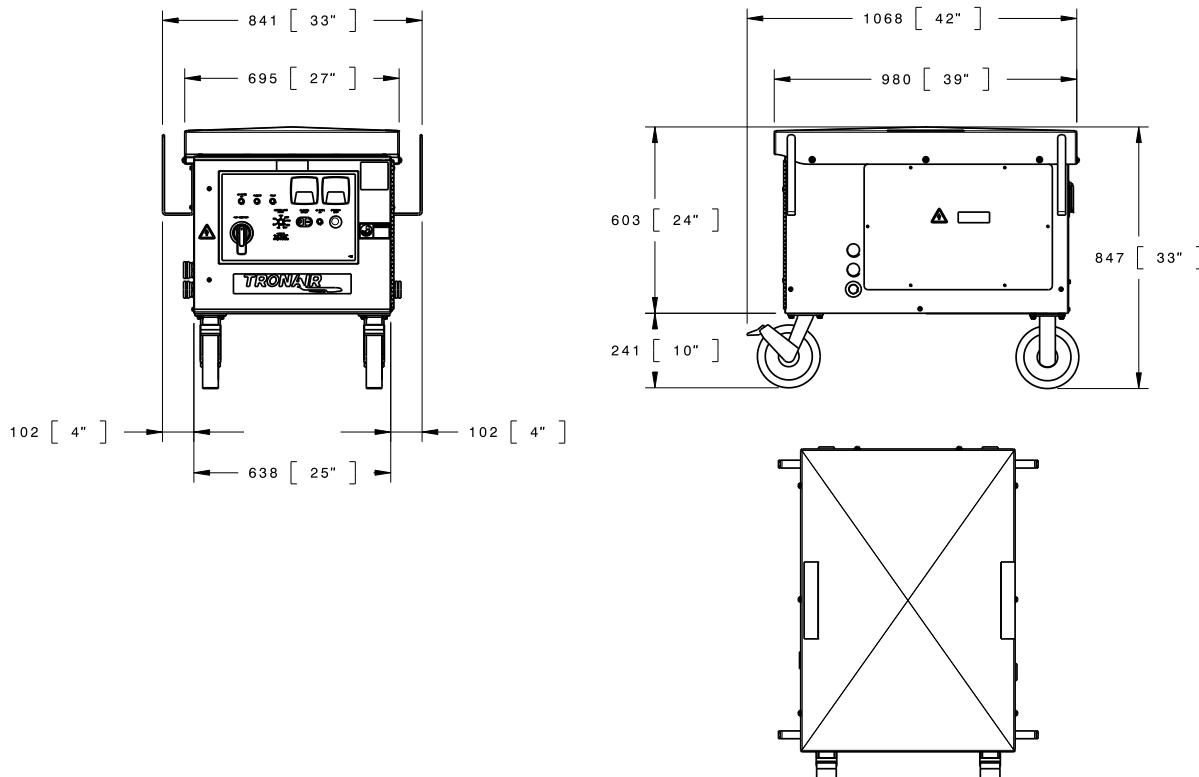




|             | Models      | 112850S0000    | 112850S0100    | 28.5 VDC Ground Power Unit |
|-------------|-------------|----------------|----------------|----------------------------|
|             | 112850D0000 | 112850D0100/AV | 112850D0100-A5 | 112850S0200                |
| 112860S0000 | 112860S0100 | 112860S0100-A4 | 112860S0100-A6 | 112850D0200                |
| 112860D0000 | 112860D0100 | 112860SD100-A5 | 112860D0200    | 112860SD200-A5             |

#### 4.4.2 Space Requirements/Dimensions

About 80 cm/32" clearance should be left in front of the unit to provide unimpeded access to the cubicle. Local or general safety regulations, e.g. escape routes, should also be observed. In no circumstances must the air inlet (around the bottom of the unit) and the air outlet (around the top of the unit) be covered or obstructed.



#### 4.4.3 Altitude, Temperature & Humidity

The 28V DC GPU is designed for an installation altitude of up to 1000 meters above mean sea level, an ambient temperature of -20 to 40 °C / -4 to +104 °F and a relative humidity of up to 95%. The optimum temperature is around 68 °F. Please ensure that any existing air-conditioning plant meets these conditions and is also able to remove the unit's dissipated heat. Details are shown in the Technical Data (Section 2). The cooling air must always be free of corrosive agents. You should consult your Tronair representative if planning an installation above 1000 meters.

### 4.5 ELECTRICAL CONNECTIONS (POWER)

#### 4.5.1 Cable Entry

The input and output cables are connected in the lower part of the cubicle. The cables can be brought up to the cubicle from the rear (input cable) and the right (output cable) and led in through end panel of the cubicle. Please refer to table below for the cable sizes, which must conform to local electrical code.

Cables must be properly gasketed with a screwed gasket fitted with a strain-relief device and sealing ring.



|             | Models      | 112850S0000    | 112850S0100    | 28.5 VDC Ground Power Unit |
|-------------|-------------|----------------|----------------|----------------------------|
| 112860S0000 | 112850D0000 | 112850D0100/AV | 112850D0100-A5 | 112850S0200                |
| 112860D0000 | 112860S0100 | 112860S0100-A4 | 112860S0100-A6 | 112850D0200                |
|             | 112860D0100 | 112860SD100-A5 | 112860D0200    | 112860S0200                |

#### 4.5.2 Cable Sizing

Cables should be sized in accordance with the **rating of the next protective device upstream**, taking into account temperature, voltage-drop and installation method factors, as per the appropriate standard for the site. In general, Tronair recommends that the voltage-drop for both input and output power cables should not exceed 1.5%, and that the connecting cables should be as short as possible especially the output cable (less than 10 m/30 feet is recommended). Tronair should be consulted if these requirements cannot be met.

When specifying the cable lengths allow for about 0.5 m/20 in. inside the cubicle. The table on the following page shows the recommended cable types:

| Equipment Type  | Line Voltage | Rated Amps | Input Cable (If Less Than 30')/ Copper Size | Output Cable                 |
|-----------------|--------------|------------|---|------------------------------|
| 28V DC GPU 600A | 208          | 56         | 1 x NYY 4 x 10 RE/10 or #4                  | 2 x NYY 120 or 2x 4/0 cables |
|                 | 230          | 51         | 1 x NYY 4 x 10 RE/10 or #4                  |                              |
|                 | 400          | 29         | 1 x NYY 4 x 6 RE/6 or #8                    |                              |
|                 | 480          | 24         | 1 x NYY 4 x 4 RE/4 or #8                    |                              |
|                 | 575          | 20         | 1 x NYY 4 x 4 RE/4 or #8                    |                              |

#### 4.5.3 Mains Fuses

To meet Health & Safety requirements, lockable isolating fused-switches must always be installed for the mains infeed. The fuses should be of type GL. Likewise, it should be possible to isolate the converter output from downstream circuits by means of an external lockable switch or circuit breaker. Please consult your Tronair representative regarding use of circuit breakers for the mains infeed.

| Equipment Type  | Mains Isolator | CB       |
|-----------------|----------------|----------|
| 28V DC GPU 600A | 100 A          | 25 A, 5A |

#### 4.5.4 Connections

Power:

- 3 phase Mains Supply + Neutral
- 2 wire 28V DC + and -

The terminal arrangement will depend on the size and configuration of the 28 VDC GPU. The following drawings show the various configurations:

| Terminal | No. of Terminal | Function      | Short Name |
|----------|-----------------|---------------|------------|
|          | L1              | Mains Input   | L1         |
|          | L2              | Mains Input   | L2         |
|          | L3              | Mains Input   | L3         |
|          | N50/N60         | Mains Neutral | N50        |
|          | +               | Load Output + |            |
|          |                 | Load Output - |            |

|             | Models      | 112850S0000    | 112850S0100    | 28.5 VDC Ground Power Unit |
|-------------|-------------|----------------|----------------|----------------------------|
| 112860S0000 | 112850D0000 | 112850D0100/AV | 112850D0100-A5 | 112850S0200                |
| 112860D0000 | 112860S0100 | 112860S0100-A4 | 112860S0100-A6 | 112850D0200                |
|             | 112860D0100 | 112860SD100-A5 | 112860D0200    | 112860S0200                |

## 5.0 OPERATING INSTRUCTIONS

### 5.1 GENERAL

This chapter describes how the 28V DC GPU should be operated. After an introduction to the operator controls and indicators, the steps for switching the system on and off are given. A smooth sequence of operations is only achieved if the individual steps are carried out in the specific order.

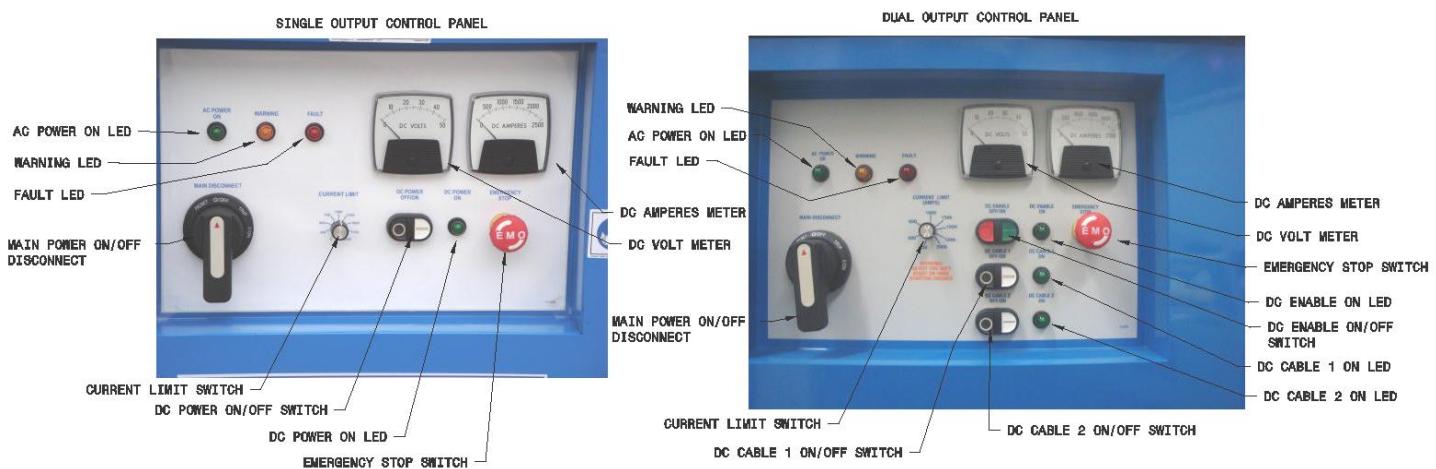
#### 5.1.1 Control Panel

The Control Panel on the cubicle door contains LED indicators, push buttons, main disconnect switch and E-stop switch.

Specific switching functions are initiated, operating information are displayed.

If an abnormal operating condition or fault occurs, the red "General failure" LED lights up. At the same time the LED's on the control panel show the current operating status and the fault is indicated on the panel.

#### 5.1.2 Operator Controls



## 5.2 COMMISSIONING

### WARNING!



Before initial start-up, check the following:

1. Is the equipment damaged? If yes, do not put into service without consulting your Tronair representative
2. Is the cabling properly installed? (Mains, output, remote control, etc.,?) Correct if necessary

#### 5.2.1 Tools Needed

The following tools will be needed in order to put the 28 VDC GPU into operation:

- Multimeter
- Allen wrench
- 7/16 wrench
- Various screwdrivers

| Models      | 112850S0000    | 112850S0100    | 28.5 VDC Ground Power Unit |
|-------------|----------------|----------------|----------------------------|
| 112850D0000 | 112850D0100/AV | 112850D0100-A5 | 112850S0200                |
| 112860S0000 | 112860S0100    | 112860S0100-A4 | 112850D0200                |
| 112860D0000 | 112860D0100    | 112860SD100-A5 | 112860S0200                |
|             |                | 112860D0200    | 112860SD200-A5             |

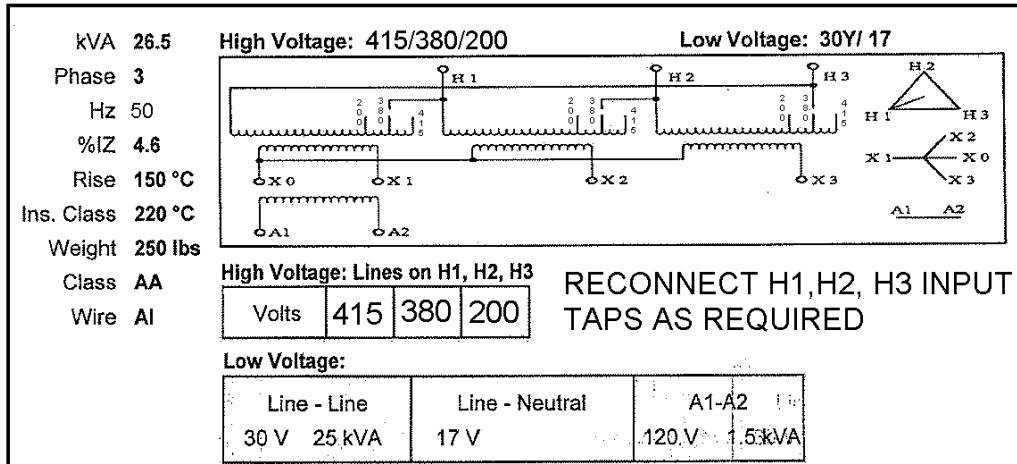
### 5.2.2 Settings

The rectifier is available in 50 Hz and 60 Hz, both units are capable of being operated at various input voltages. The 50 Hz unit can be operated with 200V, 380V or 415V and the 60Hz unit with 208V, 240V or 480V. Before the mains supply is switched on, the unit type has to be adjusted correctly.

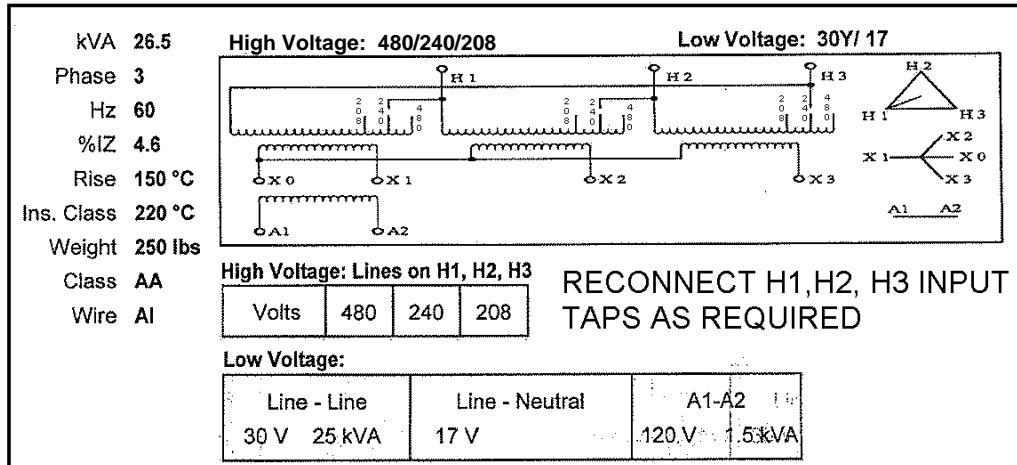
#### Setting the various transformer taps:

The unit is equipped with two control voltage transformers (T2 and T3) and one main transformer (T1). The wires have to be connected to the correct tap in accordance with the mains input voltage at T1 transformer. T1 transformer has terminals for 3 different input voltages. Place the wire jumpers according to the drawings below.

## VOLTAGE CHANGING INSTRUCTIONS – 50 Hz



## VOLTAGE CHANGING INSTRUCTIONS – 60 Hz



### 5.2.3 Converter Commissioning

#### WARNING!

- A. Commissioning must be only carried out by trained personnel since work has to be done on component that may be "live"!
- B. Power up the device only when requested to do so in the following text.

#### ATTENTION:

- I. Commissioning tasks should be carried out if:
  - the system is being put into service for the first time,
  - changes have been made, or
  - repairs were carried out



|             | Models      | 112850S0000    | 112850S0100    | 28.5 VDC Ground Power Unit |
|-------------|-------------|----------------|----------------|----------------------------|
|             | 112850D0000 | 112850D0100/AV | 112850D0100-A5 | 112850S0200                |
| 112860S0000 | 112860S0100 | 112860S0100-A4 | 112860S0100-A6 | 112850D0200                |
| 112860D0000 | 112860D0100 | 112860SD100-A5 | 112860D0200    | 112860SD200-A5             |

### 5.2.3 Converter Commissioning (*continued*)

- II. Carry out the individual steps in the correct sequence:
- 1. Check all T-1 transformer connections and tighten if necessary. Ensure voltage is tapped for **(480, 240, 208VAC 60Hz or 415,380, 200 VAC 50Hz)**
- 2. Ensure **MAIN DISCONNECT SWITCH** on the **GPU** is in the **OFF** position
- 3. Connect AC input power cable to the main power outlet and apply electrical power
- 4. Set current limiting switch on front panel to highest setting (**2000 AMP**)
- 5. Turn **GPU** main disconnect switch to **ON**
- 6. Ensure green main input power lamp is **ON**, DC voltmeter is indicating 28.5 volts, and no other fault lamps are on

**NOTE: Ensure DC output power is not on and DC lamps are off.**

- 7. For all models, connect a load bank to the **DC OUTPUT CABLE 1**, set load bank to **2000 Amps**, and ensure load bank switch is **OFF**
- 8. Connect a digital multi meter to the test points on the load bank

**NOTE: The following test is for Single Output Cable units.**

- 9. Push the **WHITE DC ON** switch. Observe **GREEN DC ON** lamp is **ON**
- 10. Ensure load bank is **ON** and cooling fans should begin spinning
- 11. Switch the load bank to **300 AMP**; verify the voltage at the load bank is **28.0 (MIN) - 28.9 (MAX) Volts DC**. Adjust **R-67** on Interface Board to obtain correct voltage output
- 12. Move load bank switch to **AUTO**; verify the voltage range at the load bank is **16.0 thru 28.9 Volts DC** and a minimum **1600 AMPS** at full load
- 13. Observe **Amber Warning** lamp flashes if **DC output** volts drops below **21VDC**. LET LOAD BANK COOL, push **Black DC Off** switch

**NOTE: The following test is for Dual Output Cable units.**

- 14. Follow steps 1 thru 8
- 15. Push **GREEN DC ENABLE ON** switch; verify **GREEN DC ENABLE** lamp is **ON**
- 16. Push the **WHITE DC 1 ON** switch, observe **GREEN DC 1** lamp is **ON**
- 17. Follow steps 10 thru 13
- 18. Connect a load bank to the **DC OUTPUT CABLE 2**
- 19. Push the **WHITE DC 2 ON** switch, observe **GREEN DC 2** lamp is **ON**
- 20. Repeat steps 13 and 17 using **DC OUTPUT CABLE 2**. Let load bank **COOL**, push **Black DC 2 Off** switch
- 21. Connect load banks to **DC OUTPUT CABLES 1 and 2**. (**Set Load for 300 Amps Each**)
- 22. Push the **WHITE DC 1 & 2 ON** switches, observe **GREEN DC 1 & 2** lamps are **ON**
- 23. Observe voltage on digital multi meter, it should indicate 28(MIN) VDC with loads. Reduce loads to 0 Amps
- 24. Let load banks **COOL**, push **Black DC 1 & 2 Off** switches
- 25. Disconnect load banks
- 26. Turn disconnect on main power outlet to **OFF**
- 27. Final inspect the unit for missing, loose, components
- 28. When the unit passes all test, release unit for normal operation

**NOTE: The following test is for External Voltage Adjustable units**

- 29. Follow steps 1 thru 2
- 30. Open control panel door, locate the Interface Board, insure voltage adjust switch (SW1) is in the external (EXT) position
- 31. Insure over-volt trip switch (**SW2**) is in the low (**LOW**) position. Close control panel door
- 32. Connect AC input power cable to the main power outlet and apply electrical power
- 33. Set current limiting switch on front panel to highest setting (2000 AMP)
- 34. Turn GPU main disconnect switch to **ON**
- 35. Ensure green main power lamp is **ON**, DC voltmeter is indicating 28.5 volts and no other fault lamps are on
- 36. Connect a load bank switch to the **DC OUTPUT CABLE 1**, set load bank to 2000 Amps and ensure load bank switch is **OFF**
- 37. Connect a digital multi meter to the test points on the load bank
- 38. Push **GREEN DC ENABLE ON** switch; verify **GREEN DC ENABLE** lamp is **ON**
- 39. Adjust voltage control knob on control panel to 28 VDC mark
- 40. Push **WHITE DC 1 ON** switch, observe **GREEN DC 1** lamp is **ON**
- 41. Ensure load bank is **ON** and cooling fans should be spinning
- 42. Switch the load bank to 300 AMP; verify the voltage at the load bank is 28.0 (min) – 28.9 (max) Volts DC. Adjust the External Voltage control knob on the control panel to obtain correct voltage output
- 43. Move load bank switch to **AUTO**; verify the voltage range at the load bank is 16.0 thru 28.9 Volts DC and a minimum 1600 Amps at full load



|             | Models      | 112850S0000    | 112850S0100    | 28.5 VDC Ground Power Unit |
|-------------|-------------|----------------|----------------|----------------------------|
| 112860S0000 | 112850D0000 | 112850D0100/AV | 112850D0100-A5 | 112850S0200                |
| 112860D0000 | 112860S0100 | 112860S0100-A4 | 112860S0100-A6 | 112850D0200                |
|             | 112860D0100 | 112860SD100-A5 | 112860D0200    | 112860S0200                |

### 5.2.3 Converter Commissioning (*continued*)

44. Observe amber warning lamp flashes if DC output volts drops below 21 VDC. LET LOAD BANK COOL, push black DC OFF switch
45. Disconnect load bank
46. Turn disconnect on main power outlet to **OFF**
47. Final inspect the unit for missing or loose components
48. When the unit passes all tests release for normal operation

### 5.3 SWITCHING ON

**NOTE:** Before switching the set on for the first time after installation, check that the cabling has been correctly installed.

1. Connect AC input power cable to the main power outlet and apply electrical power
2. Set current limiting switch on front panel to as needed
3. Turn **GPU** main disconnect switch to **ON (RIGHT/HORIZONTAL)**
4. Ensure green main input power lamp is **ON**, DC voltmeter is indicating 28.5 volts, and no other fault lamps are on

**Note:** Ensure DC output power is not on and DC lamps are off

5. For all models, connect the DC output cable (s) to the aircraft DC socket. Ensure cable plug is fully inserted into the socket
6. Push the **WHITE DC ON** switch. Observe **GREEN DC ON** lamp is **ON**
7. The unit will operate normally
8. Push **BLACK DC OFF** switch to stop
9. Turn **GPU** main disconnect switch to **OFF (LEFT/VERTICAL)**
10. Disconnect DC cable from aircraft. Disconnect AC input power cable and stow cables on GPU

**NOTE:** The following steps are for Dual Output Cable units



#### WARNING!

Do not use DC Cable 2 for starting aircraft engines 300 amps maximum output.

11. Follow steps 1 thru 5
12. Push **GREEN DC ENABLE ON** switch; verify **GREEN DC ENABLE** lamp is **ON**
13. Push the **WHITE DC 1 or 2 ON switches**; observe **GREEN DC 1 or 2** lamps are **ON**. (USE BOTH CABLES IF NEEDED)
14. Push **BLACK DC OFF** switches to stop
15. Push **RED DC ENABLE OFF** switch
16. Turn **GPU** main disconnect switch to **OFF (LEFT/VERTICAL)**
17. Disconnect DC cable (s) from aircraft. Disconnect AC input power cable and stow cables on GPU

**NOTE:** The following test is for External Voltage Adjustable units

18. Follow steps 1 thru 4
19. Connect the DC output cable(s) to the aircraft DC socket. Ensure cable plug is fully inserted into the socket
20. Adjust voltage control knob on control panel to 28 VDC mark
21. Push the **WHITE DC 1 ON** switch, observe **GREEN DC 1** lamps is **ON**
22. The unit will operate normally
23. Push **BLACK DC OFF** switch to stop
24. Turn GPU main disconnect switch to **OFF (left/vertical)**
25. Disconnect DC cable from aircraft. Disconnect AC input power cable and stow cables on GPU

#### WARNING!



Even when switched off, a few components inside the set remain "live". Only trained personnel should be allowed to work on set.

### 5.4 EMERGENCY STOP

In an emergency, to immediately shut off the system, the red Emergency Stop push button on the Control Panel must be pressed. Bear in mind, however, that the mains in feed is still "live". It can only be isolated by using suitable external means



|             | Models      | 112850S0000    | 112850S0100    | 28.5 VDC Ground Power Unit |
|-------------|-------------|----------------|----------------|----------------------------|
| 112860S0000 | 112850D0000 | 112850D0100/AV | 112850D0100-A5 | 112850S0200                |
| 112860D0000 | 112860S0100 | 112860S0100-A4 | 112860S0100-A6 | 112850D0200                |
|             | 112860D0100 | 112860SD100-A5 | 112860D0200    | 112860S0200                |

## 5.5 OUTPUT VOLTAGE DC ADJUSTMENT

### WARNING!



**Dangerous voltages in side control panel door!  
This adjustment procedure shall be performed by qualified personnel!**

1. Open control panel door.
2. Connect AC input power cable to the main power outlet and apply electrical power.
3. Turn GPU main disconnect switch to **ON (RIGHT/HORIZONTAL)**
4. Ensure green main input power lamp is **ON**, DC voltmeter is indicating 28.5 volts, and no other fault lamps are on.

**NOTE: Ensure DC output power is not on and DC lamps are off.**

5. For all models, connect a load bank to the **DC OUTPUT CABLE 1**, set load bank to **2000 Amps**, and ensure load bank switch is **OFF**.
6. Connect a digital multi meter to the test points on the load bank.

**NOTE: The following test is for Single Output Cable units.**

7. Push the **WHITE DC ON** switch. Observe **GREEN DC ON** lamp is **ON**.
8. Ensure load bank is **ON** and cooling fans should begin spinning.
9. Switch the load bank to **300 AMP**; verify the voltage at the load bank is **28.0(MIN) - 28.9(MAX) Volts DC**. Adjust **R-67** on Interface Board to obtain correct voltage output.
10. Move load bank switch to **AUTO**; verify the voltage range at the load bank is **16.0 thru 28.9 volts DC** and a minimum **1600 AMPS** at full load.
11. Observe **Amber Warning** lamp flashes if **DC output** volts drops below **21VDC**. **LET LOAD BANK COOL**, push **Black DC Off** switch.
12. Turn GPU main disconnect switch to **OFF (LEFT/VERTICAL)**
13. Disconnect DC cable from load bank. Disconnect AC input power cable and stow cables on GPU.

## 6.0 TROUBLE SHOOTING

### 6.1 GENERAL

**NOTE In the event of a fault, the system fault messages should be evaluated using the chart below.**

If the cause of the fault is within the converter and you cannot clear it with your own personnel, please contact your Tronair Service representative:

**TRONAIR, Inc.**  
1740 Eber Road  
Holland, Ohio 43528-9794 USA

Telephone: (419) 866-6301 or 800-426-6301  
Fax: (419) 867-0634  
E-mail: sales@tronair.com  
Website: www.tronair.com

It is very helpful for fault diagnosis if you can tell us the fault messages in the order in which they occurred.



| Models      | 112850S0000    | 112850S0100    | 112850S0200    |
|-------------|----------------|----------------|----------------|
| 112850D0000 | 112850D0100/AV | 112850D0100-A5 | 112850D0200    |
| 112860S0000 | 112860S0100    | 112860S0100-A4 | 112860S0200    |
| 112860D0000 | 112860D0100    | 112860SD100-A5 | 112860SD200-A5 |

## 6.2 PROCEDURES IN THE EVENT OF MALFUNCTIONS

Follow the steps below in case of malfunctions:

| Action Upon Fault Detection  |   |  |                    |                     |                      |                           |                   |                   |                       |                                  |  |
|------------------------------|---|--|--------------------|---------------------|----------------------|---------------------------|-------------------|-------------------|-----------------------|----------------------------------|--|
| Fault Description            | Condition   | Fault Sense Location                             | Input Breaker      | DC Output Contactor | SCR Firing Enable    | (Green) Input Voltage LED | Amber Warning LED | Red Fault LED     | Output Contact or LED | Recovery                         | Notes  |
| None                         | Normal  | Firing Board to Interface Board                  | ON                 | ON                  | Enabled              | ON                        | OFF               | OFF               | ON                    | None                             |  |
| Missing Phase                | Any phase voltage missing (>5% of rated voltage)              | Firing Board to Interface Board                  | Opened Immediately | Unit Power Is Off   | Unit Power Is Off    | Unit Power Is Off         | Unit Power Is Off | Unit Power Is Off | Unit Power Is Off     | Input Breaker Must be Cycled     |  |
| Input Overvoltage            | Secondary AC Voltage >115% of max voltage range               | Interface Board                                  | Opened Immediately | Unit Power Is Off   | Unit Power Is Off    | Unit Power Is Off         | Unit Power Is Off | Unit Power Is Off | Unit Power Is Off     | Input Breaker Must be Cycled     |  |
| Input Under Voltage          | Primary AC Voltage <85% of rated voltage                      | Interface Board                                  | ON                 | ON                  | ON                   | BLINK                     | ON                | OFF               | ON                    | Automatic when condition changes | If input voltage is to low unit will brown out |
| Output Over Voltage          | Output Voltage >103% of Max of 32.5V at unit output (> 33.5V) | Interface Board                                  | ON                 | Opened After 100ms  | Disabled Immediately | On                        | BLINK             | BLINK             | OFF                   | Input Breaker Must be Cycled     |  |
| Output Under Voltage         | Output <97% of Min of 24 V at unit output (< 23.3V)           | Interface Board                                  | ON                 | ON                  | ON                   | ON                        | BLINK             | OFF               | ON                    | Automatic when condition changes |  |
| Output High Over Current     | Output Current > 2100A  | Interface Board                                  | ON                 | Opened After 100ms  | Disabled Immediately | ON                        | ON                | BLINK             | OFF                   | Input Breaker Must be Cycled     |  |
| Transformer Over-Temperature | Any/All Core Temperature > 180°C                              | Transformer Thermal Switches to Interface Board  | ON                 | Opened After 100ms  | Disabled Immediately | ON                        | ON                | ON                | OFF                   | Input Breaker Must be Cycled     |  |
| SCR Over-Temperature         | Any/All SCR Temperature > 82°C                                | SCR/Heatsink Thermal Switches to Interface Board | ON                 | Opened After 100ms  | Disabled Immediately | ON                        | OFF               | BLINK             | OFF                   | Input Breaker Must be Cycled     |  |



|             | Models      | 112850S0000    | 112850S0100    | 28.5 VDC Ground Power Unit |
|-------------|-------------|----------------|----------------|----------------------------|
| 112860S0000 | 112850D0000 | 112850D0100/AV | 112850D0100-A5 | 112850S0200                |
| 112860D0000 | 112860S0100 | 112860S0100-A4 | 112860S0100-A6 | 112850D0200                |
|             | 112860D0100 | 112860SD100-A5 | 112860D0200    | 112860S0200                |

## 6.3 MONITORS & FAULT INDICATION

The following LEDs are used to define the color/flashing status of the GPU on the Control Panel:

| Condition                                       | (Green) Input Power LED | (Amber) Warning LED | (Red) Fault LED | (Green) Output Contactor LED |
|---|-------------------------|---------------------|-----------------|------------------------------|
| Normal Operation/Output Switch On               | On                      | Off                 | Off             | On                           |
| Power Off or Missing Phase or Input Overvoltage | Off                     | Off                 | Off             | Off                          |
| Input Undervoltage                              | *Blink*                 | On                  | Off             | On                           |
| Output Overvoltage                              | On                      | *Blink*             | *Blink*         | Off                          |
| Output Undervoltage                             | On                      | *Blink*             | Off             | On                           |
| Output High Overcurrent (>2100A)                | On                      | On                  | *Blink*         | Off                          |
| Transformer Overtemperature                     | On                      | On                  | On              | Off                          |
| SCR Overtemperature                             | On                      | Off                 | *Blink*         | Off                          |
| Normal Operation/Output Enable Switch Off       | On                      | Off                 | Off             | Off                          |
| Emergency Stop Switch Pushed In                 | Off                     | Off                 | Off             | Off                          |

## 7.0 MAINTENANCE AND SERVICE

### 7.1 PREVENTIVE MAINTENANCE

#### 7.1.1 General

Because of their construction, Tronair converters require practically no maintenance. The few operations necessary should be carried out carefully since they contribute to the trouble-free operation and increased service life of the installation.

#### 7.1.2 Cleanliness

Always ensure that the system environment is kept as free as possible of dust, metal chips, lubricants, etc. Check at regular intervals, that all air inlets and outlets are free of dust and are not blocked by any obstructions, sheets of papers, etc. Air inlets (underside of the roof) should be vacuumed from time to time.

In no circumstances use compressed air since this can force dust particles into the interior and cause malfunctions.

#### 7.1.3 Voltage Check

To ensure that the set is delivering the correct voltage we recommend that this be checked at regular intervals.

### 7.2 SERVICE

Prior to delivery each converter is subjected to a thorough check, which includes running at full load for a prolonged period, and the prescribed overload test. Faults should not normally occur during proper, careful handling. Faults cannot be entirely ruled out, however, if caused by transportation, unfavorable environmental or operating conditions, or incorrect operation.

If a fault occurs and you are unable to rectify this yourself with the aid of the fault table, please contact us at:

**TRONAIR, Inc.**  
1 Air Cargo Pkwy East  
Swanton, Ohio 43558 USA

Telephone: (419) 866-6301 or 800-426-6301  
Fax: (419) 867-0634  
E-mail: sales@tronair.com  
Website: www.tronair.com

With all enquiries please state the model number and serial number of the equipment. These are located on the front panel of the unit.



|             |             |                | 28.5 VDC Ground Power Unit |
|-------------|-------------|----------------|----------------------------|
|             | Models      | 112850S0000    | 112850S0100                |
| 112860S0000 | 112850D0000 | 112850D0100/AV | 112850D0100-A5             |
| 112860D0000 | 112860S0100 | 112860S0100-A4 | 112860S0100-A6             |
|             | 112860D0100 | 112860SD100-A5 | 112860D0200                |
|             |             |                | 112860SD200-A5             |

## 8.0 ADDITIONAL INFORMATION

### 8.1 LED FUNCTIONS & ARRANGEMENTS

As described in Section 3, the system control is completely digital. System control software is comprised of measurements, evaluation of measurements, threshold control, and a programmable logic control (PLC) known as the User Program. The individual parts are fully integrated to operate together as a software control system. The most important function is that of the User Program. The PLC has digital inputs and outputs which converts the information coming from the hardware into a form recognizable by the User Program software. Each input and output is monitored by an LED, and all inputs and outputs, which are used, are shown on the control diagrams. Checking the status of these LED's is a quick and easy way of establishing the operational status of the converter, and is useful during fault-finding. An illuminated LED indicates a high potential (+24V) at the hardware digital input or output. If the LED is off, then the potential is low (0V).

## 9.0 GUARANTEES/LIMITATION OF LIABILITY

Tronair products are warranted to be free of manufacturing or material defects for a period of one year after shipment to the original customer. This is solely limited to the repair or replacement of defective components. This warranty does not cover the following items:

- a) Parts required for normal maintenance
- b) Parts covered by a component manufacturers warranty
- c) Replacement parts have a 90-day warranty from date of shipment

If you have a problem that may require service, contact Tronair immediately. Do not attempt to repair or disassemble a product without first contacting Tronair, any action may affect warranty coverage. When you contact Tronair be prepared to provide the following information:

- a) Product Model Number
- b) Product Serial Number
- c) Description of the problem

If warranty coverage is approved, either replacement parts will be sent or the product will have to be returned to Tronair for repairs. If the product is to be returned, a Return Material Authorization (RMA) number will be issued for reference purposes on any shipping documents. Failure to obtain a RMA in advance of returning an item will result in a service fee. A decision on the extent of warranty coverage on returned products is reserved pending inspection at Tronair. Any shipments to Tronair must be shipped freight prepaid. Freight costs on shipments to customers will be paid by Tronair on any warranty claims only. Any unauthorized modification of the Tronair products or use of the Tronair products in violation of cautions and warnings in any manual (including updates) or safety bulletins published or delivered by Tronair will immediately void any warranty, express or implied.

The obligations of Tronair expressly stated herein are in lieu of all other warranties or conditions expressed or implied. **Any unauthorized modification of the Tronair products or use of the Tronair products in violations of cautions and warnings in any manual (including updates) or safety bulletins published or delivered by Tronair will immediately void any warranty, express or implied and Tronair disclaims any and all liability for injury (WITHOUT LIMITATION and including DEATH), loss or damage arising from or relating to such misuse.**

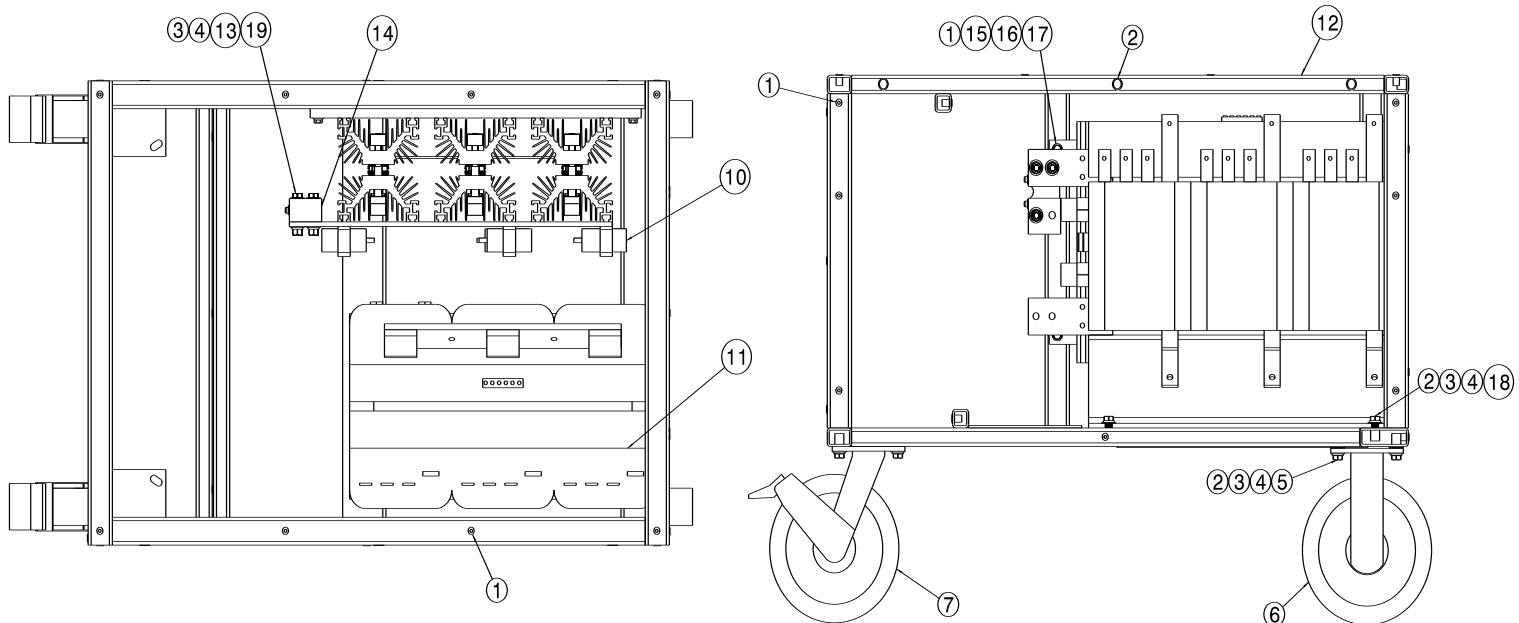
## 10.0 APPENDICES

- APPENDIX I      Wiring Diagram and Schedule – Single Output
- APPENDIX II     Diagram and Schedule – Dual Output
- APPENDIX III    Declaration of conformity

|             | Models      | 112850S0000    | 112850S0100    | 28.5 VDC Ground Power Unit |
|-------------|-------------|----------------|----------------|----------------------------|
| 112860S0000 | 112850D0000 | 112850D0100/AV | 112850D0100-A5 | 112850S0200                |
| 112860D0000 | 112860S0100 | 112860S0100-A4 | 112860S0100-A6 | 112850D0200                |
|             | 112860D0100 | 112860SD100-A5 | 112860D0200    | 112860S0200                |

## Parts List

When ordering replacement parts/kits, please specify model, serial number and color of your unit.



| Item | Part Number   | Description                       | Qty |
|------|---------------|-----------------------------------|-----|
| 1    | G-1439-1050-S | Nutsert, Thinwall 1/4 - 20        | 33  |
| 2    | G-1439-1070-S | Nutsert, 3/8 – 16 Open End        | 24  |
| 3    | G-1503-1070N  | Flatwasher, 3/8 Narrow SS         | 34  |
| 4    | G-1502-1070R  | Lockwasher, 3/8 Regular SS        | 19  |
| 5    | G-1112-107010 | Bolt, 3/8 – 16 x 1.0 LG, HH SS    | 12  |
| 6    | U-1112        | Caster, Rigid                     | 2   |
| 7    | U-1085        | Caster, Swivel                    | 2   |
| 10   | EC-2128       | SCR Pak                           | 1   |
| 11   | Z-6943        | Assy., Transformer                | 1   |
| 12   | Z-6897-01     | Weldment, Frame                   | 1   |
|      | Z-6897-SP     | Weldment, Frame (Special Paint)   | 1   |
| 13   | G-1112-107020 | Bolt, 3/18 - 16 2.0 LG, HH SS     | 4   |
| 14   | 13002         | Shunt Resistor                    | 1   |
| 15   | G-1112-105020 | Bolt, 1/4 - 20 x 2, HH SS         | 4   |
| 16   | G-1503-1050N  | Flatwasher, 1/4 Narrow SS         | 4   |
| 17   | G-1502-1050R  | Lockwasher, 1/4 Regular SS        | 4   |
| 18   | G-1112-107012 | Bolt, 3/18 - 16 x 1 1/4 LG, HH SS | 4   |
| 19   | G-1500-1070   | Nut, 3/8 – 16 HH SS               | 3   |
| N/S  | G-1351-03-SS  | Rivet, 1/8 Open End SS            | 4   |
| N/S  | G-1580        | Door, Latch Receptacle            | 2   |
| N/S  | 12048         | Split Polyloom 1/2, 36 in         | 1   |
| N/S  | 12085         | Split Polyloom 1, 36 in           | 1   |
| N/S  | 13092         | Cradle, Mounting                  | 10  |

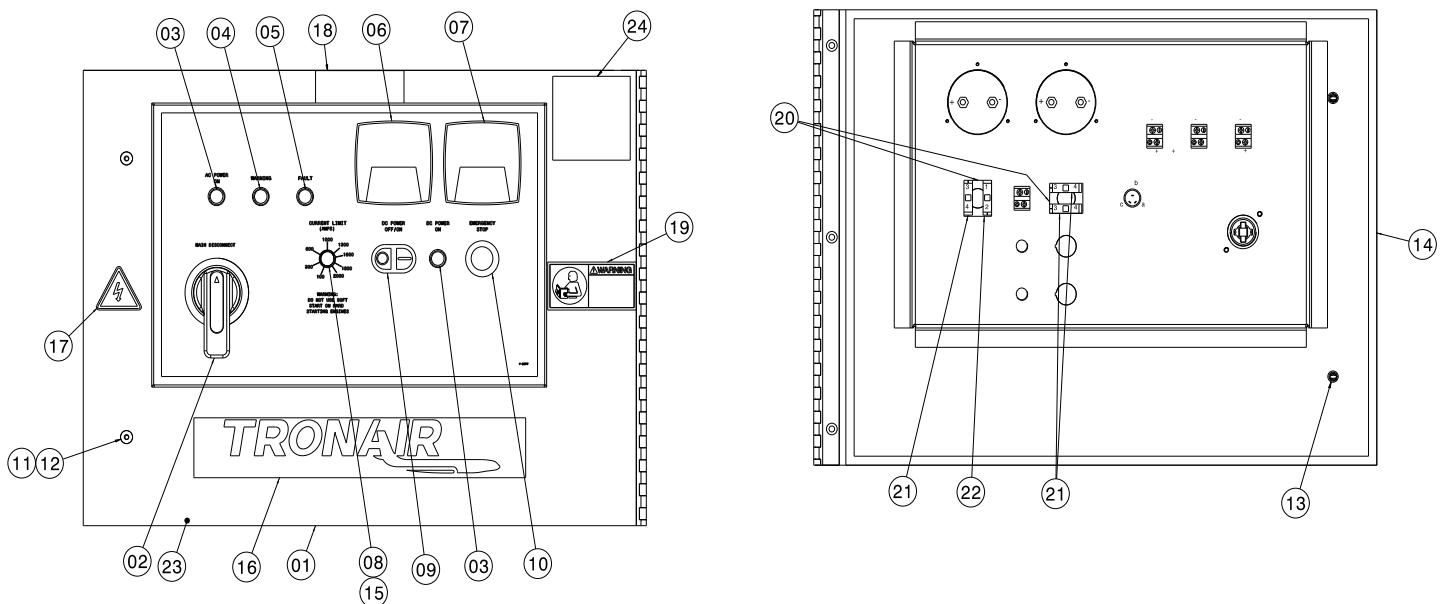


®

|             |  | Models      | 112850S0000    | 112850S0100    | 28.5 VDC Ground Power Unit |
|-------------|--|-------------|----------------|----------------|----------------------------|
| 112860S0000 |  | 112850D0000 | 112850D0100/AV | 112850D0100-A5 | 112850S0200                |
| 112860D0000 |  | 112860S0100 | 112860S0100-A4 | 112860S0100-A6 | 112850D0200                |
|             |  | 112860D0100 | 112860SD100-A5 | 112860D0200    | 112860S0200                |

## Parts List

When ordering replacement parts/kits, please specify model, serial number and color of your unit.



| Item | Part Number   | Description                   | Qty |
|------|---------------|-------------------------------|-----|
| 1    | S-2293        | Door/Control panel            | Ref |
| 2    | H-3155        | Handle, Circuit Breaker       | 1   |
| 3    | EC-2008-02    | LED Green (Single)            | 2   |
|      |               | LED Green (Dual)              | 4   |
| 4    | EC-2008       | LED Amber                     | 1   |
| 5    | EC-2008-03    | LED Red                       | 1   |
| 6    | 14009         | Voltmeter DC                  | 1   |
| 7    | 14008         | DC Ammeter                    | 1   |
| 8    | 12031         | Knob, DC                      | 1   |
| 9    | 14131         | Switch On/Off                 | 1   |
| 10   | 14132         | Switch, Emergency Stop        | 1   |
| 11   | G-1577-19     | Fastener, ¼ Turn              | 2   |
| 12   | G-1579        | Washer, Sealing ¼ Turn        | 2   |
| 13   | G-1578        | Retainer, ¼ Turn Fastener     | 2   |
| 14   | H-3191*084.50 | Tape, Neoprene Foam Seal      | 1   |
| 15   | EC-2144-07    | Potentiometer, 10K Sealed     | 1   |
| 16   | V-1033        | Label, Tronair                | 1   |
| 17   | V-1050        | Label, ISO Electrical         | 1   |
| 18   | V-2097        | Label, Warning                | 1   |
| 19   | V-1986        | Label, Read Manual            | 1   |
| 20   | 14142         | Flange, Latch (Single)        | 2   |
|      |               | Flange, Latch (Dual)          | 4   |
| 21   | 14143         | Block, Contact Green (Single) | 3   |
|      |               | Block, Contact Green (Dual)   | 5   |
| 22   | 14144         | Block, Contact Red (Single)   | 1   |
|      |               | Block, Contact Red (Dual)     | 3   |
| 23   | V-2258        | Label, Panel                  | 1   |
| 24   | V-2258        | Label, Serial Number CE       | 1   |
| N/S  | EC-2165       | P6 Interface Harness          | 1   |
| N/S  | 14130         | Switch, Power On/Off          | 1   |



|             | Models      | 112850S0000    | 112850S0100    | 28.5 VDC Ground Power Unit |
|-------------|-------------|----------------|----------------|----------------------------|
|             | 112850D0000 | 112850D0100/AV | 112850D0100-A5 | 112850S0200                |
| 112860S0000 | 112860S0100 | 112860S0100-A4 | 112860S0100-A6 | 112850D0200                |
| 112860D0000 | 112860D0100 | 112860SD100-A5 | 112860D0200    | 112860S0200                |

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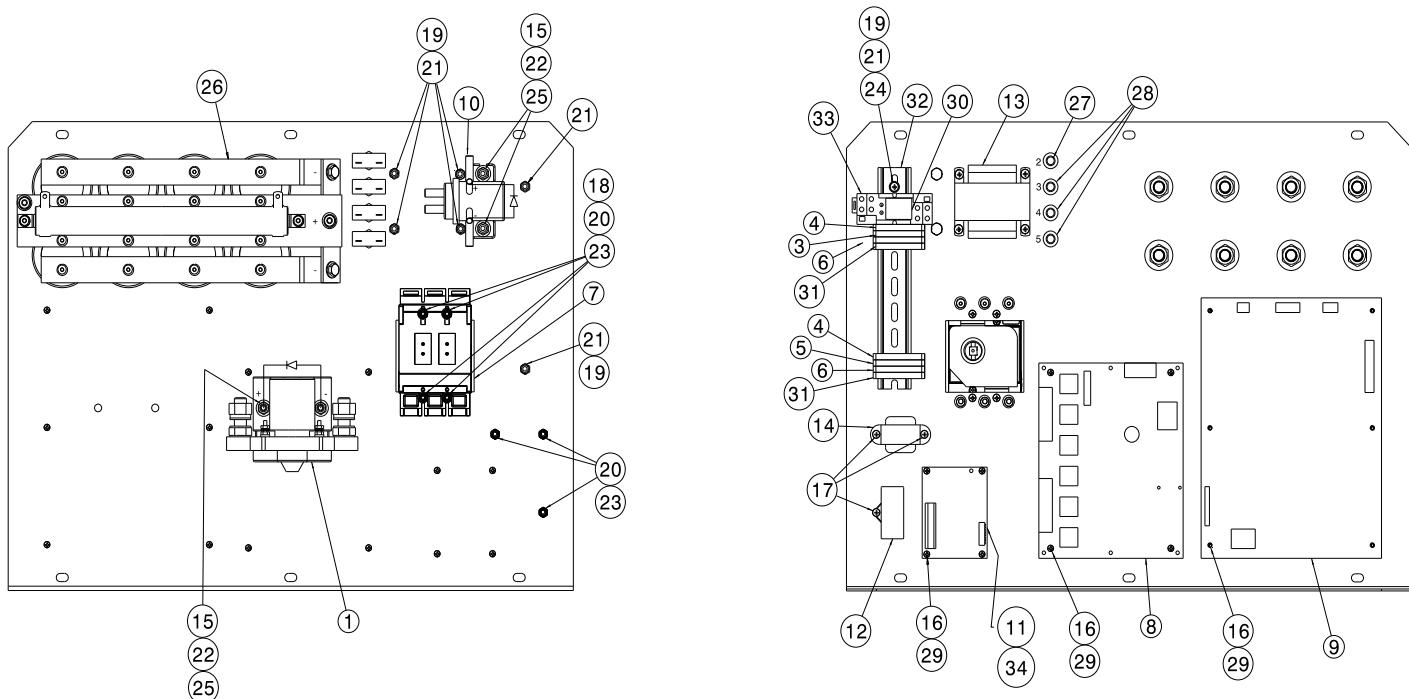
| Models      | 112850S0000 | 112850D0100/AV | 112850S0100    | 112850D0200 |
|-------------|-------------|----------------|----------------|-------------|
| 112860S0000 | 112860S0100 | 112860S0100-A4 | 112850D0100-A5 | 112850D0200 |
| 112860D0000 | 112860D0100 | 112860SD100-A5 | 112860S0100-A6 | 112860S0200 |

| Models      | 112850D0000 | 112860S0100    | 112860D0100    | 28.5 VDC Ground Power Unit |
|-------------|-------------|----------------|----------------|----------------------------|
| 112860S0000 | 112860S0100 | 112860S0100-A4 | 112860D0100-A5 | 112850D0200                |
| 112860D0000 | 112860D0100 | 112860SD100-A5 | 112860S0100-A6 | 112860S0200                |
|             |             |                | 112860D0200    | 112860SD200-A5             |

## Parts List

When ordering replacement parts/kits, please specify model, serial number and color of your unit.



| Item | Part Number   | Description                         | Qty |
|------|---------------|-------------------------------------|-----|
| 1    | EC-1027       | Contactor, DC Output (Single)       | 1   |
| 3    | EC-2065       | Terminal Block, 4 Pole Black        | 1   |
| 4    | EC-2083       | Terminal Block, 4 Pole Lt Gray      | 2   |
| 5    | EC-2084       | Terminal Block, 4 Pole Red          | 1   |
| 6    | EC-2065       | Plate, End 4CTerminal Block         | 2   |
| 7    | EC-2169       | Circuit Breaker, 100 Amp            | 1   |
| 8    | EC-2127       | Firing Board                        | 1   |
| 9    | EC-2129       | Interface Board                     | 1   |
| 10   | EC-2177       | Relay, High Circuit                 | 1   |
| 11   | EC-2138       | Fan Speed Controller w/Probe        | 1   |
| 12   | EC-2141       | Capacitor, Fan Motor                | 1   |
| 13   | EC-2157       | Transformer, Control 115/24 VAC, 4A | 1   |
| 14   | EC-2156       | Transformer, 117V – 24VT            | 1   |
| 15   | G-1112-105006 | Bolt, 1/4 - 20 x 3/4 HH SS          | 4   |
| 16   | G-1497-101002 | SCR, 6-32 x 1/4 RD HD PH SS         | 28  |
| 17   | G-1497-102006 | SCR, 8-32 x 1/2 RD HD PH SS         | 3   |
| 18   | G-1497-101034 | SCR, 6-32 x 3 1/2 RD HD PH SS       | 4   |
| 19   | G-1497-103104 | SCR, 10-32 x 1/2 RD HD PH SS        | 6   |
| 20   | G-1501-1010   | Stopnut, 6-32 Elastic SS            | 7   |
| 21   | G-1501-1031   | Stopnut, 10-32 Elastic SS           | 7   |
| 22   | G-1501-1050   | Stopnut, 1/4 - 20 Elastic SS        | 6   |
| 23   | G-1503-1010N  | Flatwasher, 6 Narrow SS             | 8   |
| 24   | G-1503-1030N  | Flatwasher, 10 Narrow SS            | 7   |
| 25   | G-1503-1050N  | Flatwasher, 1/4 Narrow SS           | 4   |
| 26   | Z-6900        | Assembly, Capacitors                | 1   |
| 27   | EC-2159       | Circuit Breaker, 25 Amp             | 1   |
| 28   | 12002         | Circuit Breaker, 5 Amp              | 3   |
| 29   | 12034         | PCB Stand Offs                      | 14  |
| 30   | 13064         | Relay, Compact 24VDC (Single)       | 1   |
|      |               | Relay, Compact 24VDC (Dual)         | 2   |
| 31   | 13070         | Anchor, Din Rail End                | 2   |



|             |  | Models      | 112850S0000    | 112850S0100    | 28.5 VDC Ground Power Unit |
|-------------|--|-------------|----------------|----------------|----------------------------|
|             |  | 112850D0000 | 112850D0100/AV | 112850D0100-A5 | 112850S0200                |
| 112860S0000 |  | 112860S0100 | 112860S0100-A4 | 112860S0100-A6 | 112850D0200                |
| 112860D0000 |  | 112860D0100 | 112860SD100-A5 | 112860D0200    | 112860S0200                |

## Parts List

When ordering replacement parts/kits, please specify model, serial number and color of your unit.

| Item | Part Number  | Description                          | Qty |
|------|--------------|--------------------------------------|-----|
| 32   | 13072*008.50 | Rail, Din                            | 1   |
| 33   | 13074        | Socket, Relay 11 PIN (Single)        | 1   |
|      |              | Socket, Relay 11 PIN (Dual)          | 2   |
| 37   | EC-2163      | P2 Interface Board Harness           | 1   |
| 38   | EC-2164      | P3 Interface Board Harness           | 1   |
| 39   | EC-2166      | P8 Interface Board Harness           | 1   |
| 40   | EC-2167      | P9 Interface Board Harness           | 1   |
| 41   | EC-2176      | Connector, Lag 3/8 Stud              | 6   |
| 42   | G-1501-1020  | Stopnut, 8-32 Elastic SS             | 7   |
| 43   | 4002-6       | Diode, Power                         | 1   |
| N/S  | EC-2085      | Diode, Plug-In Relay Socket (Single) | 1   |
|      |              | Diode, Plug-In Relay Socket (Dual)   | 2   |
| N/S  | EC-2158      | Temp Sensor                          | 1   |

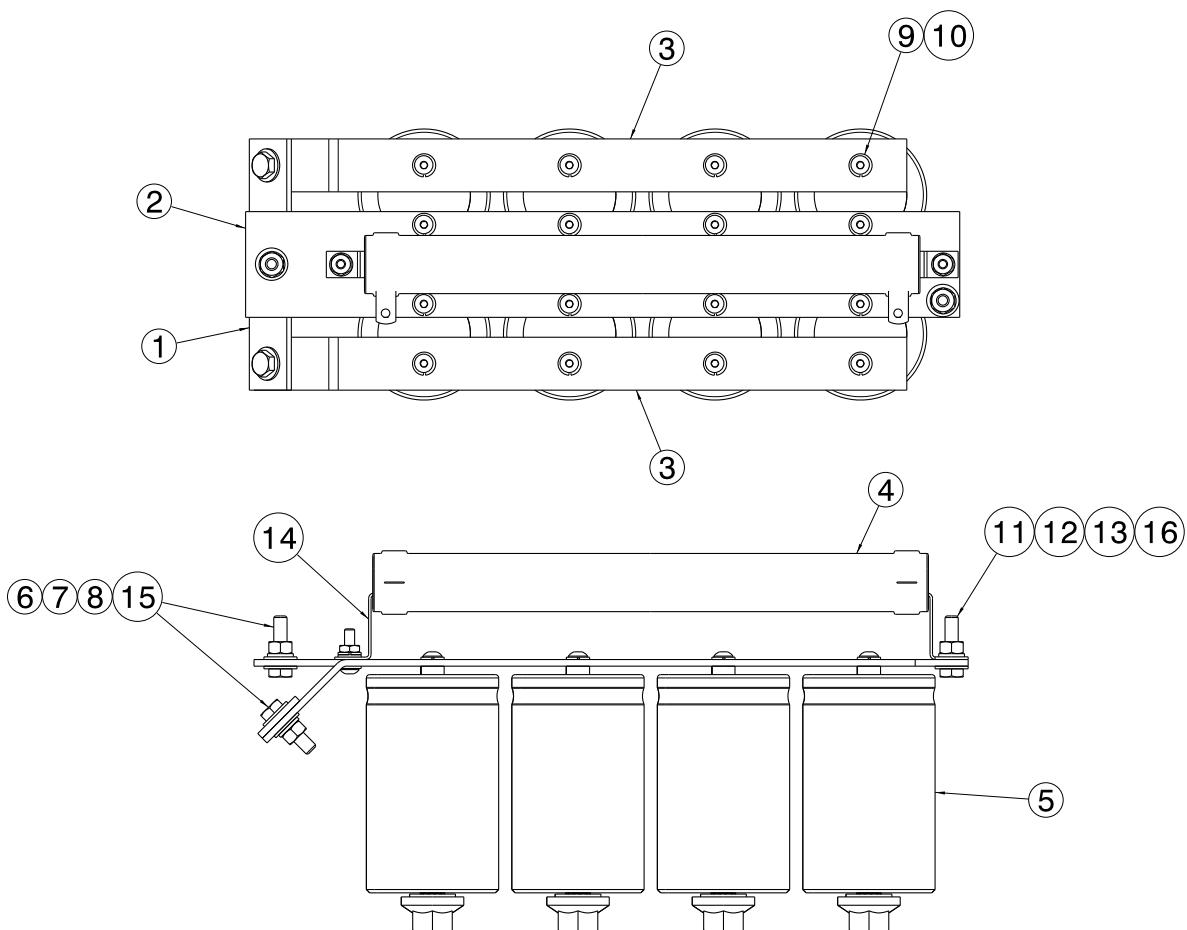
The following parts are for the 112860S0100-A4 unit ONLY: (all other parts are for all units)

| Item | Part Number | Description        | Qty  |
|------|-------------|--------------------|--|
| N/S  | CRHX1806-71 | Plug, Input Male   | Installed on the input cable                 |
| N/S  | CRHX1806-62 | Plug, Insert       | Loose with unit, to be installed by customer |
| N/S  | CRHX1806-91 | Receptacle, Female | Loose with unit, to be installed by customer |

|             | Models      | 112850S0000    | 112850S0100    | 28.5 VDC Ground Power Unit |
|-------------|-------------|----------------|----------------|----------------------------|
| 112860S0000 | 112850D0000 | 112850D0100/AV | 112850D0100-A5 | 112850S0200                |
| 112860D0000 | 112860S0100 | 112860S0100-A4 | 112860S0100-A6 | 112850D0200                |
|             | 112860D0100 | 112860SD100-A5 | 112860D0200    | 112860S0200                |

## Parts List

When ordering replacement parts/kits, please specify model, serial number and color of your unit.



| Item | Part Number   | Description                            | Qty |
|------|---------------|--|-----|
| 1    | J-4324        | Buss Bar Bridge                        | 1   |
| 2    | J-4303        | Buss Bar                               | 1   |
| 3    | J-4304        | Buss Bar                               | 2   |
| 4    | EC-2134       | Resistor                               | 1   |
| 5    | EC-2133       | Capacitor                              | 8   |
| 6    | G-1112-105010 | Bolt, $\frac{1}{4}$ - 20 x 1 LG, HH SS | 4   |
| 7    | G-1503-1050N  | Flatwasher, $\frac{1}{4}$ Narrow SS    | 8   |
| 8    | G-1502-1050R  | Lockwasher, $\frac{1}{4}$ SS           | 4   |
| 9    | G-1593-07SS   | Lockwasher, Internal Tooth, #10        | 16  |
| 10   | G-1476-103103 | SCR, #10-32 SOC BUT HD CAP             | 16  |
| 11   | G-1476-103106 | SCR, #10-32 SOC BUT HD CAP SS          | 16  |
| 12   | G-1503-1030N  | Flatwasher, #10 SS                     | 4   |
| 13   | G-1500-1031   | Nut, #10 – 32 Hex SS                   | 2   |
| 14   | H-3156        | Resistor, Bracket                      | 2   |
| 15   | G-1500-1050   | Nut, $\frac{1}{4}$ – 20 Hex SS         | 4   |
| 16   | G-1500-1050   | Nut, $\frac{1}{4}$ - 20 Hex SS         | 4   |
| 18   | H-3173        | Nut, Plastic Capacitor                 | 8   |
| N/S  | EC-1034-01    | Terminal Ring                          | 4   |



## APPENDIX I

### **Wiring Diagram and Schedule Single Output**

For 112850S0200 sales, parts and service, click here to view this item on PilotJohn.com

|  |                            |                              |
|--|----------------------------|------------------------------|
| <b>TRONAIR</b>   | INSTRUCTION<br>PAGE 1 OF 4 | DOCUMENT NUMBER:<br>INS-1993 |
| Model: 1128X0S0X00– Wiring Schedule (Single Output 50/60 Hertz)) | DATE: 01/2011              | REV: 04                      |

NOTE: REFER TO WIRING DIAGRAM INS-2007

| WIRE LETTER | WIRE SIZE/COLOR | FROM                           | TO   |
|-------------|-----------------|--------------------------------|--|
| A           | 20/BLACK        | P-6 HARNESS CONNECTOR (PIN 5)  | EMERGENCY STOP SWITCH SW1 TERMINAL (3)         |
| B           | 20/BLACK        | P-6 HARNESS CONNECTOR (PIN 6)  | EMERGENCY STOP SWITCH SW2 TERMINAL (1)         |
| C           | 20/BLACK        | P-6 HARNESS CONNECTOR (PIN 18) | EMERGENCY STOP SWITCH SW2 TERMINAL (2)         |
| D           | 20/BLACK        | P-6 HARNESS CONNECTOR (PIN 17) | EMERGENCY STOP SWITCH SW1 TERMINAL (4)         |
| E           | 20/GREEN        | P-6 HARNESS CONNECTOR (PIN 7)  | DC POWER ON/OFF SWITCH SW3 TERMINAL (4)        |
| F           | 20/GREEN        | P-6 HARNESS CONNECTOR (PIN 20) | DC POWER ON/OFF SWITCH SW3 & SW4 TERMINALS (3) |
| G           | 20/GREEN        | P-6 HARNESS CONNECTOR (PIN 19) | DC POWER ON/OFF SWITCH SW4 TERMINAL (4)        |
| H           | 20/BLACK        | P-6 HARNESS CONNECTOR (PIN 1)  | INPUT POWER ON LAMP L1 TERMINAL (PLUS)         |
| I           | 20/GREEN        | P-6 HARNESS CONNECTOR (PIN 13) | INPUT POWER ON LAMP L1 TERMINAL (MINUS)        |
| J           | 20/BLACK        | P-6 HARNESS CONNECTOR (PIN 2)  | WARNING LAMP L2 TERMINAL (PLUS)                |
| K           | 20/GREEN        | P-6 HARNESS CONNECTOR (PIN 14) | WARNING LAMP L2 TERMINAL (MINUS)               |
| L           | 20/BLACK        | P-6 HARNESS CONNECTOR (PIN 3)  | FAULT LAMP L3 TERMINAL (PLUS)                  |
| M           | 20/GREEN        | P-6 HARNESS CONNECTOR (PIN 15) | FAULT LAMP L3 TERMINAL (MINUS)                 |
| N           | 20/BLACK        | P-6 HARNESS CONNECTOR (PIN 9)  | CURRENT LIMIT POT SW5 TERMINAL (a)             |
| O           | 20/GREEN        | P-6 HARNESS CONNECTOR (PIN 21) | CURRENT LIMIT POT SW5 TERMINAL (c)             |
| P           | 20/BLACK        | P-6 HARNESS CONNECTOR (PIN 10) | CURRENT LIMIT POT SW5 TERMINAL (b)             |
| Q           | 20/BLACK        | P-6 HARNESS CONNECTOR (PIN 24) | DC CURRENT METER M1 TERMINAL (PLUS)            |
| R           | 20/GREEN        | P-6 HARNESS CONNECTOR (PIN 12) | DC CURRENT METER M1 TERMINAL (MINUS)           |
| S           | 20/BLACK        | P-6 HARNESS CONNECTOR (PIN 8)  | DC VOLT METER M2 TERMINAL (PLUS)               |
| T           | 20/GREEN        | P-6 HARNESS CONNECTOR (PIN 22) | DC VOLT METER M2 TERMINAL (MINUS)              |
| U           | 20/BLACK        | P-6 HARNESS CONNECTOR (PIN 4)  | DC 1 ON LAMP L4 TERMINAL (PLUS)                |
| V           | 20/GREEN        | P-6 HARNESS CONNECTOR (PIN 16) | DC 1 ON LAMP L4 TERMINAL (MINUS)               |
| W           | 20/BLACK        | BLACK TERMINAL BLOCK (1)       | LATCH RELAY K1 TERMINALS (9 & 10)              |
| X           | 20/BLACK        | P-3 HARNESS CONNECTOR (PIN 1)  | LATCH RELAY K1 TERMINAL (13)                   |
| Y           | 20/GREEN        | P-3 HARNESS CONNECTOR (PIN 5)  | LATCH RELAY K1 TERMINAL (14)                   |
| Z           | 20/GREEN        | P-3 HARNESS CONNECTOR (PIN 8)  | DC SHUNT (PLUS)                                |
| A A         | 20/GREEN        | P-3 HARNESS CONNECTOR (PIN 4)  | DC SHUNT (MINUS)                               |
| B B         | 20/BLACK        | SCR BUS BAR (PLUS)             | P-3 HARNESS CONNECTOR (PIN 3)                  |



| WIRE LETTER | WIRE SIZE/COLOR | FROM  | TO  |
|-------------|-----------------|---|---|
|             | 4/0 BLACK       |   | DC CONTACTOR <b>CONT1</b> CONTACT   |
| C C         | 20/RED          | P-8 HARNESS CONNECTOR ( <b>PIN 1</b> )            | P-5 HARNESS CONNECTOR ( <b>PIN 1</b> )  |
| D D         | 20/RED          | P-8 HARNESS CONNECTOR ( <b>PIN 3</b> )            | P-5 HARNESS CONNECTOR ( <b>PIN 3</b> )  |
| E E         | 20/RED          | P-8 HARNESS CONNECTOR ( <b>PIN 5</b> )            | P-5 HARNESS CONNECTOR ( <b>PIN 5</b> )  |
| F F         | 20/RED          | P-9 HARNESS CONNECTOR ( <b>PIN 1</b> )            | P-3 HARNESS CONNECTOR ( <b>PIN 1</b> )  |
| G G         | 20/RED          | P-9 HARNESS CONNECTOR ( <b>PIN 2</b> )            | P-3 HARNESS CONNECTOR ( <b>PIN 2</b> )  |
| H H         | 20/BLACK        | P-9 HARNESS CONNECTOR ( <b>PIN 3</b> )            | P-3 HARNESS CONNECTOR ( <b>PIN 3</b> )  |
| I I         | 20/BLACK        | P-9 HARNESS CONNECTOR ( <b>PIN 4</b> )            | P-3 HARNESS CONNECTOR ( <b>PIN 4</b> )  |
| J J         | 20/BLACK        | P-9 HARNESS CONNECTOR ( <b>PIN 5</b> )            | P-3 HARNESS CONNECTOR ( <b>PIN 5</b> )  |
| K K         | 20/GREEN        | P-9 HARNESS CONNECTOR ( <b>PIN 8</b> )            | P-3 HARNESS CONNECTOR ( <b>PIN 8</b> )  |
| L L         | 20/BLACK        | P-9 HARNESS CONNECTOR ( <b>PIN 9</b> )            | P-3 HARNESS CONNECTOR ( <b>PIN 9</b> )  |
| M M         | 20/BLACK        | P-9 HARNESS CONNECTOR ( <b>PIN 10</b> )           | P-3 HARNESS CONNECTOR ( <b>PIN 10</b> )   |
| N N         | 20/GREEN        | P-9 HARNESS CONNECTOR ( <b>PIN 11</b> )           | P-3 HARNESS CONNECTOR ( <b>PIN 11</b> )   |
| O O         | 20/BLACK        | P-9 HARNESS CONNECTOR ( <b>PIN 12</b> )           | P-3 HARNESS CONNECTOR ( <b>PIN 12</b> )   |
| P P         | 20/BLACK        | SCR BUS BAR ( <b>PLUS</b> )                       | <b>BLACK</b> TERMINAL BLOCK (1)   |
| Q Q         | 20/BLACK        | LATCH RELAY <b>K1</b> TERMINAL (5)                | DC CONTACTOR <b>CONT1</b> COIL  |
| R R         | 20/BLACK        | <b>BLACK</b> TERMINAL BLOCK (1)                   | BLEED RESISTOR SOLENOID <b>SOL1</b> COIL  |
| S S         | 20/GREEN        | <b>LT. GRAY</b> TERMINAL BLOCK (4)                | DC CONTACTOR <b>CONT1</b> COIL  |
| T T         | 20/RED          | FAN CONTROLLER PC BOARD <b>PCB3</b> TERMINAL (L)  | <b>RED</b> TERMINAL BLOCK (3)   |
| U U         | 20/RED          | P-2 HARNESS CONNECTOR ( <b>PIN 6</b> )            | CIRCUIT BREAKER <b>CB4</b>  |
| V V         | 20/RED          | P-2 HARNESS CONNECTOR ( <b>PIN 13</b> )           | TRANSFORMER <b>T3</b> ( <b>RED WIRE</b> )   |
| W W         | 20/GREEN        | SCR BUS BAR ( <b>MINUS</b> )                      | <b>LT. GRAY</b> TERMINAL BLOCK (4)  |
| X X         | 20/GREEN        | <b>LT. GRAY</b> TERMINAL BLOCK (4)                | BLEED RESISTOR SOLENOID <b>SOL1</b> COIL  |
| Y Y         | 16/RED          | CIRCUIT BREAKER <b>CB2</b>                        | GFCI OUTLET <b>SOC1</b> TERMINAL ( <b>HOT</b> ) OR <b>BLACK</b> TERMINAL BLOCK (8)                    |
| Z Z         | 16/WHITE        | TRANSFORMER <b>T1</b> TERMINAL (A2)               | GFCI OUTLET <b>SOC1</b> LINE TERMINAL ( <b>WHITE</b> ) OR <b>YELLOW</b> TERMINAL BLOCK (10)           |
| A B         | 20/RED          | CONTROL TRANSFORMER <b>T2</b> ( <b>RED WIRE</b> ) | CIRCUIT BREAKER <b>CB5</b>  |
| A C         | 12/RED          | CIRCUIT BREAKER <b>CB6</b>                        | 230 VOLT AC OUTLET ( <b>SOC 1</b> )   |
| A D         | 16/RED          | CIRCUIT BREAKER <b>CB2</b>                        | <b>RED</b> TERMINAL BLOCK (6)   |
| A E         | 6/BLACK         | SCR BUS BAR ( <b>PLUS</b> )                       | CAPACITOR ASSEMBLY BUS BAR ( <b>PLUS</b> )<br>BLEED RESISTOR <b>R1</b>                                |
| A F         | 6/BLACK         | SCR BUS BAR ( <b>MINUS</b> )                      | CAPACITOR ASSEMBLY BUS BAR ( <b>MINUS</b> )<br>BLEED RESISTOR SOLENOID <b>SOL1</b> ( <b>CONTACT</b> ) |
| A G         | 20/GREEN        | TRANSFORMER THERMO TERMINAL BLOCK                 | P-2 HARNESS CONNECTOR ( <b>PIN 8</b> )  |
| A H         | 20/GREEN        | TRANSFORMER THERMO TERMINAL BLOCK                 | P-2 HARNESS CONNECTOR ( <b>PIN 9</b> )  |
| A I         | 20/BLACK        | SHUNT-TRIP CIRCUIT BREAKER ( <b>BLACK WIRE</b> )  | P-2 HARNESS CONNECTOR ( <b>PIN 5</b> )  |
| A J         | 20/GREEN        | SHUNT-TRIP CIRCUIT BREAKER ( <b>BLACK WIRE</b> )  | P-2 HARNESS CONNECTOR ( <b>PIN 12</b> )   |



| WIRE LETTER | WIRE SIZE/COLOR | FROM                              | TO                                 |
|-------------|-----------------|-----------------------------------|------------------------------------|
| A K         | 20/RED          | CIRCUIT BREAKER CB5               | P-2 HARNESS CONNECTOR (PIN 7)      |
| A L         | 20/GREEN        | TRANSFORMER T3 (RED WIRE)         | P-2 HARNESS CONNECTOR (PIN 14)     |
| A M         | 20/RED          | TRANSFORMER T1 TERMINAL (X3)      | P-2 HARNESS CONNECTOR (PIN 3)      |
|             | 4/0 BLACK       |                                   | SCR MODULE MOD1 TERMINAL SCR# 5    |
| A N         | 20/RED          | TRANSFORMER T1 TERMINAL (X2)      | P-2 HARNESS CONNECTOR (PIN 2)      |
|             | 4/0 BLACK       |                                   | SCR MODULE MOD1 TERMINAL SCR# 3    |
| A O         | 20/RED          | TRANSFORMER T1 TERMINAL (X1)      | P-2 HARNESS CONNECTOR (PIN 1)      |
|             | 4/0 BLACK       |                                   | SCR MODULE MOD1 TERMINAL SCR# 1    |
| A P         | 20/BLACK        | TRANSFORMER T2 (BLACK WIRE)       | CIRCUIT BREAKER CB3                |
| A Q         | 20/RED          | CIRCUIT BREAKER CB3               | RED TERMINAL BLOCK (6)             |
| A R         | 20/GREEN        | TRANSFORMER T3 (RED/YELLOW WIRE)  | P-2 HARNESS CONNECTOR (PIN 11)     |
| A S         | 20/RED          | TRANSFORMER T3 (RED WIRE)         | CIRCUIT BREAKER CB4                |
| A T         | 16/RED          | TRANSFORMER T1 TERMINAL (A1)      | CIRCUIT BREAKER CB2                |
| A V         |                 | NOT USED                          | NOT USED                           |
| A W         | 16/WHITE        | TRANSFORMER T1 TERMINAL (A2)      | LT.GRAY TERMINAL BLOCK (5)         |
| A X         |                 | NOT USED                          | NOT USED                           |
| A Y         | 20/BLACK        | RED TERMINAL BLOCK (3)            | UNIT COOLING FAN FAN1 (BLACK WIRE) |
| A Z         | 20/RED          | RED TERMINAL BLOCK (6)            | FAN CONTROL PCB PCB3 TERMINAL (L)  |
| B A         | 20/GREEN        | LT GRAY TERMINAL BLOCK (5)        | FAN CONTROL PCB PCB3 TERMINAL (N)  |
| B C         | 20/BLUE         | FAN CONTROL PCB PCB3 TERMINAL (F) | UNIT COOLING FAN FAN1 (BLUE WIRE)  |
| B D         | 20/BROWN        | LT GRAY TERMINAL BLOCK (2)        | UNIT COOLING FAN FAN1 (BROWN WIRE) |
| B E         |                 | NOT USED                          | NOT USED                           |
| B F         |                 | NOT USED                          | NOT USED                           |
| B G         |                 | NOT USED                          | NOT USED                           |
| B H         | 6/BLACK         | SHUNT-TRIP CIRCUIT BREAKER (L1)   | TRANSFORMER T1 TERMINAL (H3)       |
| B I         | 6/BLACK         | SHUNT-TRIP CIRCUIT BREAKER (L2)   | TRANSFORMER T1 TERMINAL (H2)       |
| B J         | 6/BLACK         | SHUNT-TRIP CIRCUIT BREAKER (L3)   | TRANSFORMER T1 TERMINAL (H1)       |
| B K         |                 | NOT USED                          | NOT USED                           |
| B L         |                 | NOT USED                          | NOT USED                           |
| B M         |                 | NOT USED                          | NOT USED                           |
| B N         | 12/WHITE        | TRANSFORMER T1 TERMINAL (A4)      | 230 VOLT AC OUTLET (SOC 1)         |
| B O         |                 | NOT USED                          | NOT USED                           |
| B P         |                 | NOT USED                          | NOT USED                           |
| B Q         |                 | NOT USED                          | NOT USED                           |
| B R         | 4/0 BLACK       | SCR BUS BAR (PLUS)                | DC CONTACTOR CONT1 MAIN CONTACT    |
| B S         |                 | NOT USED                          | NOT USED                           |



| WIRE LETTER | WIRE SIZE/COLOR | FROM                         | TO  |
|-------------|-----------------|------------------------------|---|
| B T         | 6/BLACK         | BLEED RESISTOR R1            | BLEED RESISTOR SOLENOID SOL1 MAIN CONTACT |
| B U         | 12/RED          | TRANSFORMER T1 TERMINAL (A3) | CIRCUIT BREAKER CB6                       |



## APPENDIX II

### **Wiring Diagram and Schedule Dual Output**

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|   |                                    |                                      |
|---|------------------------------------|--------------------------------------|
| <b>TRONAIR®</b>   | <b>INSTRUCTION<br/>PAGE 1 OF 4</b> | <b>DOCUMENT NUMBER:<br/>INS-1998</b> |
| Model: 1128X0D0XXX– Wiring Schedule (Dual Output 50/60 Hertz) | DATE: 01/2011                      | REV: 03                              |

NOTE: REFER TO WIRING DIAGRAM INS-1992

| WIRE LETTER | WIRE SIZE/COLOR | FROM                                    | TO   |
|-------------|-----------------|---|--|
| A           | 20/BLACK        | P-6 HARNESS CONNECTOR ( <b>PIN 5</b> )  | EMERGENCY STOP SWITCH <b>SW1</b> TERMINAL (3)              |
| B           | 20/BLACK        | P-6 HARNESS CONNECTOR ( <b>PIN 6</b> )  | EMERGENCY STOP SWITCH <b>SW2</b> TERMINAL (1)              |
| C           | 20/BLACK        | P-6 HARNESS CONNECTOR ( <b>PIN 18</b> ) | EMERGENCY STOP SWITCH <b>SW2</b> TERMINAL (2)              |
| D           | 20/BLACK        | P-6 HARNESS CONNECTOR ( <b>PIN 17</b> ) | EMERGENCY STOP SWITCH <b>SW1</b> TERMINAL (4)              |
| E           | 20/GREEN        | P-6 HARNESS CONNECTOR ( <b>PIN 7</b> )  | DC ENABLE ON SWITCH <b>SW3</b> TERMINAL (4)                |
| F           | 20/GREEN        | P-6 HARNESS CONNECTOR ( <b>PIN 20</b> ) | DC ENABLE ON/OFF SWITCH <b>SW3 &amp; SW4</b> TERMINALS (3) |
| G           | 20/GREEN        | P-6 HARNESS CONNECTOR ( <b>PIN 19</b> ) | DC ENABLE OFF SWITCH <b>SW4</b> TERMINAL (4)               |
| H           | 20/BLACK        | P-6 HARNESS CONNECTOR ( <b>PIN 1</b> )  | INPUT POWER ON LAMP <b>L1</b> TERMINAL ( <b>PLUS</b> )     |
| I           | 20/GREEN        | P-6 HARNESS CONNECTOR ( <b>PIN 13</b> ) | INPUT POWER ON LAMP <b>L1</b> TERMINAL ( <b>MINUS</b> )    |
| J           | 20/BLACK        | P-6 HARNESS CONNECTOR ( <b>PIN 2</b> )  | WARNING LAMP <b>L2</b> TERMINAL ( <b>PLUS</b> )            |
| K           | 20/GREEN        | P-6 HARNESS CONNECTOR ( <b>PIN 14</b> ) | WARNING LAMP <b>L2</b> TERMINAL ( <b>MINUS</b> )           |
| L           | 20/BLACK        | P-6 HARNESS CONNECTOR ( <b>PIN 3</b> )  | FAULT LAMP <b>L3</b> TERMINAL ( <b>PLUS</b> )              |
| M           | 20/GREEN        | P-6 HARNESS CONNECTOR ( <b>PIN 15</b> ) | FAULT LAMP <b>L3</b> TERMINAL ( <b>MINUS</b> )             |
| N           | 20/BLACK        | P-6 HARNESS CONNECTOR ( <b>PIN 9</b> )  | CURRENT LIMIT POT <b>SW5</b> TERMINAL (a)                  |
| O           | 20/GREEN        | P-6 HARNESS CONNECTOR ( <b>PIN 21</b> ) | CURRENT LIMIT POT <b>SW5</b> TERMINAL (c)                  |
| P           | 20/BLACK        | P-6 HARNESS CONNECTOR ( <b>PIN 10</b> ) | CURRENT LIMIT POT <b>SW5</b> TERMINAL (b)                  |
| Q           | 20/BLACK        | P-6 HARNESS CONNECTOR ( <b>PIN 24</b> ) | DC CURRENT METER <b>M1</b> TERMINAL ( <b>PLUS</b> )        |
| R           | 20/GREEN        | P-6 HARNESS CONNECTOR ( <b>PIN 12</b> ) | DC CURRENT METER <b>M1</b> TERMINAL ( <b>MINUS</b> )       |
| S           | 20/BLACK        | P-6 HARNESS CONNECTOR ( <b>PIN 8</b> )  | DC VOLT METER <b>M2</b> TERMINAL ( <b>PLUS</b> )           |
| T           | 20/GREEN        | P-6 HARNESS CONNECTOR ( <b>PIN 22</b> ) | DC VOLT METER <b>M2</b> TERMINAL ( <b>MINUS</b> )          |
| U           | 20/BLACK        | P-6 HARNESS CONNECTOR ( <b>PIN 4</b> )  | DC ENABLE ON LAMP <b>L4</b> TERMINAL ( <b>PLUS</b> )       |
| V           | 20/GREEN        | P-6 HARNESS CONNECTOR ( <b>PIN 16</b> ) | DC ENABLE ON LAMP <b>L4</b> TERMINAL ( <b>MINUS</b> )      |
| W           | 20/BLACK        | <b>BLACK</b> TERMINAL BLOCK (1)         | LATCH RELAY <b>K1</b> TERMINALS (9 & 10)                   |
| X           | 20/BLACK        | P-3 HARNESS CONNECTOR ( <b>PIN 1</b> )  | LATCH RELAY K1 TERMINAL (13) OR BLACK TERMINAL BLOCK (7)   |
| Y           | 20/GREEN        | P-3 HARNESS CONNECTOR ( <b>PIN 5</b> )  | DC 1 POWER OFF SWITCH <b>SW7</b> TERMINAL (2)              |
|             |                 |   | OR LATCH RELAY <b>K1</b> TERMINAL (14)                     |



| WIRE LETTER | WIRE SIZE/COLOR | FROM  | TO  |
|-------------|-----------------|---|---|
| Z           | 20/GREEN        | P-3 HARNESS CONNECTOR ( <b>PIN 8</b> )                    | DC SHUNT ( <b>PLUS</b> )  |
| A A         | 20/GREEN        | P-3 HARNESS CONNECTOR ( <b>PIN 4</b> )                    | DC SHUNT ( <b>MINUS</b> )   |
| B B         | 20/BLACK        | SCR BUS BAR ( <b>PLUS</b> )                               | P-3 HARNESS CONNECTOR ( <b>PIN 3</b> )  |
| C C         | 20/RED          | P-8 HARNESS CONNECTOR ( <b>PIN 1</b> )                    | P-5 HARNESS CONNECTOR ( <b>PIN 1</b> )  |
| D D         | 20/RED          | P-8 HARNESS CONNECTOR ( <b>PIN 3</b> )                    | P-5 HARNESS CONNECTOR ( <b>PIN 3</b> )  |
| E E         | 20/RED          | P-8 HARNESS CONNECTOR ( <b>PIN 5</b> )                    | P-5 HARNESS CONNECTOR ( <b>PIN 5</b> )  |
| F F         | 20/RED          | P-9 HARNESS CONNECTOR ( <b>PIN 1</b> )                    | P-3 HARNESS CONNECTOR ( <b>PIN 1</b> )  |
| G G         | 20/RED          | P-9 HARNESS CONNECTOR ( <b>PIN 2</b> )                    | P-3 HARNESS CONNECTOR ( <b>PIN 2</b> )  |
| H H         | 20/BLACK        | P-9 HARNESS CONNECTOR ( <b>PIN 3</b> )                    | P-3 HARNESS CONNECTOR ( <b>PIN 3</b> )  |
| I I         | 20/BLACK        | P-9 HARNESS CONNECTOR ( <b>PIN 4</b> )                    | P-3 HARNESS CONNECTOR ( <b>PIN 4</b> )  |
| J J         | 20/BLACK        | P-9 HARNESS CONNECTOR ( <b>PIN 5</b> )                    | P-3 HARNESS CONNECTOR ( <b>PIN 5</b> )  |
| K K         | 20/GREEN        | P-9 HARNESS CONNECTOR ( <b>PIN 8</b> )                    | P-3 HARNESS CONNECTOR ( <b>PIN 8</b> )  |
| L L         | 20/BLACK        | P-9 HARNESS CONNECTOR ( <b>PIN 9</b> )                    | P-3 HARNESS CONNECTOR ( <b>PIN 9</b> )  |
| M M         | 20/BLACK        | P-9 HARNESS CONNECTOR ( <b>PIN 10</b> )                   | P-3 HARNESS CONNECTOR ( <b>PIN 10</b> )   |
| N N         | 20/GREEN        | P-9 HARNESS CONNECTOR ( <b>PIN 11</b> )                   | P-3 HARNESS CONNECTOR ( <b>PIN 11</b> )   |
| O O         | 20/BLACK        | P-9 HARNESS CONNECTOR ( <b>PIN 12</b> )                   | P-3 HARNESS CONNECTOR ( <b>PIN 12</b> )   |
| P P         | 20/BLACK        | SCR BUS BAR ( <b>PLUS</b> )                               | <b>BLACK TERMINAL BLOCK (1)</b>   |
| Q Q         | 20/BLACK        | LATCH RELAY <b>K1</b> TERMINAL ( <b>5</b> )               | DC CONTACTOR <b>CONT1</b> COIL  |
| R R         | 20/BLACK        | <b>BLACK TERMINAL BLOCK (1)</b>                           | BLEED RESISTOR SOLENOID <b>SOL1</b> COIL  |
| S S         | 20/GREEN        | <b>LT. GRAY TERMINAL BLOCK (4)</b>                        | DC 1 CONTACTOR <b>CONT1</b> COIL  |
|             |                 |   | DC 2 CONTACTOR <b>CONT2</b> COIL  |
| T T         | 2/RED           | FAN CONTROLLER PC BOARD <b>PCB3</b> TERMINAL ( <b>L</b> ) | <b>RED TERMINAL BLOCK (3)</b>   |
| U U         | 20/RED          | P-2 HARNESS CONNECTOR ( <b>PIN 6</b> )                    | CIRCUIT BREAKER <b>CB4</b>  |
| V V         | 20/RED          | P-2 HARNESS CONNECTOR ( <b>PIN 13</b> )                   | TRANSFORMER <b>T3 (RED WIRE)</b>  |
| W W         | 20/GREEN        | SCR BUS BAR ( <b>MINUS</b> )                              | <b>LT. GRAY TERMINAL BLOCK (4)</b>  |
| X X         | 20/GREEN        | <b>LT. GRAY TERMINAL BLOCK (4)</b>                        | BLEED RESISTOR SOLENOID <b>SOL1</b> COIL  |
| Y Y         | 12/RED          | CIRCUIT BREAKER <b>CB2</b>                                | GFCI OUTLET <b>SOC1</b> TERMINAL ( <b>HOT</b> ) OR <b>RED TERMINAL BLOCK (8)</b>              |
| Z Z         | 12/WHITE        | TRANSFORMER <b>T1</b> TERMINAL ( <b>A2</b> )              | GFCI OUTLET <b>SOC1</b> LINE TERMINAL ( <b>WHITE</b> ) OR <b>LT. GRAY TERMINAL BLOCK (10)</b> |
| A B         | 20/RED          | CONTROL TRANSFORMER <b>T2 (RED WIRE)</b>                  | CIRCUIT BREAKER <b>CB5</b>  |
| A C         | 12/RED          | CIRCUIT BREAKER <b>CB6</b>                                | 230 VOLT AC OUTLET ( <b>SOC1</b> )  |
| A D         | 16/RED          | CIRCUIT BREAKER <b>CB2</b>                                | <b>RED TERMINAL BLOCK (6)</b>   |



| WIRE LETTER | WIRE SIZE/COLOR | FROM   | TO  |
|-------------|-----------------|--|---|
| A E         | 6/BLACK         | SCR BUS BAR ( <b>PLUS</b> )                      | CAPACITOR ASSEMBLY BUS BAR ( <b>PLUS</b> )      |
|             |                 |  | BLEED RESISTOR R1                               |
| A F         | 6/BLACK         | SCR BUS BAR ( <b>MINUS</b> )                     | CAPACITOR ASSEMBLY BUS BAR ( <b>MINUS</b> )     |
|             |                 |  | BLEED RESISTOR SOLENOID SOL1 ( <b>CONTACT</b> ) |
| A G         | 20/GREEN        | TRANSFORMER THERMO TERMINAL BLOCK                | P-2 HARNESS CONNECTOR ( <b>PIN 8</b> )          |
| A H         | 20/GREEN        | TRANSFORMER THERMO TERMINAL BLOCK                | P-2 HARNESS CONNECTOR ( <b>PIN 9</b> )          |
| A I         | 20/BLACK        | SHUNT-TRIP CIRCUIT BREAKER ( <b>BLACK WIRE</b> ) | P-2 HARNESS CONNECTOR ( <b>PIN 5</b> )          |
| A J         | 20/GREEN        | SHUNT-TRIP CIRCUIT BREAKER ( <b>BLACK WIRE</b> ) | P-2 HARNESS CONNECTOR ( <b>PIN 12</b> )         |
| A K         | 20/RED          | CIRCUIT BREAKER <b>CB5</b>                       | P-2 HARNESS CONNECTOR ( <b>PIN 7</b> )          |
| A L         | 20/WHITE        | TRANSFORMER <b>T3 (RED WIRE)</b>                 | P-2 HARNESS CONNECTOR ( <b>PIN 14</b> )         |
| A M         | 20/RED          | TRANSFORMER <b>T1 TERMINAL (X3)</b>              | P-2 HARNESS CONNECTOR ( <b>PIN 3</b> )          |
|             | 4/0 BLACK       |  | SCR MODULE <b>MOD1 TERMINAL SCR# 5</b>          |
| A N         | 20/RED          | TRANSFORMER <b>T1 TERMINAL (X2)</b>              | P-2 HARNESS CONNECTOR ( <b>PIN 2</b> )          |
|             | 4/0 BLACK       |  | SCR MODULE <b>MOD1 TERMINAL SCR# 3</b>          |
| A O         | 20/RED          | TRANSFORMER <b>T1 TERMINAL (X1)</b>              | P-2 HARNESS CONNECTOR ( <b>PIN 1</b> )          |
|             | 4/0 BLACK       |  | SCR MODULE <b>MOD1 TERMINAL SCR# 1</b>          |
| A P         | 20/BLACK        | TRANSFORMER <b>T2 (BLACK WIRE)</b>               | CIRCUIT BREAKER <b>CB3</b>                      |
| A Q         | 20/RED          | CIRCUIT BREAKER <b>CB3</b>                       | RED TERMINAL BLOCK ( <b>6</b> )                 |
| A R         | 20/GREEN        | TRANSFORMER <b>T3 (RED/YELLOW WIRE)</b>          | P-2 HARNESS CONNECTOR ( <b>PIN 11</b> )         |
| A S         | 20/RED          | TRANSFORMER <b>T3 (RED WIRE)</b>                 | CIRCUIT BREAKER <b>CB4</b>                      |
| A T         | 16/RED          | TRANSFORMER <b>T1 TERMINAL (A1)</b>              | CIRCUIT BREAKER <b>CB2</b>                      |
| A V         | 20/BLACK        | DC CABLE 1 ON SWITCH <b>SW6 TERMINAL (4)</b>     | DC 1 ON LAMP <b>L5 TERMINAL (PLUS)</b>          |
|             |                 |  | LATCH RELAY 1 <b>K1 TERMINALS (8 &amp; 13)</b>  |
| A W         | 16/WHITE        | TRANSFORMER <b>T1 TERMINAL (A2)</b>              | LT.GRAY TERMINAL BLOCK ( <b>5</b> )             |
| A X         | 20/GREEN        | DC CABLE 1 OFF SWITCH <b>SW7 TERMINAL (1)</b>    | DC 1 ON LAMP <b>L5 TERMINAL (MINUS)</b>         |
|             |                 |  | LATCH RELAY 1 <b>K1 TERMINAL (14)</b>           |
| A Y         | 20/BLACK        | RED TERMINAL BLOCK ( <b>3</b> )                  | UNIT COOLING FAN <b>FAN1 (BLACK WIRE)</b>       |
| A Z         | 20/RED          | RED TERMINAL BLOCK ( <b>6</b> )                  | FAN CONTROL PCB <b>PCB3 TERMINAL (L)</b>        |
| B A         | 20/GREEN        | LT.GRAY TERMINAL BLOCK ( <b>5</b> )              | FAN CONTROL PCB <b>PCB3 TERMINAL (N)</b>        |
| B C         | 20/BLUE         | FAN CONTROL PCB <b>PCB3 TERMINAL (F)</b>         | UNIT COOLING FAN <b>FAN1 (BLUE WIRE)</b>        |
| B D         | 20/BROWN        | LT.GRAY TERMINAL BLOCK ( <b>2</b> )              | UNIT COOLING FAN <b>FAN1 (BROWN WIRE)</b>       |



| WIRE LETTER | WIRE SIZE/COLOR | FROM  | TO   |
|-------------|-----------------|---|--|
| B E         | 20/BLACK        | DC CABLE 2 ON SWITCH <b>SW8</b> TERMINAL (3)  | DC 2 ON LAMP <b>L6</b> TERMINAL ( <b>PLUS</b> )  |
|             |                 |   | LATCH RELAY 2 <b>K2</b> TERMINALS (8 & 13)       |
| B F         | 20/GREEN        | DC 2 POWER OFF SWITCH <b>SW9</b> TERMINAL (2) | DC 2 ON LAMP <b>L6</b> TERMINAL ( <b>MINUS</b> ) |
|             |                 |   | LATCH RELAY 2 <b>K2</b> TERMINAL (14)            |
| B G         |                 | <b>NOT USED</b>                               | <b>NOT USED</b>                                  |
| B H         | 6/BLACK         | SHUNT-TRIP CIRCUIT BREAKER ( <b>L1</b> )      | TRANSFORMER <b>T1</b> TERMINAL ( <b>H3</b> )     |
| B I         | 6/BLACK         | SHUNT-TRIP CIRCUIT BREAKER ( <b>L2</b> )      | TRANSFORMER <b>T1</b> TERMINAL ( <b>H2</b> )     |
| B J         | 6/BLACK         | SHUNT-TRIP CIRCUIT BREAKER ( <b>L3</b> )      | TRANSFORMER <b>T1</b> TERMINAL ( <b>H1</b> )     |
| B K         | 20/BLACK        | <b>BLACK</b> TERMINAL BLOCK (7)               | LATCH RELAY 2 <b>K2</b> TERMINAL (12)            |
| B L         |                 |   | DC CABLE 1 ON SWITCH <b>SW6</b> TERMINAL (3)     |
| B M         |                 |   | DC CABLE 2 ON SWITCH <b>SW8</b> TERMINAL (4)     |
| B N         | 12/WHITE        | TRANSFORMER <b>T1</b> TERMINAL ( <b>A4</b> )  | 230 VOLT AC OUTLET ( <b>SOC1</b> )               |
| B O         | 20/BLACK        | NOT USED                                      | NOT USED   |
| B P         | 20/BLACK        | <b>BLACK</b> TERMINAL BLOCK (1)               | LATCH RELAY 2 <b>K2</b> TERMINAL (9)             |
| B Q         | 20/BLACK        | LATCH RELAY 2 <b>K2</b> TERMINAL (5)          | DC 2 CONTACTOR <b>CONT2</b> COIL                 |
| B R         | 4/0 BLACK       | SCR BUS BAR ( <b>PLUS</b> )                   | DC CONTACTOR <b>CONT1</b> MAIN CONTACT TERMINAL  |
| B S         | 4/0 BLACK       | SCR BUS BAR ( <b>PLUS</b> )                   | DC CONTACTOR <b>CONT2</b> MAIN CONTACT TERMINAL  |
| B T         | 6/BLACK         | BLEED RESISTOR <b>R1</b>                      | BLEED RESISTOR SOLENOID <b>SOL1</b> MAIN CONTACT |
| B U         | 12/RED          | TRANSFORMER <b>T1</b> TERMINAL ( <b>A3</b> )  | CIRCUIT BREAKER <b>CB6</b>                       |



**APPENDIX III**

**Declaration of Conformity**

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## DECLARATION of CONFORMITY

The design, development and manufacture is in accordance with European Community guidelines

28.5 VDC Ground Power Unit

Relevant standards complied with by the machinery:

MIL-STD-704F  
UL 1012  
EN 55011  
EN60146 part 1-1  
EN 61000-6-2  
NFPA 70

Identification of person empowered to sign on behalf of the Manufacturer:

A handwritten signature in black ink, appearing to read "Patrick Finch", is placed above a solid horizontal line.

Quality Assurance Representative