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Operation and Maintenance Manual with Illustrated Parts List for GPU-400

3-Phase Solid State Transformer-Rectifiers

Series 500160-401, -402, -403

Hobart Ground Power
Troy, Ohio 45373
U.S.A.

Warranty

Data Sheet 165
Index: 990223
Replaces: 980601

HOBART GROUND POWER
TROY, OHIO 45373

1. Hobart Brothers Company (hereinafter called HOBART) warrants that each new and unused Hobart Ground Power Equipment, (hereinafter called the PRODUCT) is of good workmanship and is free from mechanical defects, provided that (1) the PRODUCT is installed and operated in accordance with the printed instructions of HOBART, (2) the PRODUCT is used under the normal operating conditions for which it is designed, (3) the PRODUCT is not subjected to misuse, negligence or accident, and (4) the PRODUCT receives proper care, lubrication, protection, and maintenance under the supervision of trained personnel.
2. This warranty expires 15 months after shipment by HOBART to the first user, or 12 months after installation, whichever first occurs.
3. This warranty does not apply to: primary and secondary switch contacts, cable connectors, carbon brushes, fuses, bulbs, and filters unless found to be defective prior to use.
4. Hobart DOES NOT WARRANT THE FOLLOWING COMPONENTS: Engines, engine components; such as: starters, alternators, regulators, governors, etc., and cable retrieving devices. Many of the foregoing components are warranted directly by the manufacturer to the first user and serviced by a worldwide network of distributors and others authorized to handle claims for component manufacturers. A first user's claim should be presented directly to such an authorized component service outlet. In the event any component manufacturer has warranted its component to HOBART and will not deal directly with a first user then HOBART will cooperate with the first user in the presentation of a claim to such manufacturer. Under NO circumstances does HOBART assume any liability for any warranty claim against or warranty work done by or in behalf of any manufacturer of the foregoing components.
5. This warranty is extended by HOBART only to the purchaser of new PRODUCTS from HOBART or one of its authorized distributors. The PRODUCTS purchased under this warranty are intended for use exclusively by the buyer and his employees and by no other persons and, therefore, there shall be no third party beneficiary to this warranty.
6. A claim of defects in any PRODUCT covered by this warranty is subject to HOBART factory inspection and judgment. HOBART'S liability is limited to repair of any defects found by HOBART to exist, or at HOBART'S option the replacement of the defective product, F.O.B. factory, after the defective product has been returned by the purchaser at its expense to HOBART'S shipping place. Replacement and exchange parts will be warranted for the remainder of the original Warranty, or for a period of ninety (90) days, whichever is greater.
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8. Continued use of the PRODUCT(S) after discovery of a defect VOIDS ALL WARRANTIES.
9. Except as authorized in writing, this warranty does not cover any equipment that has been altered by any party other than HOBART.
10. THERE ARE NO WARRANTIES WHICH EXTEND BEYOND THE DESCRIPTION ON THE FACE HERE OF. HOBART MAKES NO WARRANTIES, EXPRESSED OR IMPLIED, OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.
11. HOBART neither assumes nor authorizes any person to assume for HOBART any liability in connection with the PRODUCTS sold, and there are no oral agreements or warranties collateral to or affecting this written Warranty. This warranty and all undertakings of HOBART thereunder shall be governed by the laws of the State of Ohio, United States of America.

WARNING

AT ALL TIMES, SAFETY MUST BE CONSIDERED AN IMPORTANT FACTOR IN THE INSTALLATION, SERVICING AND OPERATION OF THE PRODUCT, AND SKILLED, TECHNICALLY QUALIFIED PERSONNEL SHOULD ALWAYS BE EMPLOYED FOR SUCH TASKS.

Safety Warnings and Cautions

WARNING

ELECTRIC SHOCK can KILL. Do not touch live electrical parts.

ELECTRIC ARC FLASH can injure eyes, burn skin, cause equipment damage, and ignite combustible material. DO NOT use power cables to break load and prevent tools from causing short circuits.

IMPROPER PHASE CONNECTION, PARALLELING, OR USE can damage this and attached equipment.

IMPORTANT

Protect all operating personnel. Read, understand, and follow all instructions in the Operating/Instruction Manual before installing, operating, or servicing the equipment. Keep the manual available for future use by all operators.

1) General

Equipment that supplies electrical power can cause serious injury or death, or damage to other equipment or property. The operator must strictly observe all safety rules and take precautionary actions. Safe practices have been developed from past experience in the use of power source equipment. While certain practices below apply only to electrically-powered equipment, other practices apply to engine-driven equipment, and some practices to both.

2) Shock Prevention

Bare conductors, terminals in the output circuit, or ungrounded, electrically-live equipment can fatally shock a person. Have a certified electrician verify that the equipment is adequately grounded and learn what terminals and parts are electrically HOT. Avoid hot spots on machine. Use proper safety clothing, procedures, and test equipment. The electrical resistance of the body is decreased when wet, permitting dangerous currents to flow through it. When inspecting or servicing equipment, do not work in damp areas. Stand on a dry rubber mat or dry wood, and use insulating gloves when dampness or sweat cannot be avoided. Keep clothing dry, and never work alone.

a) Installation and Grounding of Electrically Powered Equipment

This equipment must be installed and maintained in accordance with the National Electrical Code, ANSI/NFPA 70, or other applicable codes. A power disconnect switch or circuit breaker must be located at the equipment. Check the nameplate for voltage, frequency, and phase requirements. If only 3-phase power is available, connect any single-phase rated equipment to only two wires of the 3-phase line. DO NOT CONNECT the equipment grounding conductor (lead) to the third live wire of the 3-phase line, as this makes the equipment frame electrically HOT, which can cause a fatal shock.

Always connect the grounding lead, if supplied in a power line cable, to the grounded switch box or building ground. If not provided, use a separate grounding lead. Ensure that the current (amperage) capacity of the grounding lead will be adequate for the worst fault current situation. Refer to the National Electrical Code ANSI/NFPA 70 for details. Do not remove plug ground prongs. Use correctly mating receptacles.

b) Output Cables and Terminals

Inspect cables frequently for damage to the insulation and the connectors. Replace or repair cracked or worn cables immediately. Do not overload cables. Do not touch output terminals while equipment is energized.

3) Service and Maintenance

This equipment must be maintained in good electrical condition to avoid hazards stemming from disrepair. Report any equipment defect or safety hazard to the supervisor and discontinue use of the equipment until its safety has been assured. Repairs should be made by qualified personnel only. Before inspecting or servicing this equipment, take the following precautions:

a) Shut off all power at the disconnecting switch or line breaker before inspecting or servicing the equipment.

b) Lock switch OPEN (or remove line fuses) so that power cannot be turned on accidentally.

c) Disconnect power to equipment if it is out of service.

d) If troubleshooting must be done with the unit energized, have another person present who is trained in turning off the equipment and providing or calling for first aid.

4) Fire And Explosion Prevention

Fire and explosion are caused by electrical short circuits, combustible material near this equipment, or unsafe operating conditions. Overloaded or shorted equipment can become hot enough to cause fires by self destruction or by causing nearby combustibles to ignite. For electrically-powered equipment, provide primary input protection to remove short circuited or heavily overloaded equipment from the line.

5) Bodily Injury Prevention

Serious injury can result from contact with live circuit components inside this equipment. Shut DOWN this equipment for inspection and routine maintenance. When equipment is in operation, use extreme care in doing necessary troubleshooting and adjustment.

6) Medical and First Aid Treatment

First aid facilities and a qualified first aid person should be available for each shift for immediate treatment of all injury victims. Electric shock victims should be checked by a physician and taken to a hospital immediately if any abnormal signs are observed.

EMERGENCY FIRST AID	Call physician immediately. Seek additional assistance. Use First Aid techniques recommended by American Red Cross until medical help arrives. IF BREATHING IS DIFFICULT, give oxygen, if available, and have victim lie down. FOR ELECTRICAL SHOCK, turn off power. Remove victim; if not breathing, begin artificial respiration, preferably mouth-to-mouth. If no detectable pulse, begin external heart massage. CALL EMERGENCY RESCUE SQUAD IMMEDIATELY.

7) Equipment Precautionary Labels

Inspect all precautionary labels on the equipment monthly. Order and replace all labels that cannot be easily read.

Introduction

This manual contains operation and maintenance information for “GPU-400” solid state Transformer-Rectifiers manufactured by Hobart Ground Power, Troy, Ohio 45373.

This manual is not intended to be a textbook on electricity or electronics. Its primary purpose is to provide information and instructions to experienced operators, electricians, and mechanics who have never operated this equipment. It is the intent of this manual to guide and assist operators and maintenance people in the proper use and care of the equipment.

Use of the manual should not be put off until a trouble or need for help develops. Read the instructions before starting the unit. Learn to use the manual and to locate information contained in it. Its style and arrangement are very similar to commercial aircraft manuals.

The manual is divided into five chapters plus an appendix. Each chapter is divided into as many sections as required. Each new section starts with page 1. Each page is identified by chapter, section and page number, which are located in the lower, outside corner. When information located in another portion of the manual is referred to, its location is identified by a chapter, section, paragraph or figure number.

For example: “(see Section 2-3, Paragraph 1.a.)” refers to information located in Chapter 2, Section 3, Paragraph 1.a. If a chapter and section are not indicated in a reference, the referenced material is located in the same section as the reference, for example: “(see Paragraph 1.a.).”

The Appendix is the last section. Its contains a list of available options that may be purchased with that unit. Items on the list with check marks next to them, have been added to the standard unit per the customer’s order. Literature for each option follows. The Appendix will help control the information in the manual: making it unique to the unit purchased.

In addition to operation and maintenance instructions, the manual contains an illustrated parts list in Chapter 4, and a collection of manufacturer’s literature and supplemental information in Chapter 5.

Contents of the manual is arranged as follows:

Chapter 1. Description/Operation

Chapter 2. Servicing/Troubleshooting

Chapter 3. Overhaul/Major Repair

Chapter 4. Illustrated Parts List

Chapter 5. Manufacturer’s Literature

Appendix A Options

If you have any questions concerning your Hobart Ground Power equipment, immediately contact our Service Department by mail, telephone, FAX, or E-Mail.

Write:	Hobart Brother Company Ground Power Division Service Department 1177 Trade Square East Troy, Ohio 45373 U.S.A.
Call Inside U.S.A.:	(800) 422-4166 (Parts) (800) 422-4177 (Service)
Call From Foreign Countries:	(937) 332-5050 (Parts) (937) 332-5060 (Service)
FAX Inside U.S.A.	(800) 367-4945
FAX From Foreign Countries:	(937) 332-5121
E-Mail :	service@hobartgroundpower.com
Web Page :	www.hobartgroundpower.com

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Chapter 1 Description/Operation

Section 1 Description

1) General

The GPU-400 Solid State Transformer-Rectifiers covered by this manual are manufactured by Hobart Ground Power, Troy, Ohio 45373. These Transformer Rectifiers (GPU) are designed to provide ground power for maintenance and startup of aircraft having 28-VDC electrical systems.

The number 500160 identifies the "model or series" of the GPU. The part number is followed by a different dash number which separates the basic units available. The criteria for input voltages, Amps, and frequencies change with each dash number. Figure 1 uses the part number to identify the variations possible covered by this manual.

Part & Dash Number	Input Voltage	Amps	Frequency
500160-401	208/230/460	56/52/26	60
500160-402	220/380	54/32	50
500160-403	230/460/575	52/26/32	60
500160-412	220/380	54/32	50

Series 500160 Transformer-Rectifier Part Number Descriptions
Figure 1

2) Optional Equipment - Appendix A

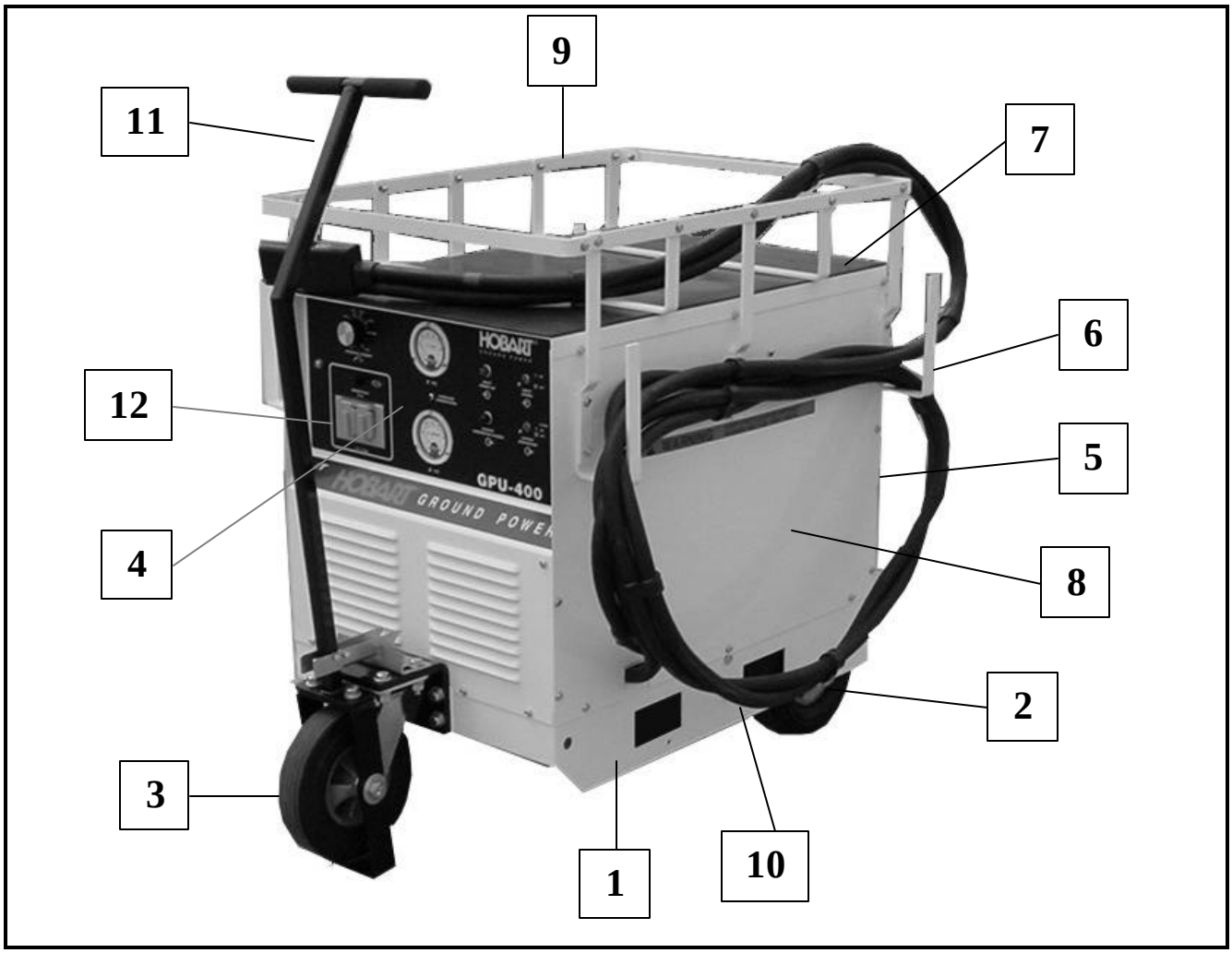
Chapters 1 through 5 of this Operation and Maintenance Manual identifies only the basic version of a Series 500160 GPU. Component differences between the different machines will be listed when necessary. A list of optional equipment, which make this manual unique to the GPU that you have purchased, appears in Appendix A. Examples of items located Appendix A are 14V output kit, cable tray, etc.

3) Orientation

To avoid confusion in the location of components, the control panel is considered to be the front of the unit. Left and right are determined by looking at the unit from the front.

4) Mounting for the GPU

The standard Transformer-Rectifier GPU is mounted on 3 wheels, the front wheel is a caster style pivot point for easy maneuverability (i.e. 5th wheel).



1. Mounting Base
2. Rear Wheels
3. Front Caster
4. Front/Control Panel
5. Rear Panel [Not Shown]
6. Cable Hanger
7. Top Panel
8. Side Panel (Right Side Shown)
9. Cable Storage Basket [Option Only]
10. Output Cable
11. Pull Handle
12. AC Power Receptacle

General Assembly of GPU-400 Power Supply
Figure 2

ELECTRICAL	DATA		
MODEL	6T28-400CL	5T28-400CL	6T28-400CL
SPECIFICATION NUMBER	500160-401	500160-402	500160-403
INPUT			
Voltage	208 / 230 / 460	220 / 380	230 / 460 / 575
Amps	56 / 52 / 26	54 / 32	52 / 26 / 21
Frequency	60	50	60
Phase	3	3	3
Convenience Receptacle	10A / 115V / 60 Hz	10A / 220V / 50 Hz	10A / 115V / 60 Hz
For ground cable size See Section 2, Figure 1			
OUTPUT			
D.C. Voltage	28.5	28.5	28.5
Amps	400	400	400
Duty Cycle	100%	100%	100%
Kilowatts	11.4	11.4	11.4

PHYSICAL / DIMENSIONS					
Model	Length (overall)	Width (case)	Width (overall)	Height (w/o cable basket)	Weight (overall)
All Model	45.7 inches (116.1 cm)	24.1 inches (61.3 cm)	33 inches (83.8 cm)	35 inches (88.8 cm)	450 lbs. (204 kg)

Specifications and Capabilities
Figure 3

5) Safety Features

The Hobart Transformer-Rectifier continuously monitors output values, and automatically shuts down the converter, if a fault occurs, in order to minimize risks to the aircraft and GPU.

See Paragraph 7 “Detailed Description of GPU-400 Components”, for details on the types and levels of protection provided by the control system.

6) Theory of Operation

a) The GPU provides regulated 28.5V DC. Power to the GPU is provided from the local utility company, through the input contactor. The output contactor, controlled by the Output Switch, connects DC power to the load.

The 28V DC power supply consists of a simple and reliable step-down transformer (1, Figure 5) whose output is rectified by 6 silicon controlled rectifiers (SCRs) (3, Figure 7) in a full-wave, center tapped configuration. A filter consisting of an inductor and capacitors produces a low ripple DC voltage.

The printed circuit board (PC Board) (9, Figure 5) regulates the output voltage by controlling the SCR turn-on. It does this via the phase control method; which uses the SCRs to select the desired portion of the voltage that has been stepped down by the main transformer to produce the DC voltage. The PC Board also provides current limiting, over-voltage and overload protection for loads connected to the DC output. This output is floating (isolated from chassis ground) eliminating any grounding problems between the load and the chassis ground.

b) The GPU is designed to optionally supply 14VDC for aircraft requiring that voltage. By design, only one of the output voltages can be supplied at one time. Separate output cables are used for the two voltages for additional protection against the use of the wrong voltage in cases where both 14 V DC and 28 V DC equipment is used. Note that the 31.5 V DC overload trip for both the 14 V DC and 28 V DC output circuits allows a higher percentage overvoltage to a 14 V DC load that to a 28 V DC load.

CAUTION	Capacitor charge can injure! Allow capacitors to discharge and verify capacitor discharge with voltmeter before touching the capacitor circuitry.

7) Detailed Description of GPU-400 Components

a) Front Panel Control Components (See Figure 4)

(1) Output Meter

The power supply is typically supplied with a 0 to 1600 Amp scale DC ammeter M1 (2, Figure 4) which measures the millivolt drop across the R11 ammeter shunt (20, Figure 5) that corresponds to the scale calibration. The scale range is so much more than the rated output because the unit is capable of providing much more current for short durations (engine starts). The R13 starting current potentiometer (8, Figure 4) can select any initial or starting current from 150 amperes to a maximum of 1600 amperes.

The M2 output voltmeter (3, Figure 4) measures the DC output voltage across the main filter capacitors. The scale typically has a 50 V DC maximum reading. The R12 control feedback shunt (16, Figure 5) provides an output current feedback signal to the PC Board. This feedback signal is higher than that from the ammeter shunt. This larger signal provides better output control stability.

(2) Input Contactor Switch with Light

The S1 input contactor switch (10, Figure 4) controls the 115 V AC contactor pickup voltage supplied by the control transformer T2 (6, Figure 5) via the F8 fuse. The amber input contactor light DS1 (12, Figure 4) glows whenever voltage is applied to the input contactor coil. The input contactor applies the rated input voltage from the input, to the voltage changeover board (12, Figure 5).

CAUTION

Electric shock can kill! Disconnect the input power from the power supply before removing canopy parts and touching internal parts. The input contactor does not remove all input power from the unit. Be sure all capacitors have discharged before touching the components.

CAUTION

Incorrect usage can damage this equipment! Do not switch from one output voltage mode to the other while load current is flowing.

(3) Output Contactor Switch and Light

The S2 output contactor close on-off switch (11, Figure 4) has a spring loaded up position for the close mode, a middle position for “on” mode, and a bottom position for the “off” mode. The green output contactor “on” light (13, Figure 4) glows for all the positions except “off”.

(4) Overload/Overvoltage Trip Light

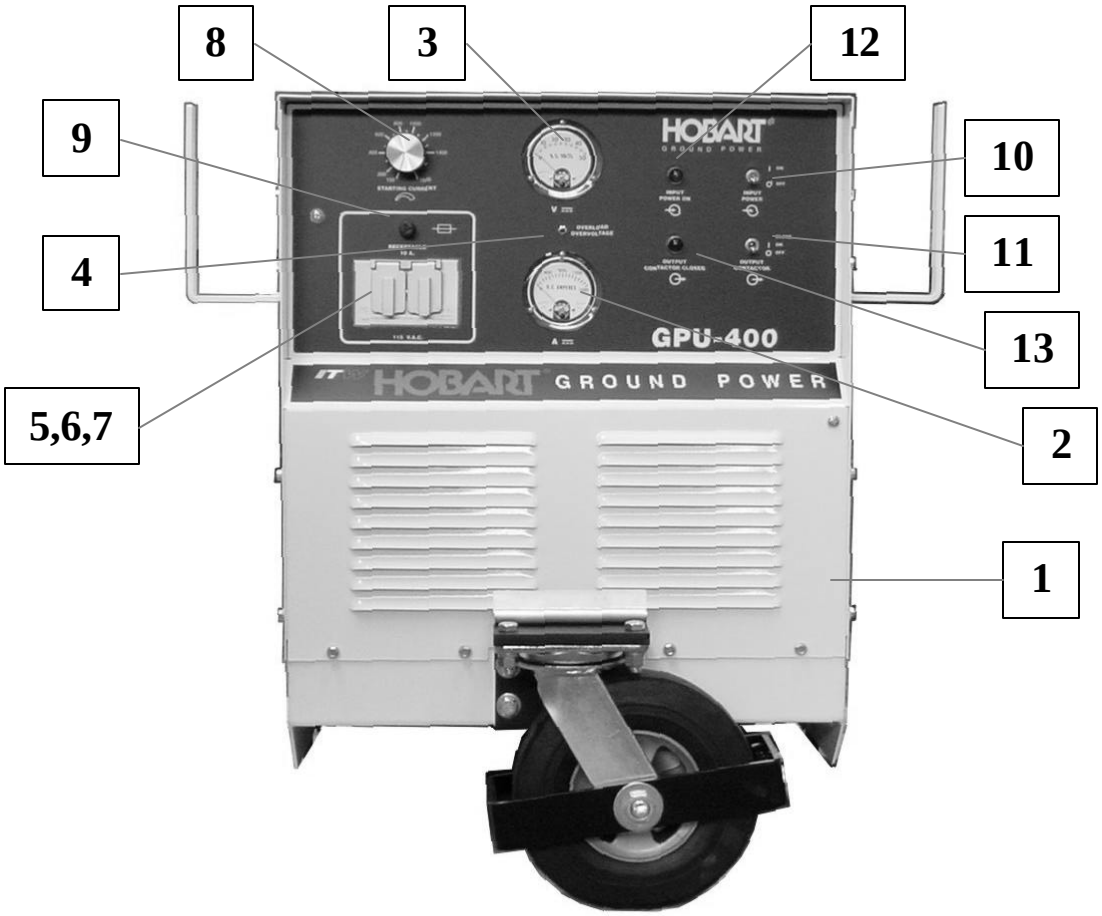
The overload/overvoltage trip light DS2 (4, Figure 4) glows whenever the solid state printed circuit board turns off the power supply output due to output voltage exceeding 31.5 V DC, output current surge exceeding 1750 to 1825 A DC, or whenever the S5 overload thermostat (18, Figure 5) on the SCR heat sink (13, Figure 5) opens because the temperature setting has been exceeded.

b) Solid State Printed Circuit Control Board (9, Figure 5)

The printed circuit board is located inside the GPU, on a steel panel behind the left side panel. This large printed circuit board is the “brains” or electronic control for the following functions:

(1) Electronic Overvoltage/Overload Trip Circuit

The control board trips the power supply off and turns on DS2 red overload trip light (4, Figure 4) on the front panel if more than 31.5 V DC or 1750 A overload exists. To reset, correct the cause of the condition and then turn the input switch off and back on.



1. Front Panel
2. DC Ammeter (M1)
3. DC Voltmeter (M2)
4. Overload/Overvoltage Light (DS2)
5. Convenience Receptacle (J4) (115 VAC Shown)
6. MOV Surge Suppressor [Not Shown]
7. Receptacle Weather Cover (115 VAC Shown)
8. Start Level Control (R13)
9. Receptacle Fuse (F1)
10. Input On-Off Switch (S1)
11. Output On-Off Switch (S2)
12. Input Power Light (DS1) (amber)
13. Output Contactor Light (DS3) (green)

Front Panel Assembly of GPU-400
Figure 4

(2) Electronically Controlled Current Limit

The starting current or output surge current is selected by adjusting R13 starting current control (8, Figure 4) on the front panel from the minimum 150 A DC to the maximum 1600 A DC.

CAUTION	Excess starting current may cause damage to load, blow fuses or damage power supply. Contact factory if you require a current limit lower than the 150 A DC standard minimum limit.

(3) Regulated DC Output Voltages

The voltage value is continuously compared to the actual output. If adequate input voltage exists, deviation from the desired voltage output is corrected by the change in SCR conduction time set by the printed circuit board firing pulse output. This corrective action is done quickly because the control is done electronically with only limited stored energy in the circuitry. Typical response time is about 25 milliseconds.

(4) Thermal Overload Trip

The printed circuit board turns off the SCR firing or gate pulses and turns on the trip light when S5 overload thermostat (18, Figure 5) opens. The power supply can not produce any DC output until the S5 thermostat cools enough to automatically reset (close).

c) Main Transformer (1, Figure 5)

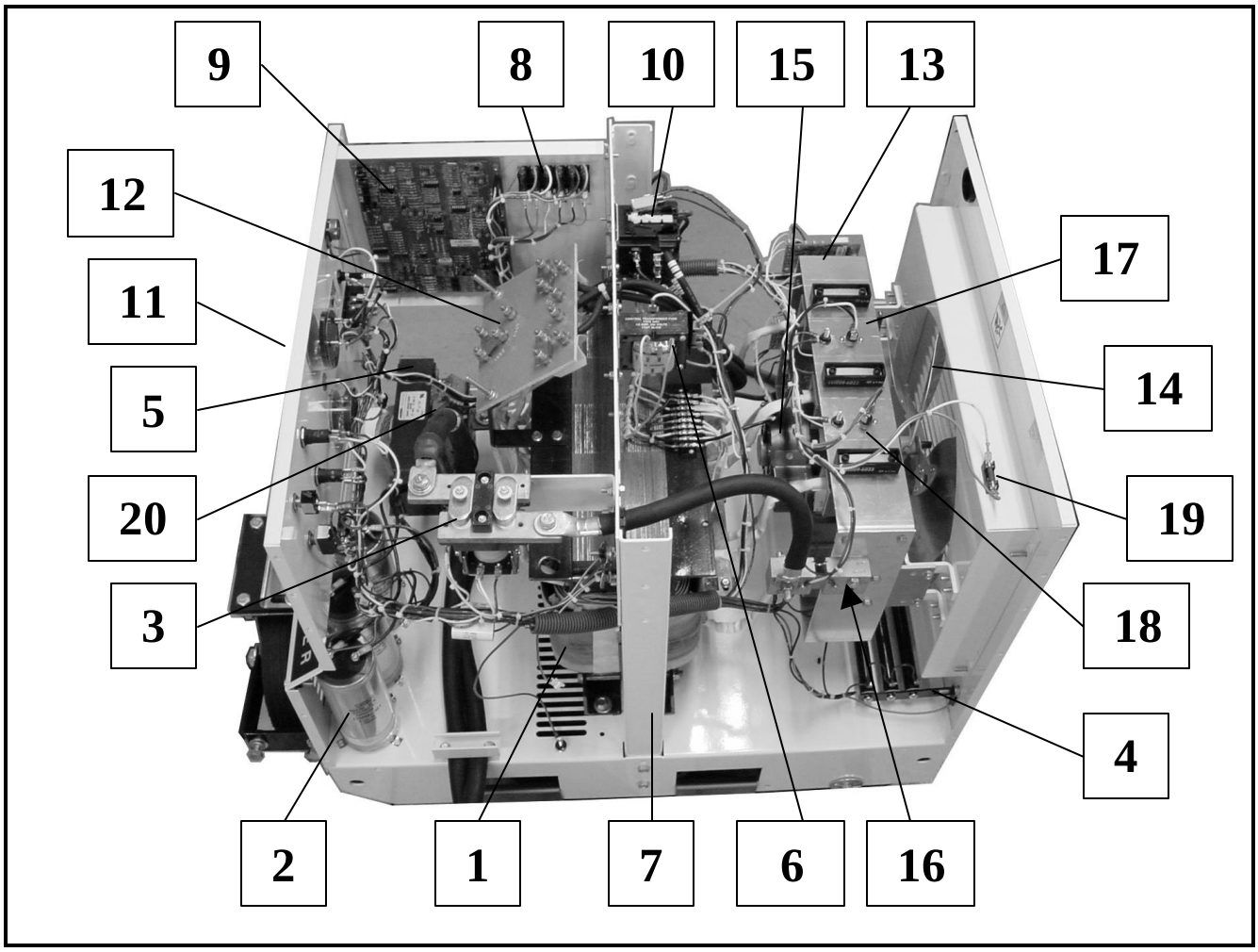
The main power transformer is a forced air cooled, core-type, 3 phase unit that reduces the rated input voltage or voltages to a voltage somewhat higher than the maximum rated output voltage. The extra voltage for the output provides a reserve capability to compensate for undervoltage on the input circuit, for the higher IR voltage drop found as the transformer, cables and other components heat up with load and ambient temperature rises.

The main transformer of the 208/230/460-V (Spec. 500160-401) and 230/460/575-V (Spec. 500160-403) power supplies has a winding to provide the 115-V AC for the auxiliary power receptacle and fan motor.

The main transformer of the 220/380-V power supply (Spec. 500160-402) has a 220-V AC winding for its auxiliary power receptacle and a 110-V AC winding for the fan motor.

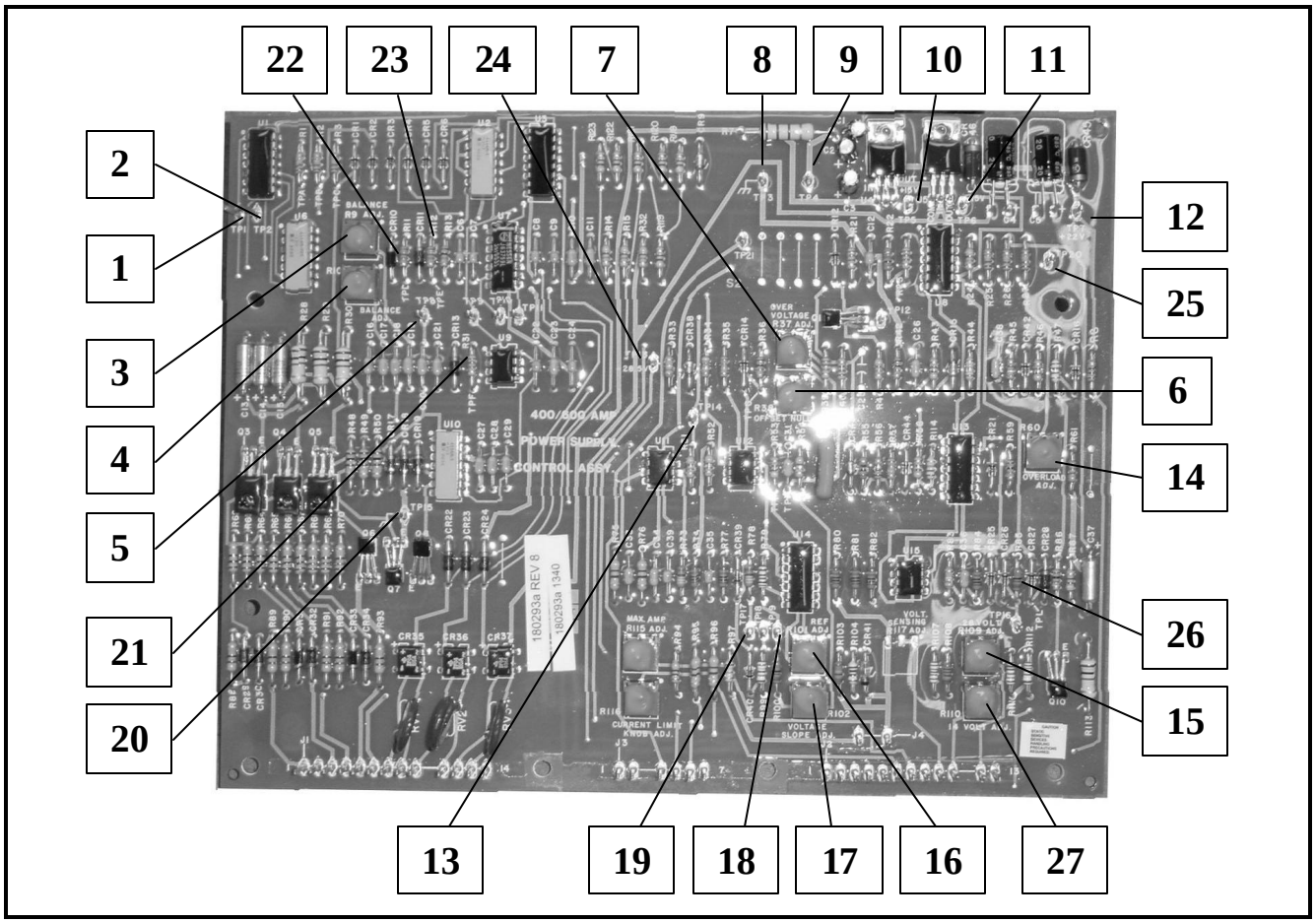
The main transformer has a center tapped coil on each phase that provides six fused (F2-F7) sensing or synchronizing voltage signals to the solid state printed circuit control board (9, Figure 5). Be certain to follow the changeover diagram for both the main transformer and the control transformer (6, Figure 5) for the input voltage you have available.

CAUTION	Improper connections will cause damage. Contact factory if your equipment specification information and/or voltage changeover diagram does not agree with your rated 3 phase input voltage.



1. Power Transformer (T1)
2. Capacitors (C15, C16, C17)
3. 28.5 VDC Output Contactor (K2)
4. Pre-load Resistor Assembly (R2, R3, R4)
5. Choke (L1)
6. Control Transformer (T2)
7. Interior Panel
8. Fuse Block (F2 through F7)
9. Printed Circuit Board (A1)
10. 10. Line Contactor (K1)
11. Front Panel
12. Voltage Changeover Board
13. SCR Heat Sink Assembly
14. Fan Blade
15. Fan Motor (B1)
16. Feedback Shunt (R12)
17. Fan Turn-on Thermostat (S4)
18. Overload Thermostat (S5)
19. Fan Fuse (F1)
20. Ammeter Shunt (R11)

Internal Components of GPU-400
Figure 5



1. TP1 SCR Gate Pulse from R10 Adjustment
2. TP2 SCR Gate Pulse from R9 Adjustment
3. R9 Balance Adjustment Phase 2 (TP2)
4. R10 Balance Adjustment Phase 3 (TP1)
5. TP8 Balance SCR Gate Pulse Phase1
6. R38 No Load Amp Off Set Null (TP14)*
7. R37 Over-voltage Trip Point
8. TP3 PC Board Common
9. TP4 +9.1 VDC Timer Voltage
10. TP5 +15 V Regulated Voltage
11. TP6 –15 V Regulated Voltage
12. TP7 +24 V Nonregulated Voltage
13. TP14 Null at 0 A DC TP (R38)*
14. R60 Overload Limit (TP20)
15. R109 28 V DC Output Calibration (TP13)
16. R101 5 V Reference Volt Adjustment (TP19)
17. R102 Voltage Slope Adjustment (TP17)
18. TP19 Reference Volt Test Point (R101)
19. TP17 Voltage Slope Test Point (R102)
20. TP15 Common, PC Board Volts
21. TPF SCR Gate Pulse Timer
22. TPE Gate Timer Output Phase 2
23. TPD Gate Timer Output Phase 3
24. TP13 Actual Output Volt (28.5 or 14.25)
25. TP20 Overload Limit (R60) Adjustment
26. TPL Overload Trip Summing Point
27. R110 14 V DC Output Calibration (TP13)

* Note TP14 provides amplified load amp reading for comparison with overload limit (TP20) and starting amperage limit (TP21) set by R13 control on front panel.

Solid State Printed Circuit Control Board Test Points of GPU-400
Figure 6

The 1 amp, F2 through F7 fuses (8, Figure 5) are located near the control board behind the left side panel. These fuses are accessible by removing the top panel.

d) Control Transformer (6, Figure 5)

The small control transformer located on the interior panel (7, Figure 5) provides 115 V AC to the K1 (10, Figure 5) input contactor coil, input contactor light A (12, Figure 4), and S1(10, Figure 4) input contactor switch via the half amp F8 contactor fuse (located on the control transformer). This transformer does not provide the 9A, 115 V AC auxiliary power.

WARNING

Electric shock can kill! Disconnect input power at source to remove voltage to control transformer and input fuses and contactor.

e) Auxiliary Power Circuitry

The single phase auxiliary power receptacle (5, Figure 4) has the same frequency as the primary input voltage. It is protected by the F9 fuse (8, Figure 4) located on the front panel, typically, 10 Amperes. The auxiliary power circuitry is turned off whenever the primary contactor is open or off. The auxiliary power winding is typically located on the middle leg (B phase) of the main transformer. It provides power to the receptacle (5, Figure 4) and to the fan motor via the S4 fan turn-on thermostat. The fan thermostat saves energy and reduces internal dust accumulation by allowing the fan to run only when necessary to prevent overheating.

A “MOV” voltage surge suppressor, RV1 (6, Figure 4), is installed across the receptacle terminals to reduce voltage surge problems to the load equipment and the power source.

f) Output Contactor Circuitry

Output contactor K2 (3, Figure 5) is operated by the output contactor ON-OFF switch S2 (11, Figure 4). Placing this switch momentarily in the TOP (spring-loaded) position turns the output contactor ON, and placing it in the DOWN position turns the output contactor OFF.

The positive output lead is to be connected to the positive output terminal of the K2 contactor. The negative output lead is to be connected to the R11 ammeter shunt. A small notch has been made in the bottom of the right and left side panels to allow for the output cable assembly to pass out either side.

The S5 normally-closed overload thermostat (18, Fig. 5) mounted on the main SCR rectifier heatsink is designed to remove the output command signal whenever the heatsink temperature rise becomes too high from overload, loss of cooling air flow, etc. The thermostat automatically resets on cool down.

g) Output Filter Circuitry

The DC output voltage is smoothed (filtered) by an L-C filter made up of L1 iron core reactor (4, Figure 5) carrying the output current to the load and the ripple current to the C15, C16, C17 capacitors (2, Figure 5) in parallel with the load terminals. The R2, R3, R4 bypass resistors (4, Figure 5) provide both a pre-load to the SCR devices and a safety discharge circuit for quickly discharging the filter capacitors whenever the power supply is turned off.

Note: 500160-402 has an additional capacitor in this circuit, for extra filtering for 50 Hz applications.

CAUTION Capacitor charge can injure. Be sure capacitors are discharged before touching.

The CR7 flyback diode (9, Figure 7) acts to facilitate discharge of the output filter circuitry as well as to protect the main SCR rectifier assembly from damaging reverse voltage spikes.

h) Main SCR Heat Sink Assembly (See Figure 7)

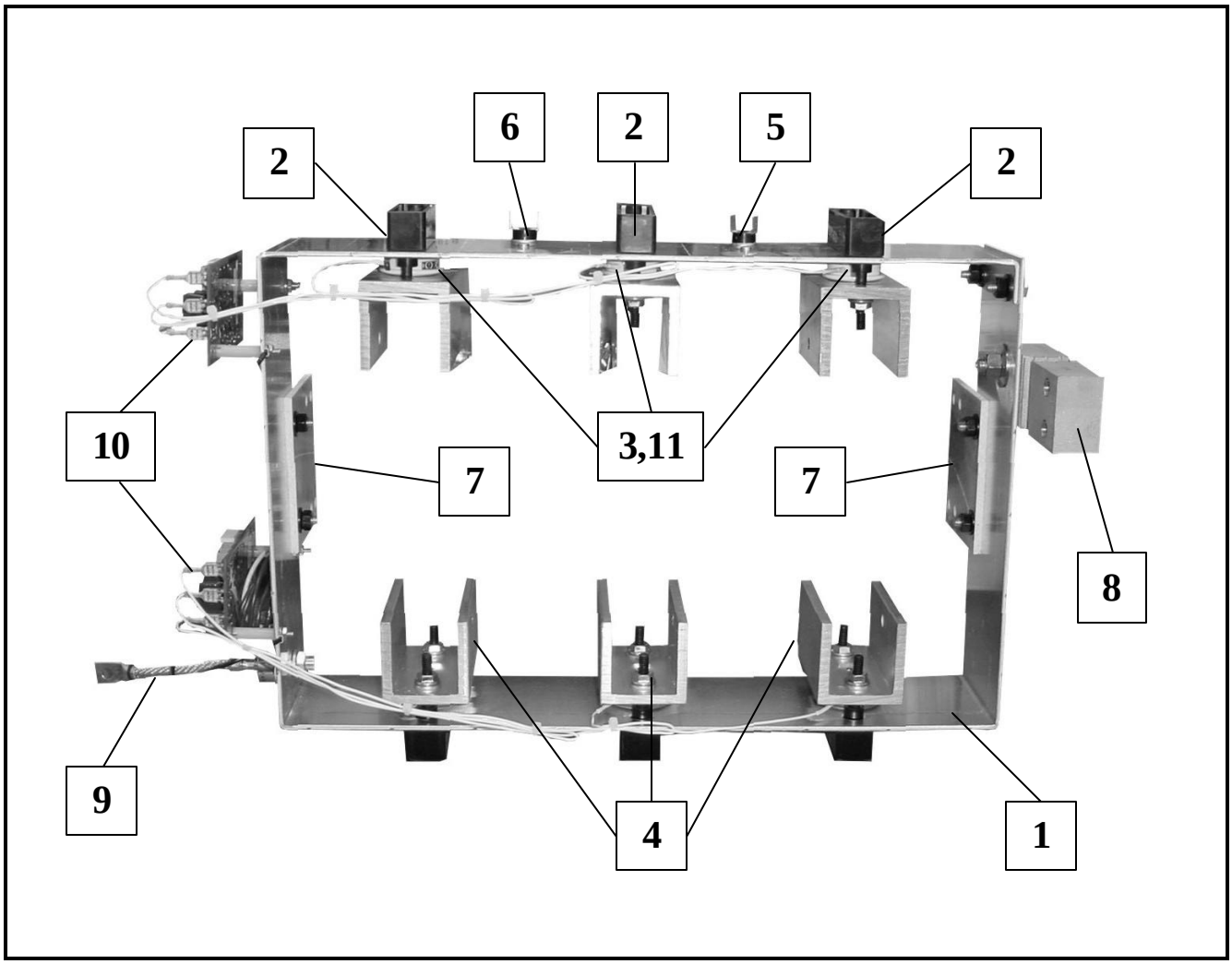
The main SCR heat sink assembly is mounted on the front of the rear panel. It surrounds the 115 V AC cooling fan assembly for optimum cooling efficiency. The SCR heat sink consists of a formed aluminum heat sink with 6 “hockey puck” silicon controlled rectifiers (3, Figure 7) held by 6 insulated compression spring assemblies (2, Figure 7), held against it by 6 U-shaped aluminum heat sinks (4, Figure 7) for the “SCR” device cooling. There are two snubber pc board assemblies for SCR gate signal control and protection (10, Figure 7), and the associated insulators, thermostats and hardware.

The solid state printed circuit board (9, Figure 5) provides a properly timed and sequenced turn on signal to the silicon controlled rectifiers that must be conducted to provide the desired output.

If the output voltage is too high or if the output current is above the limit set by controls such as the R13 starting potentiometer, the control board delays the SCR turn-on signal to allow less SCR device conduction time for a corresponded lower output. Conversely, if the output voltage is too low, the SCR turn-on signal is delivered earlier in the possible conduction time for each SCR; thereby, allowing more power to be supplied because of the longer conduction time. Proper operation of the SCR devices requires phase sequence and presence of all 6 voltage sensing signals, proper phase sequence and presence of the output voltage to the SCR devices, and the proper magnitude and sequence of the SCR turn-on signal to the SCR gate leads.

i) Thermostatically Controlled Fan

The 115 V AC fan motor (15, Figure 5) does not run until the SCR heat sink gets hot enough to turn on the S4 thermostat (6, Figure 7). This feature can reduce the need for internal power supply cleaning and the use of electricity.



1. Rectifier Heat Sink
2. SCR Mounting Clamp
3. Silicon Rectifier (CR1 through CR6)
4. SCR Heat Sink
5. Overload Thermostat (S5)
6. Fan Turn-on Thermostat (S4)
7. Rectifier Mounting Insulator
8. Feedback Shunt (Not Shown) (R12)
9. Positive Base Silicone Diode (CR7)
10. Surge Supressor (A2, A3)
11. Pin Spring

SCR Heat Sink Assembly of GPU-400
Figure 7

Section 2 Preparation for Use, Storage, or Shipping

1) Receipt and Inspection of Equipment

Check the equipment received against the Hobart Brothers Company invoice to make certain that the shipment is complete and undamaged. If the equipment has been damaged in transit, notify the carrier (railroad, trucking company, etc.) at once and file a claim for damages. If you require assistance with a damage claim, furnish Hobart Brothers Company with full information about the claim.

If the shipment is in error, contact Order Department, Hobart Brothers Company, Ground Power Division, Troy, Ohio 45373.

Give the MODEL, SPECIFICATION, and SERIAL numbers of the equipment, and a full description of the parts in error. Refer to the title of this manual for a listing of the specification numbers described in the manual. An identification and rating nameplate is normally located on the power supply on the rear panel for your convenience. If the rated input or output voltages do not agree with your requirements, contact the order department for instructions or corrective action.

Generally, it is good practice to move the equipment to the site of installation before uncrating or unpacking. When unpacking, take care to avoid damage to the equipment if bars, hammers, etc., are used.

Best results will be obtained with this equipment ONLY if the responsible operating personnel have access to this manual, and are familiar with these instructions. Additional copies of this manual may be obtained at a small cost per copy by writing to: Hobart Brothers Company, Ground Power Division, Troy, Ohio. Supply the owner's manual no. (OM-2100) plus the model, specification, a serial numbers of your equipment.

2) Installation

A Hobart converter requires no additional preparation in order to supply power to an aircraft. It needs only to have its input cable connected to an appropriate source of power and its output cable(s) connected to an aircraft. Proceed as follows for putting the converter unit into service.

For best operating characteristics and longest unit life, select an installation site that is not exposed to high humidity, dust, high ambient temperature, flooding, or corrosive agents. Moisture can condense on electrical components, causing corrosion or shorting of circuits. Dirt on components help retain this moisture in addition to providing a conducting material.

Adequate air circulation is needed at all times in order to assure proper operation. Provide a minimum of 12 inches (305mm) of free air space at both the front and rear of the unit. Make sure that the ventilator openings are not obstructed. The unit should not be installed on a grade greater than 10°.

3) Internal Wiring check

Refer to the product identification plate (nameplate) on the machine's rear panel to determine the power input voltages and frequency at which it may be operated.

WARNING

Electric shock can kill! Open the disconnect switch, or breaker, and determine that no voltage is present before removing top canopy and connecting wires between the input service and power supply or working on the power supply.

CAUTION

Reconnection of control transformer as well as main input connection panel must be made when changing rated input voltage. See changeover diagram.

Remove cabinet top for access to LINE VOLTAGE MAIN CHANGEOVER circuitry. Check line voltage connections against instructions on the VOLTAGE CHANGEOVER DIAGRAM supplied with this manual. If necessary, rearrange internal wiring and/or link connections to agree with the requirements for your input.

4) Connecting the Machine to Line Voltage

The user shall furnish a suitable disconnecting means before input power is connected to the input contactor on the internal panel of the GPU. Install the input cable through the hole provided in the rear panel. Be certain the cable inside the power supply will not contact the fan or hot parts. The lower holes may provide less weather leakage.

CAUTION

The method of installation, conductor size, and over-current protection shall conform to the requirements of the local electrical code, the national electrical code, or other national codes, as applicable. Qualified persons shall do all installation wiring and machine reconnection.

Figure 1 provides minimal information for selection of line conductors, fuses, and the equipment grounding conductor. This information is from the National Electrical Code NFPA 70-1981 Edition. Install this equipment per the latest edition, available from the National Fire Protection Association, 470 Atlantic Avenue, Boston, MA 02210.

Connect the three-phase line leads to terminals L1, L2, and L3 on the input line contactor located on the interior panel inside the power supply cabinet.

NOTE: After connecting the input cables, it is recommended that Hobart # 904021 urethane coating be sprayed on the connections at the contactor to protect these connections from corrosion, fungus, and contamination. Spraying these connections will also reduce the potential for arcing from dirt and condensation.

LINE VOLTS	RATED	COPPER LINE WIRE SIZE	
		In Conduit (*)	In Flexible Cable (**)
208	59	No. 6	No. 6
220	56	No. 6	No. 6
230	54	No. 6	No. 6
380	32	No. 8	No. 8
460	27	No. 10	No. 8
575	21	No. 12	No. 8

* Conductor sizes listed are for 30 feet or less of each conductor in conduit and for conductors having 90º C insulation, such as type **FEB, FEPB, RHH,** and **THHN** as based on an ambient temperature of 50° C. For conductors having other insulation, or for conductors longer than 30 feet, consult **Hobart Brothers Company** as to size required.
** Conductor sizes listed are for 30 feet or less of each conductor in conduit and for conductors having 90º C insulation, such as type **W, SC, SCE, SCT, PPE, G,** and **G-GC** as based on an ambient temperature of 50° C. For conductors having other insulation, or for conductors longer than 30 feet, consult **Hobart Brothers Company** as to size required.

Recommended Wire and Fuse Size Table
Figure 1

5) Grounding

The frame of this ground power unit should be grounded for personnel safety, and to assure operation of the over-current protection. The grounding method and the equipment grounding conductor size and type shall conform to local and national codes. For the National Electrical Code, the equipment-grounding conductor shall be green, green with a yellow stripe, or bare. If flexible power cable is used, use a cable assembly that includes the equipment-grounding conductor. If metallic armored cable or conduit is used, the metal sheathing or conduit must be effectively grounded per local and national codes. Rubber-tire mounted equipment shall be grounded to conform to local national codes. The grounding assists in providing protection against line voltage electrical shock and static shock. The grounding serves to discharge the static electric charge that tends to build up on rubber-tire mounted equipment. This static charge can cause painful shock and lead to the erroneous conclusion that an electrical fault exists in the equipment. An ungrounded cabinet can be at a lethal potential if a component fails electrically to the case.

If a system ground is not available, consult the electrical code enforcement body for instructions. The ground power unit should be connected per your electrical code to an adequate driven ground rod or to a water pipe that enters the ground not more than 10 feet (3 meters) from the machine.

The equipment grounding conductor size listed in Figure 1 is a guide if no local or national code is applicable.

Attach the equipment grounding block conductor to the stud provided adjacent to the contactor. Determine that the ground wire size is adequate before the machine is used.

CAUTION

For personnel safety and to assure adequate ventilation, be sure to replace cabinet top.

6) Output Leads

Use your applicable electrical code to determine the minimum size output cable you need. If the cable voltage drop is too large with the minimum size cable, use a larger size cable. For example, the 90 C rated insulation, 4/0 cable in a 40 C ambient needed for 400 A DC may have to be larger for carrying that amperage over 200 feet with less than 4.5 Volts cable drop.

7) Lubrication

The fan motor incorporates a sleeve bearing, and therefore will need periodic lubrication. The following table will furnish a recommended guide as to the frequency of this lubrication.

Type of Duty	Lubrication Interval
Light (up to 6 hours/day)	Every 12 months
Moderate (7 to 15 hours/day)	Every 6 months
Heavy Duty (16 to 24 hours/day)	Every 3 months

8) Preparation for Storage

a) General

(1) The unit should be prepared for storage, as soon as possible, after being removed from service.

(2) The unit should be stored in a building which is dry and which may be heated during winter months. The unit shall be stored on a grade no greater than 10°.

(3) Moisture absorbing chemicals are available for use where excessive dampness is a problem. However, the unit must be completely packaged and sealed if moisture-absorbing chemicals are to be effective.

b) Temporary Storage

When storing the unit for 30 days or less, prepare as follows:

(1) Use moisture-absorbing chemicals where excessive dampness is a problem. However, the unit must be completely packaged and sealed if moisture-absorbing chemicals are to be effective. Seal all openings. Use a waterproof, vapor proof material that is strong enough to resist puncture damage.

(2) Store the unit in a building which is dry and which may be heated during winter months.

c) Long Time Storage

(1) To protect the converter's components, the complete unit should be packaged, using moisture proof packaging and sealing material. Place containers of moisture-absorbing chemicals, such as silica gel, in the unit before packaging.

(2) Store the unit in a building which is dry and which may be heated during winter months.

9) Preparation for Shipment

During long shipments, vibration, jolting, etc may loosen the converter unit's retaining hardware. Check this hardware periodically during the shipment to make certain that retaining hardware is secure.

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Section 3 Operation

IMPORTANT

Before attempting to operate the converter, read this entire section to become fully familiar with how the converter operates.

1) General

This section contains information for safe and efficient operation of the equipment. Operating instructions are presented in step-by-step sequence of procedures to be followed in supplying 28 V DC to an aircraft or similar load.

WARNING

Electric shock and fire can kill! Read and understand all operating instructions before attempting to operate the equipment. Operation attempts by untrained personnel can endanger people, this equipment, and the load. Do not attempt to operate the equipment for uses not approved by the manufacturer, or at input and output ratings not listed in the specification table located in 1-1, Figure 3.

The repeated opening of input fuses or repeated functioning of the overload trip circuitry indicates a misapplication, a faulty main component, or an improper connection or load. Correct the problem by following the instructions in Chapter 2 before attempting to operate the power supply. Be certain that a input disconnect means is readily accessible between the power input source and this DC power supply. You may need to quickly isolate the DC power source from all power during an emergency, fire, or equipment malfunction.

2) Operation Preparation

a) Verify input power is disconnected at source.

b) Verify that the supply-input connections agree with the input voltage available by comparison to the voltage changeover diagram.

c) Connect output cable between load and the proper connection points in the DC power supply.

d) When all covers or panels are in place, turn on the source of input power.

e) Set R13 start level control knob (1-1, 8, Figure 4) to the output surge limit required for your load.

3) Operation Procedure

a) Input Control Functions

(1) Turn on S1 input contactor switch (1-1, 10, Figure 4).

(2) Verify that only the amber input power light (1-1, 12, Figure 4) glows. If the light glows, no problems exist requiring service.

b) Output Control Functions

(1) Hold the S2 output contactor switch (1-1, 11, Figure 4) in the up “CLOSE” position long enough for the green output contactor light (1-1, 13, Figure 4) to glow.

(2) Release S2 switch to the middle “ON” position.

(3) Verify that M1 DC ammeter (1-1, 2, Figure 4) does not read excessive amperage.

(4) The DC power supply should continue to deliver power until the S2 switch is placed in the down “OFF” position or one of the other control functions turn the unit “OFF”.

4) Voltmeter

a) Verify on the M2 DC voltmeter (1-1, 3, Figure 4) that the DC output voltage level is correct. If not, turn off power supply, disconnect your load, and refer to Service, Chapter 2 for instructions.

5) Output Current Limit

a) If the DC ammeter continuously reads more than 400 A DC after start-up, immediately turn R13 current limit control (1-1, 8, Figure 4) down to continuous operation current point, normally 400 A DC. This may prevent input fuse blowing and automatic overload trip out.

b) If R13 has no effect or if the output current cannot be decreased to about 150 A DC at the R13 minimum position, a faulty SCR device or control circuit malfunction is indicated requiring power supply repair. Refer to Chapter 2 for service instructions.

Chapter 2 Servicing / Troubleshooting

Section 1 Troubleshooting

1) General

The troubleshooting information provided in this section is limited to procedures for determining the cause of faults, and for restoring the converter to operation after faults develop which shut off the unit.

Calibration, service, and repair is to be done by Hobart Ground Power Service Department personnel, authorized distributors of Hobart Ground Power equipment, or trained qualified electronic technicians.

If you have any questions concerning your Hobart Ground Power, contact our Service Department by mail, telephone, FAX or E-Mail.

Write:	Hobart Brother Company Ground Power Division Service Department 1177 Trade Square East Troy, Ohio 45373 U.S.A.
Call Inside U.S.A.:	(800) 422-4166 (Parts) (800) 422-4177 (Service)
Call From Foreign Countries:	(937) 332-5050 (Parts) (937) 332-5060 (Service)
FAX Inside U.S.A.	(800) 367-4945
FAX From Foreign Countries:	(937) 332-5121
E-Mail :	service@hobartgroundpower.com
Web Page :	www.hobartgroundpower.com

2) Troubleshooting

a) Description

The troubleshooting chart lists information under three headings:

(1) Trouble, symptom, and condition

(2) Probable cause

(3) Test, check, and remedy

b) Use of the Troubleshooting Chart

The troubleshooting chart is designed to provide maintenance and repair personnel with a timesaving guide for locating the source of trouble.

(1) Terminal points (Reference applicable schematic and connection diagrams), installed on the power supply at several locations, provide easily accessible and identifiable test points for checking circuits and electrical components.

(2) Test points are located throughout the circuitry in such a manner that input and output power may be used for test purposes. Because of these test points and their location, a complete check of circuitry may be completed very quickly. Therefore, “probable causes” and “remedies” are listed in a step-by-step sequence which will insure power for testing in all instances where input or output power may be used with proper safety practices, test equipment, and training experience.

(3) Printed circuit board output troubles should be pinpointed only to determine if the problem is a board calibration problem or a PC board failure problem. Failure of PC board requires replacement of the board. Field repair attempts are not recommended.

(4) Always check circuit fuses, circuit breakers and the position of switches first in troubleshooting. The incorrect positioning of a switch may cause a condition that could be misinterpreted as a fault.

(5) Electrical component symbols, which are used on schematic diagrams, and their legends to identify components, may be used in the troubleshooting chart (in parentheses after the item name) to help maintenance personnel identify parts on the schematic diagrams.

3) Equipment for Troubleshooting

A good quality multi-scale voltmeter is the only instrument required for troubleshooting. However, for checking certain erratic, intermittent, or phase relationship problems, a good oscilloscope is strongly recommended.

WARNING

High voltage - electric shock and fire can kill! Exercise extreme care to avoid contact with high voltage leads and components that could cause serious shock and injury if touched when troubleshooting or operating the equipment. Stay clear of moving parts. Locate equipment in a safe environment. Have proper safety equipment available. Do not attempt operation or repair without adequate training.

4) Voltages of Interest

a) Across the secondary on all 3 phases - 66 VAC 10% *

b) To secondary coil center tap on all phases - 33 VAC 10% *

* The +/- 10% refers to the possibility of input voltage being out of balance or not at the nominal value.

c) Across the 115 VAC receptacle - 115 VAC *(230 VAC on 50hz units)* 10% *

d) Between X1 and X3 on Fuse Block - 37 VAC 10% *

e) Test Point Values for PC board

A control board malfunction will probably result in (a) a loss of output voltage, (b) inability to produce full load current, or (c) output voltage too high or too low. See Section 2-2, Figure 2 for nominal test values between a few selected test points shown in Section 2-2, Figure 1.

NOTE: All potentiometer operating values are preset at the factory, and normally should not have to be reset in the field. If a need arises that would indicate the need for field adjustments, please contact the factory at Troy, Ohio. Typically, only R109 and R110, 28 V and 14 V outputs respectively, are the only factory set values which the customer's use might dictate a minor change in setting. For example, long cables might need a few tenths of a volt higher set values to compensate for the cable drop.

5) SCR Malfunction Instructions

a) Normal SCR Malfunction Conditions

(1) Blown line fuses as the result of a shorted SCR (similar to a shorted diode). A shorted fly-back diode will also produce this situation. This is a severe malfunction.

(2) If one SCR does not turn on (either it is open or the gate signal is not being received by the SCR), a very small change will occur at the output which will be difficult to notice. The ripple voltage at the output will increase.

(3) If two SCR's do not turn on, the ripple current will increase and can cause other problems. (Consult troubleshooting procedure).

b) Severe SCR Malfunction Conditions

(1) In the case of a severe malfunction, such as a shorted SCR or diode, do not turn on the unit. Disconnect the leads from the transformer to the heat sink assembly and check with a VOM for shorted SCR's or a shorted fly-back diode.

(2) To eliminate the possibility of a control malfunction, go inside the unit and check the control circuit board. See the instructions provided for this test. It is important to run through the tests in the order they are listed. Note that the SCR devices and fly-back diode are still disconnected.

c) SCR tests or checks

(1) If nothing is found defective on the board the next step is to go to the SCR's. First of all an open gate or an open SCR cannot be checked with a VOM. If an SCR is not firing, the AC ripple current will increase across the filter capacitors, but no fuses blow. Also, the ripple voltage will increase at the output.

(2) The best way of checking for a SCR device, or fly-back diode which breaks down into a shorted condition because of inadequate voltage withstand capability, is to add one component at a time and then turn on the input power for a short time. When the faulty component gets connected, excessive input current will flow.

WARNING

Electric shock and fire can kill! Do not touch energized parts. Do not leave power supply on long enough to overheat or fail in the faulty condition.

(3) The best way to check that all SCR devices are firing and conducting correctly is to connect the probe of an oscilloscope to the heat sink and the isolated neutral of the oscilloscope to the braid of the fly-back diode. The SCR pulses will show as 6 evenly spaced pulses of about the same height. If one of the pulses appears to be part of a malfunction SCR device circuit, the gate lead for that device may be disconnected from the applicable suppressor board point. The lead disconnection, which does not affect the trace, is the lead for the SCR device and suppressor circuit in question. However, if every third pulse is low or missing, check the balance adjustments, R9 and R10, before attributing the problem to faulty components.

Machine Will Not Operate

Trouble, Symptom, Condition	Probable Cause	Test, Check, and/or Remedy
1. Machine will not start.	**a.** The input power is turned OFF at remote disconnect switch.	Turn the power ON at remote disconnect switch.
	b. Blown fuse in remote disconnect switch	Replace blown fuse. If fuse blows frequently, determine and remedy the cause.
	c. Incorrect input power connections at machine.	Check input power connections against appropriate connection diagram in Chapter 5.
	d. Incorrect power input (frequency and voltage).	Check that voltage and frequency of power input for this ground power unit, according to the rating on its nameplate.
	e. Broken input cable.	Repair cable as necessary.
2. Line contactor fails to close.	**a.** Line contactor fuse blown.	Replace fuse. Check for cause if fuse blows frequently.
	b. Mechanical obstruction on contactor.	Remove obstruction.
	c. Defective line contactor switch.	Replace line contactor switch.
	d. Defective coil in line contactor.	Replace contactor if coil is open or shorted.
	e. Cable broken at line contactor.	Repair broken cable as necessary.
3. Line contactor chatters.	**a.** Input cables too small or too long.	Use input cables of sufficient capability for proper operation of the machine. Refer to Section 1-2, Figure 1 for proper cable size to be used.
	b. Faulty contactor coil.	Check coil voltage. If correct, replace contactor.
	c. Low line voltage.	Check line voltage. Correct problem as necessary.

Trouble, Symptom, Condition	Probable Cause	Test, Check, and/or Remedy
Machine Will Not Operate		
4. Contactor operates and blows line fuses.	**a.** Wrong line voltage.	Check nameplate of machine for line voltage to be used. Then measure line voltage. If line voltage is of improper value, correct this condition as is necessary to provide proper voltage input to the machine.
	b. Line fuses too small.	Install fuses of proper amperage rating. Refer to Section 1-2, Figure 1 for proper fuse size.
	c. Links on voltage changeover board incorrectly connected.	Check appropriate voltage changeover diagram in Chapter 5 for proper link positions. Make correction as necessary.
	d. SCR failure or shorted fly-back diode.	Refer to detail troubleshooting instructions.
	e. Short circuit in primary connections.	Remove short circuit.

Unit Trips Out After Starting

Trouble, Symptom, Condition	Probable Cause	Test, Check, and/or Remedy
1. Unit delivers power but soon shuts down. (Thermal overload, electronic overload or over-voltage circuit trips).	**a.** Power supply overloaded.	Reduce load, overload can be carried only for a short time.
	b. Duty cycle too high.	Do not operate continually at overload currents.
	c. Ambient temperature too high.	Operate at reduced loads when temperature exceeds 104° F (40° C) or improve cooling ambient.
	d. Ventilation blocked.	Check that air intake and exhaust openings are not obstructed.
	e. Fan not operating.	Check fuse F1 on fan shroud. If it is good, disconnect the fan motor leads and apply 115-VAC directly to fan motor. Replace fan motor if it fails to operate or if its bearings are defective.
	f. Shorted output.	Reset electronic overload.
2. Over-voltage/Overload trip malfunction is in unit's internal circuitry.	**a.** Control circuit board failure.	Refer to detail troubleshooting instructions.
	b. Loose connections in voltage control circuit	Check for loose connections. Tighten and secure as required.
	c. Starting current potentiometer (R13) open.	Replace potentiometer.
3. Fan not operating (also see causes and remedies under "Machine will not start").	**a.** Blown fuse (F1) on front panel of machine.	Replace fuse.
	b. Fan control thermostat defective.	Place a jumper wire across the overheated thermostat. If fan then runs, replace thermostat.
	Note: A properly operating fan thermostat will turn on the fan at 100°F and keep the fan running until 80° F is reached at heat sink.	
	c. Broken lead or connection to fan motor.	Repair wiring as necessary.
	d. Fan motor defective.	Disconnect fan motor leads and apply 115-V AC directly to fan motor. If it fails to operate, replace it.

Trouble, Symptom, Condition	Probable Cause	Test, Check, and/or Remedy
Power Supply Case Has Voltage Potential On It		
1. Operator gets shock when machine case is touched.	**a.** Case of machine not grounded.	Ground machine case to an earth-type ground if utility ground is already connected. Connect the normal safety ground and recheck if "utility" ground had not been connected.
Power Supply Output Current Varies Without Voltage Change		
1. Abnormal current fluctuation, voltage nearly constant.	**a.** Loose cable connections at output.	Check for overheated connections and tighten.
Power Supply Will Not Turn Off		
1. Contactor fails to open.	**a.** Contacts sticking in contactor.	Clean contacts or replace contactor, whichever is needed.
Power Supply On: No Voltage Output		
1. Unit on, but no output voltage.	**a.** Protective circuit tripped.	Determine and correct cause of trip. Then reset and restart unit.
	b. Component failure in protective circuit.	Find the defective component and replace it.
	c. Control circuit board failure.	Check control board per Section 2-2 and replace it if faulty.

Trouble, Symptom, Condition	Probable Cause	Test, Check, and/or Remedy
Output Voltage Not Proper Level		
1. Poor voltage regulation.	**a.** Loose connection of voltage sensing lead.	Check connection at output contactor and control circuit board. Tighten connection as necessary.
2. Output voltage too high (above 32 Volts).	**a.** Voltage calibration off.	Attempt calibration per Section 2-2. If calibration isn't possible replace PC control board.
	b. Voltage sensing lead open.	Repair or replace voltage-sensing lead.
3. Unstable voltage.	**a.** Open filter capacitor.	Find and replace defective capacitor.
	b. One or more SCRs not firing properly.	c. Adjust balance control or replace defective SCR heat sink assembly if oscilloscope shows faulty SCR devices. Replace PC control boards if oscilloscope shows no gate pulse and the PC control board inputs and controls are proper except for output.

Output Contactor Fault

Trouble, Symptom, Condition	Probable Cause	Test, Check, and/or Remedy
1. Output contactor will not close.	A. Defective output switch (S2).	With the unit turned off, place a jumper between terminals 2 and 4 on S2. Turn S1 on. If output contactor closes, S2 is defective. Replace.
	B. Defective input contactor auxiliary contacts (K1).	With the unit turned off, place a jumper between terminals NO 1 and COM 3 on input contactor. Turn S1 on, and place S2 in Close position. If output contactor closes, K1 is defective. Replace.
	C. Defective output voltage select switch (S103) (if applicable).	With the unit turned off, place a jumper between terminals 4 and 5 on S103. Turn S1 on, and place S2 in Close position. If Output contactor closes, S103 is defective. Replace.
	D. Defective output contactor (K2).	Measure voltage between + and – terminals on K2 Coil with S1 on and S2 held in Close position. If 28.5 VDC is present K2 is defective.
2. Output contactor will not stay closed.	A. Defective output switch (S2).	With the unit turned off, place a jumper between terminals 1 and 3 on S2. Turn S1 on, and place S2 in Close position. If output contactor stays closed after S2 is released, S2 is defective. Replace.
	B. Defective output contactor auxiliary contacts (K2).	With the unit turned off, place a jumper between terminals NO 3 and NO 4 on output contactor. Turn S1 on, and place S2 in Close position. If output contactor stays closed after S2 is released, K2 is defective. Replace.

Section 2 Calibration and Test of PC Control Board

IMPORTANT

Before attempting to make tests and adjustments on the converter, READ THIS ENTIRE SECTION to become familiar with the proper procedures.

1) General

This section describes the test points, test values, and adjustment locations for testing and adjusting the printed circuit control board that is the “brains” of the GPU400 DC power supply. As a minimum the following equipment and tools are required.

a) High impedance, high accuracy DC voltmeter;

b) Small, standard blade screwdriver;

c) Small, insulated clip leads;

d) A resistance load bank or equivalent that can safely dissipate 1600 A DC at 21 V DC if over-current trip point is to be checked or adjusted. Faulty control boards should be returned to the manufacturer for repair.

2) Printed Circuit Board Test Values and Adjustments

a) Refer to Figure 1 for the location of test points and adjustment potentiometers for possible field adjustment.

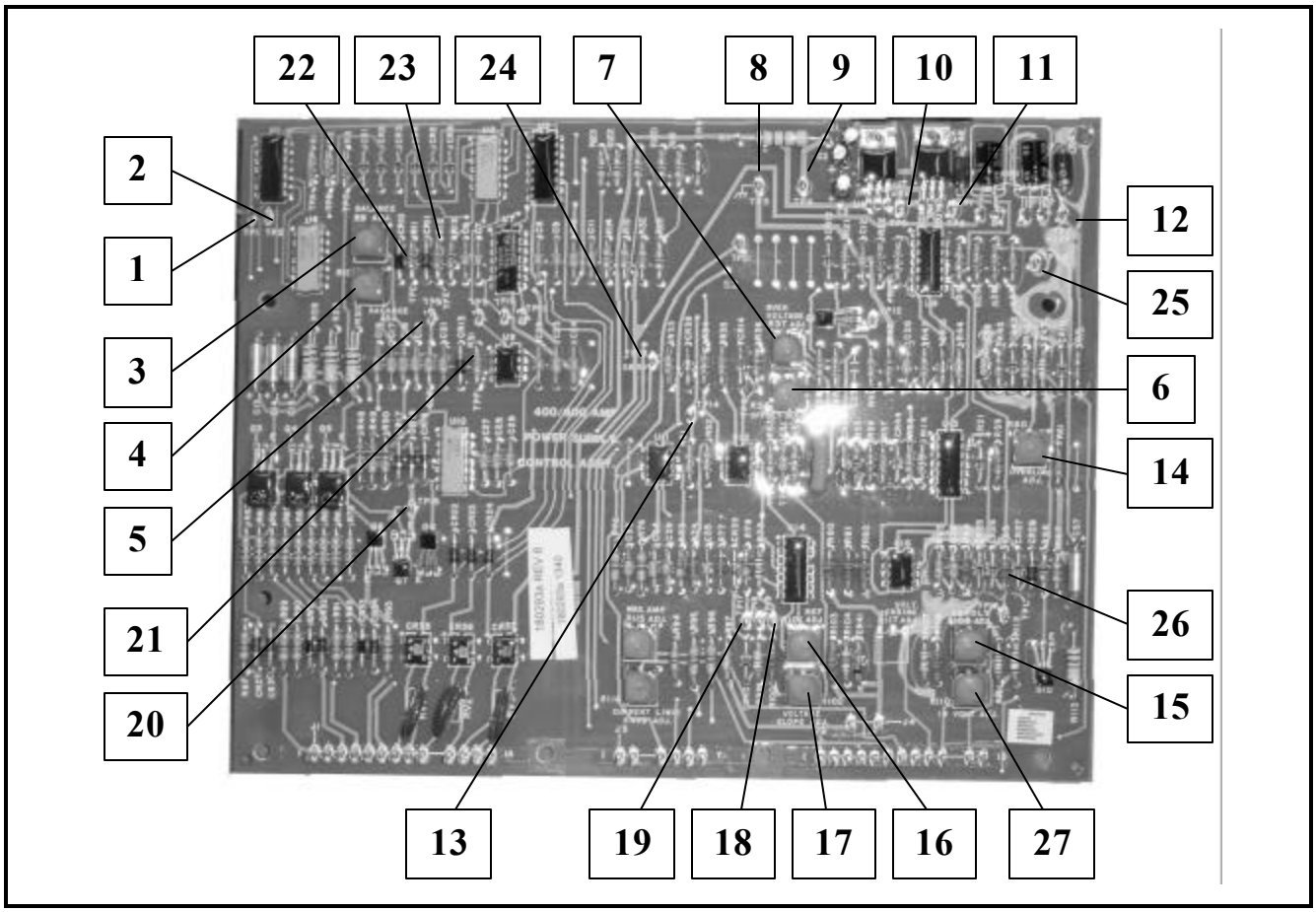
b) Test point values and comments about the measurements and testing conditions are tabulated in Figure 2.

WARNING

Electric shock and arcs can kill or injure! Use caution to inspect or test the printed circuit control board while the equipment is running. The voltages on the printed circuit board are safe; however, removing the top panel exposes people to dangerous voltages. The printed circuit control board is hinged to move away from internal parts.

c) Test and Calibration Procedure

Follow Figures 1 and 2 to verify that the PC board is functioning to the standard. If the voltage readings to the PC board common are not within specification, attempt to correct the reading by adjusting the applicable control. Be certain the operating conditions are exactly as stated in Figure 2. If the board does not adjust and the leads, fuses (F2-F7), and connectors to the PC control board are good and proper, the PC control board is faulty. Replace it with a known good board after the input power has been turned off. The PC board is held in place by six (6) screws. After unplugging the three polarized connection plugs, remove the screws and keep for the new board. Reverse the procedure when the new PC board is mounted in the exact orientation of the old board. Recheck the voltages. In some cases a minor adjustment may be required for optimum calibration. If the same magnitude of error and lack of adjustment control is encountered, it is possible that the control board is not at fault.



1. TP1 SCR Gate Pulse from R10 Adjustment
2. TP2 SCR Gate Pulse from R9 Adjustment
3. R9 Balance Adjustment Phase 2 (TP2)
4. R10 Balance Adjustment Phase 3 (TP1)
5. TP8 Balance SCR Gate Pulse Phase1
6. R38 No Load Amp Off Set Null (TP14)*
7. R37 Over-voltage Trip Point
8. TP3 PC Board Common
9. TP4 +9.1 VDC Timer Voltage
10. TP5 +15 V Regulated Voltage
11. TP6 –15 V Regulated Voltage
12. TP7 +24 V Nonregulated Voltage
13. TP14 Null at 0 A DC TP (R38)*
14. R60 Overload Limit (TP20)
15. R109 28 V DC Output Calibration (TP13)
16. R101 5 V Reference Volt Adjustment (TP19)
17. R102 Voltage Slope Adjustment (TP17)
18. TP19 Reference Volt Test Point (R101)
19. TP17 Voltage Slope Test Point (R102)
20. TP15 Common, PC Board Volts
21. TPF SCR Gate Pulse Timer
22. TPE Gate Timer Output Phase 2
23. TPD Gate Timer Output Phase 3
24. TP13 Actual Output Volt (28.5 or 14.25)
25. TP20 Overload Limit (R60) Adjustment
26. TPL Overload Trip Summing Point
27. R110 14 V DC Output Calibration (TP13)

* Note TP14 provides amplified load amp reading for comparison with overload limit (TP20) and starting amperage limit (TP21) set by R13 control on front panel.

Solid State Printed Circuit Control Board Test Points of GPU-400
Figure 1

Consideration should be given to returning the GPU-400 DC power supply to the factory or an authorized repair facility if your recheck of the GPU-400 does not find the cause of the difficulty. Field repair of the PC control board is not recommended.

CAUTION

Improper test equipment can be damaged! Use only recommended test equipment and tools. Never apply test voltage directly to components on the board. This solid state control uses low current devices that quickly burn out if a low impedance voltage source is applied directly to the component. The device may not fail until later resulting from the test.

TEST POINTS	VOLTAGE & CIRCUIT CONDITIONS	DESCRIPTION OF TEST
1. TP5 (10) to TP3 (8)*	**a.** + 15 VDC +/- 5%. Test performed with open circuit and no load.	Checks (+) voltage regulator output set by U4.
2. TP6 (11) to TP3 (8)	**a.** - 15 VDC +/- 5%. Test performed with open circuit and no load.	Checks (-) voltage regulator output set by U5.
3. TP7 (12) to TP3 (8)	**a.** + 24 VDC +/- 10%. Test performed with open circuit and no load.	Checks unregulated control voltage needed for 1 and 2.
4. TP4 (9) to TP3 (8)	**a.** + 10 VDC +/- 10%. Test performed with open circuit and no load.	Checks gate pulse timer volts supply set by CR9.
5. TPD (23) to TP3 (8)	**a.** + 3.3 VDC + /-10%	**
TPE (22) to TP3 (8)	**b.** + 3.3 VDC + /-10%	**
TPF (21) to TP3 (8)	**c.** + 3.3 VDC + /-10%	**
** Checks gate pulse timer operation before phase balancing and amplification. Tests performed with open circuit.		
6. TP1 (1) to TP3 (8)	**a.** -8.2 VDC + /-10%	***
TP2 (2) to TP3 (8)	**b.** -8.2 VDC + /-10%	***
TP8 (5) to TP3 (8)	**c.** -8.2 VDC + /-10%	***
*** Checks gate pulse timer operation and balance adjustment. With a 100 A load, adjust R9 (3) and R10 (4) carefully for lowest ripple voltage (typically 100 to 160 mV). Test performed with open circuit.		
7. TP14 (13) to TP3 (8)	**a.** 0 VDC +/- .01V. Test performed with open circuit.	Checks for null (0) by R38 (6) for the no load current signal. Test performed with open circuit.
8. TP17 (19) to TP3 (8) VDC	**a.** + 1.25 +/- 10%. Test performed with open circuit.	Checks voltage slope calibrated with R102 (17).
9. TP19 (18) to TP3 (8)	**a.** - 5 VDC+ /-1%. Test performed with open circuit.	Checks reference voltage adjusted by R101 (16).

Test Value and Comment Tabulation
(For PC Boards Numbers 180893 and 180893A)
Figure 2, Sheet 1

TEST POINTS	VOLTAGE & CIRCUIT CONDITIONS	DESCRIPTION OF TEST
10. TP13 (24) to TP3 (8)	**a.** - 28.5 VDC +/- 1%. Test performed with open circuit.	Checks output volts set by R109 (15) in 28 VDC mode
TP13 (24) to TP3 (8)	**b.** - 14.3 VDC +/- 1%. Test performed with open circuit.	Checks output volts set by R110 (27) in 14 VDC mode
* TP3 (8) and TP15 (21) are the same common point of the supply.		
11. TP20 (25) to TP3 (8)	**a.** 6 +/- .5 VDC. Test performed with open circuit.	Checks R60 (14) overload current trip-out setting
12. TPL (26) to TP3 (8)	**a.** 002V. Test performed with open circuit, not tripped.	Checks trip-out light (Q10) and circuit functioning.
	b. 12 to13 VDC. Test performed with open circuit, tripped.	Checks trip-out light (Q10) and circuit functioning.

Test Value and Comment Tabulation
(For PC Boards Numbers 180893 and 180893A)
Figure 2, Sheet 2

Section 3 Schedule Maintenance

1) General

To be certain the DC power supply set is ready for operation at all times, it must be inspected and maintained systematically so that defects may be discovered and corrected before they result in serious damage or failure of the equipment. Defects discovered during operation of the unit should be noted for correction and be made as soon as operation has ceased.

WARNING

HIGH VOLTAGE - electric shock can kill! Be certain the input power source is turned off before proceeding with canopy removal and inspection or maintenance operation, which could bring personnel in contact with high voltage or revolving equipment. Stop operation immediately if a possible dangerous fault is discovered. The front panel input contactor switch does not remove input power from all components. Be sure capacitors are discharged before you touch.

The power supply is designed to be as maintenance free as possible; therefore, there are few inspection and maintenance requirements.

2) Inspection

A periodic inspection schedule should be established and maintained. A suggested inspection/check schedule is provided in Section 3-1, Figure 1; however, it may be changed as required to meet varying operating conditions and environment. See Chapter 2, Overhaul/Major Repair for inspection and check procedures to be used in conjunction with Section 3-1, Figure 1.

3) Lubrication

The subject of lubrication is mentioned here mostly to inform maintenance personnel that it has not been overlooked. No lubrication is required, except for the fan motor.

A good silicone spray lubricant is recommended for hinges, if exposure to weather should make them difficult to operate.

NOTE: The fan motor incorporates a sleeve bearing, and therefore will need periodic lubrication. The following table will furnish a recommended guide as to the frequency of this lubrication.

Type of Duty	Lubrication Interval
Light (up to 6 hours/day)	Every 12 months
Moderate (7 to 15 hours/day)	Every 6 months
Heavy Duty (16 to 24 hours/day)	Every 3 months

4) Parts Replacement

a) Minor electrical components

(1) Lamps and fuses are mortality type items that require simple periodic replacement.

(2) Switches, meters, contactors, and fan motor in the power supply fall into the category of parts, which can be expected to fail at infrequent, irregular intervals. Instructions for repair and replacement of these parts are obvious. Be certain the input power is turned off. Obtain the replacement part specified in the parts list (Chapter 4). Replace the part by substituting the new part for the old, taking care not to mix up the leads.

(3) Power input fuses must be the proper amperage for the input voltage. See the fuse rating for your input as listed in Section 1-2, Figure 1. Be certain your specification number is designed for your input voltage. No visible inspection is possible, except for the marked rating if the input power source is off. The use of the wrong fuse or the wrong input voltage could be the cause for input fuse failure or equipment damage. Other causes of the input fuse failure can be a faulty main transformer, shorted SCR devices, shorted filter capacitor, shorted or grounded components or leads in the power circuit, abuse of the equipment caused by excessive load or use with a too small sagging input power supply.

b) Major Electrical Components

(1) Major electrical components such as the power transformer, filter choke, and SCR devices on the SCR heat sink assembly should be replaced or repaired at an overhaul type facility.

(2) The firing circuit board can be easily replaced as a “plug-in” assembly. Minor calibration adjustment may be required for optimum performance. It is recommended, however, that this adjustment be made only by factory authorized personnel.

(3) The fly-back rectifier diode located on the main SCR heat sink assembly rarely fails from normal us. If replacement is ever required, be sure to connect the replacement exactly as the original after torque wrench tightening the nut to the stud at 4.2 to 5.2 ft-lb. (5.70 to 7.05 N-m).

(4) SCR device replacement requires extreme care, special tools, and the exact replacement part and technique for optimum performance. The replacement of the SCR should be done at the factory or by an authorized repair facility. A replacement SCR bridge subassembly can be obtained from the factory that would allow the customer to perform the installation, so long as he was certain to exactly replace all leads and components in the same position with the same hardware. This task would still require considerable care and time.

Chapter 3 Overhaul / Major Repair / Inspection

Unscheduled Repair

1) General

Repair of the GPU400 DC power supply will consist primarily of parts replacement. Most of the components used in the GPU400 DC power supply cannot be disassembled and repaired, and must be replaced if faulty. Additionally, inoperative PC boards cannot be repaired in the field, but must be replaced as a complete unit. PC boards may be returned to the factory for replacement. Contact Hobart Brothers service for parts and replacement instructions.

2) Service Information and Factory Repair

Questions concerning the operation, repair, and/or servicing of this converter should be directed to the Service Department of Hobart Ground Power. When making such an inquiry, be sure to provide the service department with the model number, serial number, and approximate date of receipt of the unit. If it is deemed necessary to return the unit to the factory for servicing, contact the Service Department for authorization. It is rarely necessary to return a failed converter since the unit uses plug-in type assemblies throughout its systems. For warranty information, refer to the warranty statement on the back of the cover page of this manual or contact the Hobart Service Department.

When ordering parts from your Hobart Ground Power Distributor, be sure to include all pertinent information from the unit's identification plate: Specification No., Model No., and unit rating.

If you have any questions concerning your Hobart Ground Power equipment, immediately contact our Service Department by mail, telephone or FAX.

Write:	Hobart Brother Company Ground Power Division Service Department 1177 Trade Square East Troy, Ohio 45373 U.S.A.
Call Inside U.S.A.:	(800) 422-4166 (Parts) (800) 422-4177 (Service)
Call From Foreign Countries:	(937) 332-5050 (Parts) (937) 332-5060 (Service)
FAX Inside U.S.A.	(800) 367-4945
FAX From Foreign Countries:	(937) 332-5121
E-Mail :	service@hobartgroundpower.com
Web Page :	www.hobartgroundpower.com

3) Exterior Cables and Connections

a) Input and Output Cables

Observe general condition of power-input cables and equipment output cables. Inspect for cuts and abrasions in the insulation that could cause a short circuit. Visually inspect the output cable plug connector for physical damage and evidence of overheating.

b) Cable Connections

Check all input and output cable connections for tightness and security.

WARNING

HIGH VOLTAGE – electric shock can kill! Turn the source of input power off before removing canopy and checking these connections. Be certain capacitors are discharged before touching the circuitry.

4) Controls and Instruments

a) Voltmeter, Ammeter and Control Switches

Abuse, shipping, and type of use can damage these components. Observe these instruments at each "start-up" to verify they are operating. If one of the meters is suspected of being inaccurate, check it against a master, or test instrument. Replace any faulty or intermittently faulty switches immediately.

b) Indicating Lights

(1) Power input and output lights

Life of incandescent bulbs varies with the magnitude of voltage and vibration. Check the lamps (bulbs) in these lights by substituting a known good replacement lamp. If the lights do not glow after the replacement, the circuitry is defective and should be repaired. If the proper voltage reaches the base terminals, replace the base; if not correct the wiring fault.

(2) Overload trip indicating light

More than 31.5 V DC output, over-current, or overheated heat sink trips overload trip light DS2. The light emitting diode circuit resets when S1 power on switch is cycled off and back on after the cause of the trip has been removed. The LED light does not fail in normal use. Applying reverse voltage or over-voltage to it during a test would be a more probable cause for failure, therefore applying a direct test is not recommended. A bad light does not come on during a trip.

c) Control Thermostats

The fan thermostat is open until operating temperature is reached. If the fan comes on immediately on a cold unit, the thermostat is probably shorted. If the fan fails to come on before the S5 overload thermostat trips open, the fan thermostat is faulty or the wiring is opened. If the fan does not run and 115 V AC is provided at both terminals of the thermostat, the fan is bad.

The S5 overload thermostat must be closed in order for the DS2 overload light not to be on during equipment turn-on. If AC power input is disconnected, verify continuity exists between the two S5 terminals with the leads to one of the terminals disconnected. If a severe overload causes excessive heating without overload trip-out of the DS2 overload light, replace the S5 thermostat if the wiring terminals on the S5 thermostat are not shorted.

d) Starting Current Limit Potentiometer

If the R13 starting current control has no effect on the output current above 150 A DC, check the integrity of the R13 potentiometer before replacing the solid state control board. With input power off and the R13 potentiometer slider terminal disconnected from the wiring, the resistance to the slider terminal from each end of the potentiometer should change smoothly as the knob is turned. If not, replace the potentiometer and retest. If re-testing shows no change, the printed circuit control board is probably faulty also.

e) Contactors

(1) Output Contactor, K2

The output contactor has contacts that can be visually inspected whenever the input power is removed from the power supply. If the contacts are badly burned the contactor should be replaced as soon as possible. Slightly pitted and burned contacts can be cleaned up with a commercial contact cleaner and very fine-grained emery cloth or equivalent. If application of 28 V DC to the coil of the K2 contactor does not make the normally open contacts close completely or the normally open contacts open completely, the contactor should be replaced if the contact mechanism can't be mechanically adjusted for proper operation.

(2) Input Contactor, K1

If input power has been turned off at the source of power, the K1 input contactor contacts can be visually inspected by removing the two screws holding the contact cover in place. If the contacts are badly eroded, burned, or stuck, the replacement contacts and spring for each pole can be ordered with the number given in the applicable replacement parts list. If the contactor with DS1 light on has failed to pick up before the inspection, and no mechanical obstruction has been found, the contactor should be replaced or repaired with the replacement coil and contacts specified in the parts list. Many customers prefer to replace the whole contactor, especially for the condition showing bad coil and contacts. If DS1 light is good but does not glow and the F8 fuse checks good, the problem is in the control transformer circuit.

f) Power Input Fuses

The power input fuses must be the proper amperage for the input voltage. See the fuse rating for your input power as listed in Section 1-2, Figure 1. Be certain your specification number is designed for your input voltage. No visible inspection is possible, except for the marked rating if the input power source is off.

The use of the wrong fuse or the wrong input voltage could be the cause for input fuse failure or equipment damage. Other causes of the input fuse failure can be a faulty main transformer, shorted SCR devices, shorted filter capacitor, shorted or grounded components or leads in the power circuit, abuse of the equipment caused by excessive load or use with a too small sagging input power supply.

	As required	Daily 8 hrs.	1 month 200 hrs.	3 months 600 hrs.	6 months 1200 hrs.
*** EXTERIOR CABLES**					
Inspect equipment		X			
Inspect AC input cables		X			
Check cable connections (internal)					X
*** CONTROLS AND INSTRUMENTS**					
Check voltmeter functioning	X				
Check ammeter functioning	X				
Check fan thermostat operation		X			
Check indicating lights		X			
Check starting current limit functioning			X		
Check overload thermostat					X
Check printed circuit control board				X	
Check all output contactor contacts					X
Check power input contactor contacts					X
Check voltmeter & ammeter accuracy					X
Check all wiring and connections					X
Inspect and clean general (light duty)					X
Inspect and clean general (severe duty)				X	

*Suspicious performance occurrence override timetable given.

Inspection/Check Schedule
Figure 1

5) Major Components Check and Repair

a) Main Power Transformer

No replacement parts are available for the main transformer. The replacement power transformer part number for your specification number is given in the replacement parts list in Chapter 4. This part and most of the major component parts can best be replaced at the factory or by a factory authorized repair facility. However, replacement can be done by the customer if he exercises care to reconnect everything to the same points and in the same manner as the original part.

WARNING

HIGH VOLTAGE – electric shock can kill! Turn the source of input power off before removing canopy and checking these connections. Be certain capacitors are discharged before touching the circuitry.

Normally, a visual inspection will not find a transformer problem until the failure is very severe. The typical inspection is a voltage measurement test for rated primary input voltage and for six (6) rated and balanced line to neutral AC voltages at the transformer secondary terminals. Refer to the applicable voltage changeover diagram for the input voltage test points and to the applicable connection diagram for the transformer secondary test connection points. The normal transformer line to neutral secondary voltage is approximately 33 V AC with no output amperage. Line to line voltage on the secondary is 66 V. If the line input fuses blow immediately and no evidence of lead shorting exists at the fuse block, input contactor, or the primary connection terminal board, both the main transformer and the SCR control assembly are suspect. Open the input disconnect switch external to the power supply, label all the transformer leads going to the six U-shaped SCR heat sinks before disconnecting and insulating the leads. Also disconnect the fly-back diode “pigtail” lead and L1 filter lead. These connection changes enables you to check the transformer only.

After verifying that input power can be turned on from the power source safely, turn the rated input power on. After the S1 input contactor switch is closed carefully measure the output line to neutral voltages if the primary input is still on. If the input fuses blow on turn on or the input power source voltage trips out before the input fuses blow, the main transformer has probably failed. To verify failure, disconnect the input power at the power source and then remove the copper links (jumpers) on the main voltage changeover board. If turning the primary input voltage on, after the fuses have been verified good and any input breakers at the power source have been reset, results in no high input current than the main transformer is bad.

If the problem still exists, the problem is not in the main transformer. Check the main connection terminal board for faulty connections and check the control transformer, input contactor, and the leads connecting them to the power input fuse holders for short circuits. Go to paragraph 5, b if no problem existed with all the SCR devices disconnected.

b) Silicon Controlled Rectifier Assembly and Fly-back Diode

(1) Visual

No visual failure capability is possible with the SCR assembly, except for faulty leads or misconnection that we assume have been found and corrected. The input power at the power source should be turned off at the start of the SCR check out.

(2) Voltmeter

To check with voltmeter, set the meter to the RX1 scale and check for a shorted SCR by measuring between each of the 6 U-shaped heat sink and the main heat sink. No reading should be possible with either polarity of lead connection. The fly-back diode should read 4 to 14 ohms in one direction and a very high reading with the leads from the voltmeter reversed.

If the fly-back diode is shorted, (a rare occurrence) replace it with the same type of device (see Chapter 4) taking care to torque the nut to the stud with 4.2 to 5.2 ft-lb. (5.7 to 7.05 N-m). If the SCR bridge has one or more SCR devices showing a short circuit or low ohmmeter reading, it is recommended that the GPU400 power supply be sent to the factory or an authorized repair station for repair. A replacement SCR bridge subassembly can be obtained from the factory that would allow the customer to replace the faulty SCR bridge assembly without special tools and techniques. He must still be careful to exactly replace all the mounted subassemblies and the connection leads exactly as they were on the faulty heat sink assembly. Special tools, parts, and techniques are required to replace single SCR devices on the heat sink assembly.

If the SCR heat sink and diode assembly checks good with the voltmeter, the components could still be failing due to voltage breakdown at voltages above that of the voltmeter. Go to 4-b.

(3) Voltage Test for SCR Assembly

With input power turned off, reconnect one SCR device at a time and apply power until the input power is interrupted by a fault condition or all the SCR devices are connected. The last SCR device to be connected before interruption is faulty. If no fault occurred, the SCRs are all good. The input power should be turned off and the fly-back diode mounted on the SCR heat sink should have the pigtail lead reconnected. If reapplication of power causes a trip-out, replace the faulty fly-back diode. The diode nut must be torqued to 4.2 to 5.2 ft-lb. (5.7 to 7.05 N-m). If no failure occurred, go to paragraph 4, c. after turning input power off.

c) Filter Choke and Capacitor Voltage Test

Reconnect L1 Filter Choke lead to the proper point as shown in the connection diagram. Visually check the C15, C16, and C17 capacitors for indication of a faulty connection which could cause the problem.

WARNING

Capacitor charge can injure! Be sure capacitors are discharged before touching output circuitry. Stay clear of capacitors during testing. They can burst.

Reapply input voltage. If trip out occurs, either the C15, C16, or C17 capacitors are shorted or the bus bars are shorted. Disconnect the input voltage, allow the capacitors time to discharge, and disconnect the positive and negative bus bars from the capacitor assembly. Replace any shorted or bad capacitors (having case deformation caused by high shorting amperage). If the capacitors don't check shorted or have signs of excess heating, check the (+) and (-) bus bars for low resistance between them. If low, a wiring fault exists between the bus bars and the output terminals. Repair as required. If the problem is found to be the L1 filter choke breaking down to ground, another grounded component must be present on the (+) side for the high current output to cause the trip out to occur. Check for the second grounded component also.

d) Printed Circuit Control Board

The best, most quick way to verify condition of a suspected printed circuit board is to exchange it for a known good one. This plug-in substitution method, using a known good board, also allows the equipment to go back on line immediately while the faulty board is sent back to the factory for repair or replacement. Field repair is not recommended.

Before assuming the board is faulty, and there is no spare board, perform the following checks:

(1) Check for blown fuses F2 through F7 and replace bad ones for a retest under power. If unit now works, the problem may be solved or the problem may be an intermittent one. Keep a record of which fuse blew for later assistance.

(2) Check for broken or shorted leads on or to plugs J1, J2, and J3 plugged into the printed circuit control board. Use the applicable schematic and connection diagrams for instructions and lead locations.

(3) Check snubber printed circuit boards on the left side of the SCR heatsink assembly for shorted or broken leads and for signs of overheating.

(4) Check the SCR gate leads for breaks or short circuits and correct any problems found before retesting.

(5) If the reason the control board is being checked, and no substitute board exists, is insufficiency of output voltage with proper AC secondary voltage at the main transformer. Check for proper board voltages (See Section 2-2), if no oscilloscope is available. If the readings are good, the problem may be one or more open SCR devices. The best test equipment is an oscilloscope but the use of a crude SCR tester with the input power off can verify open SCR devices but not hard to fire ones. One type of SCR turn-on tester is a battery power circuit tester with a light bulb in series with the battery and two leads. With input power off, the positive lead is connected to the anode of the SCR under test and the negative lead is connected to the cathode of the same SCR device. The light should stay off until the gate lead of the same SCR has the positive voltage applied to it. If the light turns on and remains on after the gate lead voltage is removed so long as the anode and cathode leads stay connected, the SCR is probably good. If the SCR stops conducting as soon as the gate lead is removed, open anode to cathode, a faulty SCR is probable. If any SCR devices are found to be faulty, the printed circuit board may not be faulty unless the voltages (See Section 2-2) on the control board test aren't achievable. Then both components may be faulty.

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Chapter 4 Illustrated Parts List

Section 1 Introduction

1) General

The Illustrated Parts List identifies, describes, and illustrates main assemblies, subassemblies, and detail parts of your ground power unit manufactured by Hobart Ground Power, Troy, Ohio.

2) Purpose

The purpose of this list is to provide parts identification and descriptive information to maintenance and provisioning personnel for use in provisioning, requisitioning, purchasing, storing, and issuing of spare parts.

3) Arrangement

Chapter 4 is arranged as follows:

Section 1 - Introduction
Section 2 - Manufacturer's Codes
Section 3 - Illustrated Parts List
Section 4 - Numerical index

4) Explanation of Parts List

a) Contents

The parts list contains a breakdown of the equipment into assemblies, subassemblies, and detail parts. All parts of the equipment are listed except:

(1) Standard hardware items (attaching parts) such as nuts, screws, washers, etc., which are available commercially.

(2) Bulk items such as wire, cable, sleeving, tubing, etc., which are also commercially available.

(3) Permanently attached parts, which lose their identity by being welded, soldered, riveted, etc., to other parts, weldments, or assemblies.

b) Parts List Form

This form is divided into six columns. Beginning at the left side of the form and proceeding to the right, columns are identified as follows:

(1) FIGURE-ITEM NO. Column

This column lists the figure number of the illustration applicable to a particular parts list and also identifies each part in the list by an item number. These item numbers also appear on the illustration. Each item number on an illustration is connected to the part to which it pertains by a leader line. Thus the figure and item numbering system ties the parts lists to the illustrations and vice versa. The figure and index numbers are also used in the numerical index to assist the user in finding the illustration of a part when the part number is known.

(2) HOBART PART NUMBER Column

All part numbers appearing in this column are Hobart numbers. In all instances where the part is a purchased item, the vendor's identifying five-digit code and his part number will appear in the "NOMENCLATURE" column. Vendor parts, which are modified by Hobart, will be identified as such in the "NOMENCLATURE" column. In case Hobart does not have an identifying part number for a purchased part, the "HOBART PART NUMBER" column will reflect "No Number" and the vendor's number will be shown in the "NOMENCLATURE" column. Parts manufactured by Hobart will reflect no vendor or part number in the "NOMENCLATURE" column.

(3) NOMENCLATURE Column

The item identifying name appears in this column. The indenture method is used to indicate item relationship. Thus, components of an assembly are listed directly below the assembly and indented one space. Vendor codes and part numbers for purchased parts are also listed in this column when applicable. Hobart modification to vendor items is also noted in this column.

(4) EFF (Effective) Column

This column is used to indicate the applicability of parts to different models of equipment. When more than one model of equipment is covered by a parts list, there are some parts that are used on only one model. This column is used for insertion of a code letter A, B, etc., to indicate these parts and to identify the particular model they are used on. Since this manual covers only one generator set specification, this column is not used in this manual.

Parts coded "A" are usable on Part Number 500160-401 only.

Parts coded "B" are usable on Part Number 500160-402 only.

Parts coded "C" are usable on Part Number 500160-403 only.

(5) UNITS PER ASSEMBLY Column
This column indicates the quantity of parts required for an assembly or subassembly in which the part appears. This column does not necessarily reflect the total used in the complete end item.

Section 2 Manufacturer's Codes

1) Explanation of Manufacturer's (Vendor) Code List

The following list is a compilation of vendor codes with names and addresses for suppliers of purchased parts listed in this publication. The codes are in accordance with the Federal Supply Codes for Manufacturer's Cataloging Handbook H4-1, (CAGE CODES) and are arranged in numerical order. Vendor codes are inserted in the nomenclature column of the parts list directly following the item name and description. In case a manufacturer does not have a code, the full name of the manufacturer will be listed in the nomenclature column.

Code	Vendor's Name and Address	Code	Vendor's Name and Address
00779	Amp Inc. 2800 Fulling Mill Rd. P.O. Box 3608 Harrisburg, PA 17105-3608	0HZP9	Diesel Radiator Co. 1985 Janice Ave. Melrose Park, IL 60160
01428	Tuthill Corp. Superior Linkage Div. 2110 Summit St. New Haven, IN 46774-9524	0H8R0	Magnetics 200 10TH St. P.O. Box 391 Butler, PA 16003-0391
016T7	Amaton Inc. 446 Blake St. New Haven, CT 06515	0MR72	Power Devices Inc. 26941 Cablot Rd Suite 124 Laguna Hills, CA 92653-7006
01989	Dana Corp Weatherhead Div U.S. 24 E. Antwerp, OH 45813	1AA44	Collmer Semiconductor Inc. C/O NA-NA Co. 14368 Protopn Rd. Dallas, TX 75244-3511
02660	Amphenol Corp. 720 Sherman Ave Hamden, CT 06514-1146	1DG36	E. M. Products Inc. 220 W. 90th St. Minneapolis, MN 55420
02768	Illinois Tool Works Inc. Fastex Division 19 S. Algonguin Rd. Des Plaines, IL 60016	1E045	Austin Hardware and Supply Co. 10220 E. 65TH St. P.O. Box 9550 Kansas City, MO 64133-5205
05277	Westinghouse Electric Company Semiconductor Division Hill Street Youngwood, PA 15697	1E222	Furnas Electric Co. Richmond, VA 23200
054W1	Talema Electronic Inc. 3 Industrial Park Dr. P.O. Box 306 Saint James, MO 65559	1W134	Eaton Corp. 4201 N. 27TH Ave. Milwaukee, WI 53216-1807
05YB3	Acon Inc. 22 Bristol Dr. South Easton, MA 02375	13445	Cole-Herse 20 Old Colony Ave. Boston, MA 02127

Code	Vendor's Name and Address
13902	Smith Valve Corp. 1 Apple HL Suite 316 Natick, MA 01760-2072
14552	Microsemi Corp 2830 S. Fairview St. Santa Ana, CA 92704-5948
14799	Square D Co. Chicago Assembly Plant 9522 W. Winona Schiller Park, IL 60176-1025
14604	Elmwood Sensors, Inc. Subsidary Fasco Ind. 1655 Elmwood Avenue Cranston, RI 02907
16238	Lord Mfg. Co. Inc. Sterling Road South Lancaster, Mass 01561
16476	Datcon Instrument Co. P.O. Box 128 East Petersburg, PA 17520
18265	Donaldson Co. Inc. 1400 W. 94th St. P.O. Box 1299 Minneaplis, MN 55440-1299
2B928	Barber Colman Co. Pasadena, TX 77501
2N562	Power Transmission Sales Inc. 351 Washington P.O. Box 229 Chagrin Falls, OH 44022-4446
23826	Furnas Electric Company 1004 McKee Street Batavia, IL 60510
24446	General Electric Co. 3135 Easton Tpke. Fairfield, CT 06431
25710	Deka Plastics Inc. 914 Westfield Ave. Elizabeth, NJ 07208-1222
26794	Connectron Inc. 12 Industrial Dr. South Amboy, NJ 08879
27410	Harris Corp. 1025 Nasa Blvd. Melbourne, FL 32919
28520	Heyco Molded Products Inc. 1800 Industrial Way N. P.O. Box 517 Toms River, NJ 08755
3A054	McMaster Carr Supply Co. 9630 Norwalk Blvd. Santa Fe Springs, CA 90670-2932
30104	Automotive Controls Corp. 1300 W. Oak St. P.O. Box 788 Independence, KS 67301-2347
30327	Imperial Eastman Corporation 6300 W. Howard Street Chicago, IL 60648
30430	Marathon Electric Mfg. Corp. 398 Beach Rd. Burlingame, CA 94010-2004
38151	Marathon Electric Mfg. Co. 100 E. Randolph St. P.O. Box 8003 Wausau, WI 54401-2568
40121	Peterson Mfg. Co. Inc. 700 W. 143rd St. P.O. Box 8 Plainfield, IL 60544-9733
41197	Modine Manufacturing Company 1500 Dekoven Avenue Racine, Wisconsin 53401

Code	Vendor's Name and Address
44655	Heico Ohmite LLC 3601 W. Howard St. Skokie, IL 60076-4014
49234	Protectoseal Company 1920 S. Western Chicago, Illinois 60608
5P059	Tech Products Corp. 2348 Sandridge Dr. Dayton, OH 45439
50508	Magnetic Components Inc. 9520 Ainslie St. Schiller Park, IL 60176-1116
55752	Parker Hannifin Corp. Racor Div. 3400 Finch Rd. Modesto, CA 95353-3208
56289	Sprague Electric Company 87 Marshall St. North Adams, MA, 01247
57347	Wall Industries Inc. 5 Watson Brook Rd. Exeter, NH 03833
57448	Stephens & Adamson Mfg. Company 275 Ridgeway Avenue Aurora, Illinois 60507
57733	Stewart-Warner Corporation 1826 Diversey Parkway Chicago, Illinois 60614
6H359	Hobbs Div., of Stewart Warner Corp. Highway 6 Spring Valley, IL 61362
6Y440	Micron Technologies Inc. 8000 S. Federal Way Boise, ID 83707
61706	EAO Switch Corp. 198 Pepes Farm Rd. P.O. Box 552 M O Milford, CT 06460-3670
66180	Automatic Timing and Controls 3312 Bloomingdale Melrose Park, IL 60160-1030
66844	Powerex Inc. E. Hillis St. Youngwood, PA 15697-1176
62292	EBM Industries Inc. 110 Hyde Rd. P.O. Box 4009 Farmington, CT 06034-4009
67529	All-Phase Electric Supply Co. 875 Riverview Dr. P.O. Box 67 Benton Harbor, MI 49022-0067
7M613	Wright F.B. Co. of Cincinnati 4689 Ashley Dr. Hamilton, Oh 45011-9706
71400	Bussman Manufacturing Division of McGraw-Edison Company 114 Old State Road St. Louis, MO 63178
71774	General Electric Corp. Lamp Division 4433 N. Ravenswood Ave. Chicago, IL 60640
72582	Detroit Diesel Corp 13400 W. Outer Dr. Redford, MI 48239-4001
72619	Amperex Electronic Corp. Dialight Division 203 Harrison Place Brooklyn, NY 11237
74829	Ilsco Corp. 4730 Madison Rd. Cincinnati, OH 45227-1426

Code	Vendor's Name and Address
77166	Pass and Seymour P.O. Box 4822 Syracuse, NY 13221
74542	Hoyt Electrical Instruments P.O. Box 8798 Penacook, NH 03303
74545	Hubbell Harvey Inc. 584 Derby Milford Rd. Orange, CT 06477
75418	Kysor Industrial Corporation 1100 W. Wright Street Cadillac, Michigan 49601
77342	Potter and Brumfield Inc 200 S. Richland Creek Dr. Princeton, IN 47671-0001
79497	Western Rubber Co. 620 E. Douglas Goshen, IN 46526-4035
81074	Holub Industries, Inc. 413 DeKalb Avenue Sycamore, Illinois 60178
81703	Mulberry Metal Products Inc. 2199 Stanley Terrace Union , NJ 07083
86797	Rogan Corp 3455 Woodhead Dr. Northbrook, IL 60062-1812
90201	Emhart Ind., Inc. Mallory Capacitor Co. 4760 Kentucky Ave. Indianapolis, IN 46206
91637	Dale Electronics Inc. 1122 23RD St. Columbas, NE 68601-3647
91929	Honeywell Inc. Microswitch Div. 11 W. Spring St. Freeport, IL 61032
94222	Southco Inc. 210 N. Brinton Lake Rd. Concordville, PA 19331
97520	Basler Electric Company Route 143 P.O. Box 269 Highland, IL 62249
D0024	Semikron International Sigmundstrasse 200 P.O. Box 820251 Nuerengerg, Germany 90253
E0615	Kraus and Naimer 42 Miramar Avenue P.O. Box 15-009 Wellington, New Zealand
S7023	Bossard LTD Fasteners Steinhauserstrasse 70 Zug Switzerland, CH-6300

Section 3 Illustrated Parts List

1) Explanation of Parts List Arrangement

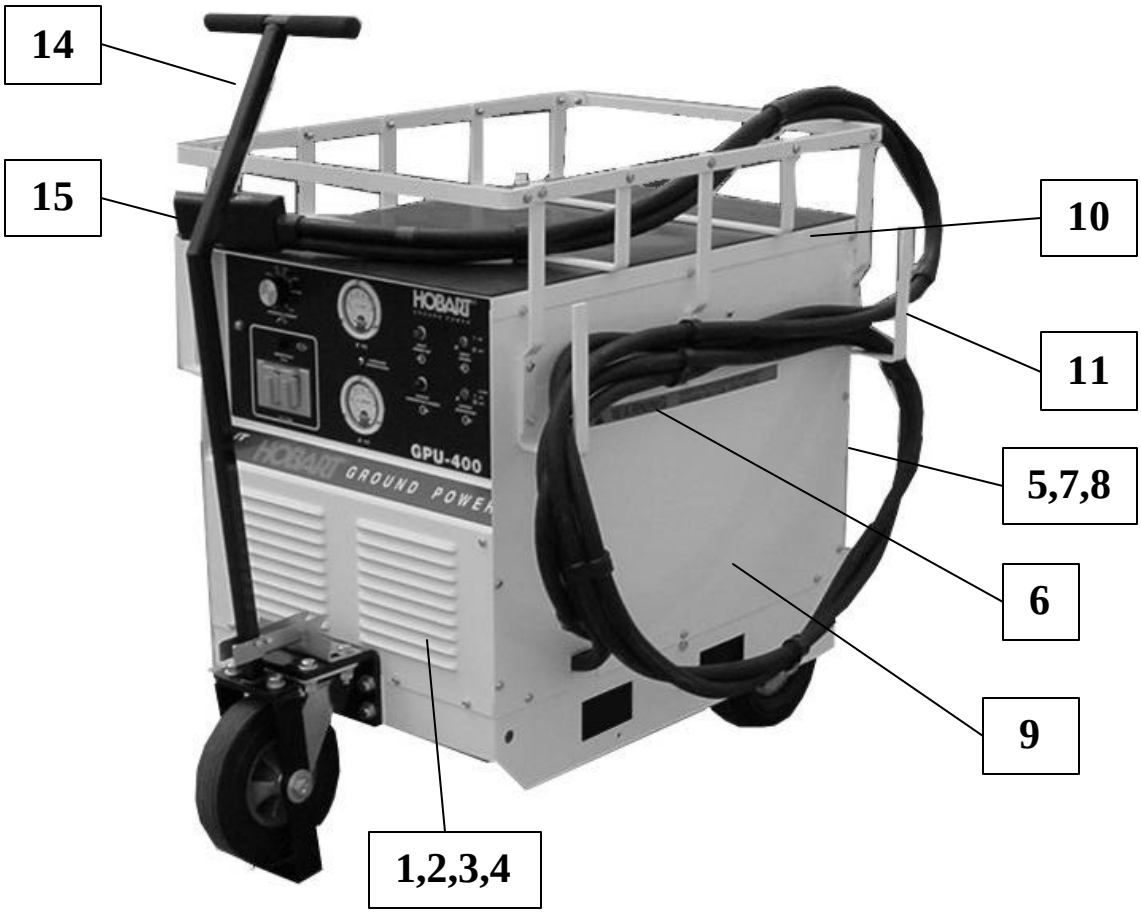
The parts list is arranged so that the illustration will appear on a left-hand page and the applicable parts list will appear on the opposite right-hand page. Unless the list is unusually long, the user will be able to look at the illustration and read the parts list without turning a page.

2) Symbols and Abbreviations

The following is a list of symbols and abbreviations used in the parts list:

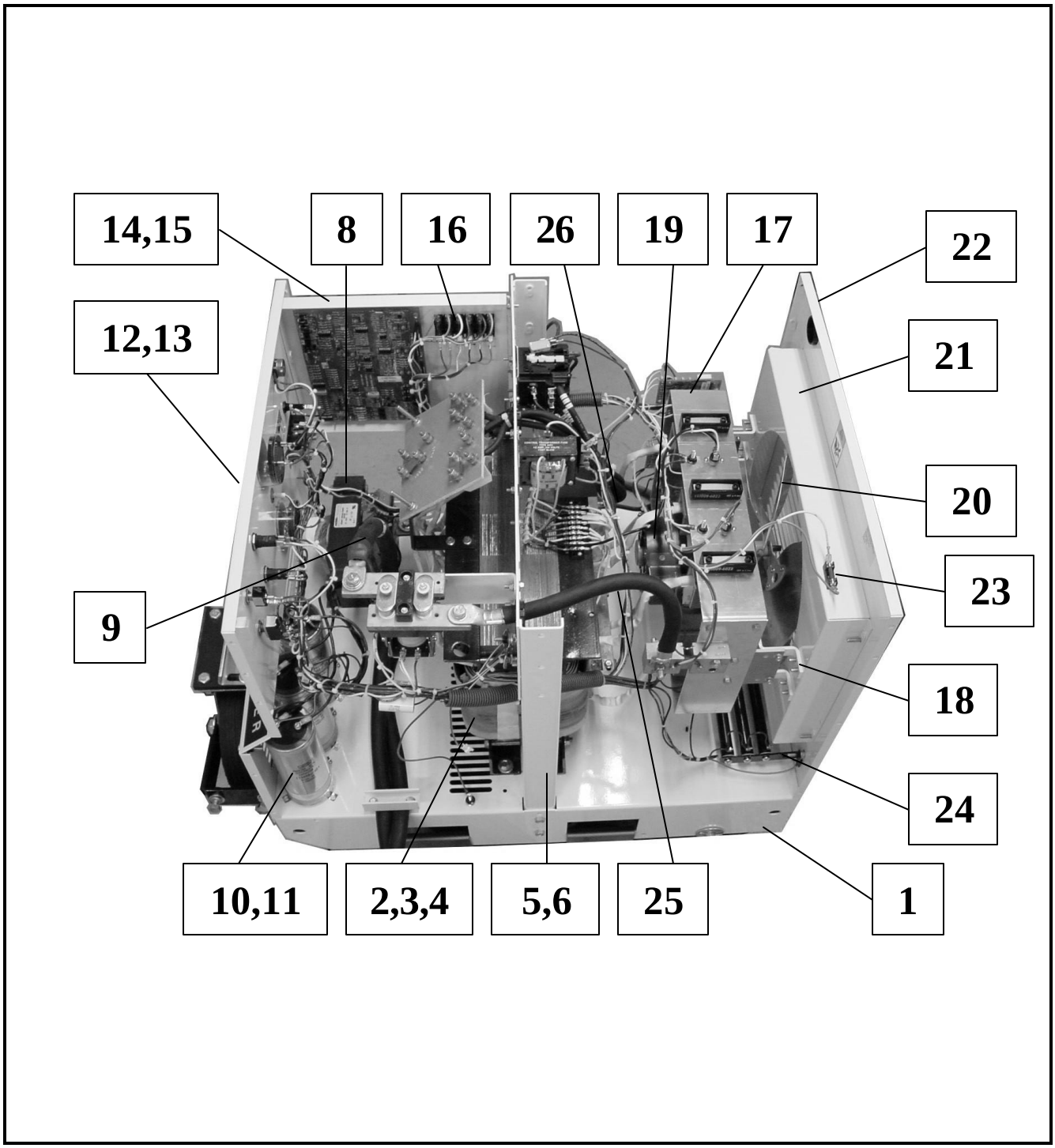
*	-	Item not illustrated
A, or AMP	-	Ampere
AC	-	Alternating current
AR	-	As required
DC	-	Direct current
Fig.	-	Figure
Ft-lb.	-	Foot-pounds
Hd.	-	Head
Hex	-	Hexagon
Hz	-	Hertz (cycles-per-second)
I.D.	-	Inside diameter
IN	-	Inch
KVA	-	Kilovolt-ampere
UF	-	Microfarad
Number	-	Number
NHA	-	Next higher assembly
N-m	-	Newton-meters
PRV	-	Peak reverse voltage
PSI	-	Pounds per square inch
Ref	-	Reference (the item has been listed previously)
TM	-	Technical Manual
T-R	-	Transformer-rectifier
V	-	Volt (when used as a prefix to a five-digit number, indicates vendor code)

NOTE: An item which does not reflect an index number is an assembly which is not illustrated in its assembled state, or it is similar (right-hand, left-hand, top, etc.) to an item which is illustrated.



Final Assembly of GPU-400 Power Supply
Figure 1

FIGURE ITEM NO.		HOBART PART NO.	NOMENCLATURE	EFF	UNIT PER ASSY.
1 -	1	500160-401	GPU 400, 60 Hz, 208/230/460 VAC	A	1
	2	500160-402	GPU 400, 50 Hz, 220/380 VAC	B	1
	3	500160-403	GPU 400, 60 Hz, 230/460/575 VAC	C	1
	4	500160-412	GPU 400, 50 Hz, 220/380 VAC	D	1
*	5	78B1130	Nameplate, Identification		1
	6	282658	Label, Warning Clearance		1
*	7	286441	Label, General		1
*	8	283533	Label, Service		1
	9	288267	Panel, Side		2
	10	288266	Panel, Top		1
	11	283323	Bracket, Cable Hanger		4
		288357-1	…Screw, 1/4-20 X 1.0 Lg., HWH, Taptite, SST		32
		287091-1	…Washer, 1/4, Flat, Nylon		32
		W11114-16	Screw, 1/4-20 X 1.25 Lg., Pan Head		3
		288323-2	…Nut, 1/4-20, Hex, Serrated Flange		3
		W11242-5	…Washer, 1/4, Flat, St.		3
		287091-1	…Washer, 1/4, Flat, Nylon		3
		288324-2	…Nut, 1/4-20, Hex, Conical		3
*	12	288362-1	Cover, Protective, Changeover Board	A,C	1
*	13	288362-2	Cover, Protective, Changeover Board	B,D	
		288324-2	…Nut, 1/4-20, Hex, Conical		4
		287091-1	…Washer, 1/4, Flat, Nylon		4
	14	288356	Handle, Ay.		1
		W11100-3	…Screw, 1/2-13 X 1.25 Lg., Hex Head		2
		DW458	…Washer, 1/2, Flat, St.		2
		W11254-8	…Washer, 1/2, Lock, Std.		2
	15	402025-2	Cable, Output, 28 V , 20 ft *[Other Lengths Available]*		1
*	16	287460	Label, Danger, High Voltage	D	1
*	17	288322	Label, Fan	D	1
*	18	288300	Label, Emergency Stop	D	1
*	19	287547-1	Label, CE	D	1

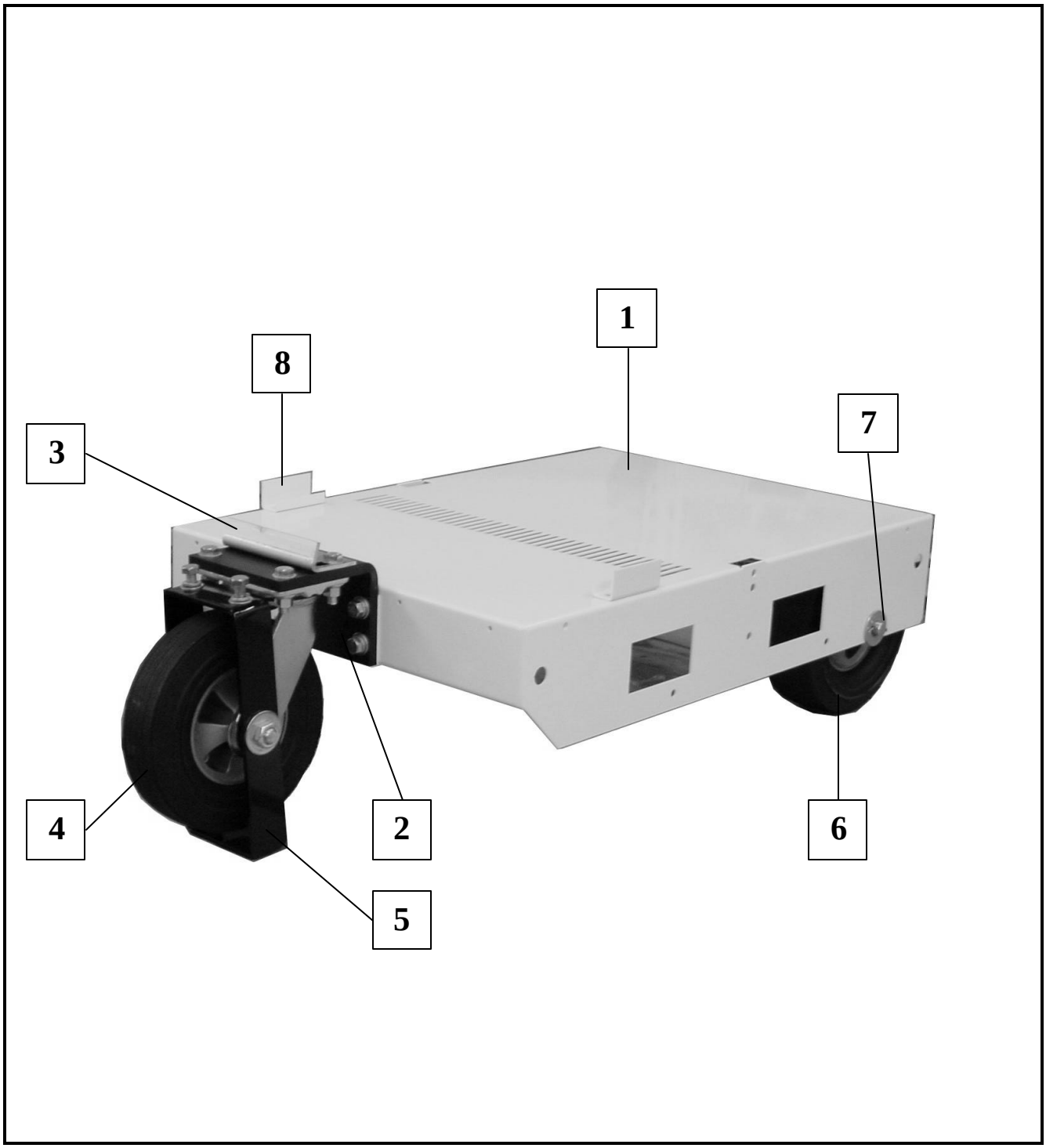


General Assembly of GPU-400 Power Supply
Figure 2

FIGURE ITEM NO.	HOBART PART NO.	NOMENCLATURE	EFF	UNIT PER ASSY.
2 - 1	288321-1	Base, Ay. (See Figure 3)		1
2	488389	Transformer, Power	A	1
3	488078	Transformer, Power	B, D	1
4	489517	Transformer, Power	C	1
	W11475-2	…Screw, 5/16-12 X .75 Lg., Sf-Tap, Type B		4
	W11263-6	…Washer, $^3/_8$, IET		1
	W11242-18	…Washer, $^3/_8$, Flat, St.		4
5	288310-1	Panel, Interior, Ay. (See Figure 5)	A	1
6	288310-2	Panel, Interior, Ay. (See Figure 5)	B, C	1
	288310-5	Panel, Interior, Ay. (See Figure 5)	D	1
	400852-1	…Screw, $^3/_8$-12 X .88 Lg., SF-Tap		4
7	288401	Baffle, Air, Transformer [Not Shown]		1
	402321-1	…Screw, ¼-20 X .50 Lg., Hex, Taptite		3
8	487952	Choke, Ay.		1
	W11236-2	…Screw, ¼-20 X .63 Lg., Sf-Tap, Type F		3
9	180068	Shunt		1
	W11097-7	…Screw, $^3/_8$-16 X 2 Lg., HHC, St.		4
	W11242-10	…Washer, $^3/_8$, Flat, St.		4
	288234-4	…Nut, $^3/_8$-16, Hex, Conical		4
10	405278-7	Capacitor, ALS, 115000 MF, 4 VDC	A, C	3
		V56289, # 36DX772F200DF2A		
11	405278-7	Capacitor, ALS, 115000 MF, 4 VDC	B, D	4
		V56289, # 36DX772F200DF2A		
	350488-94	…Insulator, Mylar, .014, 2” Wide	A, C	3
	350488-94	…Insulator, Mylar, .014, 2” Wide	B, D	4
	361052-9	…Clamp, Mounting, Capacitor (*V90201, # Vr12)*	A, C	3
	361052-9	…Clamp, Mounting, Capacitor (*V90201, # Vr12)*	B, D	4
	406931-1	…Screw, #8-32, SF-Tap, Type F	A, C	9
	406931-1	…Screw, #8-32, SF-Tap, Type F	B, D	12
	W11111-4	…Screw, # 8-32 X 1.0 Lg., Pan Hd., Phil, St.	A, C	3
	W11111-4	…Screw, # 8-32 X 1.0 Lg., Pan Hd., Phil, St.	B, D	4
	50MS732-1	…Nut, #8-32, Keps	A, C	3
	50MS732-1	…Nut, #8-32, Keps	B, D	4
12	288307-1	Panel, Front, GPU, Ay. (See Figure 4)	A, C	1
13	288307-2	Panel, Front, GPU, Ay. (See Figure 4)	B	1
	288307-5	Panel, Front, GPU, Ay. (See Figure 4)	D	1
	288357-1	…Screw, ¼-20 X 1.0 Lg., SST		4
	287091-1	…Washer, Flat, Nylon		4
14	288271	Panel, PC Board		1
	402321-1	…Screw, ¼-20 X .50 Lg., Hex, Taptite		2
	W11114-2	…Screw, ¼-20 X .50 Lg., Pan Hd.		1
	W11242-4	…Washer, ¼, Flat, .438 OD		1
	W11254-4	…Washer, ¼, Lock		1
15	180293A	Board, PC, Control, Ay.		1
	404915-1	…Spacer, Pc Board (*V02768, # 217-200-502-06-010)*		6
	405117-2	…Screw, #8-18 X .75, SF-TAP		6
	288541	…Shield, PC Board		1
	W11236-4	…Screw, ¼-20 x .50, HWH		4
	W11242-4	…Washer, ¼, STL.		8

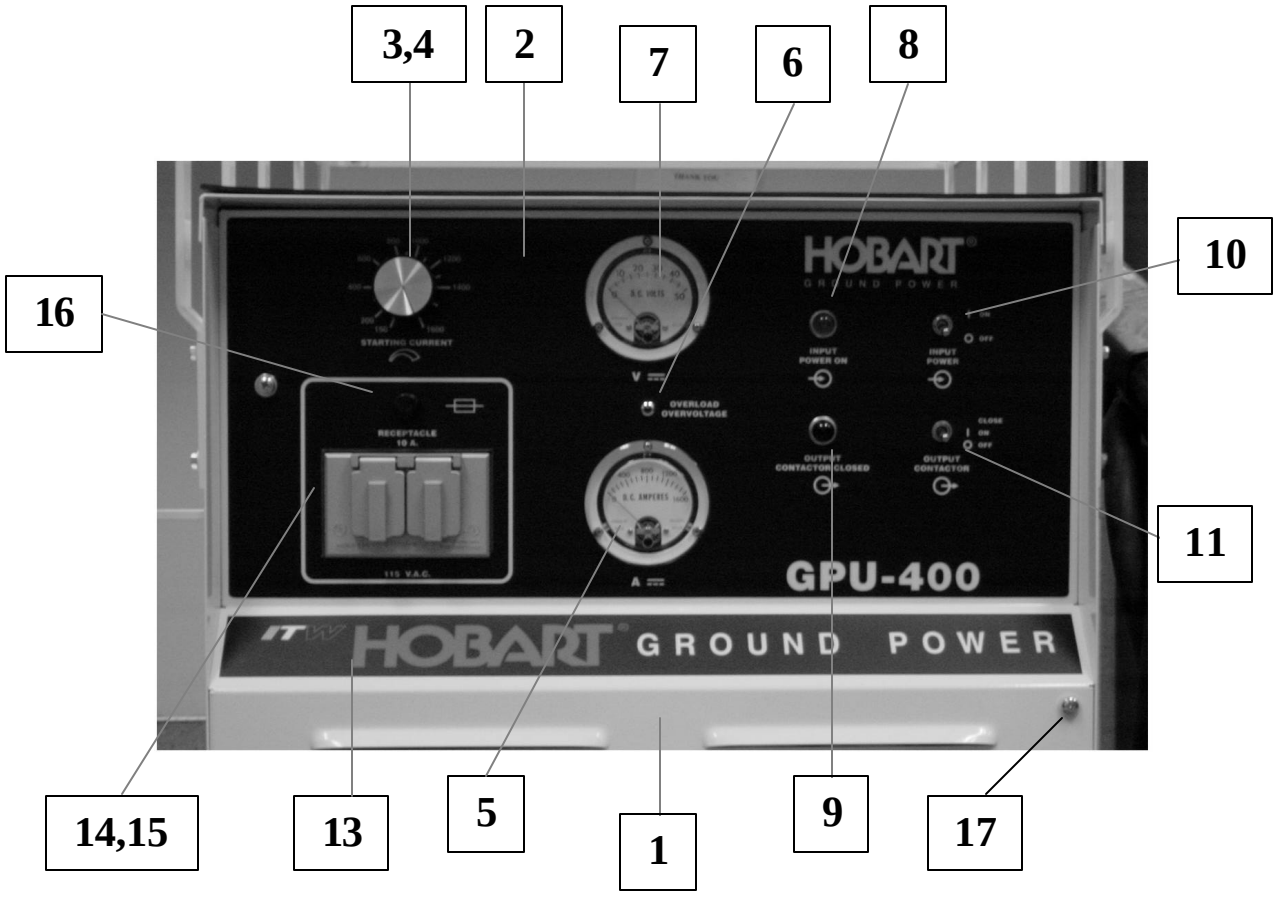
FIGURE ITEM NO.	HOBART PART NO.	NOMENCLATURE	EFF	UNIT PER ASSY.
2 - 16	405129-1	Block, Fuse		1
	W11110-4	…Screw, # 6-32 X .50 Lg., Pan Hd., Phil		2
	288324-1	…Nut, #6-32, Hex, Conical		2
	W11166-9	…Fuse, Fast Blow, AGC 1 A, 250 V		6
	83A1105	…Label, Fuse		1
17	288305-1	Rectifier, Output, Scr., Ay. (See Figure 6)		1
	402119-6	…Screw, ¼-20 X 1.0 Lg., HHC, St.		8
	W11242-5	…Washer, ¼, Flat, ST.		8
	288324-2	…Nut, ¼-20, Hex, Conical		8
	W11097-7	…Screw, $^{3}/_{8}$-16 X 2 Lg., HHC, ST.		2
	288324-4	…Nut, $^{3}/_{8}$-16, Hex, Conical		2
	402321-1	…Screw, ¼-20 X .50, Tap-Tite		4
18	201015	Bracket, Mounting, Fan Shroud		2
	W11236-2	…Screw, ¼-20 X .50, ST-Tap, Type F		4
19	287637	Motor, Fan		1
	400829-2	…Terminal, Spade, Insulated		1
	400480-12	…Terminal, Receptacle, ¼		1
20	406991	Blade, Fan		1
	50MS732-7	…Nut, #10-32, Hex, Keps		12
21	201016	Shroud, Fan		1
	288357-1	…Screw, ¼-20 X 1.0 Lg., Taptite, SST		4
	287091-1	…Washer, Flat, Nylon		4
	288322	…Label, Warning, Fan		1
	400234-3	…Tag, Instructions		2
	400828-2	…Tie, Cable, Plastic		20
22	489603	Panel, Rear		1
	288357-1	…Screw, ¼-20 X 1.0 Lg., Taptite, SST		3
	287091-1	…Washer, Flat, Nylon		3
	403091-8	…Plug, Hole, Plastic		1
23	288303-1	Block, Fuse		1
	W11110-4	…Screw, # 6-32 X .50 Lg., Pan Hd., Phil		1
	288324-1	…Nut, #6-32, Hex, Conical		1
	400647-5	…Fuse, 5 A		1
	288363	…Label, Precautionary, Fuse		1
24	487050-5	Resistor, Pre-load, Ay.		1
	405117-2	…Screw, #8-18 X .75 Lg., SF-Tap, Type F		2
	W11110-3	…Screw, # 6-32 X .38 Lg., Pan Hd., Phil		6
	288324-1	…Nut, #6-32, Hex, Conical		6
25	488819	Cable, 2/0 (#202)		1
26	W9760-66	Cable, # 6 (#201)		1
	181158	…Tubing, Z-Flex, 1.0 ID		1 FT.
	402119-4	…Screw, ¼-20 X .75 Lg., HHC, ST.		1
	W11242-5	…Washer, ¼, Flat		1
	288324-1	…Nut, #6-32, Hex, Conical		1
	W11097-35	…Screw, $^{3}/_{8}$-16 X 1.25 Lg., HHF, ST.		1
	W11242-10	…Washer, $^{3}/_{8}$, Flat		1
	288324-4	…Nut, $^{3}/_{8}$-16, Hex, Conical		1
	041552	…Insulation, Tubing, Heat Shrink, $^{3}/_{8}$		1 FT.

FIGURE ITEM NO.	HOBART PART NO.	NOMENCLATURE	EFF	UNIT PER ASSY.
2 - 27	288731	Cover, Contactor & Transformer	D	1
	W11236-4	…Screw, ¼-20 x .50 Lg., HWH	D	2
	W11242-1	…Washer, ¼, Flat	D	2
28	288732	Cover, Capacitors, CE	D	1
	400828-3	…Tie, Cable, Plastic	D	3



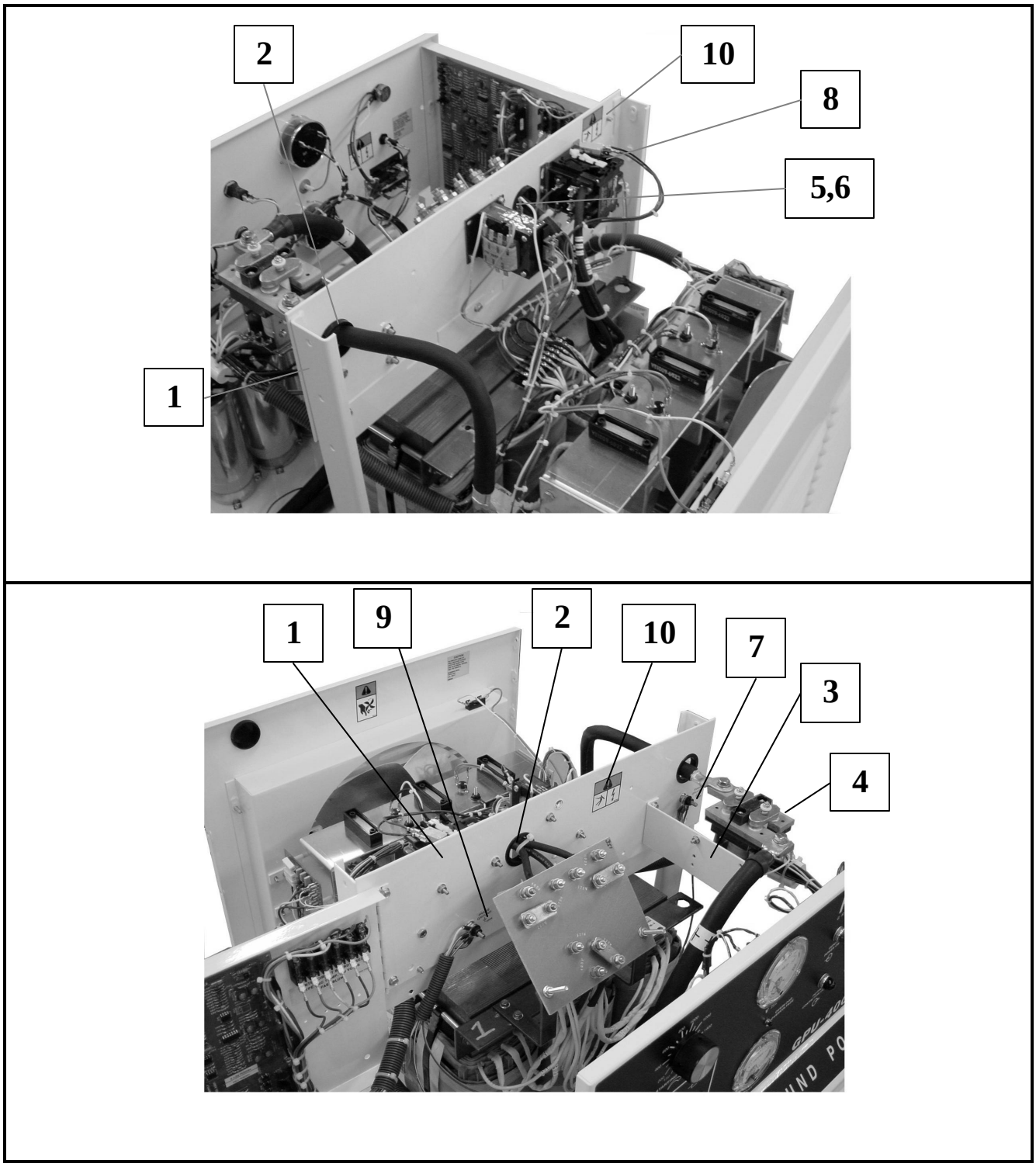
Mounting Base Assembly of GPU-400 Power Supply
Figure 3

FIGURE ITEM NO.	HOBART PART NO.	NOMENCLATURE	EFF	UNIT PER ASSY.
3 - 1	288262	Base, Mounting, GPU		1
2	288282	Support, Caster, 5th Wheel		1
	288349	…Spacer, 5th Wheel		1
	W11100-5	…Screw, ½-13 X 1.75 Lg., HHC		4
	DW458	…Washer, ½, Flat		4
	W11254-8	…Washer, ½, Lock		4
3	288283	Catch, Latch		1
4	288297-1	Kit, Caster		1
	W11100-17	…Screw, ½-13 X 2.0 Lg., HHC		2
	W11100-5	…Screw, ½-13 X 1.75 Lg., HHC		2
	DW458	…Washer, ½, Flat		4
	W11254-8	…Washer, ½, Lock		4
	W11278-1	…Nut, ½-13, Hex		4
5	288353	Brake, 5th Wheel		1
	W11242-14	…Washer, ¾, Flat, St.		2
6	83B1101	Tire, Symmetrical, Ball Bearing, 10°		2
7	288251	Axle, Mounting, Wheels		1
	486143-2	…Spacer, Black, Pipe		2
	W11242-14	…Washer, ¾, Flat, ST.		6
	W11338-3	…Pin, Cotter. $^1/_8$ ID X 1-$^1/_2$ Lg.		4
8	283322	Bracket, Output, Cable		2
	489971	…Spacer, Output Cable		4
	288325-1	…Screw, ¼-20 X 1.75, Hex, Serrated Flange		4



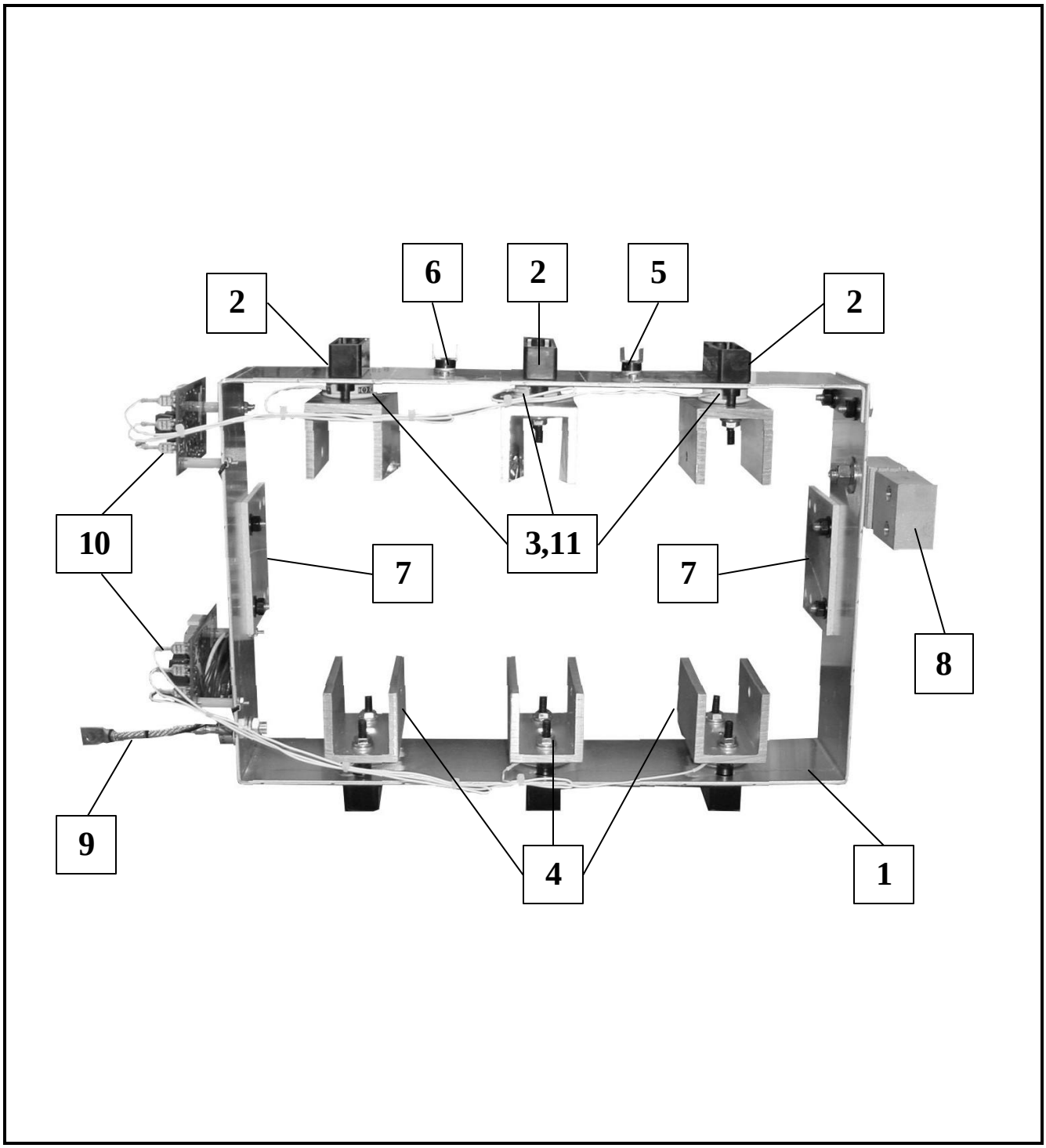
Front Panel Assembly of GPU-400 Power Supply
Figure 4

FIGURE ITEM NO.	HOBART PART NO.	NOMENCLATURE	EFF	UNIT PER ASSY.
4 - 1	288270	Panel, Front		1
2	288280-1	Label, Control		1
3	286607-1	Potentiometer, 10k Ohm, 2 W		1
4	16DA2162	Knob, Rheostat (*V44655, #5150)*		1
5	400641-11	Ampmeter, DC		1
6	405072-2	Diode, Light (*V71774, #Type 6080-002-304)*		1
	405734	…Clip, Retainer, LED (*V71774 #217-907-19)*		1
7	400642-3	Voltmeter, DC		1
8	180914	Base, Light, Pilot		1
	400613-6	…Lamp, 120 Mb, 120 V, .025 A (*V71774, #120MB)*		1
	404172-2	…Lens, Light, Pilot, Amber (*V72619)*	A,B,C	1
	400613-3	…Lamp, Type 757, 28 V, .08 A (*V71774)*	D	1
9	180914	Base, Light, Pilot		1
	400613-3	…Lamp, Type 757, 28 V, .04 A (*V71774)*		1
	404172-3	…Lens, Light, Pilot, Green *(V72619 #261193300)*		1
10	405365-1	Switch, Toggle		1
	W11160-4	…Washer, ½, Internal, Lock		1
11	403189	Switch, Toggle, 3 Position (*V91929, #312TS)*		1
	W11160-4	…Washer, ½, Internal, Lock		1
12	287460	Label, Danger, High Voltage [Not Shown]		1
13	288365	Nameplate, Hobart, GPU		1
14	402670	Receptacle, 3-Wire [125 V, 15 A] (*V74545, #5000-M9)*	A, C	1
	404277	…Cover, Receptacle (*V81703, # WPDC)*	A, C	1
	366826-1	…Suppressor, Thyrector, Diode, Ay.	A, C	1
	W11263-1	…Washer, Lock, IET #6		1
	288324-1	…Nut, #6-32, Hex, Conical		3
	W11110-6	…Screw, #6-32 X ¾ Lg., Pan Hd, MH		2
	W10051-7	…Clamp, Wire, Plastic		1
	W11245-2	…Washer, # 6, Flat		1
15	404336	Receptacle, 3-Wire [230 V, 15 A] (*V77116)*	B, D	1
	404335	…Cover, Receptacle *(V81703,#* WPRC)	B, D	1
	403955-17	…Suppressor, Thyrector, Diode, Ay.	B, D	1
	W11263-1	…Washer, Lock, IET #6		1
	288324-1	…Nut, #6-32, Hex, Conical		3
	W11110-6	…Screw, #6-32 X ¾ Lg., Pan Hd, MH		2
	W10051-7	…Clamp, Wire, Plastic		1
	W11245-2	…Washer, # 6, Flat		1
16	402658	Holder, Fuse (*V71400, # HKP-HH)*		1
	400647-8	…Fuse, 10 A (*V71400, # ABC-10)*		1
17		Grounding Hardware		
	W11114-16	…Screw, ¼-20 X 1.25 Lg., Pan Hd.		1
	288323-2	…Nut, ¼-20, Hex, Serrated		1
	287091-1	…Washer, Flat, Nylon		1
	288324-2	…Nut, ¼-20, Hex, Conical		1
	W11242-5	…Washer, ¼, Flat		1
18	288364	Label, Precautionary, Recept. [Not Shown]		1
19	288351	Harness, Wire [Not Shown]		1
	408753	…Terminal, Spade, # 6 Stud	B	2
* 20	77A1157	Switch, Maintained, Push/Pull	D	1
	408753	…Terminal, Spade, # 6 Stud	D	1



Interior Panel Assembly of GPU-400 Power Supply
Figure 5

FIGURE ITEM NO.	HOBART PART NO.	NOMENCLATURE	EFF	UNIT PER ASSY.
5 - 1	288273	Panel, Interior, Ay.		1
2	402037-27	Grommet, Rubber		2
3	487898A	Bracket, Contactor		1
	400153-2	…Screw, ¼-20 X .75 Lg., Serrated		2
	288323-2	…Nut, ¼-20, Hex, Serrated		5
4	286810-1	Contactor, 28.5 VDC		1
5	406392-2	Transformer, Control *(V97520, #18608001)*	B	1
	406247-3	Transformer, Control	D	1
6	406392-1	Transformer, Control (*V97520, #18608001)*	A, C	1
	406484	…Label, Fuse, 4-400-S, .5 Amp, 250 V		1
	W11166-11	…Fuse, Fast Blow, AGC *(V71400, #AGC/2)*		1
	W11112-3	…Screw, #10-24 X .75 Lg., Pan Hd, Phil		6
	288323-1	…Nut, #10-24, Serrated		6
	W11245-3	…Washer, # 10, Flat, Brass		6
	W11263-3	…Washer, #10, IET		2
	W11097-2	…Screw, $^3/_8$-16 X 1 Lg., HHSSt.		2
	W11242-10	…Washer, $^3/_8$, Flat		2
	W11254-6	…Washer, $^3/_8$, Lock		2
7		Grounding Screws		
	402119-27	…Screw, ¼-20 X 1.25 Lg., St, HHCS		3
	288324-2	…Nut, ¼-20, Hex, Conical		3
	W11242-5	…Washer, ¼, Flat		3
8	400663	Contactor, Line (*V23826, #42EE35AF-263)*	A,B,C	1
	288733-1	Contactor, Line	D	1
9	405548	Label, Ground		3
10	287460	Label, Danger, High Voltage		2



SCR Output Rectifier Assembly of GPU-400 Power Supply
Figure 6

FIGURE ITEM NO.	HOBART PART NO.	NOMENCLATURE	EFF	UNIT PER ASSY.
6 - 1	288277	Heat Sink, Rectifier		1
2	405140-1	Clamp, Mounting		6
3	405139	Rectifier, Silicon, Cont.		6
4	369642	Heat Sink, SCR		6
5	287929-1	Thermostat, Overload		1
6	404044-6	Thermostat, Fan Turn On (*V14604, #3455R-82-287)*		1
	W11110-3	…Screw, #6-32 X .38 Lg., Rd Hd, St.		4
	288324-1	…Nut, #6-32, Hex, Conical		8
7	369641	Insulator, Mounting, Rectifier		2
	402119-4	…Screw, ¼-20 X .75 Lg., HHC, St.		6
	288324-2	…Nut, ¼-20, Hex, Conical		6
8	280022	Shunt		1
	W11097-6	…Screw, 3/8-16 X 1.75 Lg., HHC, St.		1
	288324-4	…Nut, 3/8-16, Hex, Conical		1
	W11111-1	…Screw, #8-32 X .38 Lg., Pan Hd, Phil		2
	W11254-2	…Washer, #8-32, Lock		2
9	402832-3	Diode, Silicon, Positive Base (*V05277, #R5100315)*		1
	W11254-6	…Washer, 5/16, Flat		1
	W11280-8	…Nut, 3/8-24, Hex, Jam		1
10	367634A-3	Suppressor, Surge, Ay.		2
	W11110-14	…Screw, #6-32 X 1.5 Lg., Rd Hd, ST.		4
11	16DA954-12	Pin, Spring		6

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Section 4 Numerical Index

1) Explanation of Numerical Index

The purpose of this index is to assist the user in finding the illustration and description of a part when the part number is known. Part numbers are arranged in alphanumerical sequence. Thus, any part number beginning with the letter "A" would be located at or near the top of the index list. Likewise, a part number "9" would be listed near the end of the list and far below a part number "1000". The figure number and item number location of the part is directly opposite the part. If the part is used in more than one place, each location is listed commencing with the first location the part is listed.

FIGURE ITEM NO.	HOBART PART NO.	FIGURE ITEM NO.	HOBART PART NO.
1-	DW458	2-	W11254-4
3-	DW458	2-	W11242-4
3-	DW458	2-	W11242-4
2-26	W9760-66	2-	W11236-4
2-	W11097-35	2-	W11236-4
2-	W11242-18	4-	W11160-4
3-	W11100-17	4-	W11160-4
1-	W11114-16	2-	W11111-4
4-	W11114-16	2-	W11111-4
3-	W11242-14	2-	W11110-4
3-	W11242-14	2-	W11110-4
6-	W11110-14	3-	W11338-3
5-	W11166-11	5-	W11263-3
2-	W11242-10	5-	W11245-3
2-	W11242-10	5-	W11112-3
5-	W11242-10	2-	W11110-3
2-	W11166-9	6-	W11110-3
6-	W11280-8	1-	W11100-3
1-	W11254-8	2-	W11475-2
3-	W11254-8	6-	W11254-2
3-	W11254-8	4-	W11245-2
2-	W11097-7	4-	W11245-2
2-	W11097-7	2-	W11236-2
4-	W10051-7	2-	W11236-2
4-	W10051-7	2-	W11114-2
2-	W11263-6	5-	W11097-2
5-	W11254-6	3-	W11278-1
6-	W11254-6	4-	W11263-1
4-	W11110-6	4-	W11263-1
4-	W11110-6	2-	W11242-1
6-	W11097-6	6-	W11111-1
1-	W11242-5	2-	041552
2-	W11242-5	6-11	16DA954-12
2-	W11242-5	4-4	16DA2162
4-	W11242-5	2-9	180068
5-	W11242-5	2-15	180293A
3-	W11100-5	4-8	180914
3-	W11100-5	4-9	180914

FIGURE ITEM NO.	HOBART PART NO.	FIGURE ITEM NO.	HOBART PART NO.
2-	181158	4-	288323-2
2-18	201015	5-	288323-2
2-21	201016	1-	288324-2
6-8	280022	1-	288324-2
1-6	282658	2-	288324-2
3-8	283322	4-	288324-2
1-11	283323	5-	288324-2
1-8	283533	6-	288324-2
1-7	286441	5-	288323-1
4-3	286607-1	1-17	288322
5-4	286810-1	2-	288322
1-	287091-1	2-	288324-1
1-	287091-1	2-	288324-1
1-	287091-1	2-	288324-1
2-	287091-1	2-	288324-1
2-	287091-1	4-	288324-1
2-	287091-1	4-	288324-1
4-	287091-1	6-	288324-1
1-16	287460	3-	288325-1
4-12	287460	3-	288349
5-10	287460	4-19	288351
1-19	287547-1	3-5	288353
2-19	287637	1-	288357-1
6-5	287929-1	2-	288357-1
2-	288234-4	2-	288357-1
3-7	288251	2-	288357-1
3-1	288262	1-14	288356
1-10	288266	1-13	288362-2
1-9	288267	1-12	288362-1
4-1	288270	2-	288363
2-14	288271	4-18	288364
5-1	288273	4-13	288365
6-1	288277	2-7	288401
4-2	288280-1	2-	288541
3-2	288282	2-27	288731
3-3	288283	5-	288733-1
3-4	288297-1	2-28	288732
1-18	288300	2-	350488-94
2-	288307-5	2-	350488-94
2-23	288303-1	2-	361052-9
2-17	288305-1	2-	361052-9
2-	288310-5	4-	366826-1
2-13	288307-2	6-10	367634A-3
2-12	288307-1	6-7	369641
2-6	288310-2	6-4	369642
2-5	288310-1	5-	400153-2
2-	288324-4	2-	400234-3
2-	288324-4	2-	400480-12
6-	288324-4	4-	400613-6
2-1	288321-1	4-	400613-3
1-	288323-2	4-	400613-3

FIGURE ITEM NO.	HOBART PART NO.	FIGURE ITEM NO.	HOBART PART NO.
4-5	400641-11	3-	486143-2
4-	400647-8	2-24	487050-5
4-7	400642-3	5-3	487898A
2-	400647-5	2-8	487952
5-8	400663	2-3	488078
2-	400828-3	2-2	488389
2-	400828-2	2-25	488819
2-	400829-2	2-4	489517
2-	400852-1	2-22	489603
5-2	402037-27	3-	489971
1-15	402025-2	1-4	500160-412
5-	402119-27	1-3	500160-403
2-	402119-6	1-2	500160-402
2-	402119-4	1-1	500160-401
6-	402119-4	2-	50MS732-7
2-	402321-1	2-	50MS732-1
2-	402321-1	2-	50MS732-1
2-	402321-1	4-20	77A1157
4-16	402658	1-5	78B1130
4-14	402670	3-6	83B1101
6-9	402832-3	2-	83A1105
2-	403091-8		
4-11	403189		
4-	403955-17		
6-6	404044-6		
4-	404172-3		
4-	404172-2		
4-	404277		
4-	404335		
4-15	404336		
2-	404915-1		
4-6	405072-2		
2-	405117-2		
2-	405117-2		
2-16	405129-1		
6-2	405140-1		
6-3	405139		
2-10	405278-7		
2-11	405278-7		
4-10	405365-1		
5-9	405548		
4-	405734		
5-	406247-3		
5-5	406392-2		
5-6	406392-1		
5-	406484		
2-	406931-1		
2-	406931-1		
2-20	406991		
4-	408753		
4-	408753		

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Chapter 5 Manufacturer's Literature

Diagram Number	Diagram Description
288326	Outline, Dimensional/Installation
288367	Diagram, Schematic & Connection

Contact Hobart Ground Power if either copy of these drawings are not with this manual. Refer to Appendix A for specific information on GPU-400 Solid State Transformer-Rectifier optional equipment.

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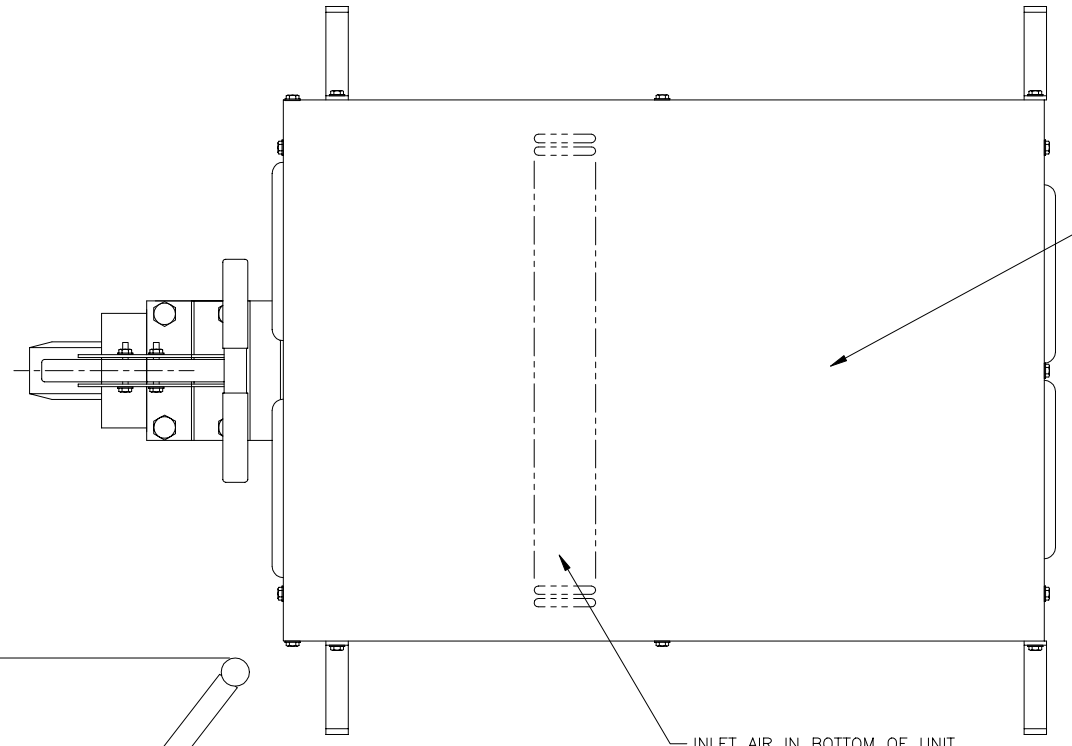
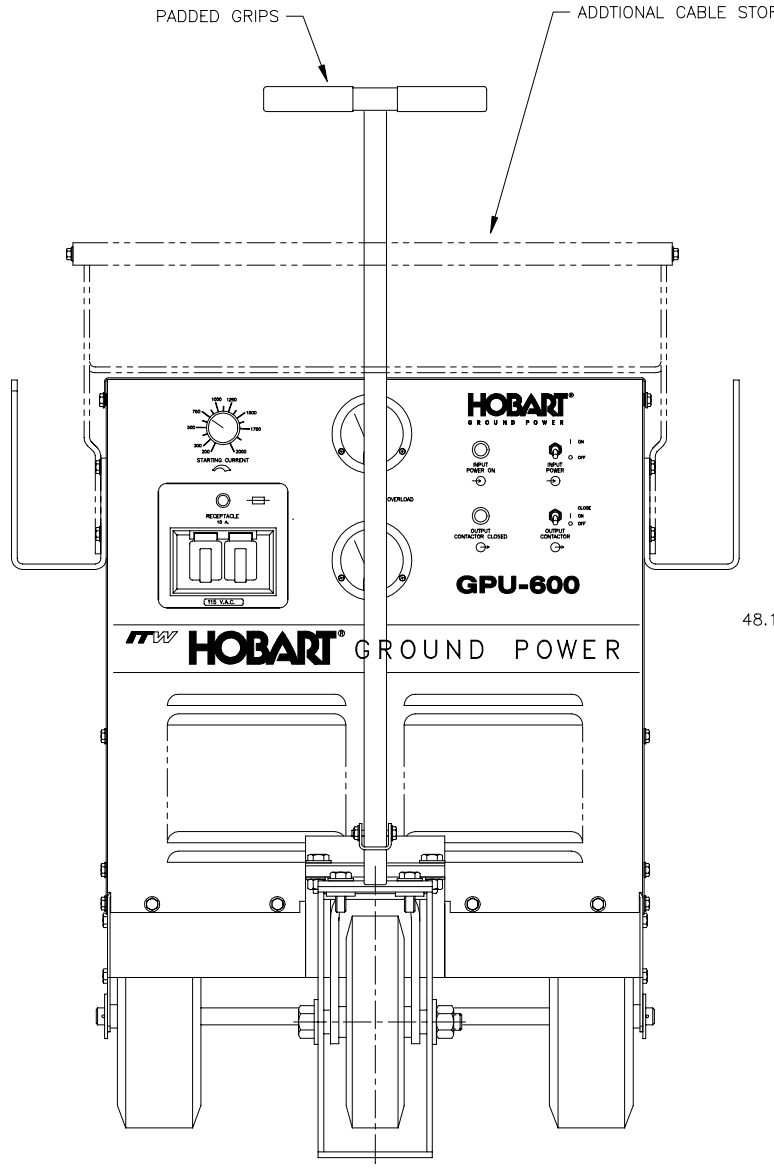
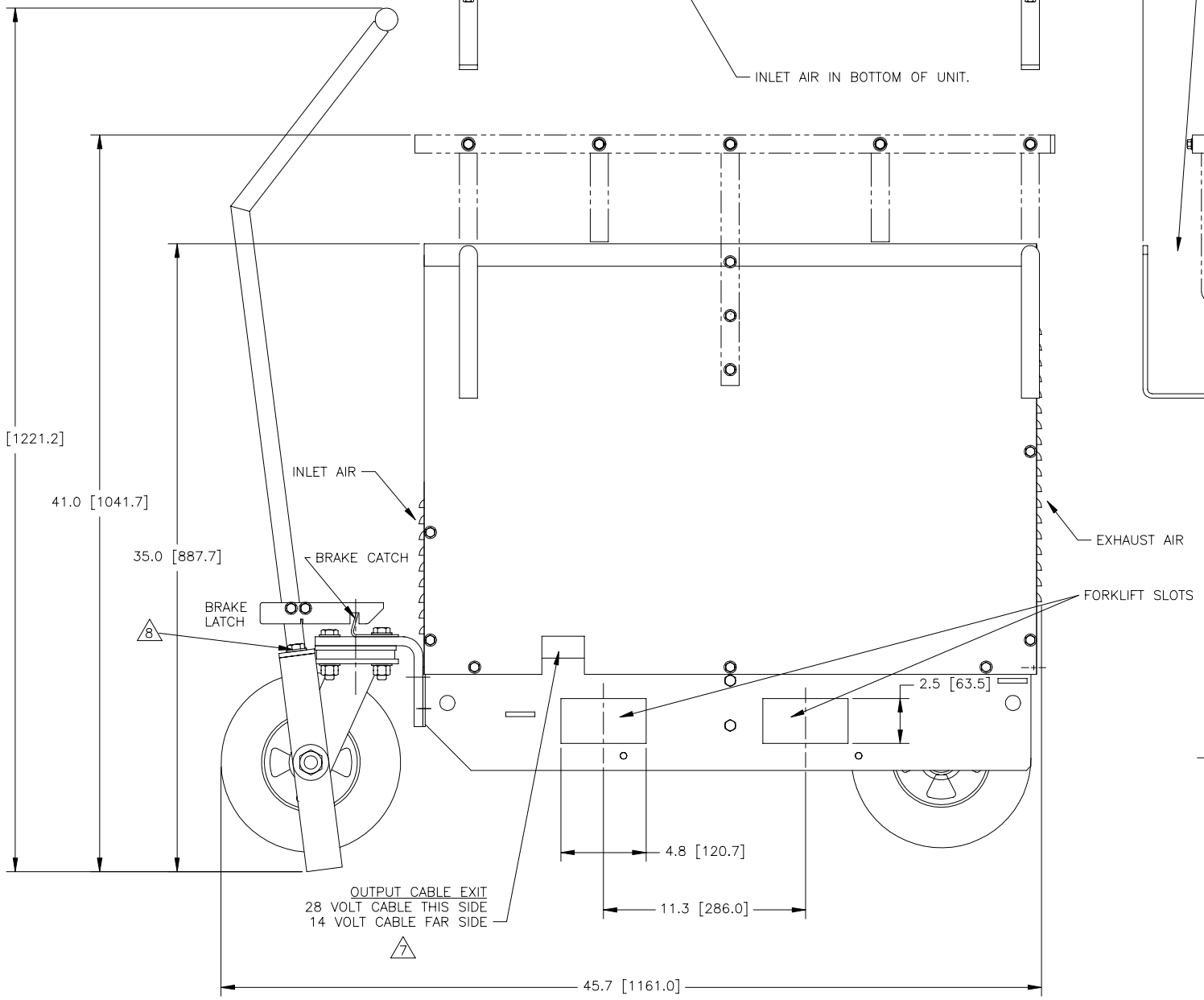
NOTES:

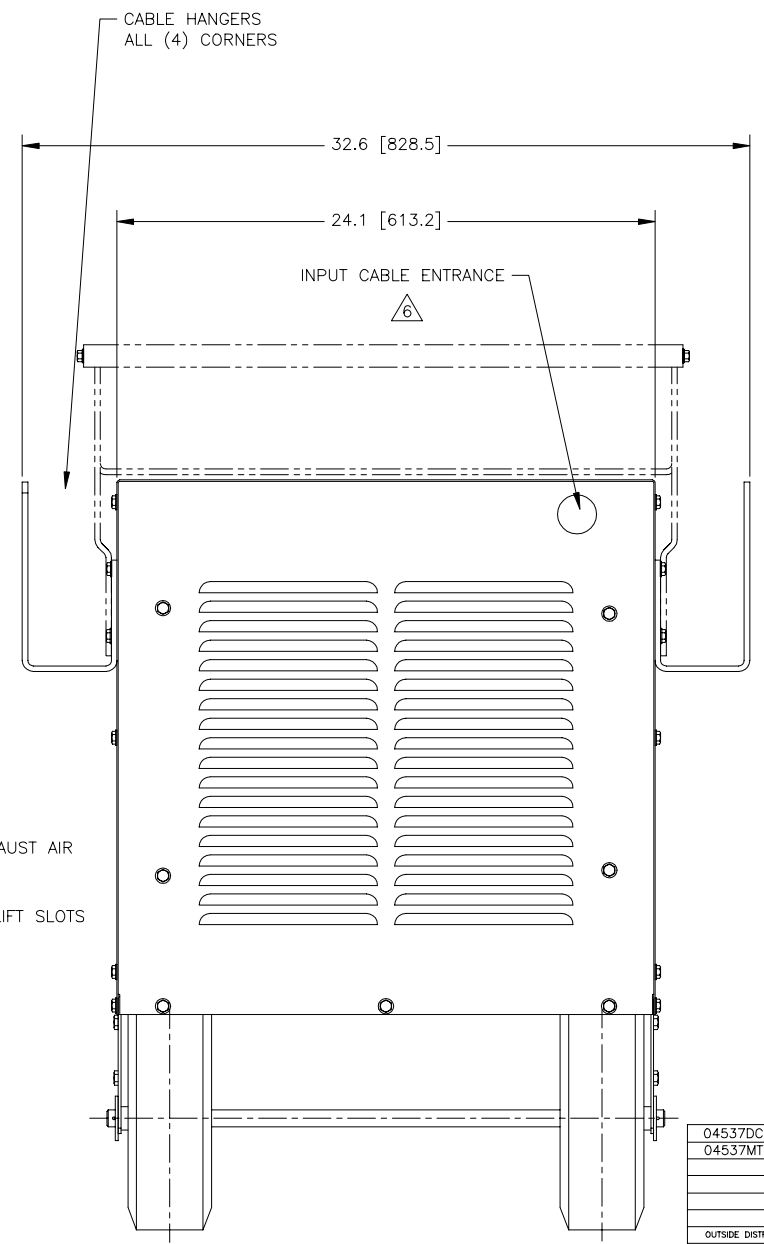
1. FIRST DIMENSION IN INCHES, [ ] MILLIMETERS.
2. 5TH WHEEL STEERING WITH TONGUE ACTUATED PARKING BRAKE.
3. 10" DIAMETER WHEELS, SOLID RUBBER TIRES.
4. CONVENIENCE RECEPTACLE AND ITS FUSE IS LOCATED ON FRONT PANEL. THE FUSE FOR THE FAN IS LOCATED ON FAN SHROUD, AND OTHER MISC. FUSES ARE BEHIND THE FRONT PANEL ADJACENT TO THE P.C. BOARD.
5. 14.25 VOLT AVAILABLE WITH GPU 400.
6. 1-3/4" DIA. HOLE PROVIDED, USE WATERTIGHT STRAIN RELIEF IF UNIT WILL BE USED OUTDOORS. INPUT CABLE CONNECTIONS LOCATED ON INTERIOR PANEL, 18.0 [458] BEHIND CABLE ENTRANCE. A SCREW DRIVER AND A 9/16 WRENCH REQUIRED.
7. NEGATIVE OUTPUT CABLE CONNECTION LOCATED ON SHUNT AND POSITIVE CABLE CONNECTION LOCATED ON CONTACTOR, 9/16 SOCKET AND WRENCH REQUIRED.
8. ASSEMBLE HANDLE TO WHEEL ASSEMBLY WITH HARDWARE PROVIDED. 3/4 WRENCH AND SOCKET REQUIRED. LOOSEN TWO BOLTS TO ADJUST BRAKE CATCH IF REQUIRED.

MODEL	WEIGHTS
GPU 400	450 lbs. 204 kg.
GPU 600	650 lbs. 295 kg









04537DCS	9-01
04537MTL	9-01

OUTSIDE DISTR.

DISTRIBUTION TABLE

CHANGE RECORD	
E.C. No.	DATE

FINISH CODE PER 910176: NONE

FILE NAME	PLOT DATE
288326s1	7/10/01

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES/MILLIMETERS TOLERANCES BELOW APPLY EXCEPT FOR VENDOR DESIGNED PARTS AND ITEMS PRODUCED TO RECOGNIZED STANDARDS. DO NOT SCALE DRAWING.

FRACT. INCH ±	ANGLES ± 3°
DECIMAL—INCH	METRIC
.00 ± .03	0.0 ±0.8mm
.000 ± .010	0.00 ±0.25mm

ACTIVITY	REPLACED BY	REPLACES
MATERIAL NO.	QUANTITY—U.M.	COMM. CLS.

MATERIAL SPEC.
—

TITLE
OUTLINE, DIMENSIONAL, INSTALLATION

DESCRIPTIVE DATA
GPU

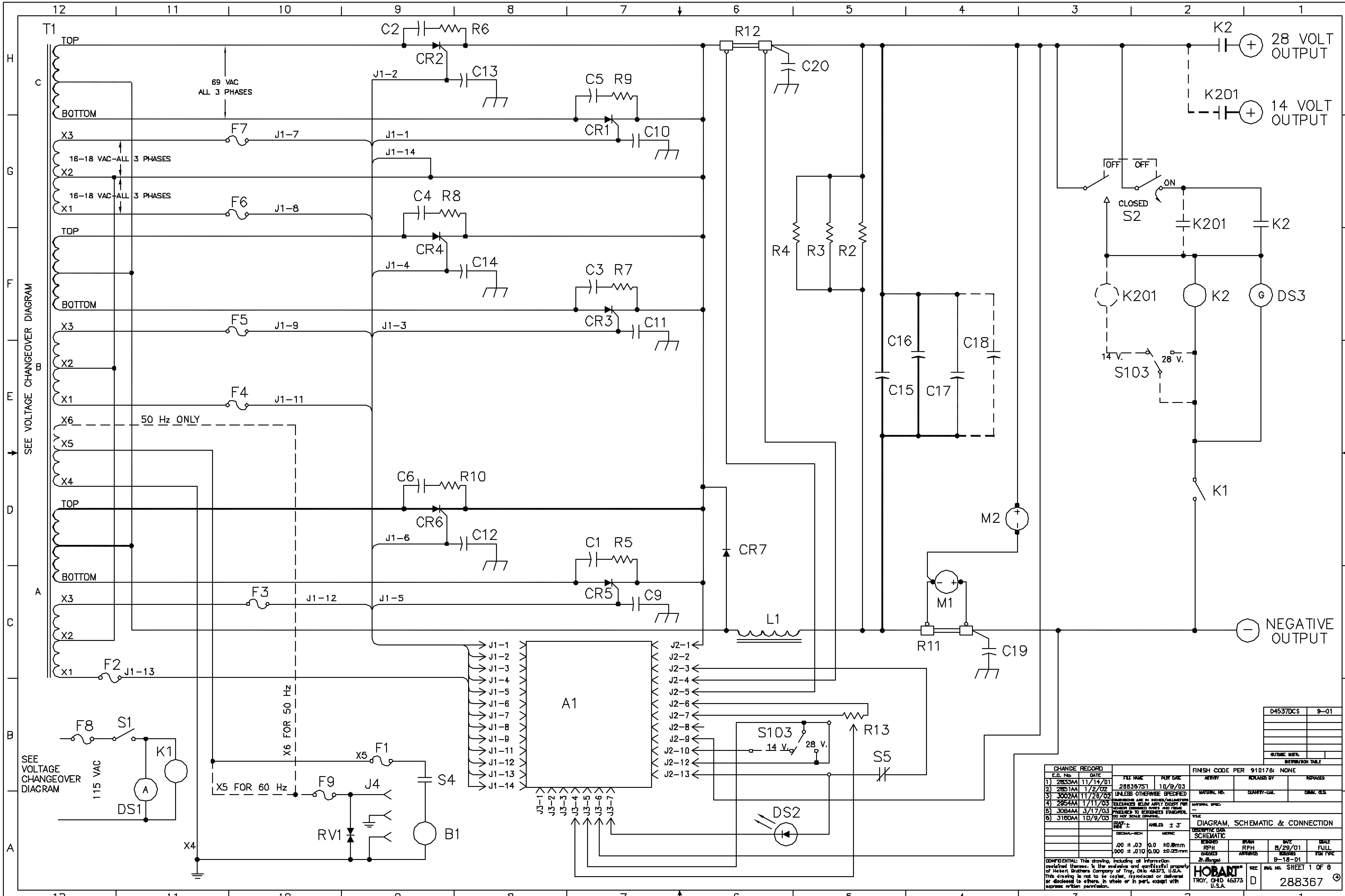
DESIGNED	DRAWN	DATE	SCALE
RPH	RPH	7/10/01	QUARTER
CHECKED	APPROVED	RECORDS 9-18-01	ITEM TYPE

HOBART
TROY, OHIO 45373 U.S.A.

SIZE D

DWG. NO. 288326

SHEET 1 OF 4



T1
TOP
BOTTOM
69 VAC ALL 3 PHASES
16-18 VAC-ALL 3 PHASES
X1
X2
X3
X4
X5
X6
50 Hz ONLY
SEE VOLTAGE CHANGEOVER DIAGRAM
C2
R6
CR2
C13
J1-2
C5
R9
CR1
C10
F7
J1-7
J1-1
J1-14
F6
J1-8
C4
R8
CR4
C14
J1-4
C3
R7
CR3
C11
F5
J1-9
J1-3
F4
J1-11
C6
R10
CR6
C12
J1-6
C1
R5
CR5
C9
F3
J1-12
J1-5
F2
J1-13
R12
C20
R4
R3
R2
C16
C15
C17
C18
CR7
L1
A1
M2
M1
R11
C19
NEGATIVE OUTPUT
K2
28 VOLT OUTPUT
K201
14 VOLT OUTPUT
OFF
ON
CLOSED
S2
K201
K2
DS3
14 V.
28 V.
S103
K1
R13
S5
DS2
F8
S1
K1
DS1
115 VAC
SEE VOLTAGE CHANGEOVER DIAGRAM
X5 FOR 60 Hz
X6 FOR 50 Hz
F1
F9
J4
S4
RV1
B1
04537DCS 9-01
OUTSIDE INSTR.
DISTRIBUTION TABLE
CHANGE RECORD
E.O. No. DATE
1) 2833AA 11/14/01
2) 2851AA 1/2/02
3) 3002AA 11/26/02
4) 2954AA 1/11/03
5) 3064AA 3/17/03
6) 3160AA 10/9/03
FILE NAME 28836751
PLOT DATE 10/9/03
UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES/MILLIMETERS TOLERANCES BELOW APPLY EXCEPT FOR VENDOR DESIGNED PARTS AND ITEMS PRODUCED TO RECOGNIZED STANDARDS. DO NOT SCALE DRAWING.
FRACT. INCH ±
ANGLES ± 3°
DECIMAL-INCH .00 ± .03 .000 ± .010
METRIC 0.0 ±0.8mm 0.00 ±0.25mm
CONFIDENTIAL: This drawing, including all information contained thereon, is the exclusive and confidential property of Hobart Brothers Company of Troy, Ohio 45373, U.S.A. This drawing is not to be copied, reproduced or delivered or disclosed to others, in whole or in part, except with express written permission.
FINISH CODE PER 910176: NONE
ACTIVITY
REPLACED BY
REPLACES
MATERIAL NO.
QUANTITY-U.M.
DIMM. GLS.
MATERIAL SPEC: —
TITLE
DIAGRAM, SCHEMATIC & CONNECTION
DESCRIPTIVE DATA
SCHEMATIC
DESIGNED RPH
DRAWN RPH
DATE 8/29/01
SCALE FULL
CHECKED
APPROVED
RECORDS 9-18-01
ITEM TYPE
HOBART
TROY, OHIO 45373 U.S.A.
SIZE D
DWG. NO. SHEET 1 OF 8
288367
4

LEGEND

A1	BOARD, P.C., CONTROL
A2, A3	BOARD, P.C., SUPPRESSOR
B1	FAN MOTOR
C1–C6	CAPACITOR, SUPPRESSION, .047 MFD, 400 WVDC
C9–C14	CAPACITOR, H.F. SUPPRESSION, .047 MFD, 400 WVDC
C15–C17	CAPACITOR, FILTER, 115,000 MFD, 40 VDC
C18	CAPACITOR, FILTER, 115,000 MFD, 40 VDC, (50 Hz. ONLY) (WHEN FURNISHED)
C19, C20	CAPACITOR, SUPPRESSOR, .047 MFD, 1200 VdC
CR1–CR6	RECTIFIER, SILICON CONTROL
CR7	DIODE, FLYBACK
DS1	PILOT LIGHT, INPUT CONTACTOR, AMBER
DS2	INDICATOR, LED, OVERLOAD, RED
DS3	PILOT LIGHT, OUTPUT CONTACTOR, GREEN
F1	FUSE, MOTOR, 5 AMP
F2–F7	FUSE, PC BOARD CONTROL, 1 AMP, 250 VOLTS, AGC, FAST BLOW
F8	FUSE, CONTROL TRANSFORMER, 1/2 AMP, 250 V., AGC, FAST BLOW
F9	FUSE, RECEPTACLE, 10 AMP
HS1, HS2	HEAT SINK CONNECTION
GND1–GND9	GROUNDING POINTS
J1	RECEPTACLE, PC BOARD, 14 PIN
J2	RECEPTACLE, PC BOARD, 13 PIN
J3	RECEPTACLE, PC BOARD, 7 PIN
J4	RECEPTACLE, 115 OR 230 VOLT AC
J5, J6, J7	CONNECTOR, GROUNDING PANELS
K1	CONTACTOR, INPUT
K2	CONTACTOR, OUTPUT, 28 VOLTS
K101, K102	RELAY, 24 VAC, BRIDGE INTERLOCK/ REMOTE (WHEN FURNISHED)
K201	CONTACTOR, OUTPUT, 14 VOLTS (WHEN FURNISHED)
L1	CHOKE, FILTER REACTOR
M1	AMMETER, 0–1600 AMPS GPU 400, 0–2000 AMPS GPU 600
M2	VOLTMETER, 0–50 VOLTS
P1	PLUG, PC BOARD, 14 SOCKETS
P2	PLUG, PC BOARD, 13 SOCKETS
P3	PLUG, PC BOARD, 7 SOCKETS
P5–P7	PLUG, GROUNDING PANELS
R2, R3, R4	RESISTOR, PRELOAD
R5–R10	RESISTOR, SUPPRESSION, 50 OHMS, 5 WATT
R11	SHUNT, METER
R12	SHUNT, FEEDBACK
R13	POTENTIOMETER, STARTING CURRENT
RV1	SUPPRESSOR, RECEPTACLE
S1	SWITCH, INPUT CONTACTOR, ON–OFF
S2	SWITCH, OUTPUT CONTACTOR
S4	THERMOSTAT, FAN
S5	THERMOSTAT, OVERLOAD TEMPERATURE
S6	SWITCH, EMERGENCY STOP, 28V. (WHEN FURNISHED)
S103	SWITCH, OUTPUT VOLTAGE SELECT, 14 OR 28 VOLTS (WHEN FURNISHED)
SP3, SP4	WIRE SPLICES
T1	TRANSFORMER, POWER
T2	TRANSFORMER, CONTROL
T101	TRANSFORMER, 24 VOLT (BRIDGE INTERLOCK/ REMOTE) (WHEN FURNISHED)
TB1	TERMINAL BLOCK, MAIN TRANSFORMER
TB101	TERMINAL BLOCK, BRIDGE INTERLOCK/ REMOTE (WHEN FURNISHED)

④ ADD S6

CHANGE RECORD		
E.C. No.	DATE	
1) 2833AA	11/14/01	
2) 2851AA	1/2/02	
3) 3002AA	11/26/02	
4) 2954AA	1/11/03	
5) 3044AA	3/17/03	
6) 3160AA	10/9/03	

FILE NAME 288367S2 — FLOT DATE 3/17/03

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES/MILLIMETERS
TOLERANCES BELOW APPLY EXCEPT FOR VENDOR DESIGNED PARTS AND ITEMS PRODUCED TO RECOGNIZED STANDARDS.
DO NOT SCALE DRAWING.

FRACT ± ANGLES ± .3°
DECIMAL-INCH .XX ± .03 .XXX ± .010
METRIC .0 ±0.8mm .00 ±0.25mm

FINISH CODE PER 910176: NONE

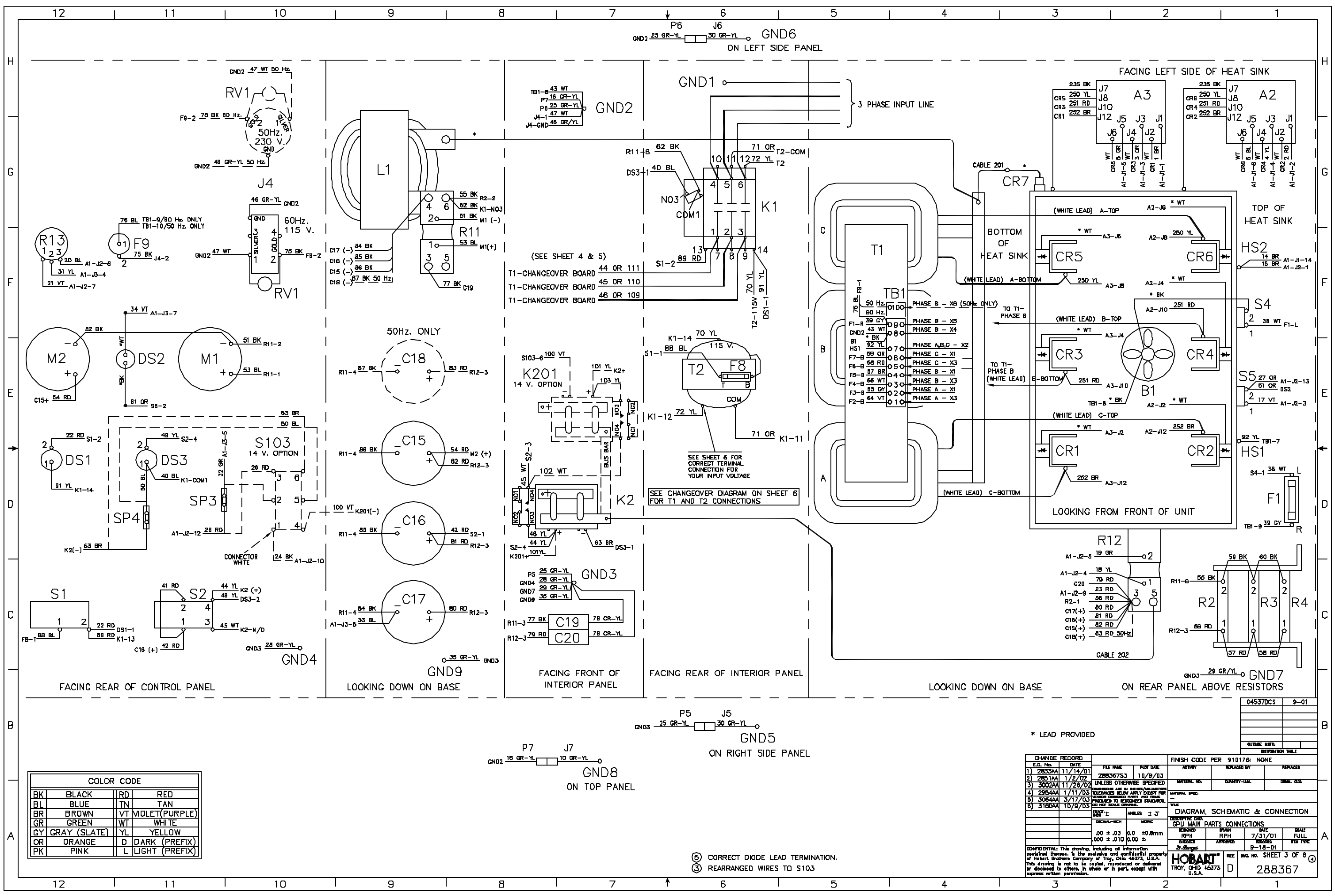
ACTIVITY — REPLACED BY — REPLACES
MATERIAL NO. — QUANTITY-U/M. — CONN. CLS.
MATERIAL SPEC.
–
TITLE
DIAGRAM, SCHEMATIC & CONNECTION
DESCRIPTIVE DATA
LEGEND

DESIGNED RPH — DRAWN RPH — DATE 8/29/01 — SCALE FULL
CHECKED — APPROVED — RECORDED 9-18-01 — ITEM TYPE

HOBART®
TROY, OHIO 45373
U.S.A.

SIZE C — DWG. NO. 288367 — SHEET 2 OF 8 — ④

OUTSIDE DISTR.	DISTRIBUTION TABLE
	D4537DGS 9-01



COLOR CODE			
BK	BLACK	RD	RED
BL	BLUE	TN	TAN
BR	BROWN	VT	VIOLET(PURPLE)
GR	GREEN	WT	WHITE
GY	GRAY (SLATE)	YL	YELLOW
OR	ORANGE	D	DARK (PREFIX)
PK	PINK	L	LIGHT (PREFIX)

CHANGE RECORD			
E.O. No.	DATE		
1) 28534A	11/14/01	FILE NAME	PLOT DATE
2) 29011A	1/2/02	288367S3	10/9/03
3) 30012A	11/26/02	UNLESS OTHERWISE SPECIFIED	
4) 29544A	1/11/03	DIMENSIONS ARE IN INCHES/MILLIMETERS	
5) 30644A	3/17/03	TOLERANCES BELOW ARE TO APPLY FOR MINOR DIMENSIONED PARTS AND THOSE PRODUCED TO ECONOMICAL STANDARDS.	
6) 31805A	10/9/03	DO NOT SCALE DRAWING.	
		DRAFT: ±	ANGLES ± 1°
		DECIMAL-INCH	METRIC
		.00 ± .03	0.0 ±0.8mm
		.000 ± .010	0.00 ±

FINISH CODE PER 910176: NONE

ACTIVITY	REMARKS BY	REMARKS
MATERIAL NO.	QUANTITY-UNIT	DIMENSIONAL DESIG.

MATERIAL SPEC: —

TITLE: DIAGRAM, SCHEMATIC & CONNECTION

DESCRIPTIVE DATA: GPU MAIN PARTS CONNECTIONS

DESIGNED	DRAWN	DATE	SCALE
RPH	RPH	7/31/01	FULL
CHECKED	APPROVED	REVISED	TITLE TYPE
		9-18-01	

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HOBART TROY, OHIO 45373 U.S.A.

SIZE D | DWG NO. 288367 | SHEET 3 OF 8 (4)

04537DCS | 9-01

OUTSIDE DISTR. | DISTRIBUTION TABLE

FOR UNITS
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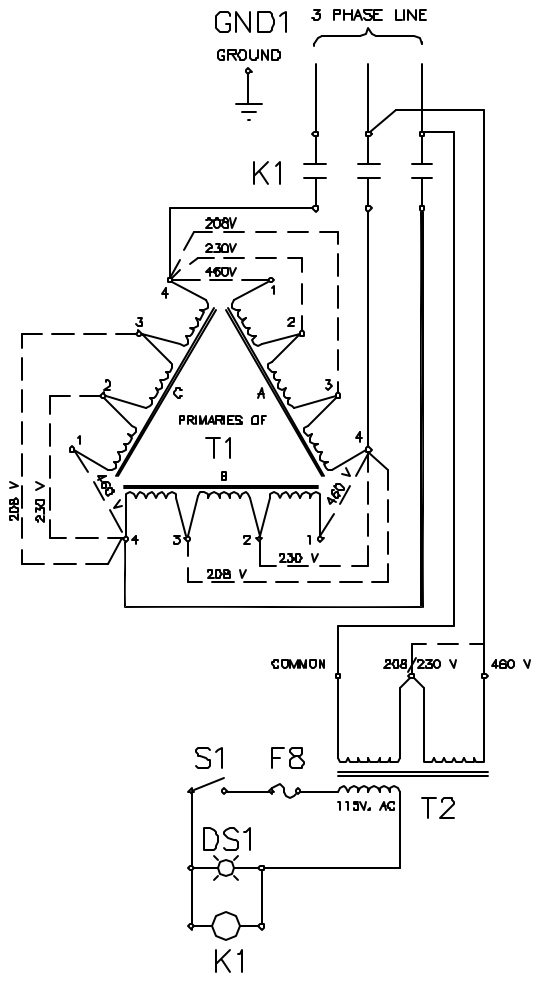
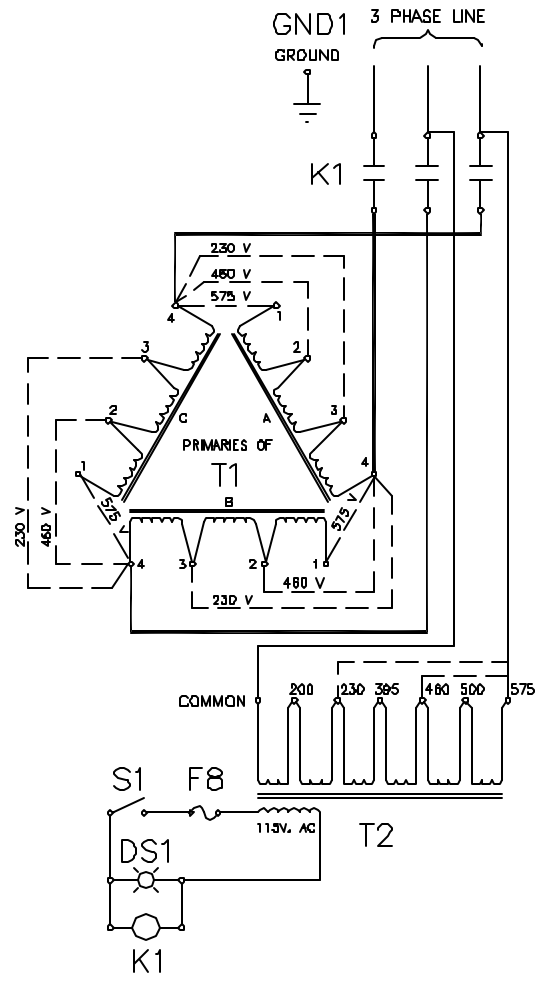
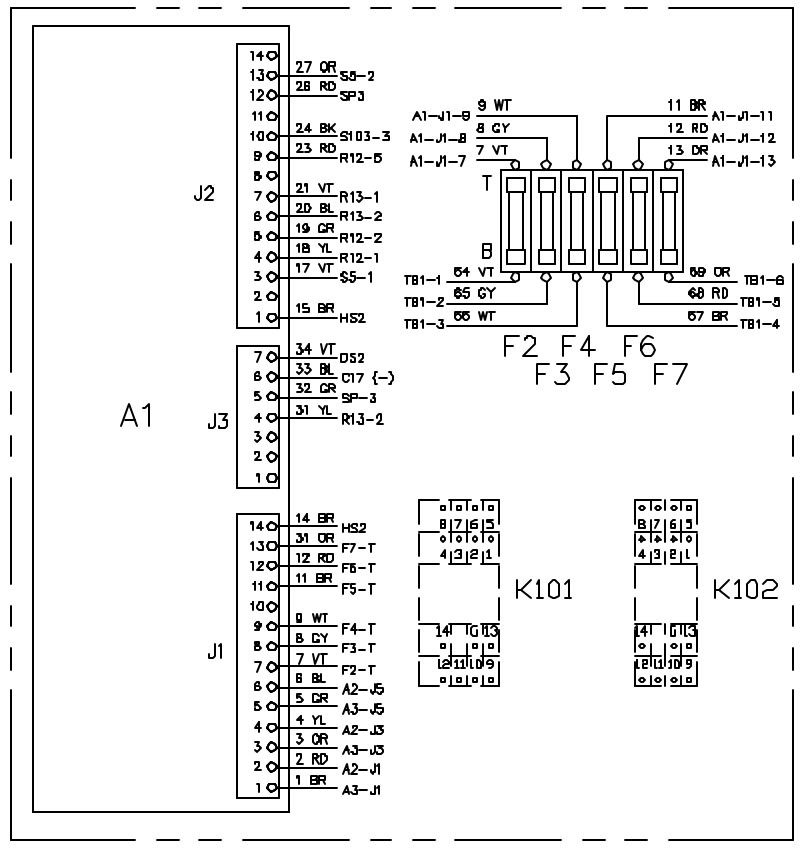
ONLY

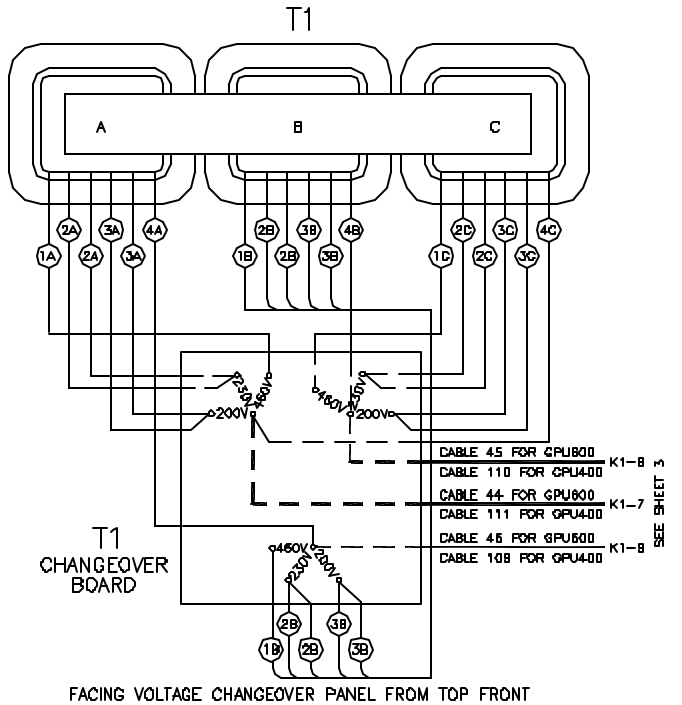


FOR UNITS
500160-403/500160-603/500160-653
ONLY

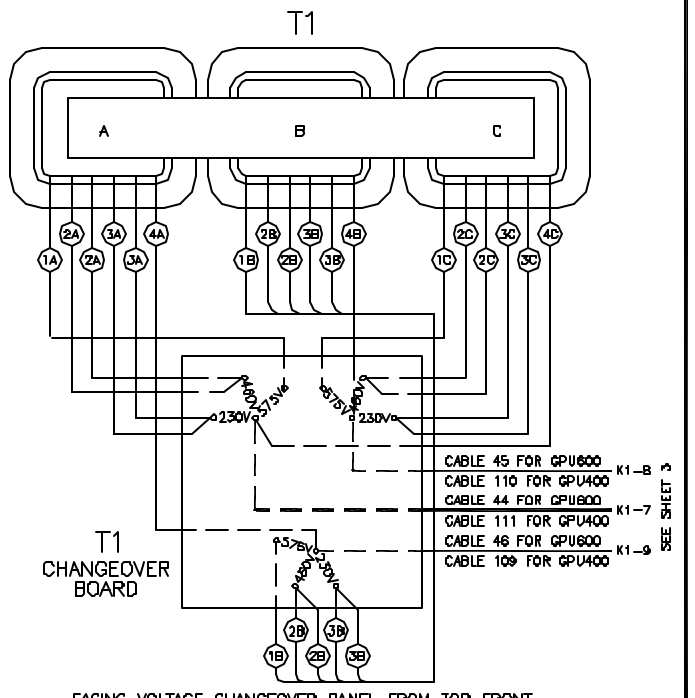




FACING FRONT OF P.C. BOARD PANEL



FACING VOLTAGE CHANGEOVER PANEL FROM TOP FRONT



FACING VOLTAGE CHANGEOVER PANEL FROM TOP FRONT

② CORRECT ORIENTATION OF WIRES ON A1 PCB

COLOR CODE			
BK	BLACK	RD	RED
BL	BLUE	TN	TAN
BR	BROWN	VT	VIOLET(PURPLE)
GR	GREEN	WT	WHITE
GY	GRAY (SLATE)	YL	YELLOW
OR	ORANGE	D	DARK (PREFIX)
PK	PINK	L	LIGHT (PREFIX)

D4537DCS	9-01
AUTOMATIC DIGITAL DISTRIBUTION TABLE	

CHANGE RECORD			
E.C. No.	DATE	FILE NAME	PLOT DATE
1) 28334A	11/14/01	288367S4	10/9/03
2) 28514A	1/2/02	UNLESS OTHERWISE SPECIFIED	
3) 30024A	11/26/02	DIMENSIONS ARE IN INCHES/MILLIMETERS	
4) 28544A	1/11/03	TOLERANCES BELOW APPLY EXCEPT FOR	
5) 30644A	3/17/03	NOMINAL DIMENSIONED PARTS AND ITEMS	
6) 31604A	10/9/03	PRODUCED TO ASSIGNED STANDARDS.	
		DO NOT SCALE DRAWING.	
		ANGULAR ±	ANGLES ±
		DECIMAL-INCH	METRIC
		.00 ± .03	0.0 ±0.8mm
		.000 ± .010	0.00 ±0.025mm

FINISH CODE PER 9101781 NONE

ACTIVITY	REVISED BY	REVISED
MATERIAL NO.	QUANTITY-UNIT	DECIMAL DES.

MATERIAL SPEC.

TITLE
DIAGRAM, SCHEMATIC & CONNECTION

DESCRIPTIVE DATA
GPU 60 Hz. TRANSFORMER AND PC BOARD

DESIGNED	DRAWN	DATE	SCALE
RPH	RPH	7/31/01	FULL
CHECKED	APPROVED	REVISED	ITEM TYPE
		9-18-01	

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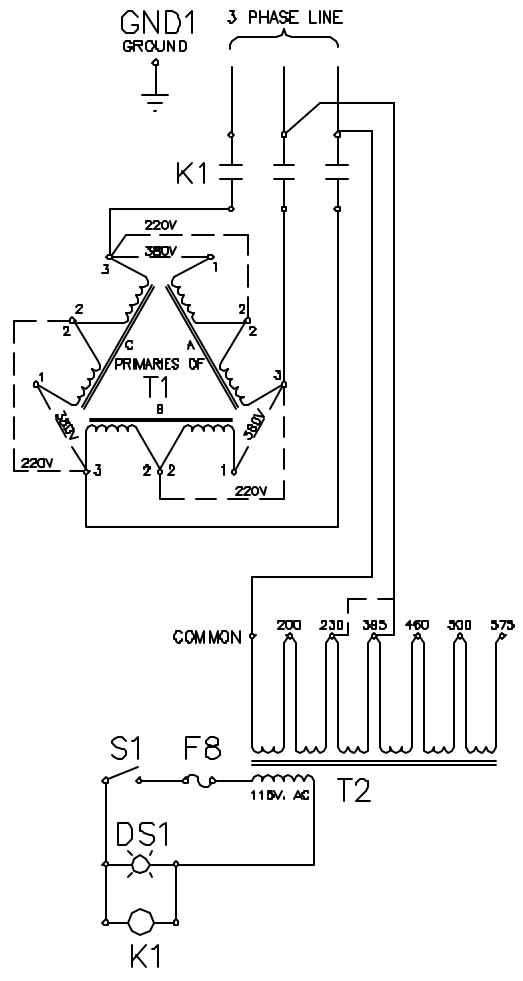
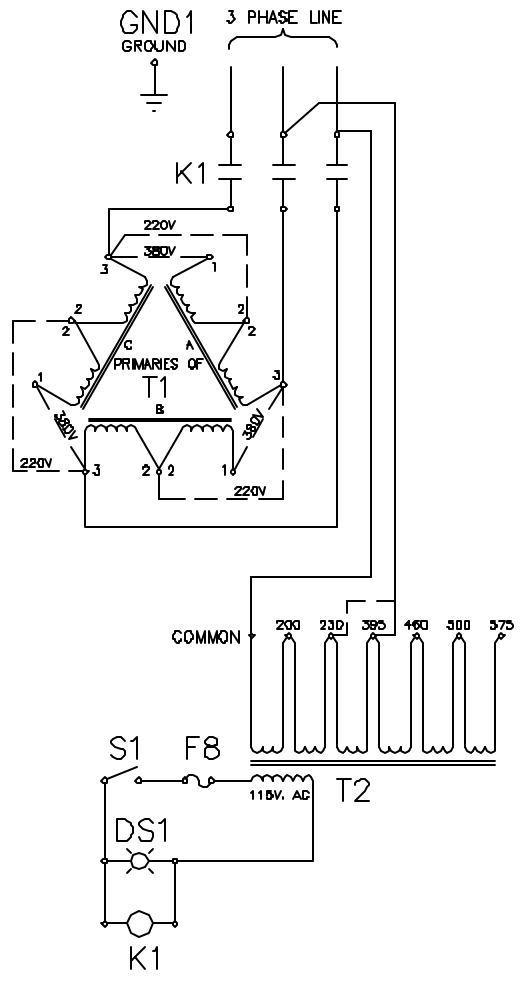
TROY, OHIO 45373
U.S.A.

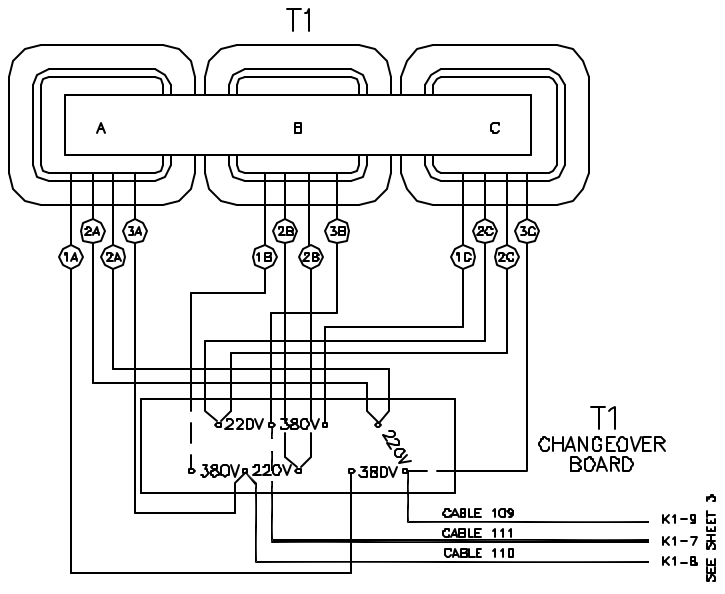
SIZE D | DWG. NO. 288367 | SHEET 4 OF 8 ①

FOR UNITS
500160-402
ONLY

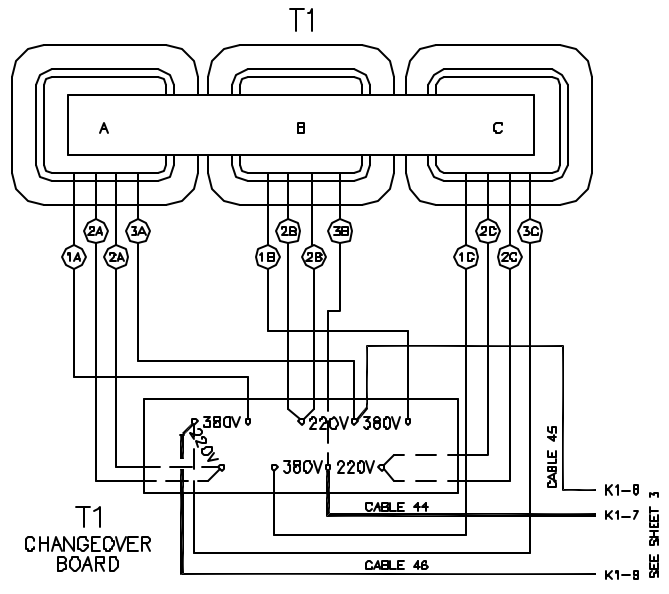


FOR UNITS
500160-602/500160-652
ONLY





FACING VOLTAGE CHANGEOVER PANEL FROM TOP FRONT



FACING VOLTAGE CHANGEOVER PANEL FROM TOP FRONT

D4537DCS	9-01
OUTSIDE INSTR.	
DISTRIBUTION TABLE	

CHANGE RECORD	
E.O. No.	DATE
1) 2833AA	11/14/01
2) 2851AA	1/2/02
3) 3002AA	11/26/02
4) 2954AA	1/11/03
5) 3054AA	3/17/03
6) 3160AA	10/9/03

FILE NAME: 288367SS | PLOT DATE: 10/9/03

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES/MILLIMETERS
TOLERANCES BELOW APPLY EXCEPT FOR HOLES DRILLED TO ESTABLISHED STANDARDS.
DO NOT SCALE DRAWING.

FRACT. ±	ANGLES ±
DECIMAL-INCH	METRIC
.00 ± .03	0.0 ±0.8mm
.000 ± .010	0.00 ±0.025mm

FINISH CODE PER 910178: NONE

ACTIVITY	NOMENCLATURE BY	REMARKS
MATERIAL NO.	QUANTITY-UNIT	DRWG. SIZE

MATERIAL SPEC.
—

TITLE
DIAGRAM, SCHEMATIC & CONNECTION

DESCRIPTIVE DATA
GPU 50 Hz. TRANSFORMER

DESIGNED	DRAWN	DATE	SCALE
RPH	RPH	7/31/01	FULL
CHECKED	APPROVED	RELEASED	ITEM TYPE
		9-18-01	

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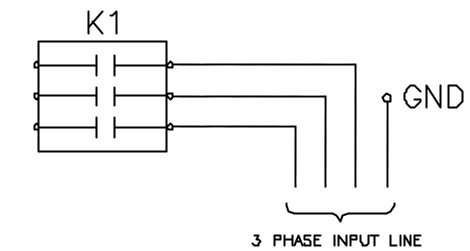
SIZE D | DWG. NO. 288367 | SHEET 5 OF 8 | 4

INSTRUCTIONS FOR SETTING VOLTAGE CHANGEOVER PANEL AND CONNECTING POWER LINE

(ALSO SEE INFORMATION IN INSTRUCTION MANUAL)

1. CHECK NAMEPLATE OF THE UNIT TO BE CERTAIN IT IS DESIGNED FOR THE LINE VOLTAGE TO WHICH YOU WISH TO CONNECT IT.
2. CONNECT THE LINKS AS SHOWN IN THE FIGURES BELOW, AS APPLICABLE, FOR THE UNIT SPECIFICATION NUMBER AND PROPER LINE VOLTAGE.
3. CHECK YOUR LOCAL CODES FOR THE PROPER LINE WIRE SIZE FOR THE LINE CURRENT SHOWN ON THE NAMEPLATE OF THE UNIT. IF NO CODES EXISTS, USE THE CHART IN THE "INSTALLATION" SECTION OF THE MANUAL.
4. CONNECT THE 3 PHASE POWER LINE TO THE INPUT CONTACTOR (K1), AS SHOWN IN THE DIAGRAM ON THE RIGHT. (CAUTION – BE CERTAIN INPUT CIRCUIT IS OPEN BEFORE HANDLING LINE.)
5. CONNECT THE POWER SYSTEM GROUND TO THE SCREW ON THE INTERIOR PANEL MARKED "GROUND".

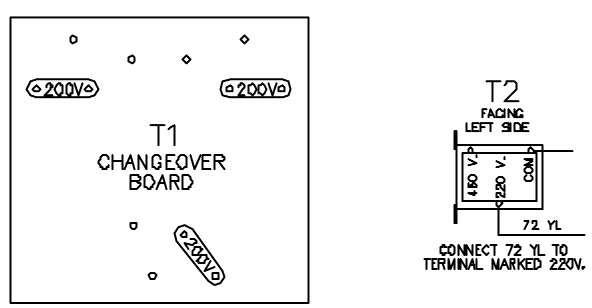
COLOR CODE			
BK	BLACK	RD	RED
BL	BLUE	TN	TAN
BR	BROWN	VT	VIOLET(PURPLE)
GR	GREEN	WT	WHITE
GY	GRAY (SLATE)	YL	YELLOW
OR	ORANGE	D	DARK (PREFIX)
PK	PINK	L	LIGHT (PREFIX)



VIEWING REAR OF INTERIOR PANEL

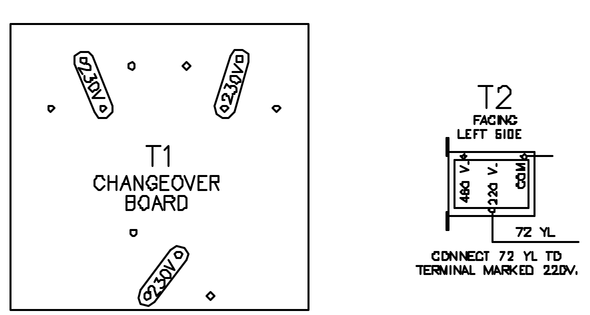
VOLTAGE CHANGEOVER DIAGRAMS

FOR UNITS 500160-401/500160-601/500160-651 ONLY



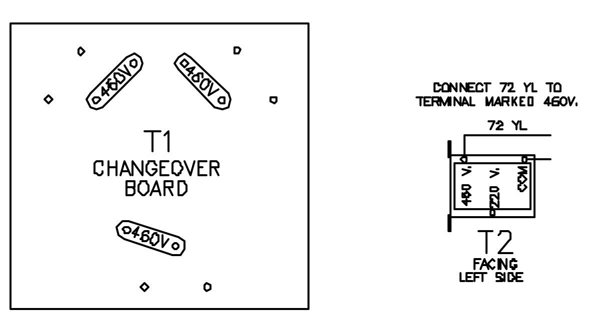
LINK CONFIGURATION

FIGURE 1
208 VOLT, 60 Hz. LINE



LINK CONFIGURATION

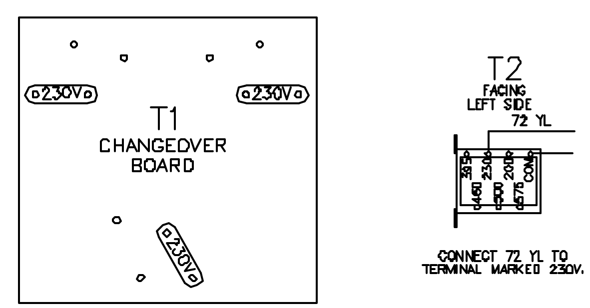
FIGURE 2
230 VOLT, 60 Hz. LINE



LINK CONFIGURATION

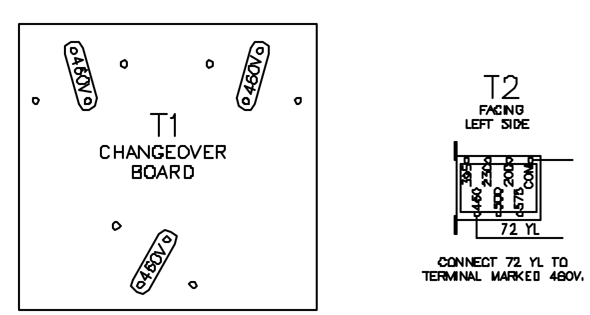
FIGURE 3
460 VOLT, 60 Hz. LINE

FOR UNITS 500160-403/500160-603/500160-653 ONLY



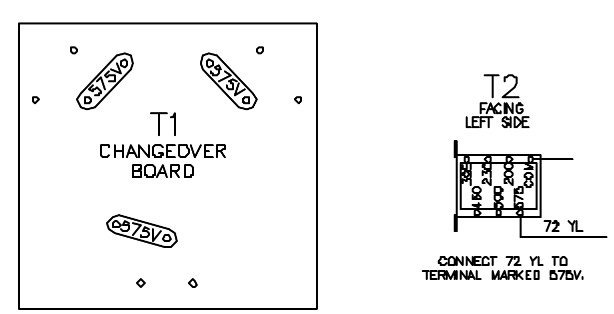
LINK CONFIGURATION

FIGURE 1
230 VOLT, 60 Hz. LINE



LINK CONFIGURATION

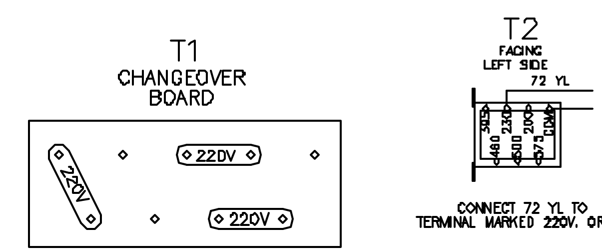
FIGURE 2
460 VOLT, 60 Hz. LINE



LINK CONFIGURATION

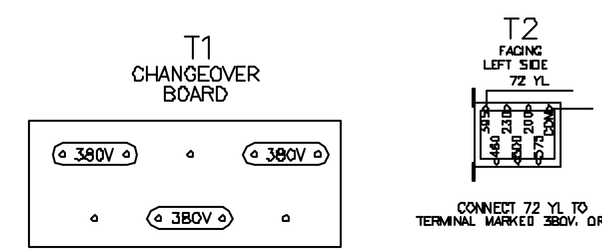
FIGURE 3
575 VOLT, 60 Hz. LINE

FOR UNITS 500160-602/500160-412/500160-652 ONLY



LINK CONFIGURATION

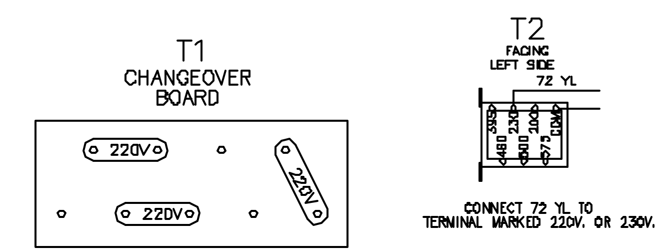
FIGURE 2
220 VOLT, 50 Hz. LINE



LINK CONFIGURATION

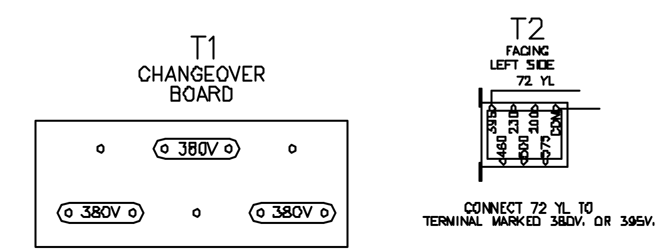
FIGURE 1
380 VOLT, 50 Hz. LINE

FOR UNIT 500160-402/500160-612 ONLY



LINK CONFIGURATION

FIGURE 2
220 VOLT, 50 Hz. LINE



LINK CONFIGURATION

FIGURE 1
380 VOLT, 50 Hz. LINE

④ ADDED 500160-412 & 500160-612

CHANGE RECORD	
E.C. No.	DATE
1) 2833AA	11/14/01
2) 2851AA	1/2/02
3) 3002AA	11/28/02
4) 2954AA	1/11/03
5) 3054AA	3/17/03
6) 3160AA	10/9/03

04537DCS 9-01

FILE NAME 288367S6 — PLOT DATE 10/9/03

UNLESS OTHERWISE SPECIFIED

FINISH CODE PER 910178: NONE

TITLE: DIAGRAM, SCHEMATIC & CONNECTION

GPU CHANGEOVER PANEL AND INPUT CONNECTION

DESIGNED RPH — DRAWN RPH — DATE 7/31/01 — SCALE FULL — RELEASED 9-18-01

.00 ± .03 | 0.0 ±0.8mm
.000 ± .010 | 0.00 ±0.25mm

ANGLES ± 3°

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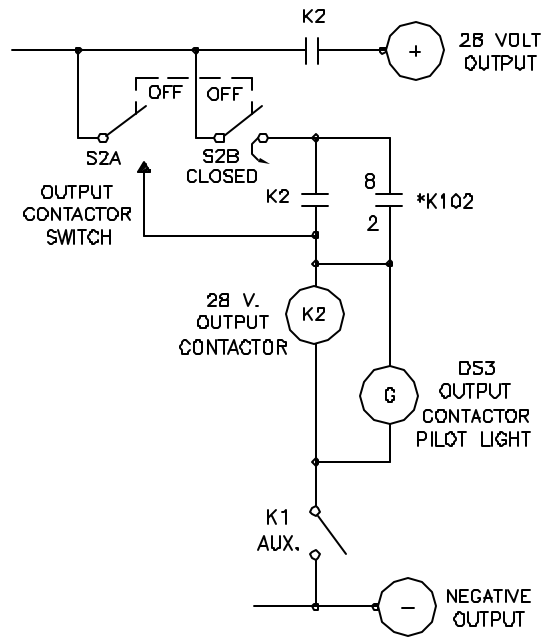
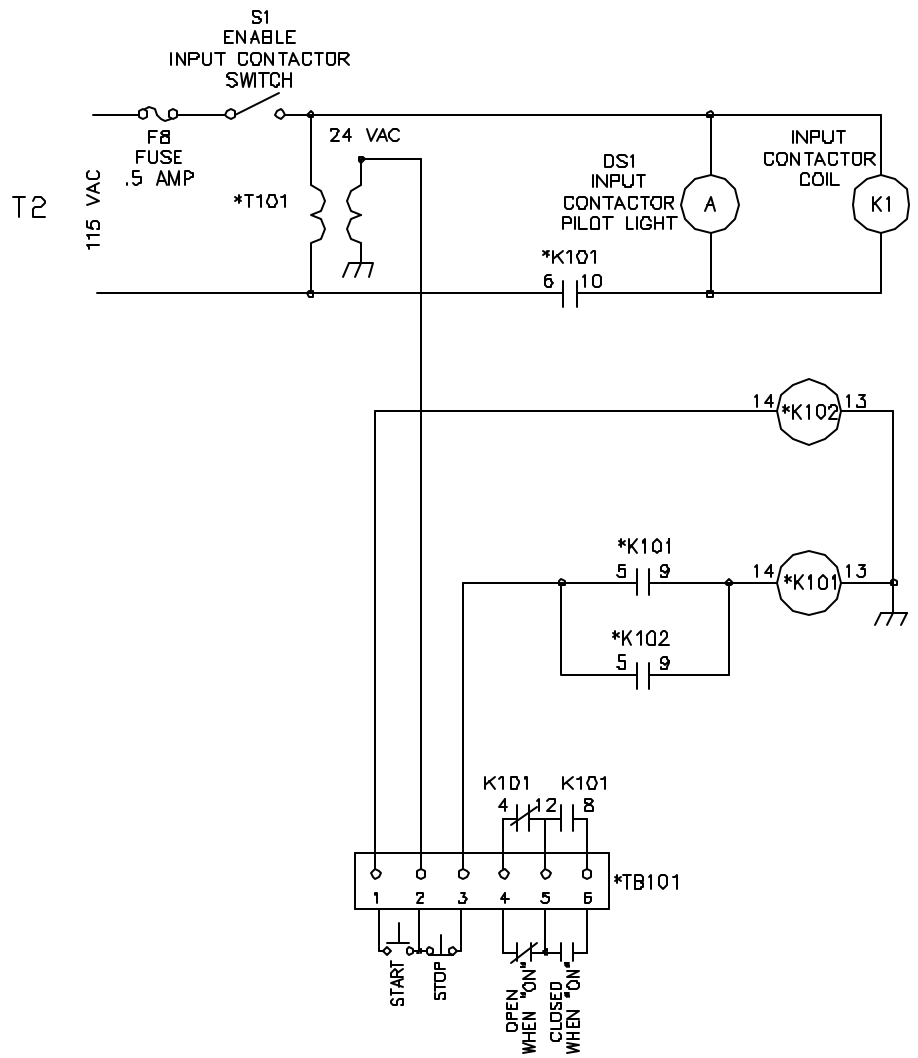
SIZE D — DWG. NO. 288367 — SHEET 6 OF 6 ④

SCHEMATIC DIAGRAM

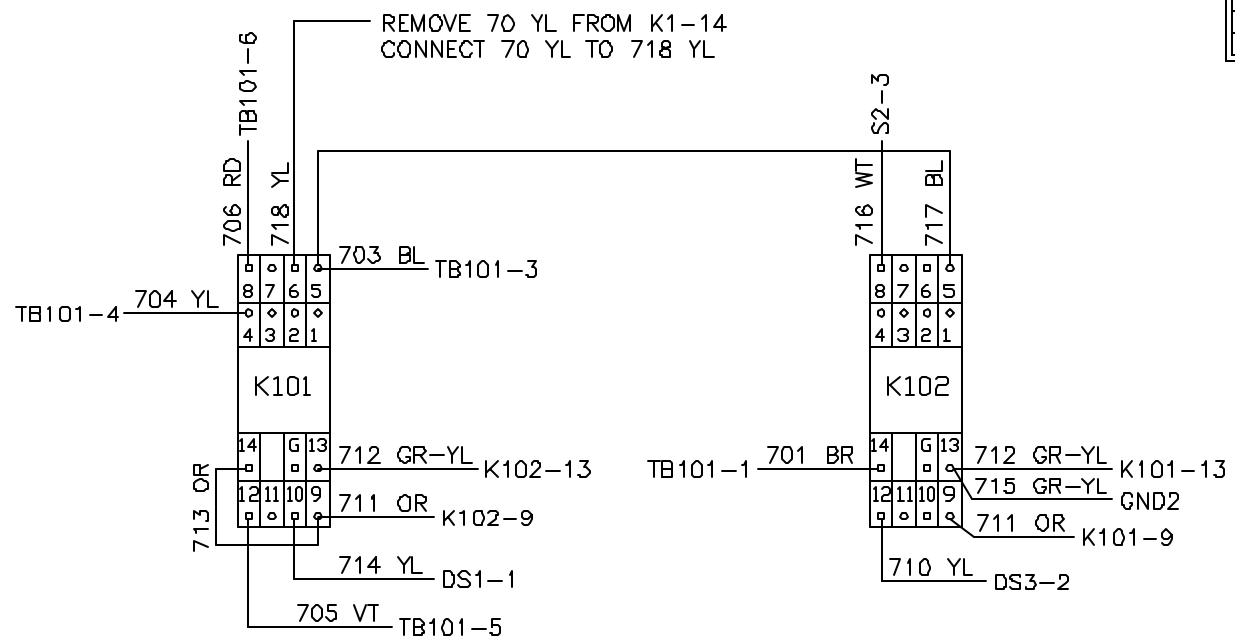




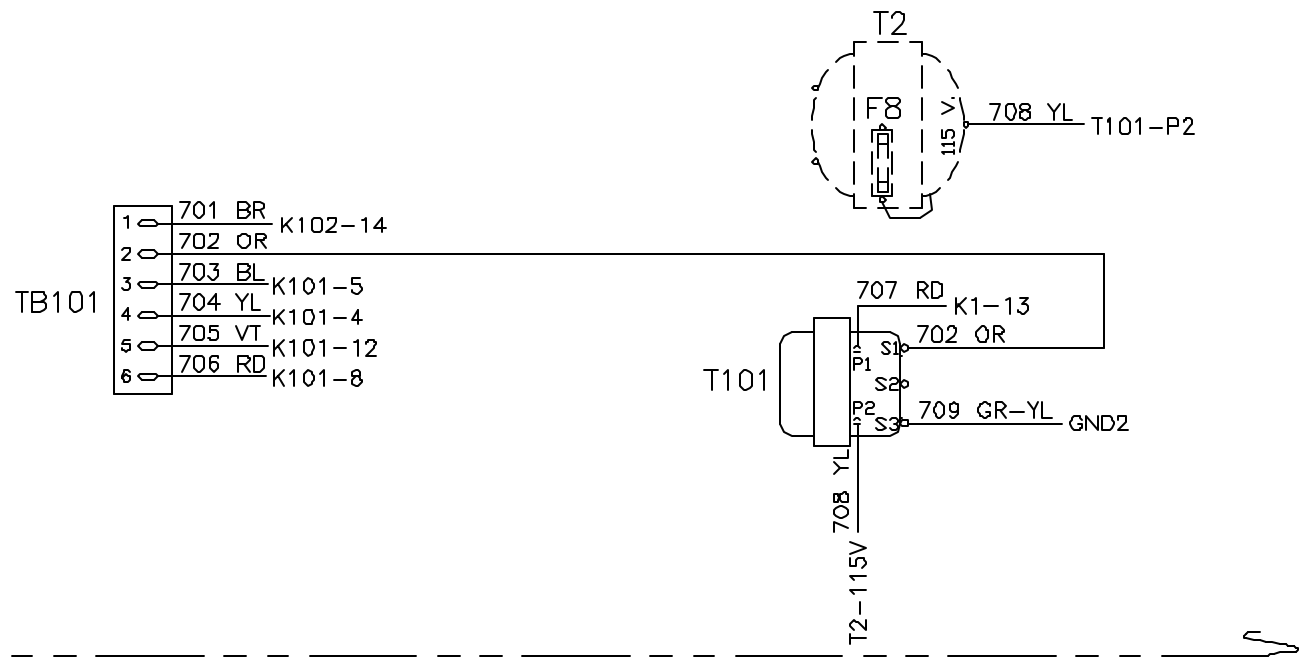
* BRIDGE INTERLOCK PART

CONNECTION DIAGRAM

COLOR CODE			
BK	BLACK	RD	RED
BL	BLUE	TN	TAN
BR	BROWN	VT	VIOLET(PURPLE)
GR	GREEN	WT	WHITE
GY	GRAY (SLATE)	YL	YELLOW
OR	ORANGE	D	DARK (PREFIX)
PK	PINK	L	LIGHT (PREFIX)



FACING P.C. BOARD PANEL



FACING FAN SIDE OF LIFTING YOKE

① ADDED TERM. DESIGNATIONS TO T101, 704YL TO K101, & 708 YL TO T2

CHANGE RECORD	
E.O. No.	DATE
1) 28333AA	11/14/01
2) 28511AA	1/2/02
3) 29934A	11/26/02
4) 29544A	1/11/03
5) 30844A	3/17/03
6) 31804A	10/9/03

FILE NAME	PLOT DATE
288367S7	10/9/03

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES/MILLIMETERS
TOLERANCES BELOW APPLY EXCEPT PER VENDOR DRAWINGS PARTS AND ITEMS PRODUCED TO ENGINEERED STANDARDS.
DO NOT SCALE DRAWING.
FRACT. ± ANGLES ± 3°
DECIMAL-INCH: .00 ± .03, .000 ± .010
METRIC: 0.0 ±0.8mm, 0.00 ±0.25mm

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FINISH CODE PER 910178: NONE

ARTWK	REVISED BY	REPARED
MATERIAL NO.	QUANTITY-UNIT	ORIGINAL ISS.

MATERIAL SPEC.: —

TITLE: DIAGRAM, SCHEMATIC & CONNECTION

DESCRIPTIVE DATA: GPW-600 W/BRIDGE INTERLOCK & REMOTE CON.

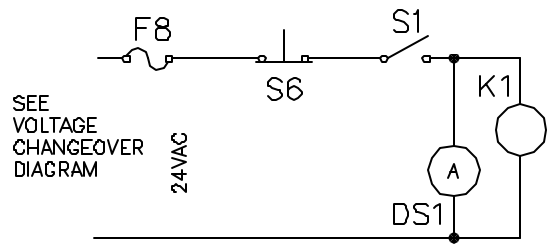
DESIGNED	DRAWN	DATE	SCALE
BJH	RPH	8/29/01	FULL
CHECKED	APPROVED	MACHINE	ITEM TYPE
		9-18-01	

HOBART® TROY, OHIO 45373 U.S.A.

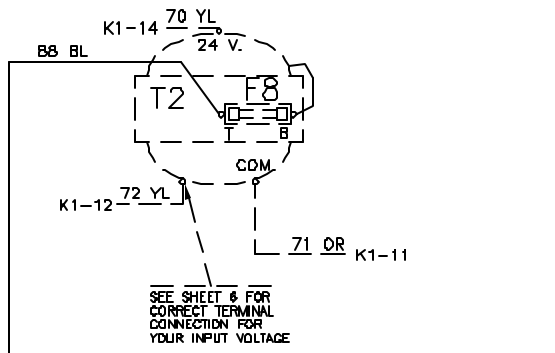
SIZE D | DWG. NO. 288367 | SHEET 7 OF 8 ①

04537DCS	9-01
OUTSIDE INSTAL. INFORMATION TABLE	

SCHEMATIC DIAGRAM



CONNECTION DIAGRAM

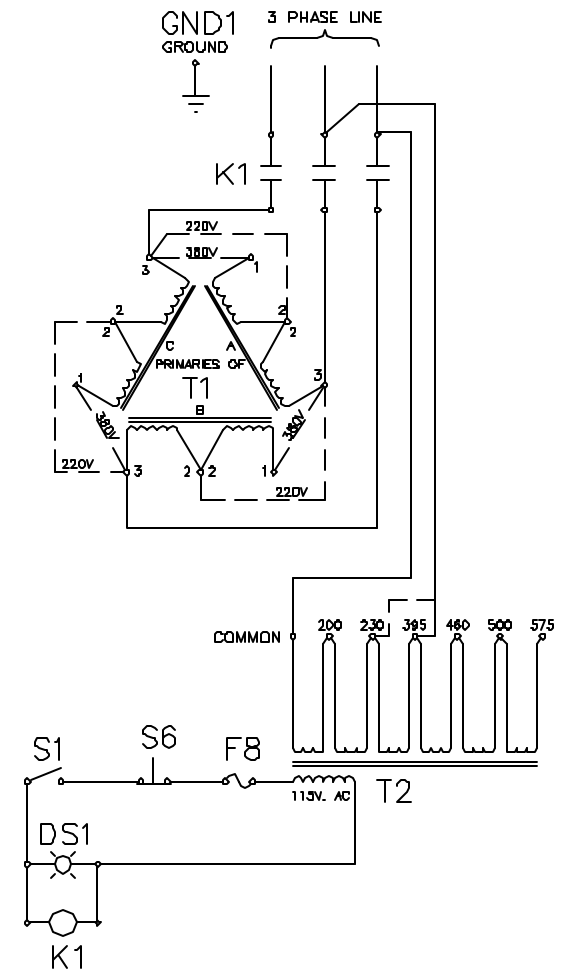


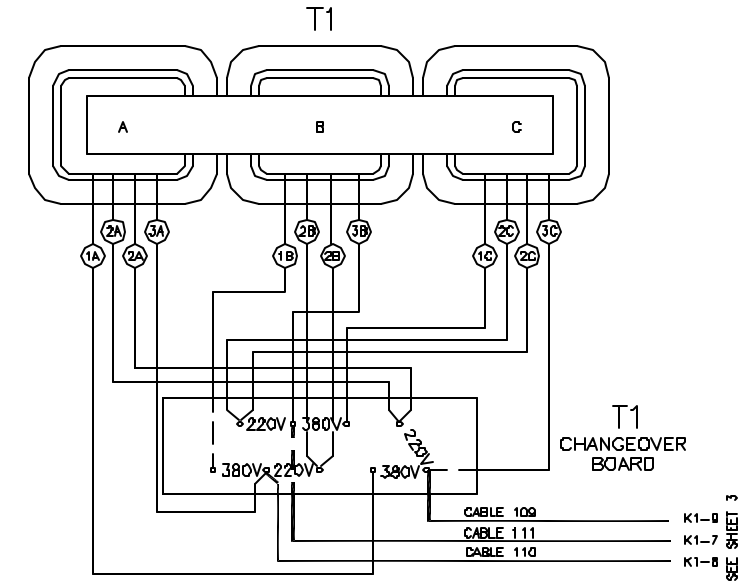
FACING REAR OF INTERIOR PANEL

FACING REAR OF CONTROL PANEL

COLOR CODE			
BK	BLACK	RD	RED
BL	BLUE	TN	TAN
BR	BROWN	VT	VIOLET(PURPLE)
GR	GREEN	WT	WHITE
GY	GRAY (SLATE)	YL	YELLOW
OR	ORANGE	D	DARK (PREFIX)
PK	PINK	L	LIGHT (PREFIX)

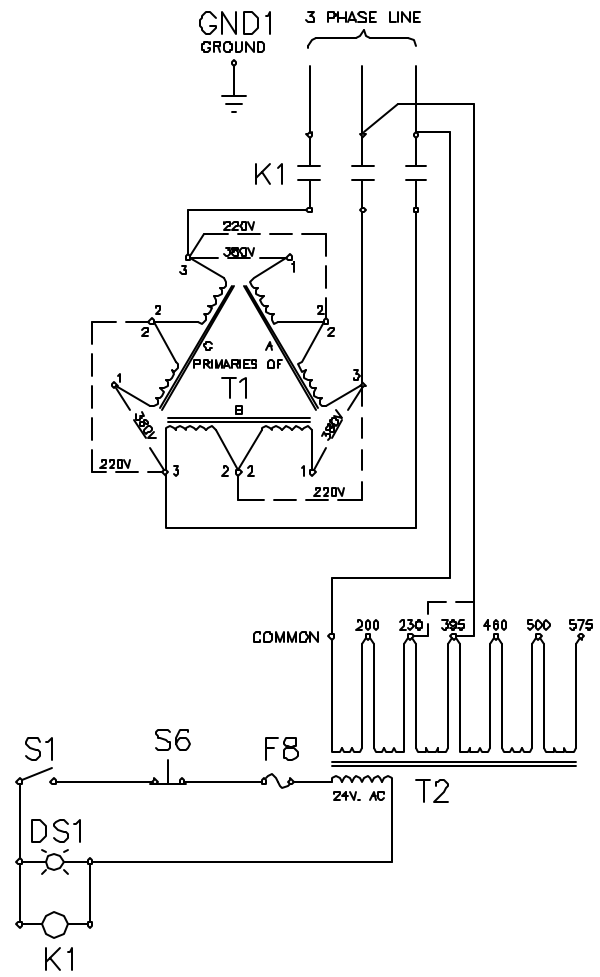
FOR UNITS 500160-412 ONLY

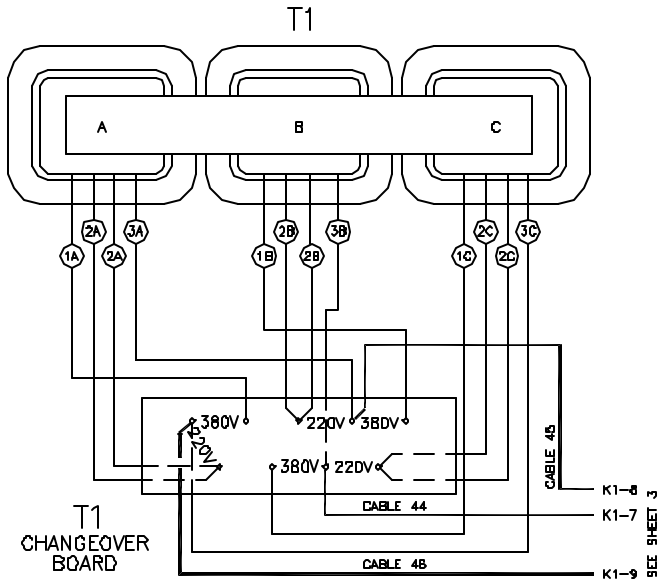




FACING VOLTAGE CHANGEOVER PANEL FROM TOP FRONT

FOR UNITS 500160-612 ONLY





FACING VOLTAGE CHANGEOVER PANEL FROM TOP FRONT

04537DCS	9-01
OUTSIDE INSTR.	

DISTRIBUTION TABLE

CHANGE RECORD		
E.O. No.		DATE
1)	N/A	
2)	N/A	
3)	N/A	
4)	2954AA	1/11/03
5)	3084AA	3/17/03
6)	3160AA	10/9/03

FILE NAME: 288367S8 — PLOT DATE: 10/9/03

UNLESS OTHERWISE SPECIFIED

DIMENSIONS ARE IN INCHES/MILLIMETERS. TOLERANCES BELOW APPLY EXCEPT FOR HOWEVER DESIGNED PARTS AND FINISH. CHANGED TO ECONOMICAL STANDARDS. DO NOT SCALE DRAWING.

FRACT.	ANGLES	
DECIMAL-INCH	METRIC	
.00 ± .03	0.0	±0.8mm
.000 ± .010	0.00	±0.025mm

FINISH CODE PER 910178: NONE

ACTIVITY	RELEASED BY	RELEASED

MATERIAL NO.	QUANTITY-UNIT	DECIMAL DES.

MATERIAL SPEC: —

TITLE: DIAGRAM, SCHEMATIC & CONNECTION

DESCRIPTIVE DATA: CE CERTIFICATION

DESIGNED	DRAWN	DATE	SCALE
BJH	RPH	8/29/01	FULL
CHECKED	APPROVED	RELEASED	ITEM TYPE
		9-18-01	

HOBART TROY, OHIO 45373 U.S.A.

SIZE D — DWG. NO. 288367 — SHEET 8 OF 8

Appendix A Options / Features

Option/Features Available			
Description	**Part Number**	**Document Number**	**In This Section**
Kit, 14 Volt Output	288386	TO-285	
Kit, Cable Tray	288360	TO-274	
Kit, Bridge Mount	288387	TO-287	

The following is a list of options/features available for the 500160, GPU-400 Solid State Transformer-Rectifier. This chart contains the description, part number, and document number of the option/feature. There is also a column to identify which option/feature is contained in this Appendix.

Unusual Service Conditions

This information is a general guideline and cannot cover all possible conditions of equipment use. The specific local environments may be dependent upon conditions beyond the manufacturer's control. The manufacturer should be consulted if any unusual conditions of use exist which may affect the physical condition or operation of the equipment.

Among such conditions are:

1) Exposure to:

a) Combustible, explosive, abrasive or conducting dusts.

b) Environments where the accumulation of lint or excessive dirt will interfere with normal ventilation.

c) Chemical fumes, flammable, or explosive gases.

d) Nuclear radiation.

e) Steam, salt-laden air, or oil vapor.

f) Damp or very dry locations, radiant heat, vermin infestation, or atmospheres conducive to fungus growth.

g) Abnormal shock, vibration or mechanical loading from external sources during equipment operation.

h) Abnormal axial or side thrust imposed on rotating equipment shafts.

i) Low and/or high ambient temperatures.

j) High electromagnetic fields

2) Operation at:

a) Voltages above or below rated voltage.

b) Speeds other than rated speed.

c) Frequency other than rated frequency.

d) Standstill with rotating equipment windings energized.

e) Unbalanced voltages.

f) Operation at loads greater than rated.

3) Operation where low acoustical noise levels are required.

4) Operation with:

a) Improper fuel, lubricants or coolant.

b) Parts or elements unauthorized by the manufacturer.

c) Unauthorized modifications.

5) Operation in poorly ventilated areas.

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