HOBART®
GROUND POWER

OM-2080A
2/5/00

Operation and Maintenance Manual

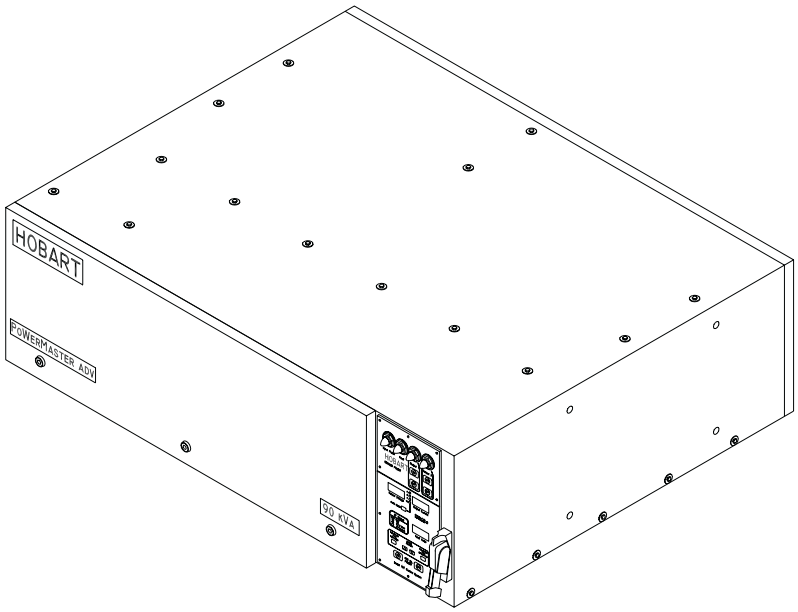
with

Illustrated Parts List

for

POWERMASTER® ADV

Series 500048A
60 and 90 kVA
Solid State Frequency Converters



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.
7. **UNDER NO CIRCUMSTANCES** whatsoever shall **HOBART** and its authorized distributors be liable for any special or consequential damages, whether based on lost goodwill, lost resale profits, work stoppage impairment of other goods or otherwise, and whether arising out of breach of any express or implied warranty, breach of contract, negligence or otherwise, except only in the case of personal injury as may be required by applicable law.
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 terminal 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 Hobart PoWerMaster ADV solid state frequency converters 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, and 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 customers 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
WWW	hobartgroundpower.com

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Appendix A

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Chapter 1. Description / Operation

Section 1. Description

1. General

The PoWerMaster ADV Solid State Frequency Converters covered by this manual are manufactured by Hobart Ground Power, Troy, Ohio 45373. These converters are designed to provide ground power for maintenance and startup of aircraft having 115/200-V AC, 3-phase, 400-Hz electrical systems.

The number 500048A identifies the "model or series" of the converter. The part number is followed by a different dash number which separates the basic units available. The criteria for number of power rating, outputs, and contactors on a converter change with each dash number. Figure 1 uses the part number to identify the variations possible covered by this manual.

Part & Dash Number	Output (kVA)	Outputs	Contactor(s)
500048A-101	90	One	One
500048A-102	90	Two	Two
500048A-001	60	One	One
500048A-002	60	Two	Two

Series 500048 Converters Part Number Descriptions
Figure 1

The Hobart PoWerMaster ADV is designed to service aircraft equipped with No-Break Power Transfer (NBPT). Advanced electronic circuitry allows the unit to automatically synchronize with onboard power during NBPT, providing successful transfers every time.

2. Optional Equipment - Appendix A

Chapters 1 through 5 of this Operation and Maintenance Manual identifies only the basic version of a Series 500048 converter. Component differences between the different machines will be listed when necessary. A list of optional equipment which make this manual unique to the generator set that you have purchased, appears in Appendix A. Examples of items located Appendix A are 12 pulse input current filtering and trailer mount configuration.

3. Orientation

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

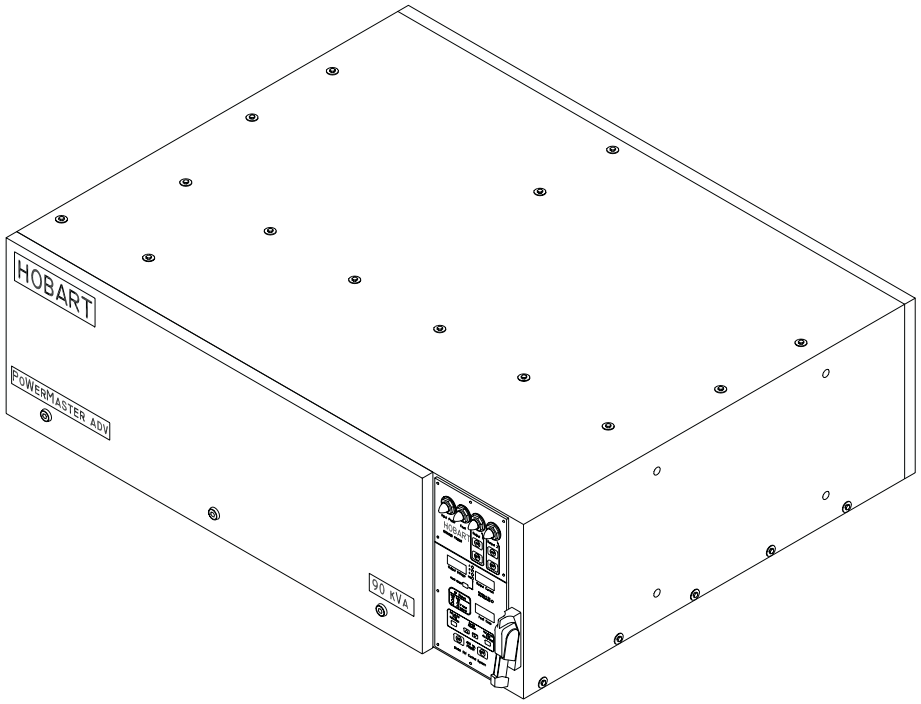
4. Mountings for the Converter

The ADV converter must be mounted horizontally in one of three ways:

Under a passenger boarding bridge.

On a trailer to make it mobile.

On a floor stand.



Hobart PoWerMaster® ADV Solid State Frequency Converter
Figure 2

PHYSICAL		
Enclosure	NEMA 3R or IEC IP 54	
Weight (approx.)	SINGLE OUTPUT	DUAL OUTPUT
Bridge Mount Unit (w/ brackets)	1100 lb (499 kg)	1108 lb (503 kg)
Bridge Mount Unit (w/ brackets) w/ 12 Pulse	1350 lb (612 kg)	1358 (616 kg)
Trailer Mount Unit (Towable)	1705 lb (773 kg)	1713 lb (777 kg)
Trailer Mount Unit (Towable) w/ 12 Pulse	1955 lb (886 kg)	1963 lb (890 kg)
Trailer Mount Unit (Hand Pull)	1374 lb (623 kg)	1382 (627 kg)
Trailer Mount Unit (Hand Pull) w/ 12 Pulse	1624 lb (736 kg)	1632 (740 kg)
Size		
Bridge Mount Unit	18" high x 60" wide x 49" deep (45.7 cm x 152.4 cm x 124.5 cm)	
(Towable) Trailer Mount Unit Towbar Raised	80.6" long x 56" wide x 54.6" high (204.7 cm x 142.2 cm x 138.7 cm)	
(Towable) Trailer Mount Unit Towbar Lowered	116.7" long x 56" wide x 54.6" high (296.4 cm x 142.2 cm x 138.7 cm)	
(Hand Pull) Trailer Mount Unit Hand Bar Raised	75.75" long x 49" wide x 45" high (192.4 cm x 124.5 cm x 114.3 cm)	
(Hand Pull) Trailer Mount Unit Hand Bar Lowered	111" long x 49" wide x 45" high (281.9 cm x 124.5 cm x 114.3 cm)	
ELECTRICAL		
Acoustical noise	Less than 65 dBA @ 1.5 m high, 2 m distance	
Operating temperature	-40 to +50 C (-40 to +122 F)	
Storage temperature	-40 to +60 C (-40 to +140 F)	
Relative humidity	10 to 100% non-condensing	
INPUT		
	60 kVA Unit	90 kVA Unit
Voltage (nominal)	400 / 460	
Frequency (Hz)	50 / 60	
Amperes (rated load)	80/67	118/100
Voltage Range (max)	340-530 VAC	
Starting Current	Less than 100% full load input current	
Power Factor	More than 0.98 lagging from 10% to full load	

Specifications and Capabilities
Figure 3

ELECTRICAL			
OUTPUT			
Voltage		115/200-V AC	
Power rating		60 or 90 kVA (48 or 72 kW continuous)	
Amperes (at rated load, per power ratings)		172-A for 60 kVA	260-A for 90 kVA
Frequency		400-Hz	
Overload trips	at 125% after 10 min.	at 150% after 30 sec.	at 200% after 10 sec.
Shorted output shutdown		Immediate	
Duty cycle		100%	
Total harmonic distortion (THD)		Less than 3%	
Individual harmonic distortion (IHD)		Less than 2%	
DC content		Less than 100-mV	
Frequency drift		+/- 0.05%	
Phase displacement		120 +/- 1.5	
Transient performance		Meets Mil Std 704E, Figure 5	
Voltage adjustment range		+/- 15% of rated voltage	
Phase voltage balance (with balanced load)		Less than 2% of rated line/neutral voltage	
Voltage unbalance (10% unbalanced load on one phase)		Less than 3-V (meets Mil Std 704E, Figure 1 and ARP-1940, 3.1.5.10)	
Voltage regulation		Less than 1% from no load to rated load	
Crest factor		1.414+/- 0.07	
Line drop compensation		Automatic, up to 8% of rated voltage at maximum rated load	
Frequency modulation		Less than +/- 0.25% of the period of output voltage wave	

Specifications and Capabilities Electrical
Figure 4

5. Safety Features

The Hobart control system provides the highest available level of protection and safety for the operator, the aircraft, and the converter itself. The ADV performs complete diagnostic testing upon each startup and continuous monitoring of all critical circuits and operating electrical values, and automatically shuts down the converter, if a fault occurs, in order to minimize risks to the user, aircraft, and converter.

See Section 2-1 Troubleshooting, for details on the types and levels of protection provided by the control system.

6. Bridge Interlock Circuit

For safety, and to prevent damage to equipment, the converter can be interlocked with the bridge drive circuitry so that the bridge cannot be moved on the apron while the converter is operating. This is done to prevent the bridge from pulling the output cable from the airplane or driving over the cable.

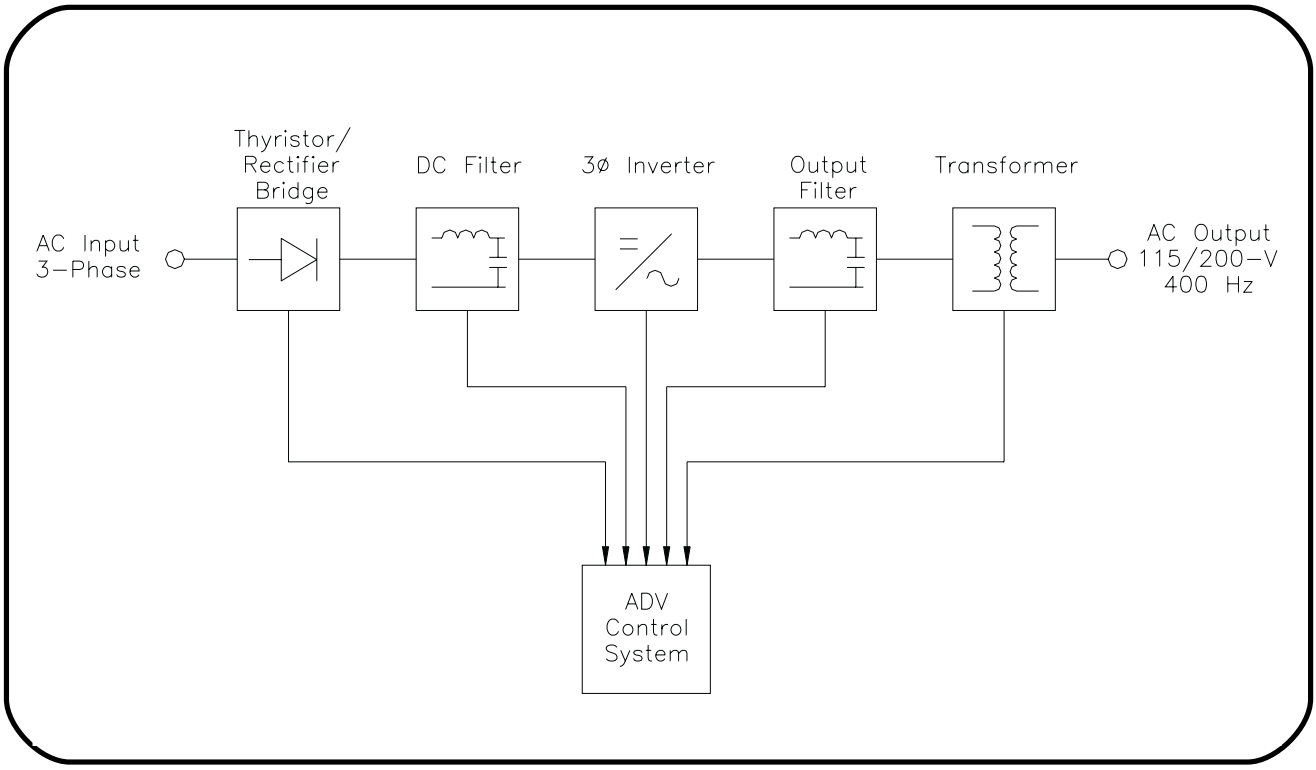
7. Converter Cabinet (See Figure 2)

The cabinet which houses the converter apparatus and circuitry is a NEMA 3R or IEC IP 54 enclosure, which means that it is weather resistant. It consists of a sturdy welded steel frame to which an aluminum enclosure fastens at the sides and top. Aluminum front and rear doors are hinged to permit opening the unit for easy access to serviceable components. Both the front and back doors open upward.

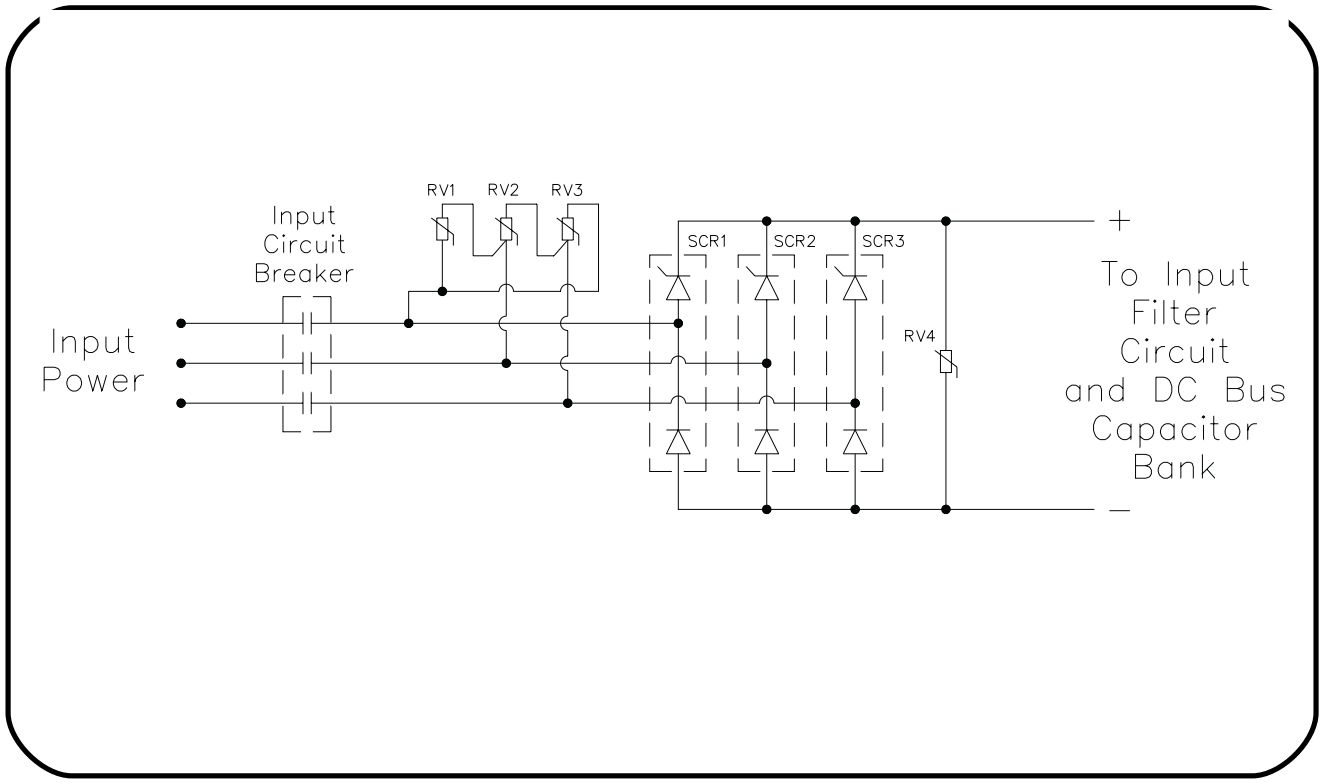
8. Theory of Operation (See Figure 5)

a. Input Rectifier (See Figure 6)

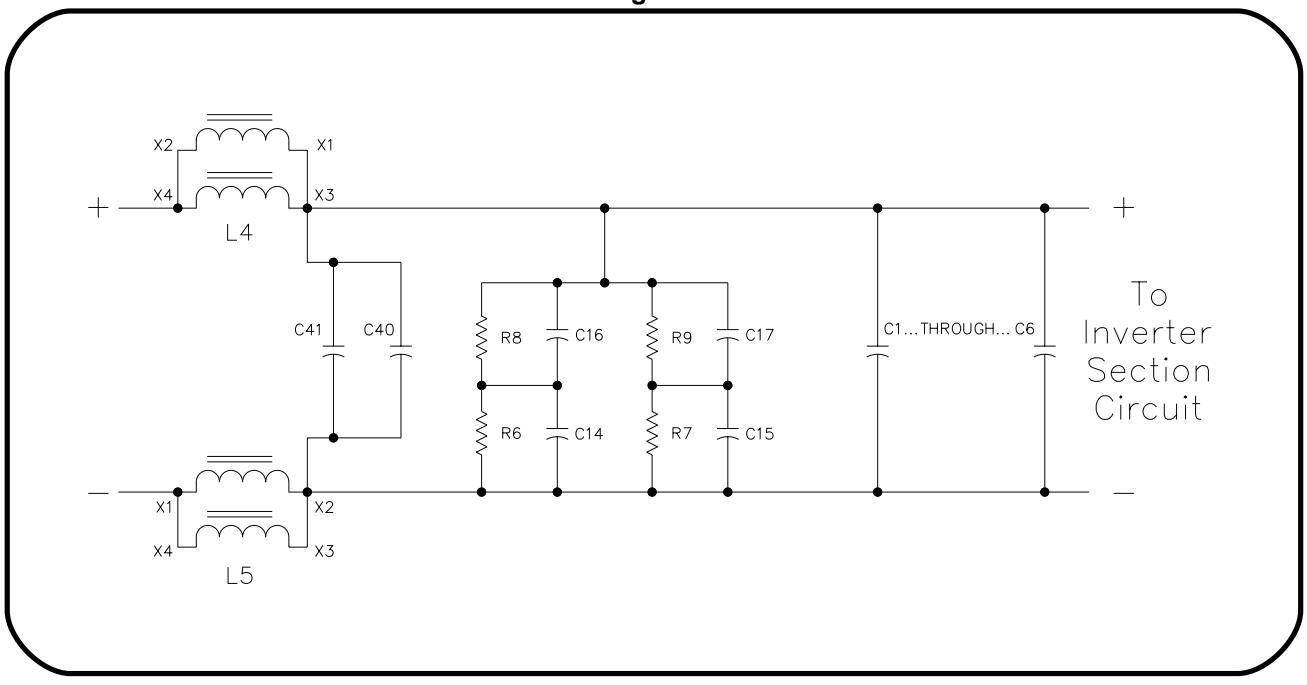
The input rectifier consists of a three phase thyristor/rectifier bridge which is phase angle regulated during startup providing a soft start of the converter. This limits the inrush current to less than the full rated value of the converter. During normal operation, the thyristor/rectifiers operate at full conduction to behave as a standard 3-phase bridge rectifier. The bridge produces an unregulated DC voltage (approximately 650 volts) which is passed through a filter before it is applied to the inverter. The converter is protected against input line voltage surges by a three phase voltage snubber network connected across the AC input of the bridge and a voltage suppresser across the DC output of the rectifier bridge.



Simplified Block Diagram of Converter
Figure 5



Input Thyristor/Rectifier Circuit
Figure 6



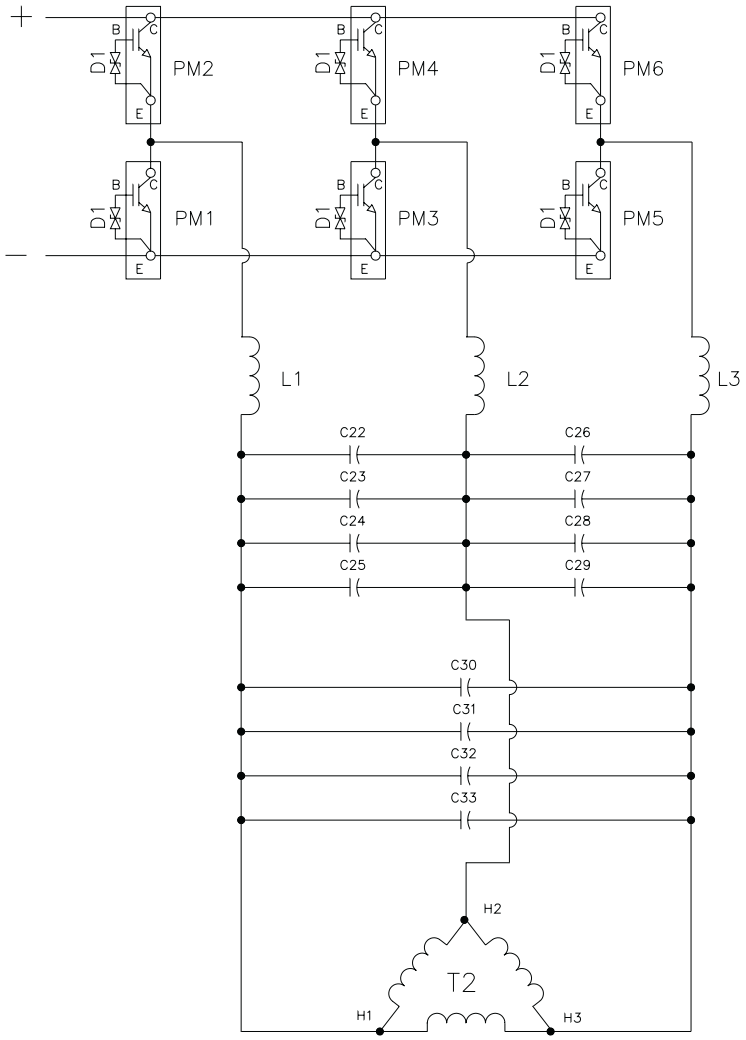
Input Filter Circuit and DC Bus Capacitor Bank
Figure 7

b. Input Filter and DC Bus Capacitor Bank (See Figure 7)

The input filter consists of two filter inductors and a bank of capacitors to provide the inverter with a low ripple DC voltage. One inductor is in the positive output of the rectifier bridge and one is in the negative output of the rectifier bridge. The capacitor bank consists of electrolytic and high frequency film capacitors connected in parallel but strategically located to utilize the advantages of each fully. The high frequency film capacitors exhibit low capacitance, extremely low series inductance with high ripple current capacity and are mounted directly across the inverter with a low inductance bus; the electrolytic capacitors which have high capacitance but low ripple current capabilities are remotely located and serve as energy storage and input rectifier filter for the DC bus. Because of the limited voltage rating of electrolytic capacitors, two capacitors are connected in series with a voltage balancing resistor across each capacitor to achieve a 900 volt capability.

c. Discharge Circuit

The discharge circuit consists of a high power, low value resistor that will discharge the DC bus to 30 volts in less than 3 seconds. An IGBT (Insulated Gate Bipolar Transistor) switches a resistor across the bus upon command from the IPC board. Red indicating lamps located on the bus discharge board and the signal conditioning boards indicate the presence of voltage (greater than 8 volts) across the bus.



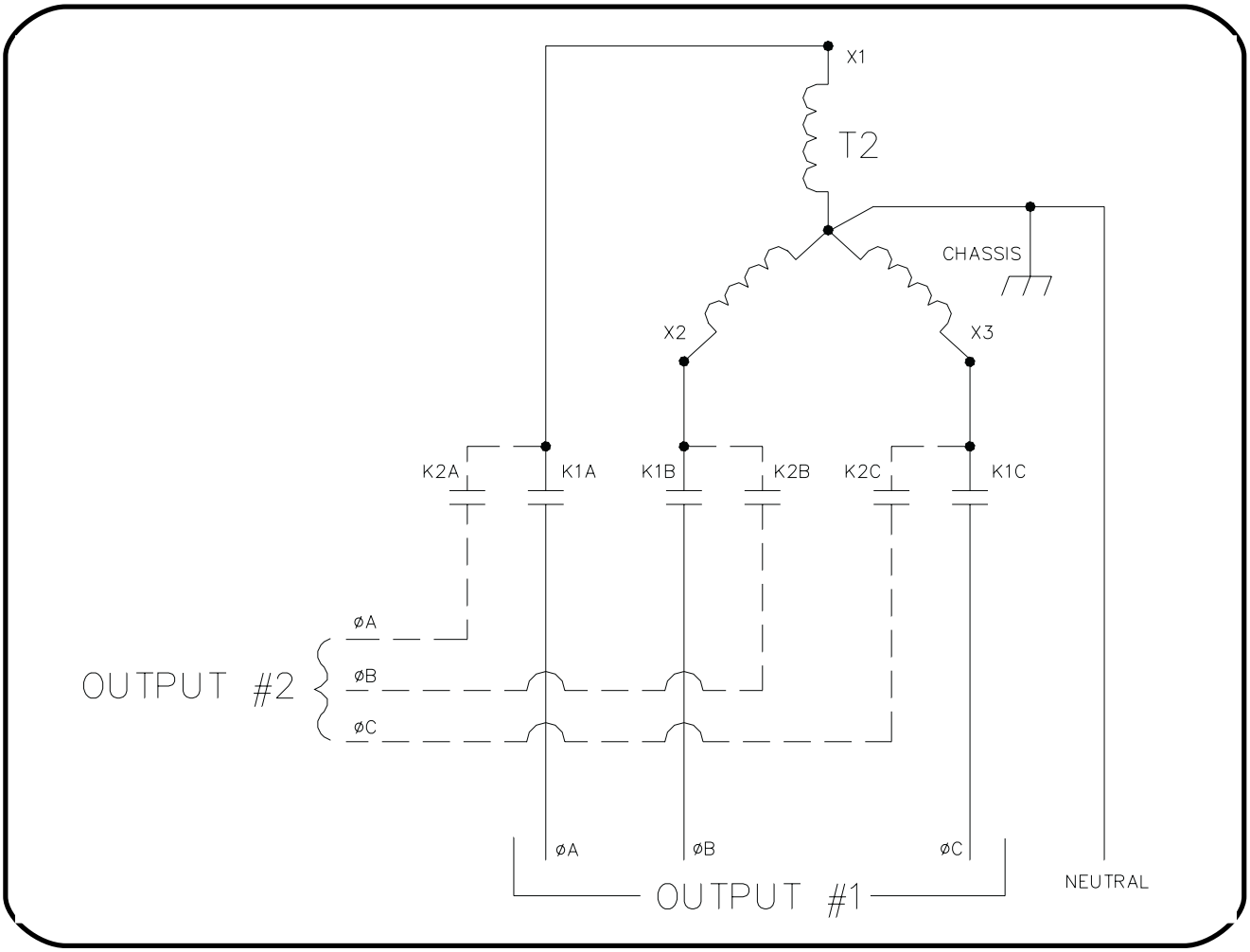
Inverter Section Circuit
Figure 8

d. Inverter and Output Filter Section (See Figure 8)

The inverter section consists of three pairs of high power IGBTs (6 total) connected in a three phase array; each pair consists of two in series IGBTs across the bus forming one output phase of the three phase output. Each pair is ADVanced Pulse-Width-Modulated to synthesize a low harmonic 400 hertz 280 volt output voltage line to line. This three phase Pulse-Width-Modulated output is connected to an output filter that smooths the output voltage by reducing the higher order switching harmonics. The result is three line to line 400 hertz voltages that contain less than 3% distortion. The Output Filter (OF) consists of three inductors, one in series with each output phase, and three banks of capacitors connected line to line (delta) across the output of the inductors. This junction is the output of the inverter. This 3-phase voltage is then applied to the primary of the output transformer which steps down the voltage and provides voltage isolation from the inverter section.

e. Converter Output (See Figure 9)

The output of the main transformer is connected to 3-phase contactors which provide the connection point for the output cables.



Output Transformer Circuitry
Figure 9

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9. Model 101 Control System

The Model 101 Control System performs complete diagnostic testing upon each startup and continuous monitoring of all critical circuits and operating electrical values. Functions of the converter are selected through the control panel of the Model 101. Specifically, the Model 101 performs the following:

a. Checks all critical components prior to supplying 400-Hz power.

b. Monitors all critical operating parameters during operation.

c. Signals a fault and indicates a potential problem if parameters approach critical levels during operation.

d. Diagnoses and identifies the cause of a fault.

e. Causes the converter to automatically shut down if factory-set output parameters or output characteristics fall outside predetermined safe limits.

f. Measures power flow for billing purposes if desired. Stores history of up to 200 power cycles at the gate.

g. Logs data into its own memory for downloading to an external computer through the control serial port.

h. Provides an advanced and easy-to-use interface between the operator and the converter.

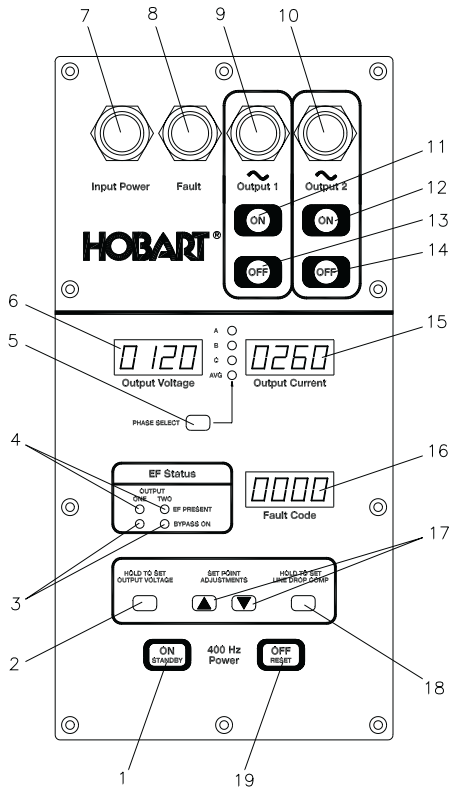
10. Event Records/Fault Monitoring

The Hobart PoWerMaster ADV Model 101 Control System performs complete diagnostic testing upon each startup and continuous monitoring of all critical circuits and operating electrical values. If the control system senses a problem with one of the circuits, or if one of the electrical values exceeds its safe operating limit, the control will generate and store an event record. Depending on the severity of the condition, the converter will either continue operation or will indicate a fault and shut the converter down. The two types of event records are Warnings and Faults.

a. Warnings result when a problem is detected which does not interfere with the proper operation of the converter. The warning will be displayed on the front panel and the machine will continue to operate normally. An event record will be recorded.

b. Faults occur when any of the fault limits are exceeded, when an internal problem occurs, or under certain conditions that would cause injury to personnel or damage to an aircraft or the converter. These limits are preset at the factory. A fault indication signifies a condition severe enough to discontinue all output power and shut the converter down. After the recognition of a fault the control system will immediately shut down, the red fault lamp will illuminate and the appropriate fault message will appear in the display. An event record will be stored to troubleshoot the problem.

(1) See the Troubleshooting section for a list of faults, their possible causes, and corrective actions.



1. 400 Hz POWER ON push button
2. OUTPUT VOLTAGE ADJUSTMENT push button
3. BYPASS ON lamps
4. EF PRESENT lamps
5. PHASE SELECT push button
6. OUTPUT VOLTAGE display
7. INPUT POWER lamp
8. FAULT lamp
9. OUTPUT 1 lamp
10. OUTPUT 2 lamp
11. OUTPUT 1 ON push button
12. OUTPUT 2 ON push button
13. OUTPUT 1 OFF push button
14. OUTPUT 2 OFF push button
15. OUTPUT CURRENT display
16. LINE DROP COMPENSATION PERCENTAGE lamp
17. FAULT CODE display
18. SET POINT UP AND DOWN ADJUSTMENT push buttons
19. LINE DROP COMPENSATION ADJUSTMENT push button
20. 400 Hz POWER OFF push button

Control Panel
Figure 10A

11. Detailed Description of Converter Components

a. Control Panel (See Figures 10A and 10B)

The function of each of the controls and indicators are as follows:

(1) 400 Hz POWER ON push button (1, Figure 10)

Pressing this push button turns the converter on and readies the machine to deliver 400 Hz power.

NOTE: Pressing the 400 Hz POWER ON push button will power the converter only, but will NOT close output contactor(s) to provide output power to the aircraft.

(2) OUTPUT VOLTAGE ADJUSTMENT push button

To adjust the output voltage, depress and hold the OUTPUT VOLTAGE ADJUSTMENT push button (2) and use the proper arrow key (18).

Note: This adjustment can be disabled if the keypad disable switch is in the “disable” position (see Sect. 1-3, Para. J).

(3) “EF” BYPASS ON lamp

CAUTION

DO NOT use the EF BYPASS unless the output cables are connected to an aircraft or an approved load bank.

These lamps indicate that EF BYPASS (Sect. 1-3; Figure 2, items 2 and 3), has been turned on for that output. Once the EF BYPASS is activated, the need for a returned EF Signal from the aircraft is disabled, therefore allowing 400 Hz power to be sent uncontested to the output cables(s). Because live unattended output cables are possible, the EF BYPASS is to be used for aircraft not equipped with EF circuitry or maintenance use only.

(4) EF PRESENT lamp

The presence of the EF signal(s) returning to the converter is displayed with illumination of the corresponding EF Present lamp(s) in the EF STATUS box.

(5) PHASE SELECT push button

With each press of this push button, either the A, B, C, or AVG. voltage lamp will light. The OUTPUT VOLTAGE display (6) and the OUTPUT CURRENT display (15) will show the real time value of the phase selected or the average of the group.

(6) OUTPUT VOLTAGE display

Displays the output voltage value of the converter at the output connection of the converter.

(7) INPUT POWER lamp

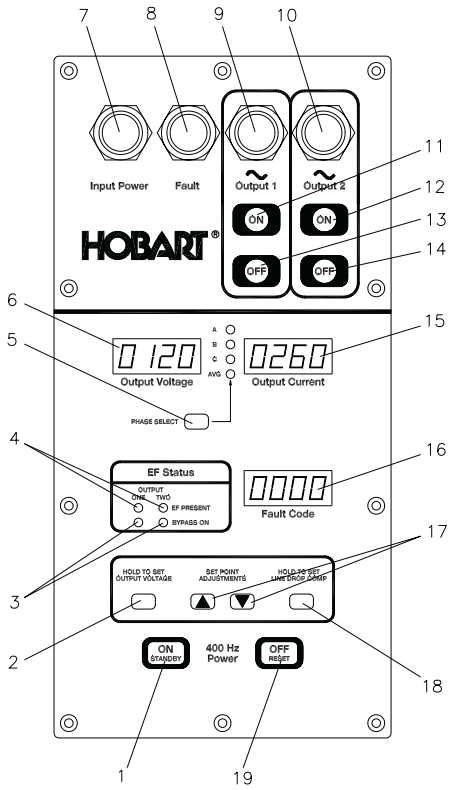
The green INPUT POWER lamp indicates the presence of input power. The input power lamp flashes during converter self test.

(8) FAULT lamp

The red FAULT lamp indicates that a fault is detected by the control system.

(9) OUTPUT 1 lamp

The amber OUTPUT 1 lamp indicates the presence of power at the output 1 terminal of the converter.



1. 400 Hz POWER ON push button
2. OUTPUT VOLTAGE ADJUSTMENT push button
3. BYPASS ON lamp
4. EF PRESENT lamp
5. PHASE SELECT push button
6. OUTPUT VOLTAGE display
7. INPUT POWER lamp
8. FAULT lamp
9. OUTPUT 1 lamp
10. OUTPUT 2 lamp
11. OUTPUT 1 ON push button
12. OUTPUT 2 ON push button
13. OUTPUT 1 OFF push button
14. OUTPUT 2 OFF push button
15. OUTPUT CURRENT display
16. LINE DROP COMPENSATION PERCENTAGE lamp
17. FAULT CODE display
18. SET POINT UP AND DOWN ADJUSTMENT push buttons
19. LINE DROP COMPENSATION ADJUSTMENT push button
20. 400 Hz POWER OFF push button

Control Panel
Figure 10B

(10) OUTPUT 2 lamp

The amber OUTPUT 2 lamp indicates the presence of power at the output 2 terminal of the converter.

(11) OUTPUT 1 ON push button

Depressing this push button will deliver 400 Hz power to the corresponding output.

(12) OUTPUT 2 ON push button

Depressing this push button will deliver 400 Hz power to the corresponding output.

(13) OUTPUT 1 OFF push button

Depressing this push button will cancel 400 Hz power to the corresponding output.

(14) OUTPUT 2 OFF push button

Depressing this push button will cancel 400 Hz power to the corresponding output.

NOTE: If 400 Hz power is on and only one contactor is closed, pressing the corresponding OUTPUT OFF push button will open the contactor and will turn the converter off. If 400 Hz power is on and 2 contactors are closed, turning off only one output will not turn off the other output.

(15) OUTPUT CURRENT display

Displays the output current to the aircraft.

(16) PERCENTAGE OF LINE DROP COMPENSATION lamp

The line drop compensation light is illuminated when the line drop compensation has been set.

(17) FAULT CODE display

When a warning or fault is detected by the control system, a code will be displayed here to indicate the problem. See Section 2-1 for a complete list of Warning and Fault codes.

(18) SET POINT UP AND DOWN ADJUSTMENT push buttons

These UP and DOWN push buttons increase or decrease the output voltage or the line drop compensation values. Simply press one of these push buttons while simultaneously pressing either one of the output voltage or line drop compensation push buttons.

(19) LINE DROP COMPENSATION ADJUSTMENT push button

To adjust the line drop compensation value, depress and hold the LINE DROP COMPENSATION ADJUSTMENTS push button while simultaneously pressing a SET POINT UP AND DOWN ADJUSTMENTS push button (18). The line drop compensation value, in percentage, will be shown in the FAULT CODE display (17).

(20) 400 Hz OFF push button

Shuts off output power. Pressing this push button opens all output contactor(s), and turns the converter off.

b. Printed Circuit Boards (See Figure 11)

The PoWerMaster ADV has 7 printed circuit (PC) boards in various locations inside the converter. The functions of each PC board are as follows.

(1) Modulator PC Board A3 (MOD)

The modulator PC board generates the pulse-width modulated switching patterns that produce the output voltage sine wave. It has circuitry to produce a stable output voltage, voltage ramp-up and ramp down, soft start, no break power transfer NBPT, active transistor diagnostics, and fault detection.

(2) Driver PC Board A5

The Driver PC board translates the input drive signal from the modulator board into an optically isolated drive signal for each of the six IGBT power modules.

(3) Input Power Control Board A4 (IPC)

The IPC Board monitors the AC input voltage, AC input frequency, and power supply voltages within the converter. It provides drive signals for the thyristor/rectifier modules, and Bus Discharge PC Board. The IPC Board has circuitry to produce a stable DC Bus voltage, soft start, self diagnostics, fault detection, and door interlock monitoring.

(4) Signal Conditioning Board A6 (SCB)

The Signal Conditioning PC Board senses and converts signals to low level DC values for use by the Control PC Board, Input Power Control PC Board, and Modulator PC Boards. The signals sensed are neutral current, output current, output voltage, DC Bus voltage, main transformer I.D. resistor, and transformer temperature sensor. In addition, the following signals are generated: average current, average power, average voltage. Each of these circuits are digitally adjustable.

(5) Control Board A2 (CTL)

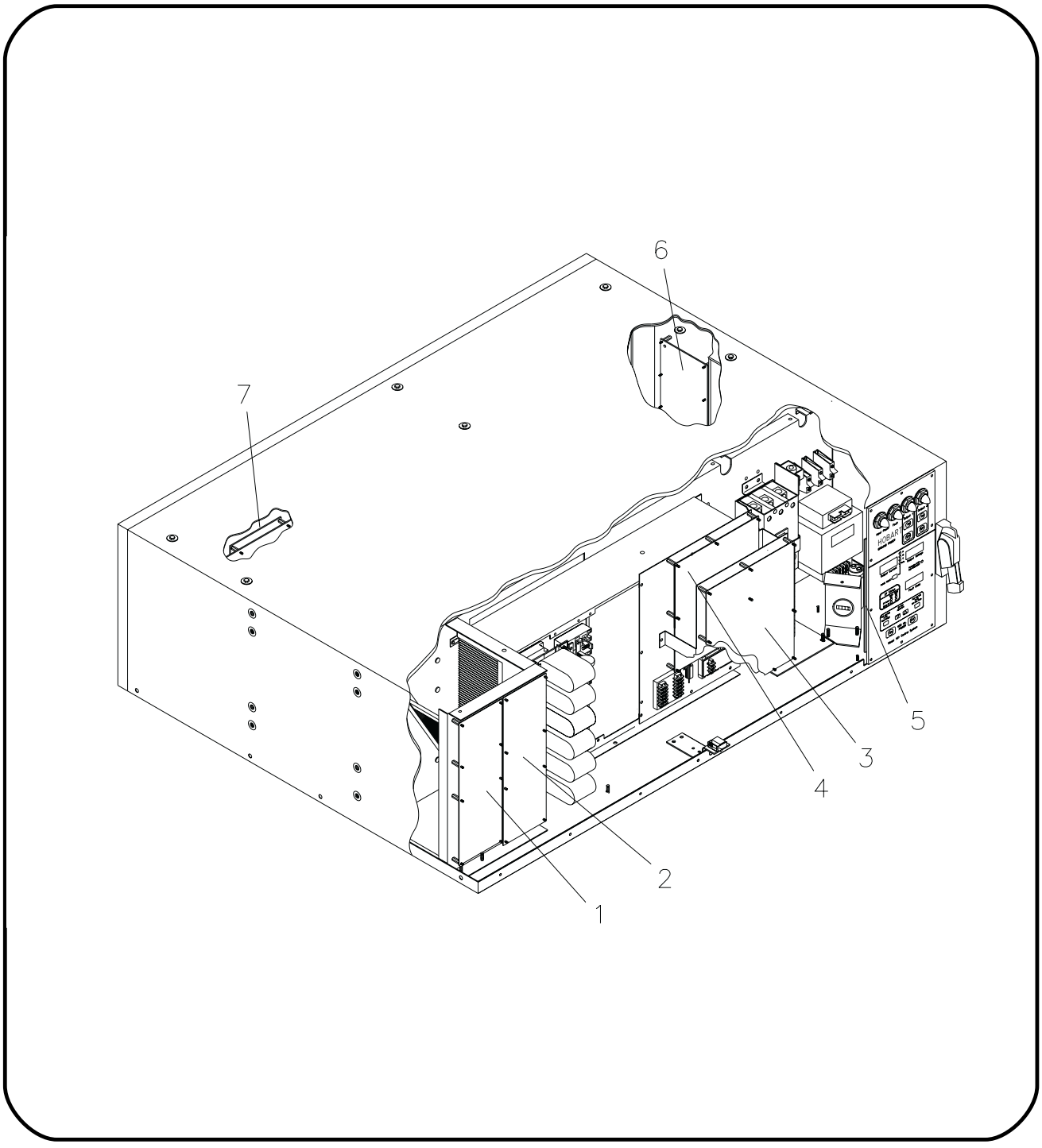
The Control Board serves as the primary user interface displaying: voltage, current, fault, warning, and EF data. It has circuitry to monitor and tests critical circuits in the converter prior to and during operation. This PC board also has circuitry to provide system diagnostics, output voltage and current monitoring, run time and diagnostic data storage, and external serial data communications.

(6) I/O (input/output) Board A1 (IOB)

The I/O Board serves as the converter interface, to the outside world. It processes the EF interlock, bridge interlock, and operator pendent signals to and from the converter.

(7) Bus Discharge PC Board A7 (BDC)

The Bus Discharge PC Board discharges the main DC bus at a controlled rate on command from the IPC Board.



1. Modulator PC Board A3 (MOD)
2. Driver PC Board A5 (DRV)
3. Signal Conditioning PC Board A6 (SCB)
4. Input Conditioning PC Board A4 (IPC)
5. Control PC Board A2 (CTL)
6. Input/Output PC Board A1(IOB)
7. Bus Discharge PC Board A7 (BDC)

PC Board Location
Figure 11

c. Components Inside Front Door (See Figure 12)

(1) Circuit Breaker CB1

The input power lines are wired into this circuit breaker. The external circuit breaker lever that operates the breaker switch utilizes a cable that pushes the breaker switch up (on) or down (off).

(2) Voltage suppressers RV1, RV2, RV3

These three voltage suppressers are designed to help protect against input voltage spikes, including lightning induced, on the AC input lines.

(3) Fuse F3

This fuse protects the control transformer secondary circuit. Its size and rating is FNQ 2A, 125-V.

(4) Input/Control Transformer

This transformer steps the input voltage down to 115-V AC for operation of the converter control circuits and other circuits requiring this voltage.

(5) Hour Meter M3

This component monitors the amount of time 400 Hz power is generated in hours.

(6) Door Interlock Switch S7

Immediately shuts down the converter when the door is opened. Can be bypassed for maintenance purposes only. See Sect. 2-2; Figure 1 to bypass switch.

(7) 115V AC Power Supply Hold-Up Capacitor (C42)

This capacitor enables the converter to withstand brief input power interruptions (micro breaks). The capacitor will discharge into the input circuitry to maintain power to the control system.

(8) DC Bus Capacitor Bank C1-C6

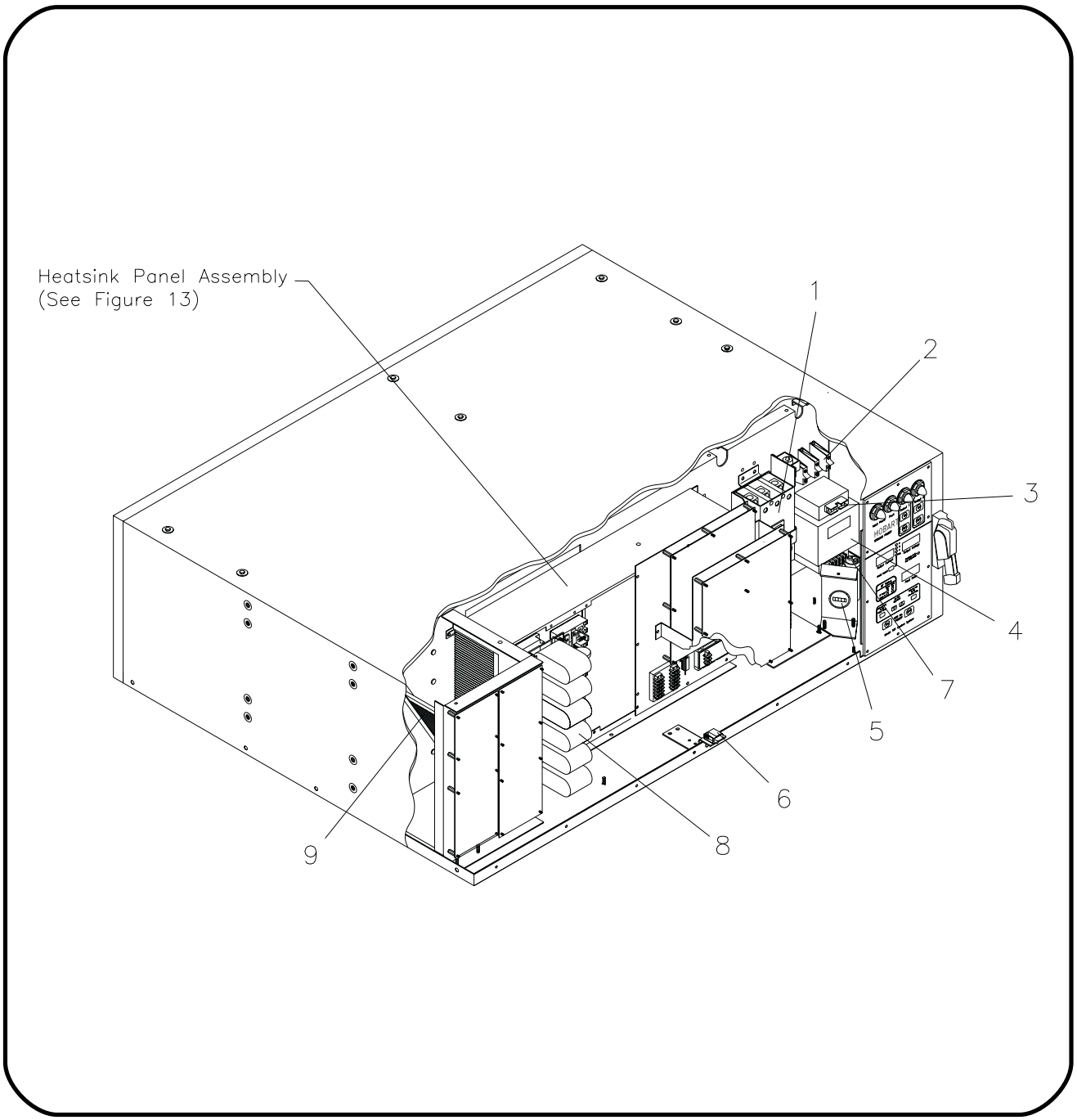
The DC capacitor bank, input filter reactors, and a number of other components provide filtering of the rectified AC input voltage. The bank consists of 50- F, 900-V capacitors connected by an integrated bus system.

(9) Air Filter - Hobart Brothers Replacement Part No. 283159-003

The air filter helps provide clean air for circulation.

CAUTION

The air filter MUST be in place at ALL TIMES during operation of the converter.



1. Circuit Breaker CB1
2. Voltage suppressers RV1, RV2, RV3
3. Fuse F3
4. Input/Control Transformer T1
5. Hour Meter M1
6. Door Interlock Switch S7
7. 115V AC Power Supply Hold-Up Capacitor (C42)
8. DC Bus Capacitor Bank C1-C6

Components Inside Front Door
Figure 12

d. Heat Sink Panel Assembly Details (See Figure 13)

(1) IGBT (Insulated Gate Bipolar Transistor) Power Modules

The six IGBT power modules (PM1 - PM6) provide the actual switching which produces the output voltage sine wave from the filtered DC voltage, under control of the modulator and driver PC Boards.

(2) Power Module Thermal Switch S4

This switch is located on the heat sink assembly. The Modulator PC board monitors the thermal switch to detect overheating.

(3) Voltage Surge suppresser RV4

The suppresser is connected across the rectified input to protect the SCR-Diode Modules from internal voltage surges.

(4) SCR-Diode Rectifier Modules CR1 - CR3

These modules are used as a soft start mechanism. They limit the inrush current to control the start up of the machine.

(5) Input Step-down Power Supply

This switching type power supply draws 115V AC from the input /control transformer and converts it to +12V DC. The output is directed to the control logic power supply.

(6) Power Supply Load Resistor R1

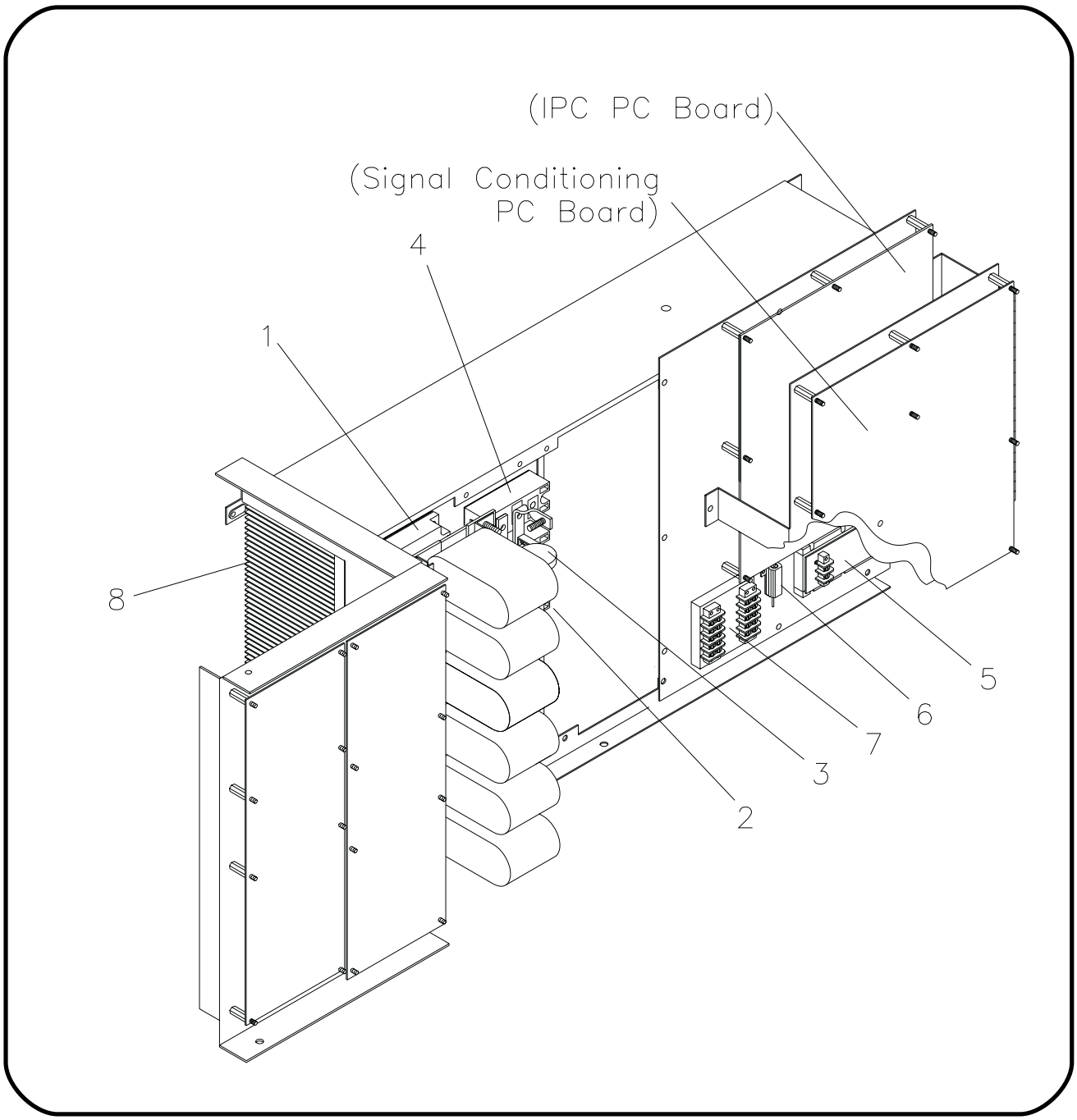
Provides a constant “load” on the input step-down and control logic power supplies.

(7) Control Logic Power Supply

The +12V DC output from the step down power supply is fed into this control logic power supply in order to achieve a -12, and +5V DC output. These two outputs feed the Input Power Control PC Board, which distributes it to other PC Boards.

(8) Heat Sink

The heat sink used provides cooling for the power components listed in Figure 13.



1. IGBT PM1 - PM7
2. Power Module Thermal Switch S4
3. Voltage Surge suppressers RV6 - RV7
4. SCR-Diode Modules SCR1 - SCR3
5. Input Step-down Power Supply
6. Resistor, Power Supply Load R1
7. Control Logic Power Supply
8. Heat Sink

Heat Sink Panel Assembly
Figure 13

e. Components Inside Rear Door (See Figure 14)

(1) Output Contactor(s) K1 and K2

The converter may have either one or two output contactors. Each contactor is a sealed unit which contains a magnetic operating coil and five sets of contacts. The three larger contacts conduct 3-phase AC voltage output. The I/O PC Board monitors the smaller, fourth and fifth sets of contacts to verify proper operation of the contactors.

(2) Output Current Sensing Transformers CT1- CT7

The cables which conduct output power to each converter output pass through a set of three current transformers. These current transformers monitor the output load current in each of the three output phases, detect the magnitude of current flowing from the converter to its load and supply a reduced value current signal to the Signal Conditioning PC board.

Neutral Line Current Sensing Transformer CT4

To detect excessive current through the neutral line, the neutral line current transformer senses the current and continually sends a signal to the Signal Conditioning PC board.

(3) Fan Motor Start Capacitor C13

This component limits the inrush of current to the fan motor upon start up.

(4) Terminal Block TB4

Provides a connection point for the cooling fan and the Fan Motor Start Capacitor.

(5) Cooling Fan B1

The aluminum panel on the bottom side of the unit has an air intake and an exhaust opening. Air enters the unit through louvers located near the front right, circulates throughout the unit, then leaves through the louvers next to the output cables.

(6) Three Phase AC Filter Inductor Assembly

These inductors, when working in conjunction with the AC filter capacitors, is a filter for the Pulse Width Modulated voltage produce by the inverter.

(7) DC Filter Inductors L4 - L5

These inductors work with the electrolytic capacitors (10) to smooth the DC current leaving the SCR Modules.

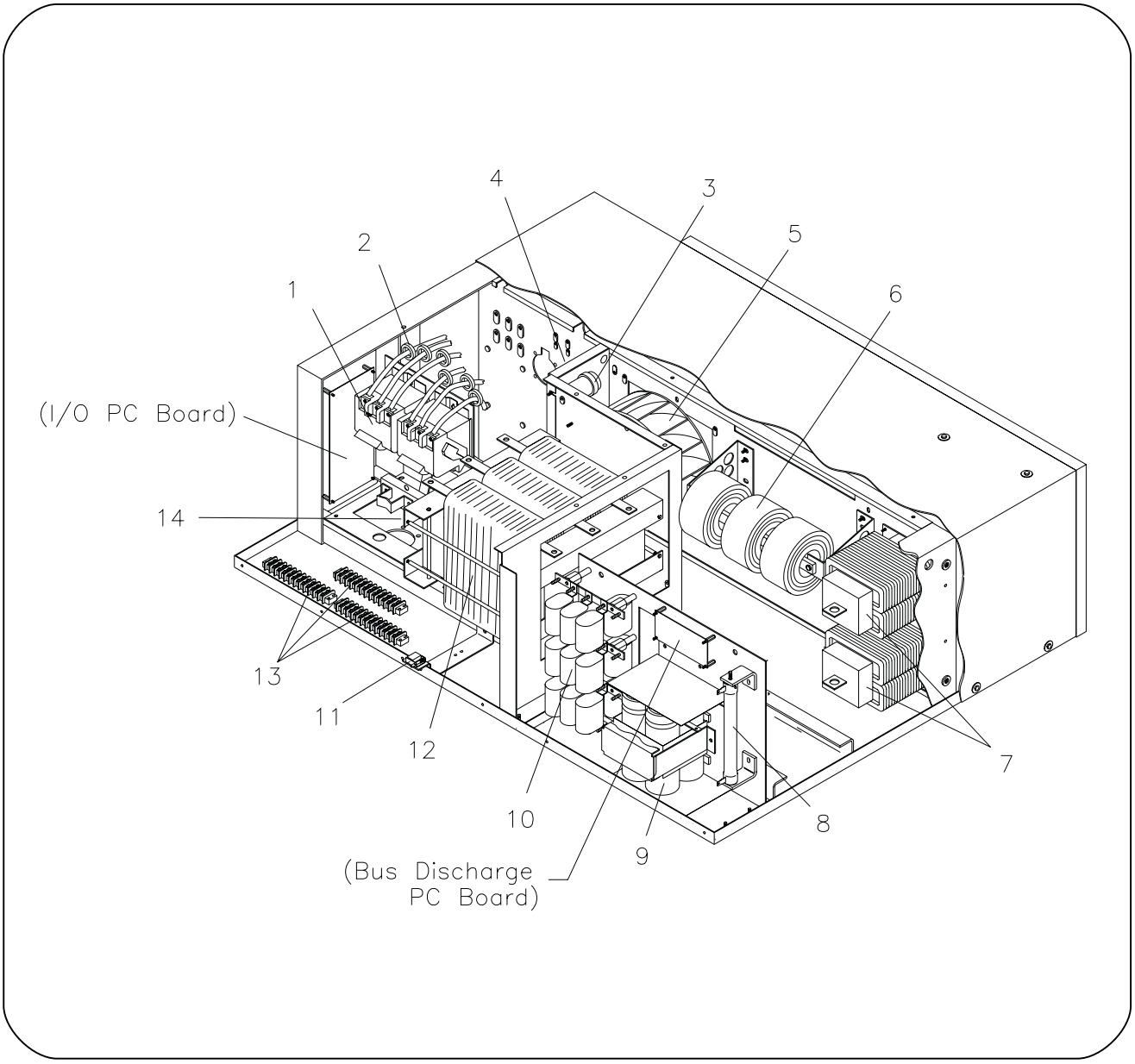
(8) DC Bus Capacitor Discharge Resistor R3

This 50 ohm 225 watt resistor works in conjuction with the Bus Discharge PC Board (Figure 14), to completely drain the Electrolytic DC Capacitors (10) to less than 30 VDC in 6 seconds. The instances that trigger this immediate discharge are:

(1) Opening either canopy door.
(2) Fault occurrences.
(3) Removal of converter input power.

(9) Electrolytic DC Capacitors C6 - C11

These capacitors work in conjunction with the DC Filter Inductors to filter the DC voltage from the SCR Modules.



1. Output Contactor(s) K1- K2
2. Output Current CT1 - CT7 and Neutral Sensing CT4 Transformers
3. Fan Motor Start Capacitor C13
4. Fan Terminal Block TB4
5. Cooling Fan B1
6. Three Phase AC Filter Inductors L1 - L3
7. DC Filter Inductors L4 - L5
8. DC Bus Capacitor Discharging Resistor R3
9. Electrolytic DC Capacitors C14 - C19
10. AC Filter Capacitor C22 - C33
11. Door Interlock Switch S2
12. Output/Main Transformers T2
13. 12 Station Terminal Strips TB1 - TB3
14. Terminal Strip TB5

Components Inside Rear Door
Figure 14

(10) AC Filter Capacitor C1 - C12

The AC capacitor bank and the output filter reactors provide filtering of the output voltage sine wave.

(11) Door Interlock Switch S2

Immediately shuts down the converter when the door is opened. Can be bypassed for maintenance purposes only. See Sect. 2-2; Figure 1 to bypass switch.

(12) Output/Main Transformer T2

The output transformer transforms the output from the inverter section into the desired 115/200-V AC output voltage. Transformer contains three input and three output windings.

(13) Terminal Strips TB1 - TB3

These three terminal strips connect the ADV to the outside world. Bridge Interlock, operator pendent, EF, remote lamps, and other external connections are maintained here.

(14) Terminal Strip TB5

Connection point for Transformer Temperature sensor.

Connection point for the Unit Identification Resistor.

Section 2. Preparation for Use, Storage or Shipping

1. Receipt and Inspection of Equipment

The converter has been thoroughly inspected and tested at the factory and prepared for shipment in accordance with standard industrial practices for safe shipment. Upon receiving this equipment, inspect it as follows.

a. Visually inspect the shipping crate for damage. If any damage is detected, request that the carrier agent inspect the shipment and note the damage on the delivery receipt. This is for your protection.

b. If there is no obvious damage to the shipping crate, unpack the unit as follows:

2. Unpacking the Unit

a. Remove crate, leaving unit on pallet for lifting it into place for mounting. Take care to avoid damage to the equipment if bars, hammers, etc. are used in unpacking. Remove all unused hardware from the unit.

b. Visually inspect the unit for evidence of external damage such as damaged sheet metal, scratches, dents, etc. Check also for loose connections and components. If the equipment has been damaged in transit, file a claim for damage at once. If you require assistance with a damage claim, furnish Hobart Brothers Company with full information about the claim.

NOTE: Save the shipping container until the unit has been put into service and determined to be operating correctly.

3. Installation

A Hobart converter requires no additional preparation in order to supply power to an aircraft. It needs only to have its input cable(s) 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.

WARNING

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. All installation wiring and machine reconnection shall be done by qualified persons.

4. Input Cable Size and Temperature Requirements

Figures 1 and 2 show input cable size and temperature requirements for converter units covered by this manual. This information is from the U.S. National Electrical Code ANSI/NFPA 70, 1933 Edition. Install this equipment per the latest edition, available from the National Fire Protection Association, 470 Atlantic Avenue, Boston, MA 02210.

INPUT VOLTAGE	60-kVA	90-kVA
380	81 Amperes #4 AWG (25 mm^2)	121 Amperes #1 AWG (50 mm^2)
460	67 Amperes #4 AWG (25 mm^2)	100 Amperes #2 AWG (25 mm^2)
Values given in this chart assume that **90º C rated cables** will be used, with typical wire sizing per chart 310-16 of the 1999 National Electrical Code. Wire sizes should be verified by a qualified electrician and should conform to local electrical codes. This chart assumes operation at 50º C ambient temperature. Total input cable weight is limited to 250-lbs (113.4 kg) on trailer mounted converters.		

Input Cable Size Requirements - Cables Rated at 90º C
Figure 1

INPUT VOLTAGE	60-kVA	90-kVA
380	81 Amperes #2 AWG (35 mm^2)	121 Amperes 2/0 AWG (70 mm^2)
460	67 Amperes #2 AWG (35 mm^2)	100 Amperes #1 AWG (120 mm^2)
Values given in this chart assume that **75º C rated cables** will be used, with typical wire sizing per chart 310-16 of the 1999 National Electrical Code. Wire sizes should be verified by a qualified electrician and should conform to local electrical codes. This chart assumes operation at 50º C ambient temperature. Total input cable weight is limited to 250-lbs (113.4 kg) on trailer mounted converters.		

Input Cable Size Requirements - Cables Rated at 75º C
Figure 2

a. Cable Entry Locations

Input and output cable entrance shall be made through the cable entrance hole(s) provided in the converter cabinet. Consult our Service Department if problems arise.

b. Install Input Cables at Power Supply Service

Before connecting input cables to the power supply service, check voltage, amperage and phase ratings of the service. Make certain that the capacity of the service is adequate for the power requirements of the unit being connected to it. Make certain also that the service used as the source of input power is grounded. Refer and conform to your local electrical code when selecting and installing power supply service.

Make sure electrical service is off. Connect the input power cables to the input power source, and connect the grounding conductor to a proper ground.

c. Install Input Cables in Converter Circuit Breaker Box (Figure 3)

(1) Make sure electrical service is off.

(2) Open the front door of the unit by turning all three latches counterclockwise with an 8 mm allen wrench

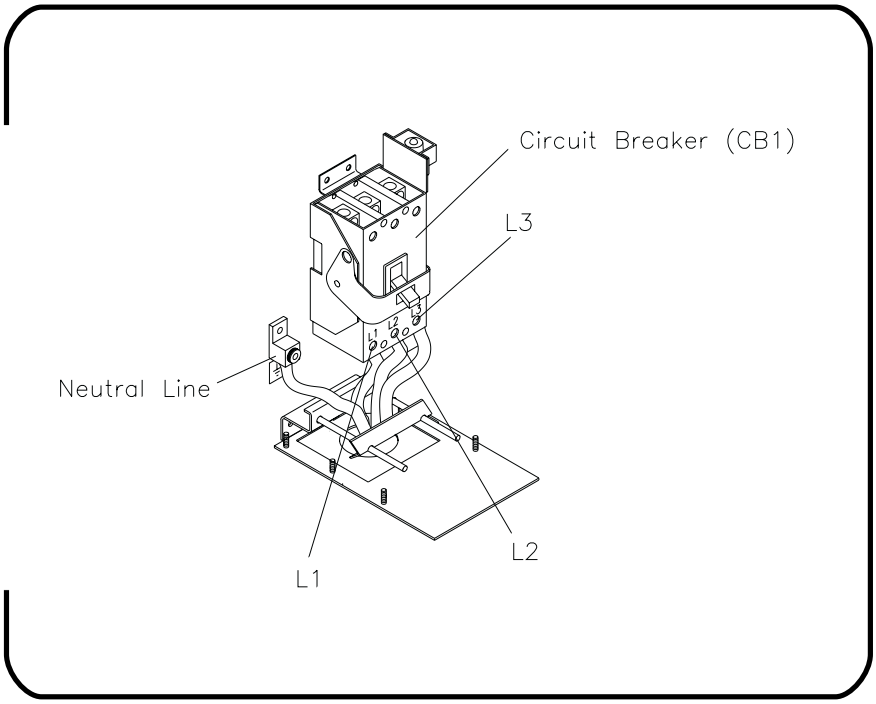
(3) Route the cable up through the hole in the base and then through the cable clamp located below the circuit breaker CB1.

(4) Using a 3/8 inch allen wrench, connect input cable leads securely to terminals L1, L2, and L3 on circuit breaker.

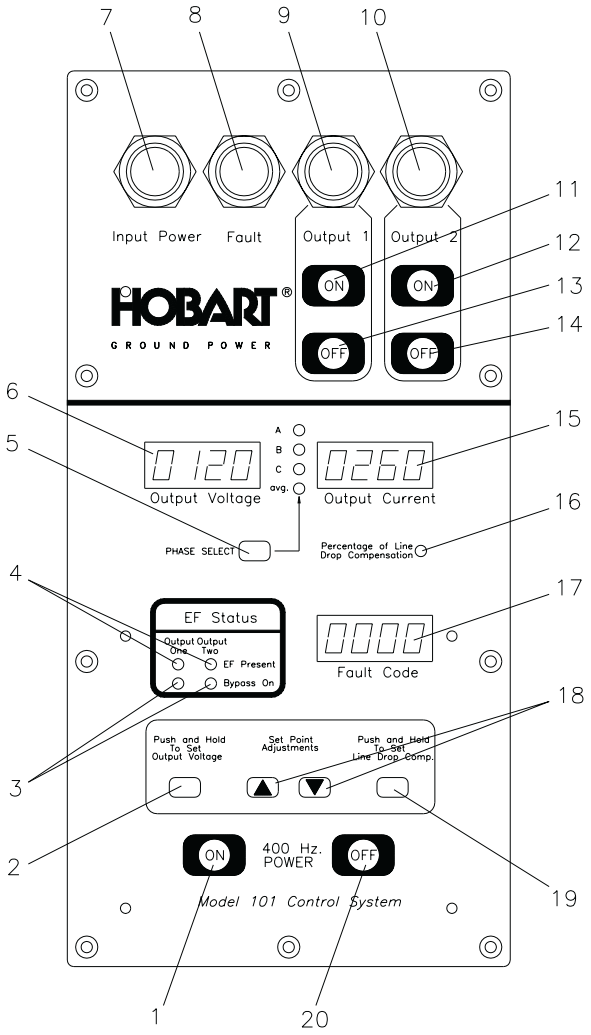
(5) Using a 5/16 inch allen wrench, connect the ground wire securely to the ground lug located below the circuit breaker.

(6) Pull the excess cable downward through the clamp in the base, and tighten the clamp around the cables. Leave just enough slack in the cables so there is no strain on them. Avoid damage to cable insulation.

(7) Close and latch the front door of the unit.



Circuit Breaker Connections
Figure 3



1. 400 Hz POWER ON push button
2. OUTPUT VOLTAGE ADJUSTMENT push button
3. BYPASS ON lamp
4. EF PRESENT lamp
5. PHASE SELECT push button
6. OUTPUT VOLTAGE display
7. INPUT POWER lamp
8. FAULT lamp
9. OUTPUT 1 lamp
10. OUTPUT 2 lamp
11. OUTPUT 1 ON push button
12. OUTPUT 2 ON push button
13. OUTPUT 1 OFF push button
14. OUTPUT 2 OFF push button
15. OUTPUT CURRENT display
16. LINE DROP COMPENSATION PERCENTAGE lamp
17. FAULT CODE display
18. SET POINT UP AND DOWN ADJUSTMENT push buttons
19. LINE DROP COMPENSATION ADJUSTMENT push button
20. 400 Hz POWER OFF push button

Control Panel

Figure 4

d. Check Converter No-Load Operation (See Figure 4)

A no-load check should be made before the output cables are connected to the converter and to a load. Proceed as follows.

(1) Make certain that both converter doors are tightly closed and latched.

(2) Apply input power to the converter from the input power source; throw circuit breaker handle on converter to on position. The green INPUT POWER lamp (7) will flash for several seconds and then illuminate.

(3) Press the 400 Hz POWER ON push button (1). At this time the unit output voltage is displayed on the control panel (6).

(4) Press the control panel 400 Hz POWER OFF push button (20). The INPUT POWER lamp remains illuminated.

(5) Check optional remote START/STOP controls and bridge interlock feature for proper operation.

(6) Shut off power at the input power source. The INPUT POWER lamp (7) will shut off.

e. Install Output Cable and Remote START/STOP Controls (Figures 5 and 6)

Each output cable and remote control used enters the converter through a cable clamp in the bottom panel. These cables are connected directly to the terminals of the output contactor and to the appropriate terminals of the 12-station terminal strips located on the base of the converter inside the rear door. Use the terminal strips for 28-V DC interlock (EF signal) and the remote control lines.

CAUTION

Use output cable(s) of proper size and length for this specific converter's output rating.

NOTE: Industry standard aircraft cable is recommended. When not using standard aircraft cable, consult your local electrical code to determine appropriate cable size. Use No. 12 AWG for interlock signal (E and F terminals). Output cable leads (A,B,C,N) should be equipped with terminals suited for the 3/8" diameter terminal stud. Interlock signal (E and F) and remote control leads should be equipped with terminals suited for a 5/16" diameter terminal stud.

NOTE: If the output cable is installed in conduit, the conduit must be non-ferromagnetic, such as aluminum.

(1) Open the rear door of the unit by turning all three latches counterclockwise with an 8 mm allen wrench.

(2) Loosen the cable clamp screws at the cable horn that is mounted in the bottom panel.

(3) Route output and remote control cables through the cable horn and clamp and pull enough of this cable through to allow working space.

(4) Connect output cables.

The output contactors can be seen inside the rear door on the far left (Figure 5). Each terminal stud on the contactor is identified by an identification plate. Each cable should be identified by a band-type marker. Connect cable lead "A" to terminal marked "A", "B" to terminal "B", and "C" to terminal "C" on the appropriate contactor (see Figure 4). Tighten terminal nuts securely using a "six point" 9/16 inch wrench.

WARNING

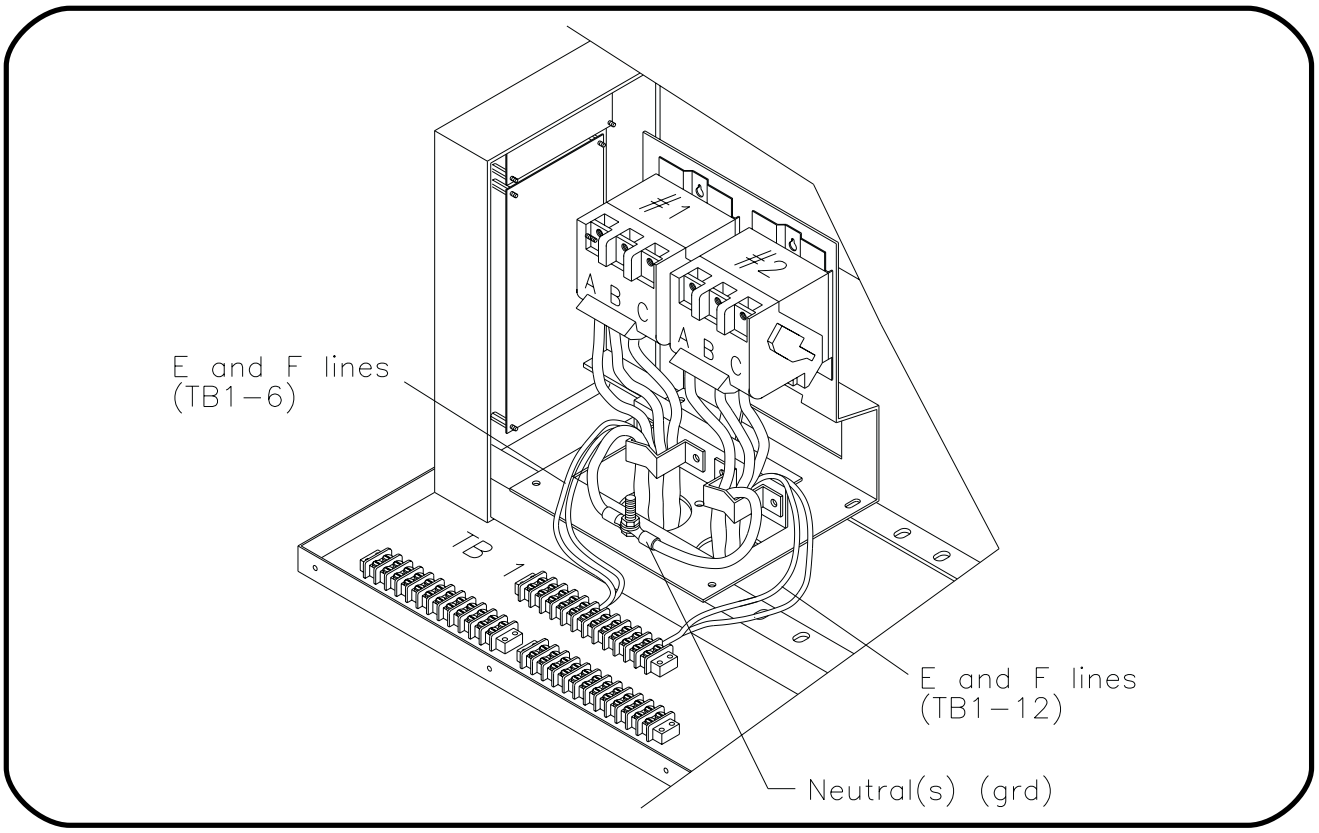
Turning wrench or socket sizes that do not fit securely may cause personal injury. Damage to hardware damage may also occur.

A terminal strip TB1 (Figure 6) is located just inside the rear door of the unit in front of the output contactors. Connect interlock leads "E" and/or "F" to the terminal marked "EF" for the corresponding output connected in the previous step.

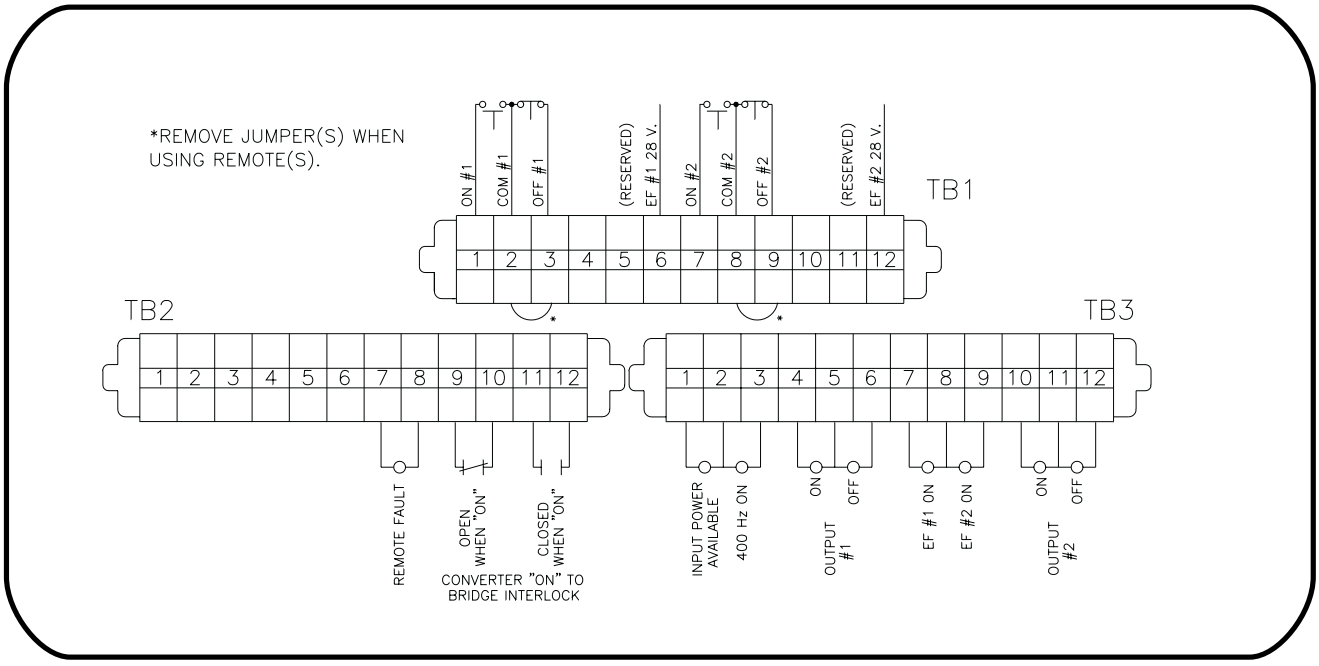
Pull the excess cable out through the clamp assembly and out of the unit, tighten the clamp around the cables. Leave just enough slack in the cables so that there is no strain on them. Avoid damage to cable insulation.

(5) Connect remote control leads (if applicable). Terminal strip TB1 (Figure 6) is located just inside the rear door of the unit. Connect the remote control leads for each corresponding output to the terminal block as required.

(6) Connect bridge interlock (if applicable). Terminal strip TB2 (Figure 6) is located just inside the rear door of the unit. Connect the bridge interlock leads to either the normally open or normally closed bridge interlock terminals as required. The bridge interlock is activated whenever the converter is operating or when an EF signal is detected from an aircraft.



Output Contactor(s) Connection
Figure 5



EF Signal and Remote START/STOP Control Connections
Figure 6

(7) Connect remote indicator lamps (if applicable). Terminal strips TB2 and TB3 (Figure 6) are located just inside the rear door of the unit. Connect the remote indicator lamps to the corresponding terminals as required. All remote indicator lamps are driven with +28VDC which is supplied from the converter.

(8) Close and latch the rear door of the unit.

(9) The converter is now ready for service. See Section 1-3, Operation, for operating instructions.

5. Preparation for Storage

a. General

(1) The unit should be prepared for storage before installation or 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.

(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 which is strong enough to resist puncture damage from air pressures.

(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.

6. Preparation for Shipment

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

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 basic instructions for safe, efficient equipment operation. Operating instructions are presented in step-by-step sequence for supplying 400-Hz power to an aircraft.

2. Basic Converter Operation

The following operating instructions explain basic converter operation from the control panel.

a. Pre-Start Up Inspection

(1) Make certain that both converter doors are tightly closed.

The unit is equipped with two door interlock switches: S7 on the front door and S2 on the back door. Opening either door will disable the unit. Therefore **both** doors must be closed to operate the unit. This feature is included for the safety of the user.

(2) Make Sure the Air Filter (Hobart Brothers Replacement Part No. 283159-003) is in place.

The air filter helps provide clean air for circulation. The air filter **MUST** be in place at **ALL TIMES** during operation of the converter.

b. Startup Procedure (See Figure 1)

The following steps will turn the machine on so that converter operation can be checked prior to delivering power to an aircraft.

(1) Raise circuit breaker handle beside the control panel to the ON position.

(2) Apply rated input power to the converter from the input power source. The green INPUT POWER lamp (7) on the control panel will flash for several seconds and then illuminate.

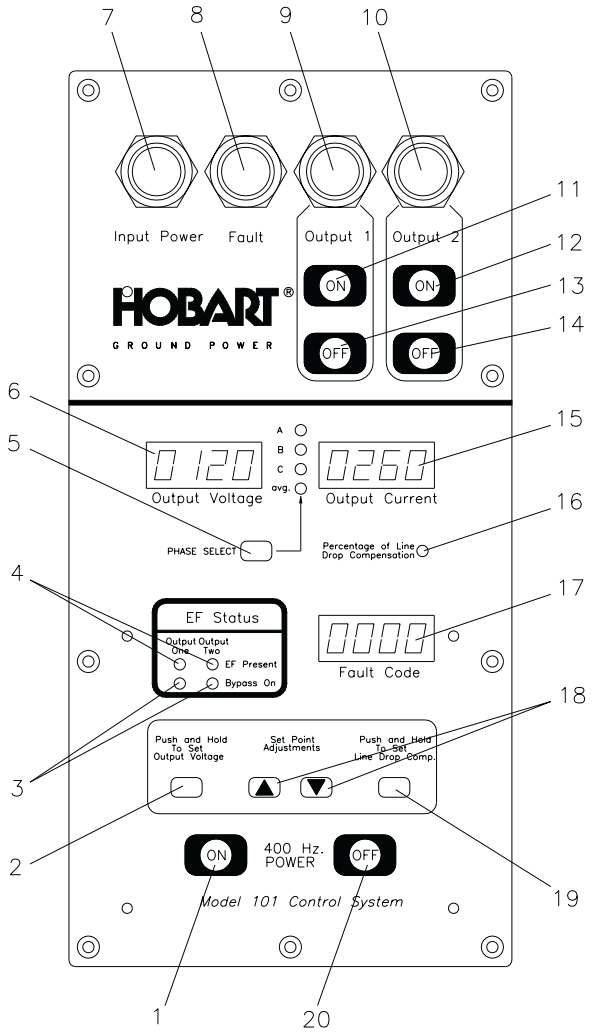
WARNING

Care must be taken not to bypass the door interlock switches. High voltages are present inside the converter, and FATAL SHOCK could result.

(3) Press the 400 Hz POWER ON push button (11) to turn machine on without power delivery. However, 400 Hz power is now present within the machine. To turn the machine off anytime hereafter, simply press the 400 Hz POWER OFF push button (20).

(4) Output voltage (voltage to be delivered to an aircraft) must be checked the first time the converter is turned on. If it is necessary to change the factory set value, press and hold the “Set Output Voltage” push button (2) while simultaneously depressing the up/or down push button (18) until the output voltage display (6) changes to the appropriate voltage value.

This new output voltage value need only be set once; the voltage level will remain the same for all future operations of the converter, even when the unit is turned off or disconnected from input power. It may, however, be changed as often as desired.



1. 400 Hz POWER ON push button
2. OUTPUT VOLTAGE ADJUSTMENT push button
3. BYPASS ON lamp
4. EF PRESENT lamp
5. PHASE SELECT push button
6. OUTPUT VOLTAGE display
7. INPUT POWER lamp
8. FAULT lamp
9. OUTPUT 1 lamp
10. OUTPUT 2 lamp
11. OUTPUT 1 ON push button
12. OUTPUT 2 ON push button
13. OUTPUT 1 OFF push button
14. OUTPUT 2 OFF push button
15. OUTPUT CURRENT display
16. LINE DROP COMPENSATION PERCENTAGE lamp
17. FAULT CODE display
18. SET POINT UP AND DOWN ADJUSTMENT push buttons
19. LINE DROP COMPENSATION ADJUSTMENT push button
20. 400 Hz POWER OFF push button

Control Panel
Figure 1

c. Immediate Output Power Delivery

400 Hz power will not be delivered to the aircraft until at least one of the output contactors has been closed. This can be done whether the converter is turned on or not, as long as the green INPUT POWER lamp (7) is illuminated and not flashing. To do this:

(1) Connect output cable plug connector(s) to aircraft receptacle(s). Be sure connectors are mated fully and securely.

(2) Apply rated input power to the converter from the input power source.

(3) Raise circuit breaker handle beside the control panel to the ON position. The green INPUT POWER lamp (7) on the control panel will flash for several seconds and then illuminate.

(4) Press OUTPUT 1 ON (11) and/or OUTPUT 2 (12) ON push button. The corresponding yellow lamps, the OUTPUT 1 lamp (9) and OUTPUT 2 lamp (10) will glow.

Note: When the output cable from the converter is connected properly to the aircraft, an interlock signal (EF signal) will be sent back to the converter to allow the converter to operate normally.

d. Line Drop Compensation Setting (See Figure 1)

Line drop compensation must be set the first time the converter is operated. Line drop compensation allows the converter to automatically make allowance for the voltage drop caused by the resistance of long output cables. The factory default setting is 3%.

When operating under no-load, the line drop compensation will be zero therefore the output voltage display (6) will read 115 volts.

When operating the converter under a load with drop compensation present, the output voltage display (6) will read the voltage at the output contactor. The value displayed should read high because it is taking into consideration how much extra voltage is needed to compensate for voltage lost through the output cables. The Percentage of Drop Compensation lamp (16) will now illuminate.

To check the line drop compensation percentage value, simply press the LINE DROP COMPENSATION push button (19). The value given, which appears in the Fault Code display (17), will be the percentage of voltage over normal (115 Volts) when the converter is supplying full load to a contactor. From the contactor, the voltage gradually decreases through resistance over the length of the output cable. As a result, the line drop in voltage will yield the desired value of 115 volts at the aircraft.

Once the line drop compensation is set, that factor value will remain the same for future operations of the converter. Turning the unit off or disconnecting from input power will not affect the line drop compensation values. It may however be changed as often as desired.

To determine if the compensation factor should be changed, perform the following steps:

(1) One Output

a. Turn on all available electrical devices on the aircraft. The aircraft should be drawing the maximum possible amount of current from the converter without exceeding the unit's maximum power rating.

b. Have an assistant measure the voltage being delivered to the aircraft at the aircraft end of the cable.

c. If the value measured above does not match the desired voltage value, press and hold the LINE DROP COMPENSATION ADJUSTMENT push button (19) while simultaneously depressing the SET POINT UP OR DOWN ADJUSTMENT push buttons (18) on the control panel to change the compensation factor. Have the assistant report when the measured value matches the desired value.

d. Once the line drop compensation value has been set, the Percentage of Line Drop Compensation lamp (16) will glow to indicate that line drop compensation is present.

(2) Two Output

a. If the converter has more than one output, setting the line drop compensation factor for the first output synchronizes the line drop compensation for the second output automatically.

e. Phase Select

Press the PHASE SELECT push button (5) to check the current and voltage values of phase A, B, or C or the average of all three.

f. Operating Procedure

Since the converter is a solid state unit, rather than a rotating, engine/generator type, the unit requires no intervention once it is running normally (i.e., no fuel, oil, etc. is needed). If the control system senses a problem, the fault light on the control panel will illuminate and take the appropriate action automatically.

g. Discontinued Power Delivery

On a single output unit, if the output cable is inadvertently disconnected from the aircraft while the converter is operating, the converter will shut off.

On a multiple-output converter, if both the cables are disconnected from the aircraft while the converter is in operation, the converter will shut off. However, if at least one cable remains connected to an aircraft, the converter will continue to operate and deliver power through that one cable**;** only the disconnected cable(s) will stop delivering output power. This feature is included for the safety of the user and should not be used as an alternate method of discontinuing output power to an aircraft.

h. Shutdown Procedure (See Figure 1)

To stop power delivery to one of the outputs, press the appropriate remote control STOP push button for that output. To turn all outputs and the converter off, either press the control panel 400 Hz POWER OFF push button (20), or press all remote control STOP push buttons on each remote connected to the converter. The amber OUTPUT POWER lamp(s) (9 or 10) will shut off when no power is being delivered through the corresponding outputs.

WARNING

Never disconnect an output cable while output power is on. SHOCK HAZARDS EXIST!

WARNING

Never disconnect an output cable while output power is on.

Note: It is not necessary to discontinue input power between operations of the converter. When the unit is not delivering output power, it uses only a small amount of input power and may be left connected to input power indefinitely.

i. EF BYPASS **switches (See Figure 2)**

WARNING

Output cables are “LIVE” when the EF BYPASS mode is selected. Exercise extreme caution or FATAL SHOCK may result.

The converter may have as many as two separate outputs. The EF BYPASS output setting, which can only be changed while the converter is not running, permits a qualified technician to set the output mode for each of the outputs to either NORMAL or to EF BYPASS.

The NORMAL setting for each output is for delivery of power to an aircraft.

The EF BYPASS setting bypasses the normal EF signal checking and permits the checking of various converter parameters which would normally only be accessible while the signal is present (i.e., when an output is connected to an aircraft). An output cannot be switched to EF bypass mode while an EF signal is present for that output; additionally, if an EF signal is applied while the converter is in EF bypass mode (e.g., by connecting an output cable to an aircraft), the unit will automatically switch that output to normal mode. Be aware that if EF bypass mode is selected, it is possible to deliver voltage to an output cable whether or not that cable is connected to an aircraft or load bank. Exercise extreme caution when selecting EF bypass mode.

The EF BYPASS push button switches (Items 2 and 3, Figure 2) are located on the bottom left of the control PC Board. These two push buttons are used to toggle between normal and EF BYPASS mode. The control panel will indicate the EF BYPASS status (3, Figure 1) for each output.

(1) EF Bypass/Normal Mode (See Figure 2)

These two push buttons switches are spring assisted for momentary contact; meaning they do not lock in or out. Just press the push button in to change the setting and press again to go back.

The push button for output 1 is the top most of the two. The push button for output 2 is the bottom switch of the two.

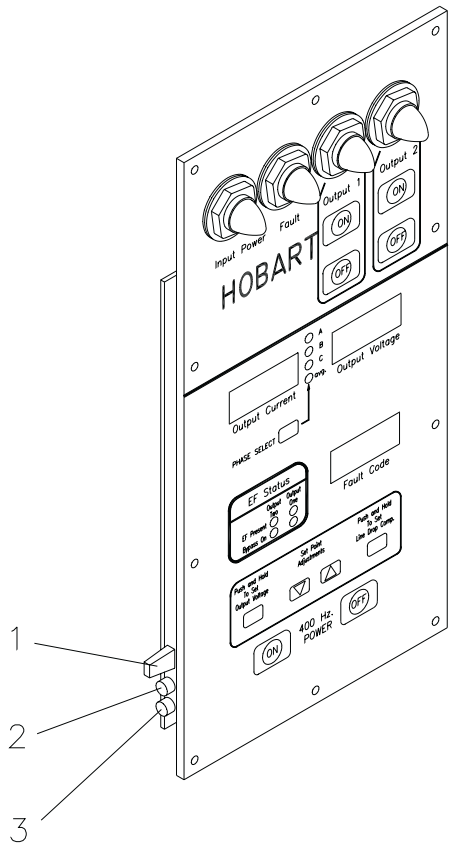
a. Open the front door of converter using an 8 mm allen wrench.

b. Reach inside and depress either of the two BYPASS/NORMAL push button switches to change the setting for that output.

c. Close and latch the front door.

j. KEYPAD DISABLE switch

Once the operator sets the output voltage and line drop compensation values, it is possible to lock both values to restrict change from the operator at the control panel. The KEYPAD DISABLE toggle switch (1, Figure 2), located above the EF BYPASS push button switches (2 and 3) on the Control PC Board, will prevent these values from being changed. Once set, the OUTPUT VOLTAGE ADJUSTMENT push button (2, Figure 1) and LINE DROP COMPENSATION ADJUSTMENT push button (19, Figure 1) on the control panel will be disabled.



1. KEY PAD DISABLE Switch
2. #1 EF BYPASS push button
3. #2 EF BYPASS push button

Figure 2

If this switch is pointed towards the PC Board, then the two control panel push buttons are disabled.

(1) Open the front door of converter using an 8 mm allen wrench.

(2) Reach inside and toggle the KEYPAD DISABLE switch. The switch is located on the Control Panel PC Board above the EF BYPASS push button switches.

(3) Toggle the switch towards the Control PC Board to disable the OUTPUT VOLTAGE ADJUSTMENT and LINE DROP COMPENSATION ADJUSTMENT push buttons.

(4) Close and latch the front door.

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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 Ground Power**
	Service Department
	1177 Trade Square East
	Troy, Ohio 45373
	U.S.A.
In U.S.A. Call:	**(800) 422-4166 (Parts)**
	(800) 422-4177 (Service)
From Foreign Countries Call:	**(937) 332-5050 (Parts)**
	(937) 332-5060 (Service)
FAX Toll Free inside U.S.A.:	**(800) 367-4945**
	(937) 332-5121
E-Mail	**service@hobartgroundpower.com**
WWW	**hobartgroundpower.com**

2. Model 101 Control Monitoring (See Fig 1)

The Hobart PoWerMaster ADV Model 101 Control performs complete diagnostic testing upon each startup and continuous monitoring of all critical circuits and operating electrical values. If the control senses a problem with one of the circuits or if any of the electrical values exceeds its safe operating limit, the Model 101 Control will shut the converter down, or may allow the converter to continue operation depending on the severity of the condition.

a. Warnings

Warnings are displayed when irregular conditions exist that are not necessarily a threat to the converter, aircraft, or personnel exist. The converter will continue to operate normally and will display the warning in the Fault Code Display (See Figure 1).

An EF By-pass warning typically occurs when an output cable is removed from an aircraft before that output is turned off. EF warnings are stored in memory, as part of an event record, and can be used to indicate patterns of improper operation.

b. Faults

Faults result when any of the fault limits are exceeded, when an internal problem occurs, or under certain conditions that would cause injury to personnel or damage to an aircraft or the converter. The PoWerMaster ADV displays a "Fault Code" (1-3, Fig. 1, Item 17) and the "Fault Lamp" (1-3, Fig. 1, Item 8) will illuminate to alert the operator that something has gone wrong during operation. Faults are also stored in memory as an event records. The fault limits and conditions are preset at the factory.

c. Fault Codes (See Fig. 1)

The numbers that appear in the Fault Code display (1-3, Fig. 1, Item 17) are used for troubleshooting the PoWerMaster ADV.

To read the four digit fault code properly, it must be understood that the first two digits represent one half of the fault code and the last two digits represent the other half.

The two digits on the left side of the Fault Code represent the **Command**.

The two digits on the right side of the Fault Code represent the **Fault** Condition.

(1) Commands

The ongoing operations conducted by the ADV are driven by the list of commands in figure 1. The control PC board communicates these commands to all of the PC boards in the converter. The first half of the fault code identifies the command that was present when the fault occurred, as well as the PC board which was commanded.

(2) Fault Condition

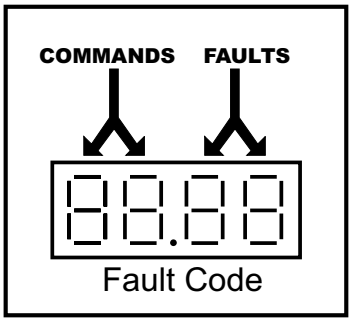
The two numbers located on the right side of the four digit fault code make up the ADV Fault. This half of the fault code identifies the detected Fault as well as the PC Board which detected it.

Fault Code Quick Reference Chart V1.01

WARNINGS

EF 1	EF 1 NOT PRESENT WARNING
EF 2	EF 2 NOT PRESENT WARNING
Con1	CONTACTOR 1 NOT PRESENT WARNING
Con2	CONTACTOR 2 NOT PRESENT WARNING
door	DOOR OPEN WARNING
----	FRONT PANEL ADJUST DISABLE WARNING

COMMANDS		FAULTS	
UNKNOWN COMMAND	00	00	INVALID FAULT
ADV SELF TEST	01	04	IPC BUS SHORT FAULT
CTL LAMP TEST	02	06	IPC SELF TEST FAULT
IPC STATUS CHECK	04	07	IPC REAR DOOR SWITCH TRIP FAULT
SCB STATUS CHECK	05	08	IPC FRONT DOOR SWITCH TRIP FAULT
MOD STATUS CHECK	06	09	IPC POS 5VDC FAULT
IOB STATUS CHECK	07	10	IPC POS 12VDC FAULT
CTL STATUS CHECK	08	11	IPC NEG 12VDC FAULT
IPC INPUT VOLTAGE TEST	11	13	IPC DISCHARGE BOARD FAULT
IPC SYSTEM POWER SUPPLY TEST	12	14	IPC DISCHARGE FAULT
IOB AUX POWER SUPPLY TEST	13	15	IPC 12 PULSE OVERHEAT FAULT
CTL ID CHECK	15	16	IPC SCR FAULT
IPC ID CHECK	16	17	IPC BUS VOLTAGE LOW FAULT
IOB CONTACTOR CHECK	17	18	IPC BUS VOLTAGE HIGH FAULT
CTL MEMBRANE CHECK	18	19	IPC INPUT VOLTAGE TOO HIGH FAULT
CTL REPORT CONFIG	22	20	IPC INPUT VOLTAGE TOO LOW FAULT
IOB PENDENT CHECK	26	21	IPC INPUT PHASE LOSS FAULT
IPC TEST DOOR SWITCHES	27	23	IPC COMM FAULT
IPC 12 PULSE OVERHEAT TEST	28	27	SCB SELF TEST FAULT
CTL OVERHEAT TEST	29	28	SCB OUTPUT OVER FREQ FAULT
MOD OVERHEAT TEST	30	29	SCB OUTPUT UNDER FREQ FAULT
IPC BUS DISCHARGE PCB TEST	32	30	SCB COMM FAULT
IPC DISCHARGE BUS	33	34	MOD DRIVER BOARD 2 FAULT
IPC BUS VOLTAGE TEST	34	35	MOD SELF TEST FAULT
CTL TEST FOR NO OUTPUT	39	36	MOD NBPT CURRENT TRIP FAULT
MOD DRIVER TEST	41	37	MOD VBUS OVER VOLTAGE FAULT
MOD IGBT A PAIR TEST	42	38	MOD DRIVER BOARD FAULT
MOD IGBT B PAIR TEST	43	39	MOD IGBT PAIR A FAULT
MOD IGBT C PAIR TEST	44	40	MOD IGBT PAIR A2 FAULT
ADV STANDBY	52	41	MOD IGBT PAIR B FAULT
ADV RAMP UP	54	42	MOD IGBT PAIR B2 FAULT
IPC TEST FOR BUS SHORT	57	43	MOD IGBT PAIR C FAULT
IPC RAMP TO MINIMUM	59	44	MOD IGBT PAIR C2 FAULT
IPC RAMP TO 25 PERCENT	61	45	MOD OUTPUT SHORT CIRCUIT FAULT
IPC RAMP TO 50 PERCENT	63	47	MOD HEATSINK OVERTEMP FAULT
IPC RAMP TO FULL OUTPUT	67	48	MOD TRANSFORMER OVERTEMP FAULT
MOD RAMP TO FULL OUTPUT	79	49	MOD NBPT FAULT
SCB TEST OUTPUT FREQUENCY	82	50	MOD COMM FAULT
CTL TEST OUTPUT	85	51	MOD VCESAT FAULT
ADV 400HZ ON	87	57	CTL SELF TEST FAULT
ADV SHUTDOWN	93	58	CTL TRANSFORMER ID FAULT
ADV FAULT SHUTDOWN	99	59	CTL RS232 FAULT
		60	CTL OUTPUT OVER VOLTAGE FAULT
		61	CTL OUTPUT UNDER VOLTAGE FAULT
		62	CTL OUTPUT 1 OVERLOAD FAULT
		65	CTL OUTPUT 2 OVERLOAD FAULT
		68	CTL MACHINE OVERLOAD FAULT
		72	CTL OUTPUT VOLTAGE IMBALANCE FAULT
		73	CTL MEMORY FAULT
		74	CTL UNBALANCED LOAD FAULT
		75	CTL MEMBRANE FAULT
		79	IOB SELF TEST FAULT
		80	IOB AUX24 FAULT
		81	IOB EF 1 VOLTAGE TOO HIGH FAULT
		82	IOB EF 1 VOLTAGE TOO LOW FAULT
		83	IOB EF 2 VOLTAGE TOO HIGH FAULT
		84	IOB EF 2 VOLTAGE TOO LOW FAULT
		89	IOB REMOTE 1 FAULT
		90	IOB REMOTE 2 FAULT
		91	IOB CONTACTOR SENSE FAULT
		92	IOB COMM FAULT
		93	IOB CONTACTOR 1 CONTACTS STUCK FAULT
		94	IOB CONTACTOR 2 CONTACTS STUCK FAULT
		99	ADV COMM FAULT



See Operation and Maintenance Manual for detailed troubleshooting procedures.

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Commands and Faults list
Figure 1

d. Self Test

When input power is first applied or after a fault has been reset, the converter performs a complete self diagnostic of its internal circuitry. The input power lamp will flash for several seconds indicating self test is in process.

During a self test, the converter will perform ADV Commands “01.” through “52.” (ADV SELF TEST through ADV STANDBY). The converter performs each test one at a time and in the order listed. When a fault is detected during self test, the current **Command** and detected **Fault** are indicated in the Fault Code display (1-3, Figure 1, Item 17).

By referencing the Fault Code chart (Figure 1), the converter state and exact nature of the fault can be determined. Not only is the failed test identified, but the tests that passed are also known. The tests are ordered such that failures which can cause misleading symptoms (ex. bad power supply) are checked first. This method yields a high degree of troubleshooting accuracy.

e. Ramp Up

When an operator presses an ON button to apply power to an aircraft, the converter performs a number of commands to perform an orderly ramp up. During ramp up, the converter also performs self diagnostics. The output contactor will only close when the output power is within specifications.

During ramp up, the converter will perform ADV Commands “54.” through “87.” (ADV RAMP UP through ADV 400Hz ON). The converter performs each command one at a time and in the order listed. When a fault is detected during ramp up, the current **Command** and detected **Fault** are indicated in the Fault Code display (1-3, Figure 1, Item 17).

By referencing the Fault Code chart (Figure 1), the converter state and exact nature of the fault can be determined. During ramp up, not only is the failed command identified, but the commands that passed are also known. The commands are ordered such that failures which can cause misleading symptoms are checked first. When the fault is reset, the converter will perform a self test and will often detect the fault again revealing additional information. This method yields a high degree of troubleshooting accuracy.

f. 400 Hz Operation

While applying power to an aircraft, the converter continually monitors all critical circuits and operating electrical values.

During 400 Hz operation, the converter continually performs ADV Command “87” (ADV 400Hz ON). When a fault is detected during 400Hz operation, this **Command** and the detected **Fault** are indicated in the Fault Code display (1-3, Figure 1, Item 17).

By referencing the Fault Code chart (Figure 1), the converter state and exact fault can be determined. When the fault is reset, the converter will perform a self test and will often detect the fault again revealing additional information. This method yields a high degree of troubleshooting accuracy.

g. Fault Code Charts/Tables :

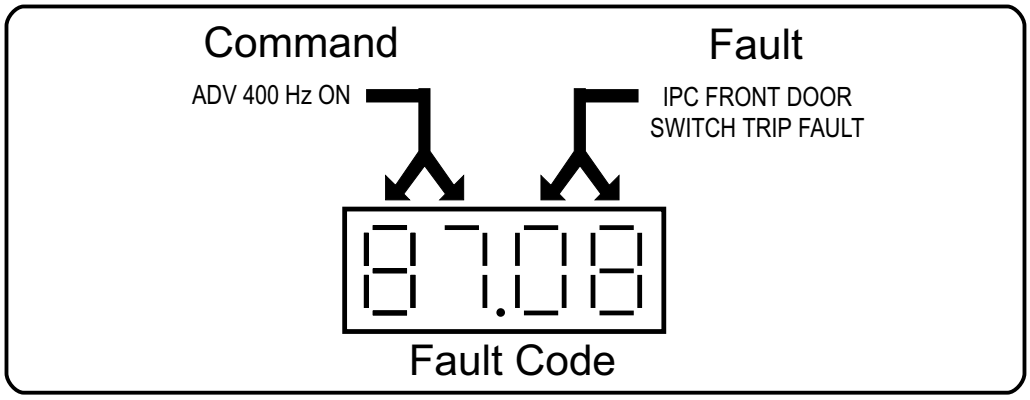
Figure 1 contains a quick reference chart. This chart is also located inside the front door of the converter.

A complete troubleshooting chart is located on Page 8 of this section.

h. Troubleshooting examples:

(1) Example 1:

The converter is operating and delivering power to an aircraft when the front door of the converter is opened. The unit shuts down and the red fault lamp on the control illuminates. The fault code display indicates an “87.08”.

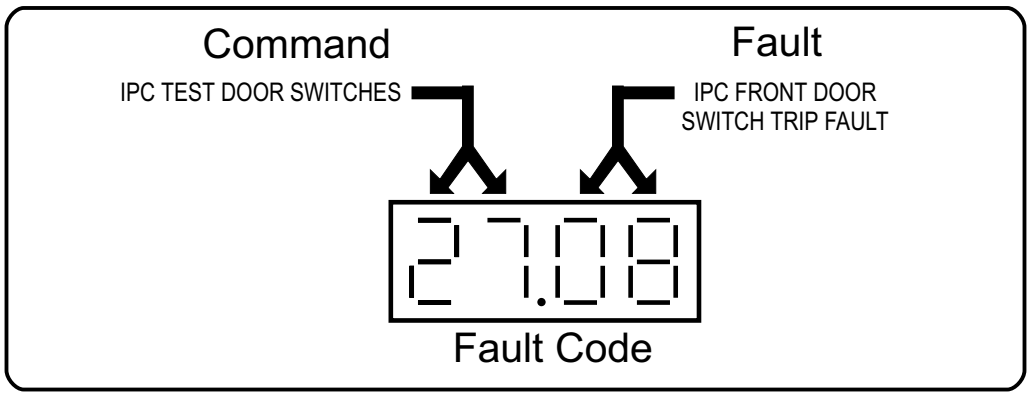


The numerals “87.” on the left of the fault code display indicates that the machine was operating, and delivering 400Hz power when the fault occurred.

The numerals “.08” on the right of the fault code display indicates that the IPC PC board detected a front door switch trip during operation.

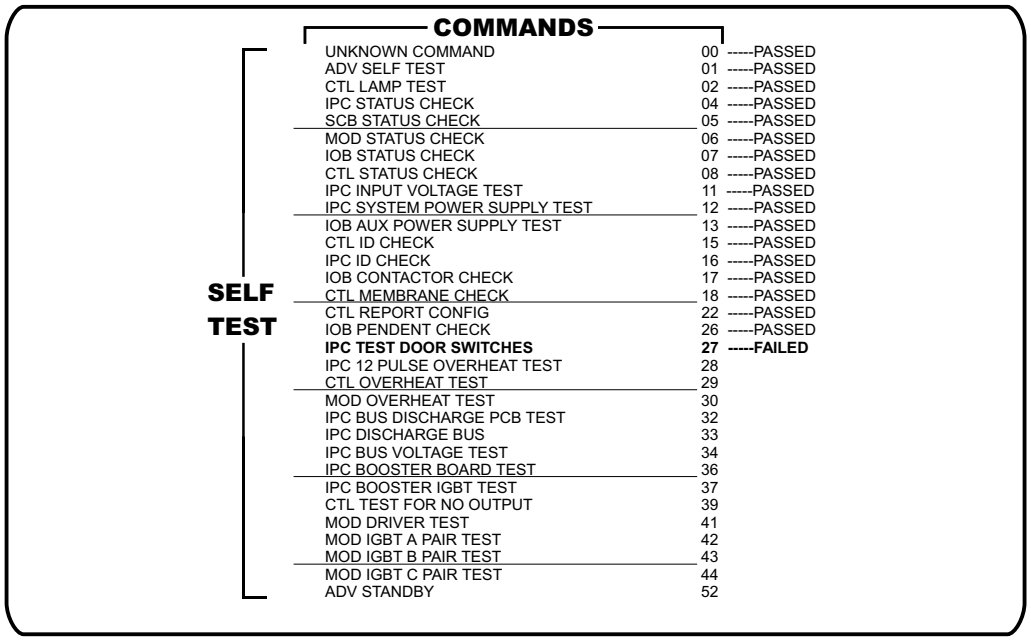
(2) Example 2:

Now with the door still open, the fault is reset by pressing the 400 Hz Off button on the front panel. The Input Power lamp begins to flash to indicate self test in process. After a couple of seconds, another fault occurs and the fault code display now indicates an “27.08”.



The numerals “27.” on the left of the fault code display indicates that the machine was executing a self test and that the IPC PC board was testing the door switches.

The “27.” also indicates that that tests “01.” through “26.” passed and that therefore the power supplies, contactors, remote pendents, etc., are ok.



The numerals “.08” on the right of the fault code display indicates that the IPC PC board detected a front door switch trip during self test.

The door is now properly latched. The 400 Hz Off button is pressed to reset the fault. The Input Power lamp flashes for several seconds to indicate self test. The input power lamp then illuminates continuously to indicate the converter is now ready for use.

Troubleshooting Table ADV Commands		
Fault Code	Name	Description
00._ _		
01._ _	ADV SELF TEST	All boards go to self test mode.
02._ _	CTL LAMP TEST	CTL turn on all front panel lights.
03._ _		
04._ _	IPC STATUS CHECK	IPC check PC board status.
05._ _	SCB STATUS CHECK	SCB check PC board status.
06._ _	MOD STATUS CHECK	MOD check PC board status.
07._ _	IOB STATUS CHECK	IOB check PC board status.
08._ _	CTL STATUS CHECK	CTL check PC board status.
09._ _		
10._ _		
11._ _	IPC INPUT VOLTAGE TEST	IPC test input voltage within limits.
12._ _	IPC SYSTEM POWER SUPPLY TEST	IPC test system power supplies within limits.
13._ _	IOB AUX POWER SUPPLY TEST	IOB test aux power supply within limits
14._ _		
15._ _	CTL ID CHECK	CTL detect main transformer rating.
16._ _	IPC ID CHECK	IPC detect 12 pulse transformer presence.
17._ _	IOB CONTACTOR CHECK	IOB detect contactors.
18._ _	CTL MEMBRANE CHECK	CTL check front switch panel for shorts.
19._ _		`
20._ _		
21._ _		
22._ _	CTL REPORT CONFIG	CTL display kVA rating, 6 or 12 pulse config., and number of contactors.
23._ _		
24._ _		
25._ _		
26._ _	IOB PENDENT CHECK	IOB check for stuck pendent buttons.
27._ _	IPC TEST DOOR SWITCHES	IPC test door switches for closed position.
28._ _	IPC 12 PULSE OVERHEAT TEST	IPC test 12 pulse transformer for overheat.
29._ _		

Troubleshooting Table ADV Commands		
Fault Code	Name	Description
30._ _	MOD OVERHEAT TEST	MOD test heatsink and main transformer for overheat.
33._ _		
32._ _	IPC BUS DISCHARGE PCB TEST	IPC test bus discharge PC board.
33._ _	IPC DISCHARGE BUS	IPC command bus discharge PC board to discharge.
34._ _	IPC BUS VOLTAGE TEST	IPC test bus voltage.
35._ _		
36._ _		
37._ _		
38._ _		
39._ _	CTL TEST FOR NO OUTPUT	CTL test for output voltage = 0.
40._ _		
41._ _	MOD DRIVER TEST	MOD test driver PC board.
42._ _	MOD IGBT A PAIR TEST	MOD test IGBT pair A for shorts.
43._ _	MOD IGBT B PAIR TEST	MOD test IGBT pair B for shorts.
44._ _	MOD IGBT C PAIR TEST	MOD test IGBT pair C for shorts.
45._ _		
46._ _		
47._ _		
48._ _		
49._ _		
50._ _		
51._ _		
52._ _	ADV STANDBY	All boards go to stand-by mode.
53._ _	ADV RAMP UP	All boards go to ramp-up mode.
54._ _		
55._ _		
56._ _		
57._ _	IPC TEST FOR BUS SHORT	IPC test D.C. Bus for short circuit.
58._ _		

Troubleshooting Table ADV Commands		
Fault Code	Name	Description
59._ _	IPC RAMP TO MINIMUM	IPC ramp SCR duty cycle to minimum bus voltage.
60._ _		
61._ _	IPC RAMP TO 25 PERCENT	IPC ramp SCR duty cycle to 25 percent duty cycle
62._ _		
63._ _	IPC RAMP TO 50 PERCENT	IPC ramp SCR duty cycle to 50 percent duty cycle
64._ _		
65._ _		
66._ _		
67._ _	IPC RAMP TO FULL OUTPUT	IPC ramp SCR duty cycle to full output duty cycle
68._ _		
69._ _		
70._ _		
71._ _		
72._ _		
73._ _		
74._ _		
75._ _		
76._ _		
77._ _		
78._ _		
79._ _	MOD RAMP TO FULL OUTPUT	MOD ramp 400Hz voltage to full.
80._ _		
81._ _		
82._ _	SCB TEST OUTPUT FREQUENCY	SCB test 400Hz frequency within limits
83._ _		
84._ _		
85._ _	CTL TEST OUTPUT	CTL test 400Hz voltage within limits.
86._ _		

Troubleshooting Table ADV Commands		
Fault Code	Name	Description
87._ _	ADV 400HZ ON	All boards go to 400Hz on mode.
88._ _		
89._ _		
90._ _		
91._ _		
92._ _		
93._ _	ADV SHUTDOWN	All boards shutdown (normal shutdown).
94._ _		
95._ _		
96._ _		
97._ _		
98._ _		
99._ _	ADV FAULT SHUTDOWN	All boards shutdown (abnormal shutdown).

Troubleshooting Table

Faults

Fault Code	Name	Possible Cause(s)	Corrective Action
_ _.00			
_ _.01			
_ _.02			
_ _.03			
_ _.04	IPC BUS SHORT FAULT	Shorted SCR	Replace SCR
_ _.05			
_ _.06	IPC SELF TEST FAULT	IPC Board failed self test	Replace IPC Board
_ _.07	IPC REAR DOOR SWITCH TRIP FAULT	Rear door is open Interlock switch is defective	Close and latch rear door Replace interlock switch S2
_ _.08	IPC FRONT DOOR SWITCH TRIP FAULT	Front door is open Interlock switch is defective	Close and latch front door Replace interlock switch S7
_ _.09	IPC POS 5VDC FAULT	Power Supply PS2 is defective	Replace PS2
_ _.10	IPC POS 12VDC FAULT	Power Supply PS1 is defective	Replace PS1
_ _.11	IPC NEG 12VDC FAULT	Power Supply PS2 is defective	Replace PS2
_ _.12			
_ _.13	IPC DISCHARGE BOARD FAULT	Discharge Board is defective Discharge Resistor is open	Replace Discharge Board A7 Replace Discharge Resistor R3
_ _.14	IPC DISCHARGE FAULT	Discharge Board is defective Discharge Resistor is open	Replace Discharge Board A7 Replace Discharge Resistor R3
_ _.15	IPC 12 PULSE OVERHEAT FAULT	Filter Clogged Fan is inoperative Defective thermal switch in 12 pulse transformer	Clean or Replace Filter Check fan Replace thermal switch
_ _.16	IPC SCR FAULT	SCR shorted or open	Replace SCR
_ _.17	IPC BUS VOLTAGE LOW FAULT	SCR open Input power control board defective	Replace SCR Replace IPC board A4
_ _.18	IPC BUS VOLTAGE HIGH FAULT	Improper No Break Power Transfer	Check output cable and load
_ _.19	IPC INPUT VOLTAGE TOO HIGH FAULT	Input voltage too high Input Power Control Board defective	Check input source, correct as necessary Replace Input Power Control Board A4
_ _.20	IPC INPUT VOLTAGE TOO LOW FAULT	Input voltage too low Input Power Control Board defective	Check input source, correct as necessary Replace Input Power Control Board A4

Troubleshooting Table

Faults

Fault Code	Name	Possible Cause(s)	Corrective Action
_ _.21	IPC INPUT PHASE LOSS FAULT	Loss of input phase detect Input Power Control Board defective	Check input source, correct as necessary Replace Input Power Control Board A4
_ _.22			
_ _.23	IPC COMM FAULT	Comm fault on Input Control Board	Replace Input Power Control Board A4
_ _.24			
_ _.25			
_ _.26			
_ _.27	SCB SELF TEST FAULT	Signal Conditioning Board failed self test	Replace Signal Conditioning Board A6
_ _.28	SCB OUTPUT OVER FREQ FAULT	Modulator Board defective	Replace Modulator Board A3
_ _.29	SCB OUTPUT UNDER FREQ FAULT	Modulator Board defective	Replace Modulator Board A3
_ _.30	SCB COMM FAULT	Comm fault on Signal Conditioning Board	Replace Signal Conditioning Board A6
_ _.31			
_ _.32			
_ _.33			
_ _.34			
_ _.35	MOD SELF TEST FAULT	Modulator Board failed self test	Replace Modulator Board A3
_ _.36	MOD NBPT CURRENT TRIP FAULT	High current No Break Power Transfer	Check output cable and load Reset and restart converter
_ _.37	MOD VBUS OVER VOLTAGE FAULT	Faulty No Break Power Transfer	Reset and restart converter
_ _.38	MOD DRIVER BOARD FAULT	Defective Driver Board	Replace Driver Board
_ _.39	MOD IGBT A FAULT	Phase A IGBT defective	Replace PM1 & PM2
_ _.40			
_ _.41	MOD IGBT B FAULT	Phase B IGBT defective	Replace PM3 & PM4
_ _.42			
_ _.43	MOD IGBT C FAULT	Phase C IGBT defective	Replace PM5& PM6
_ _.44			
_ _.45	MOD OUTPUT SHORT CIRCUIT FAULT	Shorted output	Check output cable and load Reset and restart converter
_ _.46			
_ _.47	MOD HEATSINK OVERTEMP FAULT	Filter clogged Fan inoperable Defective Thermal Switch	Clean or replace filter Check fan Replace switch S4

Troubleshooting Table

Faults

Fault Code	Name	Possible Cause(s)	Corrective Action
_ _.48	MOD TRANSFORMER OVERTEMP FAULT	Filter clogged Fan inoperable Defective Thermal Switch	Clean or replace filter Check fan Replace switch S5
_ _.49	MOD NBPT FAULT	Improper No Break Power Transfer	Reset and restart converter
_ _.50	MOD COMM FAULT	Comm fault on Modulator Board	Replace Modulator Board A3
_ _.51	MOD VCESAT FAULT	High current No Break Power Transfer. Shorted Output Defective IGBT Defective Driver board	Reset and restart converter Check output cable and load. Reset and restart converter Replace IGBT pair Replace Driver board
_ _.52			
_ _.53			
_ _.54			
_ _.55			
_ _.56			
_ _.57	CTL SELF TEST FAULT	Control Board failed self test	Replace Control Board A2
_ _.58	CTL TRANSFORMER ID FAULT	Transformer ID resistor is missing, open, or incorrect value	Replace resistor R4
_ _.59	CTL RS232 FAULT	RS232 Comm fault	Replace Control Board A2
_ _.60	CTL OUTPUT OVER VOLTAGE FAULT	Voltage set too high Line drop comp. Set too high Signal Conditioning BD. defective Modulator Board defective	Reset and restart converter Reset and restart converter Replace Signal Conditioning BD. A6 Replace Modulator Board A3
_ _.61	CTL OUTPUT UNDER VOLTAGE FAULT	Voltage set too low Signal Conditioning BD. Defective Modulator Board defective	Reset and restart converter Replace Signal Conditioning BD. A6 Replace Modulator Board A3
_ _.62	CTL OUTPUT 1 OVERLOAD FAULT	Overload on Output 1	Reset and restart converter
_ _.63			
_ _.64			
_ _.65	CTL OUTPUT 2 OVERLOAD FAULT	Overload on Output 2	Reset and restart converter
_ _.66			
_ _.67			
_ _.68	CTL MACHINE OVERLOAD FAULT	Load over rating of converter	Reset and restart converter
_ _.69			
_ _.70			

Troubleshooting Table

Faults

Fault Code	Name	Possible Cause(s)	Corrective Action
_ _.71			
_ _.72	CTL OUTPUT VOLT. IMBALANCE FAULT	Load is Unbalanced Modulator Board is defective Signal Conditioning Board defective	Reset and Restart Converter Replace Modulator Board A3 Replace Signal Conditioning Bd. A6
_ _.73	CTL MEMORY FAULT	Control Board is defective	Replace Control Board
_ _.74	CTL UNBALANCED LOAD FAULT	Load is unbalanced Output cable is defective	Reset and restart converter Check output cable
_ _.75	CTL MEMBRANE FAULT	Button held on during self test Button stuck on control membrane	Reset and restart converter Replace membrane switch panel S1
_ _.76			
_ _.77			
_ _.78			
_ _.79	SELF TEST FAULT	I/O Board failed self test	Replace I/O Board A1
_ _.80	AUX24 FAULT	I/O Board fuse blown	Replace I/O Board fuse
_ _.81	IOB EF 1 VOLTAGE TOO HIGH FAULT	EF Voltage being sent from aircraft on Output 1 to the converter on TB1 - 6 to N is too high Output Cable is Defective	Reset and restart converter Check Output Cable
_ _.82	IOB EF 1 VOLTAGE TOO LOW FAULT	EF Voltage being sent from aircraft on Output 1 to the converter on TB1 - 6 to N is too low Output Cable is Defective	Reset and restart converter Check Output Cable
_ _.83	IOB EF 2 VOLTAGE TOO HIGH FAULT	EF Voltage being sent from aircraft on Output 2 to the converter on TB1 - 12 to N is too high Output Cable is Defective	Reset and restart converter Check Output Cable
_ _.84	IOB EF 2 VOLTAGE TOO LOW FAULT	EF Voltage being sent from aircraft on Output 2 to the converter on TB1 - 12 to N is too low Output Cable is Defective	Reset and restart converter Check Output Cable
_ _.85			
_ _.86			
_ _.87			
_ _.88			
_ _.89	IOB REMOTE 1 FAULT	Button held down during self test Stuck button or open wire on remote for output #1	Reset and restart converter Repair or replace remote push buttons.

Troubleshooting Table Faults			
Fault Code	**Name**	**Possible Cause(s)**	**Corrective Action**
_ _.90	IOB REMOTE 2 FAULT	Button held down during self test Stuck button or open wire on remote for output #2	Reset and restart converter Repair or replace remote pushbuttons.
_ _.91	IOB CONTACTOR SENSE FAULT	Contactor coil open	Replace Contactor
_ _.92	IOB COMM FAULT	Comm fault on I/O board	Replace I/O board (A1)
_ _.93	IOB CONTACTOR 1 CONTACTS STUCK FAULT	Contactor on output #1 stuck closed	Replace output K1 contactor
_ _.94	IOB CONTACTOR 2 CONTACTS STUCK FAULT	Contactor on output #2 stuck closed	Replace output K2 contactor
_ _.95			
_ _.96			
_ _.97			
_ _.98			
_ _.99	ADV COMM FAULT	Converter comm fault	Replace control board A2

Converter Protective Output Faults	
Over Voltage	Trips at 125 volts after a 1-second time delay Trips at 140 volts in 160 milliseconds Trips at 180 volts in 50 milliseconds
Under Voltage	Trips at any value between 60 volts and 104 volts after a 8-second time delay. Trips immediately at any voltage below 60 volts.
Over Frequency	Trips at any value between 430-Hz and 440-Hz after a 14-second time delay. Trips immediately at any frequency above 440-Hz.
Under Frequency	Trips at any value between 350-Hz and 365-Hz after a 14-second time delay. Trips immediately at any frequency below 350-Hz.
Overloads	Trips in approximately 10 minutes at 125% load on either output or overall converter rating. Trips in approximately 30 seconds at 150% load on either output or overall converter rating. Trips in approximately 10 seconds at 200% load on either output or overall converter rating.

Fault Limits are described above and are detailed in the Fault Code Chart earlier in the chapter.

3. Troubleshooting Procedures

The remainder of this section provides further explanation of the troubleshooting information given in the preceding table. When necessary, detailed testing procedures are given to help determine which of several possible components may be in need of repair or replacement. Actual removal and replacement instructions are given in Chapter 3.

NOTE: There are no procedures listed for testing or replacing individual components on any PC board. 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.

WARNING

High voltages may be present inside the converter cabinet, even when the unit is off. Exercise extreme caution when testing and replacing components or FATAL SHOCK may result.

Before testing any components inside the converter, always make certain that the DC bus is fully discharged. In certain circumstances, such as a failure of the DC bus discharge PC board, the DC bus may not be discharged when the converter shuts down. Several hundred volts may still be present at the bus.

Test the DC bus with a voltmeter to be sure that it is fully discharged. The bus can be tested using test jacks TP1 and TP2 (2-3, Figure 1) on the upper left corner of the signal conditioning board inside the front door. If the bus is not discharged, close the converter door, wait at least 15 minutes, and test it again. Do not perform any work inside the converter while the DC bus remains charged.

a. Door Switch Fault

The converter is equipped with two door interlock switches: S7 on the front door and S2 on the back door. Opening either door will disable the unit. Therefore both doors must be closed to operate the unit. If a door interlock fault occurs, follow the procedure below to determine the cause and restore the converter to normal operation.

(1) Make sure both the front and back converter doors are tightly closed and all six latches are fastened**.** To fasten the latches, turn each one clockwise with an 8 mm (5/16 inch) Allen wrench until it stops.

(2) Press the control panel 400Hz OFF button to reset the converter.

(3) Restart the converter normally and attempt to deliver output power.

(4) If this fault reoccurs, one or both of the door interlock switches may be faulty. To test the switches, follow these steps:

a. Disconnect input power from the converter.

WARNING

High voltages may be present inside the converter cabinet, even when the unit is off. Exercise extreme caution when testing and replacing components or FATAL SHOCK may result.

b. Open the front and back doors by turning all three latches counterclockwise with an 8 mm Allen wrench**.** Exercise extreme caution while the doors is open, as high voltages may be present, even when the unit is off.

c. Test the DC bus with a voltmeter to be sure that it is fully discharged. The bus can be tested using test jacks TP1 and TP2 on the upper left corner of the signal conditioning board inside the front door. If the bus is not discharged, close the converter door, wait at least 15 minutes, and test it again. Do not perform any work inside the converter while the DC bus remains charged. See Figure 1 for the proper test points.

d. Check the continuity of each door interlock switch with an ohmmeter. When the doors are open, the switch contacts will also be open, and there should be approximately 100- or more across the terminals.

e. Press and hold the white post in front of each switch and measure the continuity**.** The switch contacts will be closed, and there should be no resistance across the terminals**.**

f. If a switch is faulty, it must be replaced**.** See Chapter 3 for replacement procedures**.**

b. Output Current Overload Fault

If an output current fault occurs, follow the procedure below to determine the cause and restore the converter to normal operation.

(1) Make sure the aircraft is not placing a load on the converter greater than the unit's power rating. Turn off unnecessary accessories on the aircraft. Check for a shorted output or output cable.

(2) Press the control panel 400Hz OFF button to reset the converter.

(3) Restart the converter normally and attempt to deliver output power.

c. Neutral Line Current Fault

A neutral line current fault may be caused by unequal loading of the output phases by the aircraft, or one or two open or shorted phases in the output cable or at the aircraft. If a neutral line current fault occurs, follow the procedure below to determine the cause and restore the converter to normal operation.

(1) Make sure the aircraft is not placing an excessive load on one output phase. The loads placed on each phase should be nearly equal. Check the output cable, aircraft plug, and contactor connections, and repair as necessary.

(2) Press the control panel 400Hz OFF button to reset the converter.

(3) Restart the converter normally and attempt to deliver output power.

Section 2. Calibration

IMPORTANT

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

As explained in Section 1-1, the Model 101 control performs monitoring and testing of critical circuits prior to and during operation. After major repair, major parts replacement, or overhaul, adjustments may be required. Adjustments or calibration may be made from inside the converter using the Signal Conditioning P.C. Board, or from the ADV service tool software from a remote PC.

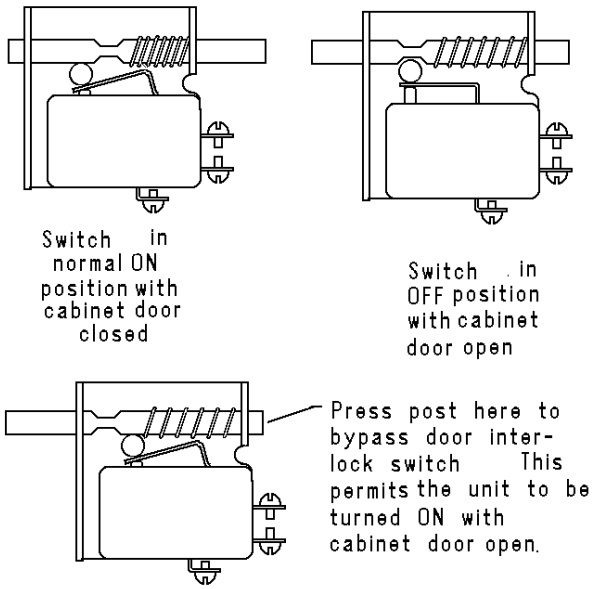
1. Test Preparation

a. Calibration adjustments must be made while the front door is open and the converter is sending output power. All test measurements can be taken behind the front door of the converter or at the ends of the output cables. It is not necessary to have access to the back door for calibration purposes. Make sure the back door is tightly closed. The unit is equipped with two door interlock switches: S7 on the front door and S2 on the back door (See Figure 1). Opening either door will prevent the unit from operating therefore, S7 (front) must be bypassed while performing measurements inside the front of the unit (Figure 4)

b. Disconnect input power from the converter.

WARNING

High voltages may be present inside the converter cabinet even when the unit is off. Exercise extreme caution when taking measurements or FATAL SHOCK may result.



Door Interlock Switches (S2 & S7)
Figure 1

c. To bypass S7, open front door by turning all three latches counterclockwise with an 8mm allen wrench.

d. Test the DC bus (1, Figure 3) with a voltmeter to be sure that it is fully discharged. The bus can be tested using test jacks TP1 and TP2 on the upper left corner of the signal conditioning board inside the front door. If the bus is not discharged, close the converter door, wait at least 15 minutes, and test it again. While the DC bus remains charged.

e. Press the end of the white post behind (Figure 1), switch until it locks into place. S7 is now bypassed and will allow the converter to operate while the front door is open.

f. Apply rated input power. The green INPUT POWER lamp (7, Figure 2) on the control panel will illuminate.

g. Use output cable of proper size and length for the converter's power output rating. Connect output cable plug connectors from all available outputs to aircraft receptacle(s) or load bank(s). Be sure connectors are mated fully and securely. Make a general inspection of all wiring and terminals.

WARNING

Never disconnect an output cable while output power is on.

2. Calibration (See Figure 2)

The Model 101 Control provides automatic and continuous monitoring of numerous critical electrical operating values.

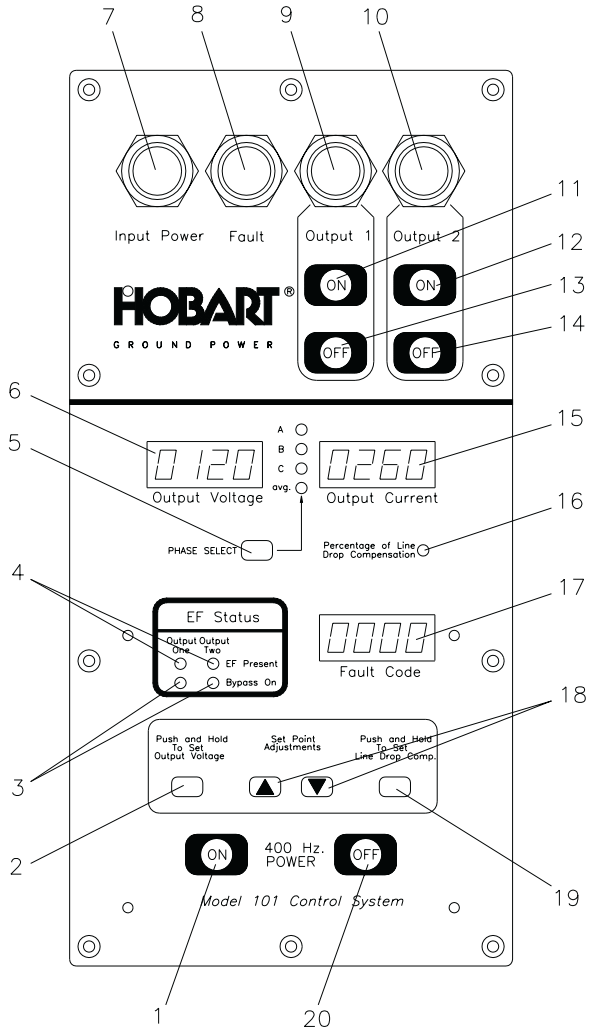
WARNING

Exercise extreme caution while performing calibrations. FATAL SHOCK OR PERMANENT DAMAGE TO EQUIPMENT may result if proper procedures and precautions are not taken.

If a qualified technician, after measuring various voltage or current values with his own testing equipment, discovers that the readings he obtained do not match the values displayed by the Model 101 Control, he may change the calibration of the unit to bring the displayed values into agreement with the measured values. This procedure should be performed especially after major repair, major parts replacement, and overhaul.

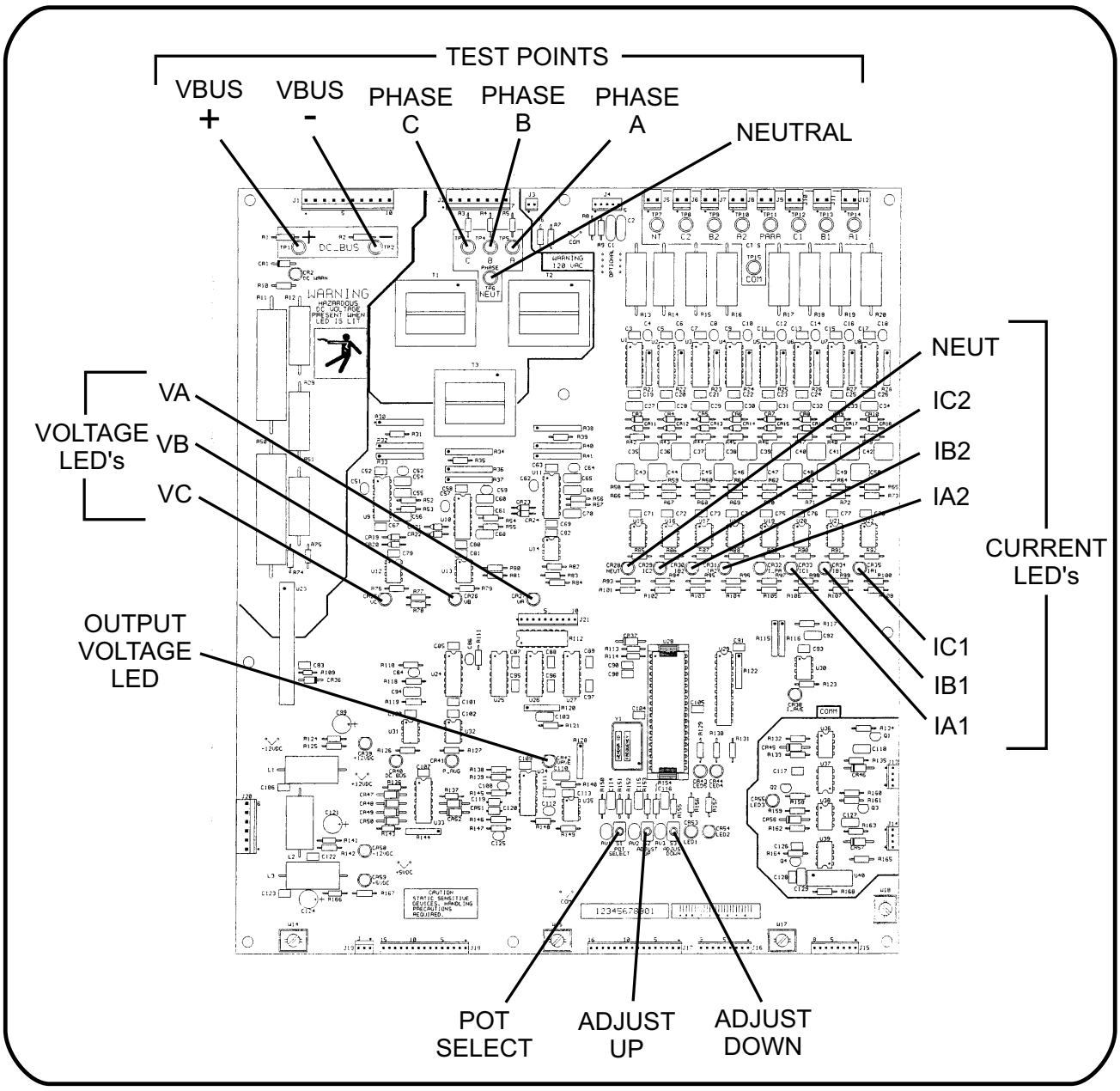
CAUTION

Only QUALIFIED personnel using ACCURATE test equipment should perform calibrations. Otherwise PERMANENT DAMAGE to the converter could result.



1. 400 Hz POWER ON push button
2. OUTPUT VOLTAGE ADJUSTMENT push button
3. BYPASS ON lamp
4. EF PRESENT lamp
5. PHASE SELECT push button
6. OUTPUT VOLTAGE display
7. INPUT POWER lamp
8. FAULT lamp
9. OUTPUT 1 lamp
10. OUTPUT 2 lamp
11. OUTPUT 1 ON push button
12. OUTPUT 2 ON push button
13. OUTPUT 1 OFF push button
14. OUTPUT 2 OFF push button
15. OUTPUT CURRENT display
16. LINE DROP COMPENSATION PERCENTAGE lamp
17. FAULT CODE display
18. SET POINT UP AND DOWN ADJUSTMENT push buttons
19. LINE DROP COMPENSATION ADJUSTMENT push button
20. 400 Hz POWER OFF push button

Control Panel
Figure 2



Signal Conditioning Board
Figure 3

a. Voltage Calibration Procedure (See Figure 3)

The voltage settings on this converter are calibrated at the factory. However, on-sight adjustments may be made using the following procedure.

To begin the calibration procedure, the converter must be ON and a load must be present. The following calibrations are to be performed on the Signal Conditioning Board (Figure 3) which is located inside the front door (Figure 4). The SCB has a series of LEDs that indicate which signal is being calibrated. The LEDs VA, VB, and VC are used to indicate that the output phase A, B, and C voltage readings are being adjusted.

(1) Turn the converter on, and place a load on any of the converter outputs.

WARNING

High voltages will be present inside the converter cabinet when the unit is on. Exercise extreme caution when taking measurements or FATAL SHOCK may result.

(2) Press and hold the “POT SELECT” push button for 3 seconds until the “IA1” LED illuminates.

(3) Depress and release the “POT SELECT” push button repeatedly until the “VA” LED illuminates.

(4) Using a properly calibrated voltage meter, place one voltmeter lead into the"NEUTRAL" test point and the other lead into the “PHASE A” test point. Turn on the voltmeter.

(5) Check that the control panel displays PHASE A (5, Figure 2); use the control panel “PHASE SELECT” push button if needed. When power is being delivered, the voltage reading on the voltmeter should match the voltage reading on the control panel (6, Figure 2).

(6) If the voltmeter and the control panel readings match, PHASE A calibration is complete.

(7) If the voltmeter and the control panel readings do not match, use the “ADJUST UP” and ”ADJUST DOWN” push buttons until the readings match.

(8) Repeat the above procedure for PHASE B and PHASE C.

(9) Depress and release the “POT SELECT” push button repeatedly until the “OUTPUT VOLTAGE” LED illuminates.

(10) Check that the control panel displays AVG (5, Figure 2); use the control panel Phase Select push button if needed. When power is being delivered, the voltage reading on the control panel is the average output voltage from the converter.

(11) If the output voltage of the converter is the desired value, the output voltage calibration is complete. If the converter output is not the desired value, use the “ADJUST UP” and the “ADJUST DOWN” push buttons until the readings match.

(12) When finished performing voltage calibration, press and hold the “POT SELECT” push button for 3 seconds until all LED’s turn OFF.

b. Current Calibration Procedure (See Figure 3)

The amperage settings on this converter are calibrated at the factory however onsight adjustments may be made using the following procedure.

To begin the calibration procedure, the converter must be ON and a load must be present. The following calibrations are to be performed on the Signal Conditioning Board (Figure 3) which is located inside the front door (Figure 4). The SCB has a series of LEDs that indicate which signal is being calibrated. The LEDs IA1, IB1, and IC1 are used to indicate that the phase A, B, and C current for output 1 is being adjusted. The LEDs IA2, IB2, and IC2 are used to indicate that the phase A, B, and C current for output 2 is being adjusted.

WARNING

A reliable and accurate ammeter is needed to complete this calibration.

a. Turn the converter on, and place a load on the output of interest.

WARNING

High voltages will be present inside the converter cabinet when the unit is on. Exercise extreme caution when taking measurements or FATAL SHOCK may result.

b. Press and hold the “POT SELECT” push button for 3 seconds until the “IA1” LED illuminates. This LED identifies that the PHASE A current for output 1 can now be calibrated.

c. Using a properly calibrated ammeter, measure the current on the PHASE A, output 1 cable.

d. Check that the control panel displays PHASE A (5, Figure 2); use the “PHASE SELECT” button if needed. When power is being delivered, the amperage reading on the control panel (6, Figure 2) should match the amperage reading on the ammeter.

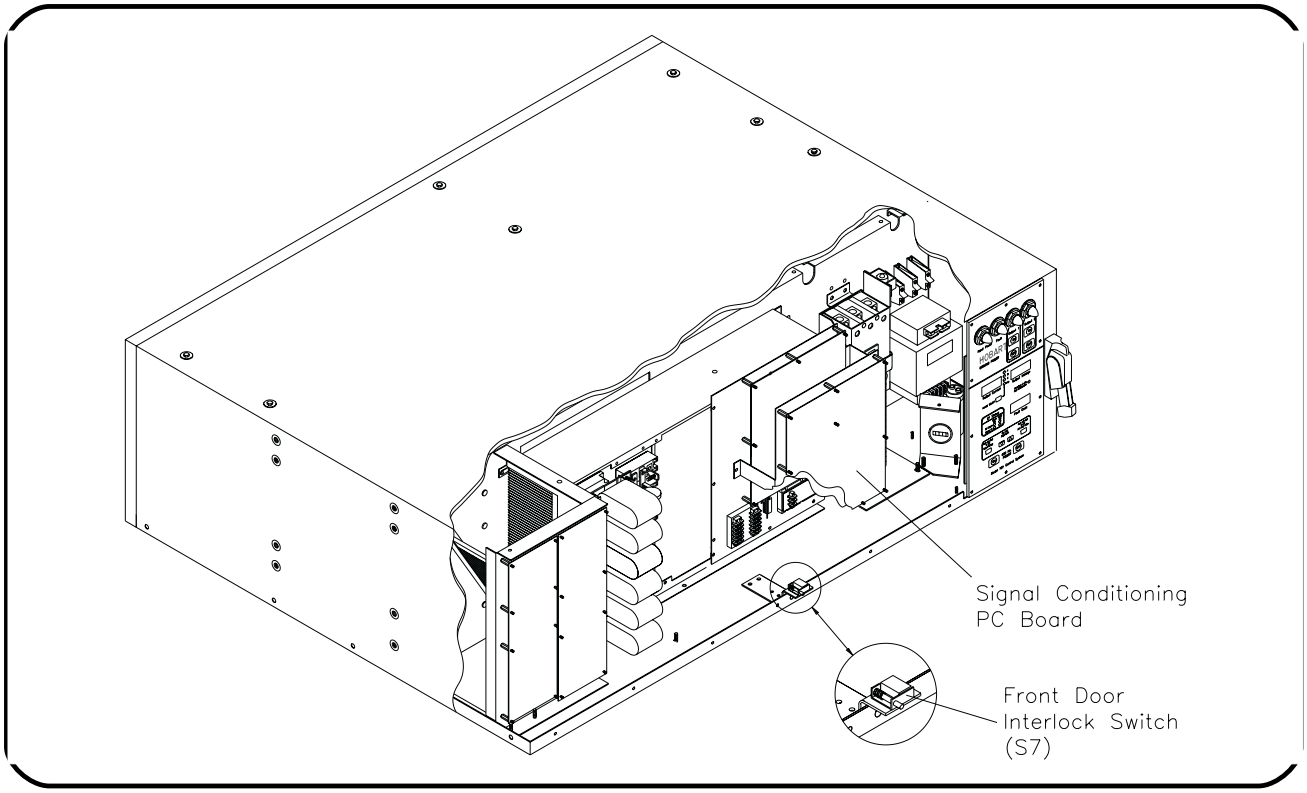
e. If the ammeter and the control panel amperage readings match, calibration is complete.

f. If the ammeter and the control panel amperage readings do not match, use the “ADJUST UP” and “ADJUST DOWN” buttons to change the control panel reading until both values match.

g. Depress and release the “POT SELECT” push button repeatedly until the next desired signal for calibration is indicated.

h. Repeat the above 6 steps (b - f) to calibrate for each signal to be calibrated.

i. When finished performing calibration, depress and hold the “POT SELECT” push button for 3 seconds until all LED’s turn OFF.



Signal Conditioning Board
and Door Interlock Switch Location
Figure 4

Section 3. Scheduled Maintenance

1. General

The Hobart PoWerMaster ADV® Frequency Converter is designed to be as maintenance free as possible. Therefore there are few maintenance requirements. Field maintenance of the converter should be done only by qualified service personnel, and should be limited to cleaning and inspection of the unit and its components, and the replacement of lamps and fuses. All servicing and repair work, including testing and calibration, should be referred to the Service Department of Hobart Brothers Company, or to an authorized service shop of Hobart Brothers ground power equipment, or to qualified electronic technicians.

2. Scheduled Maintenance Procedure

The converter should be cleaned and inspected once every six months, or more frequently if operating conditions warrant it. Proceed as follows with cleaning and inspection.

a. Turn off input power at the source. Make sure that power cannot be inadvertently turned back on.

WARNING

High voltage may be present inside the converter cabinet, even when the unit is off. Exercise extreme caution or **FATAL SHOCK** may result.

b. Open the front and rear doors by turning all six latches counterclockwise with an 8 mm Allen wrench. Exercise extreme caution while the doors is open, as high voltages may be present, even when the unit is off.

c. Test the DC bus with a voltmeter to be sure that it is fully discharged. The bus can be tested using test jacks TP1 and TP2 on the upper left corner of the signal conditioning board (Figure 1) inside the front door. If the bus is not discharged, close the converter door, wait at least 15 minutes, and test it again. Do not perform any work inside the converter while the DC bus remains charged. See Figure 1 for the proper test points.

d. Carefully clean dust from the interior of the converter by blowing low pressure compressed air into the interior from the bottom of the unit first and then from the top.

WARNING

Wear eye protection and be careful to avoid blowing debris where it could cause harm or injury.

e. Air Filter — Hobart Ground Power Replacement Part No. 283159-003

The air filter helps clean the incoming air to the converter. The air filter MUST be in place while the converter is in operation.

If the filter needs to be cleaned, flush with water and re-coat the filter with Research Products Corporation's RP Super Filter Coat Adhesive. The filter (located on the bottom left side of the converter in front) should also be inspected regularly for cleanliness. This chemical, which will increase the effectivity of the filter by 10%, can be found by calling Research Products Corporation at (608) 257-8801. The name of a local suppler of their products will be furnished.

The air filter should be replaced annually. It can only be removed from the outside of the machine.

f. Clean heat sinks and printed circuit boards using compressed air or a soft brush.

g. Inspect terminal blocks for evidence of overheating due to loose electrical connections.

h. Inspect electrical and mechanical connections for tightness. Inspect closely all compression-type connectors.

i. Inspect printed circuit boards for evidence of overheating, such as burned resistors or capacitors. Note that the printed circuit boards are coated with a fungus and moisture-proof coating which turns brown on hot components. This is a normal occurrence, especially on resistors exceeding 1-watt in rating.

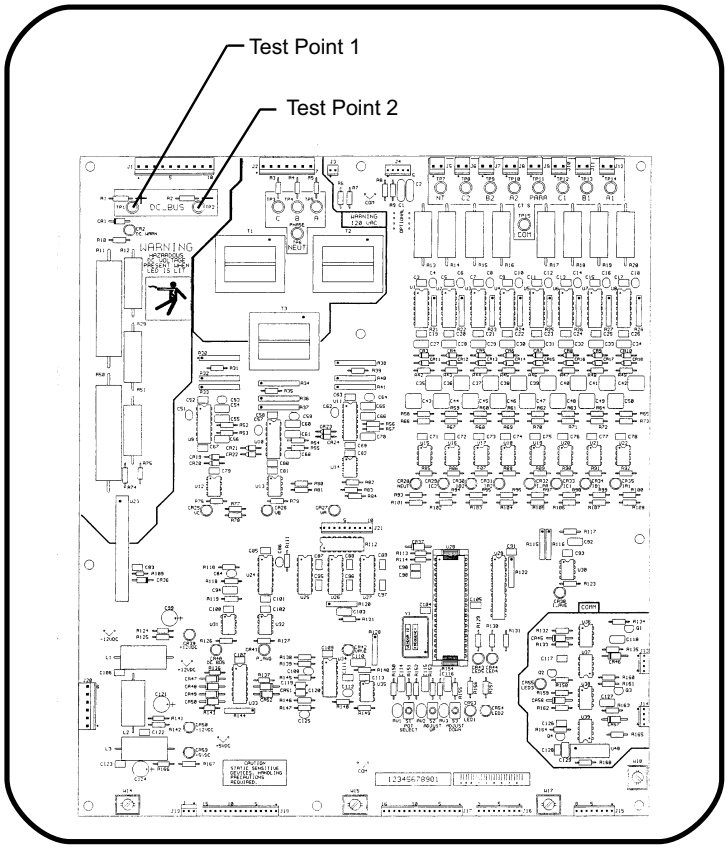
j. Check and inspect all front panel components, including indicator lamps.

k. Inspect the long hinge at the front and rear of the unit. If these hinges stick and are difficult to operate, spray hinges with a silicone spray lubricant.

l. Inspect all wiring, leads, and cables. Inspect for cuts, abrasions, and signs of deterioration and overheating. Inspect leads for broken strands at terminals.

m. Check to be sure that the fan is operational and does not exhibit excess bearing wear. The unit contains one fan hidden in the center, located behind the IPC (Input Control PC Board). Removal of the Input Control and Signal Conditioning PC Boards is required to inspect the fan, as it cannot be seen from either door access.

n. After inspection has been completed, close and latch the front and rear doors, and turn on input power at the source.



Test Points - Signal Conditioning Board
Figure 1

Chapter 3. Overhaul / Major Repair

Unscheduled Repair

1. General

Repair of the converter will consist primarily of parts replacement. Most of the components used in the converter 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 Ground Power** **Service Department** **1177 Trade Square East** **Troy, Ohio 45373** **U.S.A.**
In U.S.A. Call:	**(800) 422-4166 (Parts)** **(800) 422-4177 (Service)**
From Foreign Countries Call:	**(937) 332-5050 (Parts)** **(937) 332-5060 (Service)**
FAX:	**(937) 332-5121** **(800) 367-4945 Toll Free in U.S.A.**
E-Mail	**Service@hobartgroundpower.com**
WWW	**hobartgroundpower.com**

3. Workmanship

Perform all repairs in accordance with good electrical repair practices. All interconnecting lead connections to components must be made with proper wire terminations. Route all leads neatly and secure with wire ties, cable clamps, etc.

This converter was designed to use metric hardware wherever possible. However, some of it's purchased components, such as contactors, switches, transformers, etc., may have standard sizes (S.A.E.). Hobart Brothers does not recommend the use of standard size tools on metric hardware or vice versa. Where mentioned, use only the hardware sizes reference in this manual.

CAUTION

Use only metric tools to loosen or tighten metric hardware, and as well, use only standard size tools to loosen or tighten standard size hardware. These fundamental practices will help to avoid insufficient tightening and rounding off corners. Use only the tools that are specified,.

CAUTION

Use only the correctly sized hardware when reassembling parts on this converter. The majority of hardware for this unit is metric.

4. Converter Bridge Mount Removal and Installation

If extensive repairs are to be made to a unit which is mounted on a trailer or boarding bridge, it is suggested that the unit be removed and placed on a solid supporting structure of some kind.

WARNING

High voltages may be present inside the cabinet, even when the unit is off. Exercise extreme caution or **FATAL SHOCK** may result.

a. Turn off input power at the source. Make sure that power cannot be inadvertently turned back on.

b. Open the front door by turning all three latches counterclockwise with a 8mm allen wrench.

c. Test the DC bus (Figure 1) with a voltmeter to be sure that it is fully discharged. The bus can be tested using test jacks TP1 and TP2 on the upper left corner of the signal conditioning board inside the front door. If the bus is not discharged, close the converter door, wait at least 15 minutes, and test it again. Do not perform any work inside the converter while the DC bus remains charged.

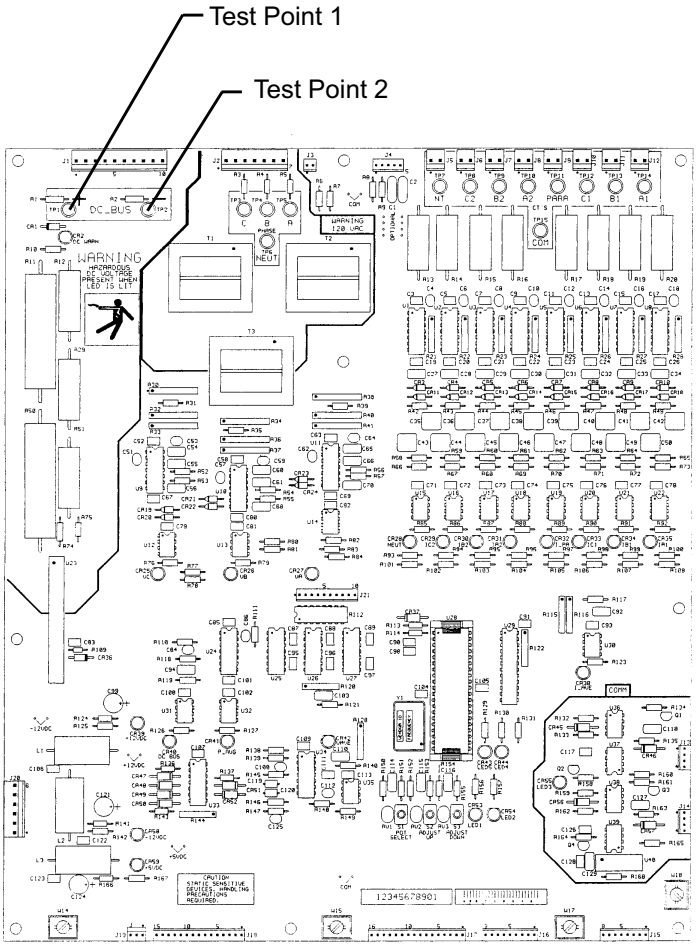
d. Disconnect the three AC input leads at terminals L1, L2, and L3 of circuit breaker CB1 and the grounding wire at the grounding lug (Figure 2).

e. Loosen the clamp in the base and remove the input cable from the clamp.

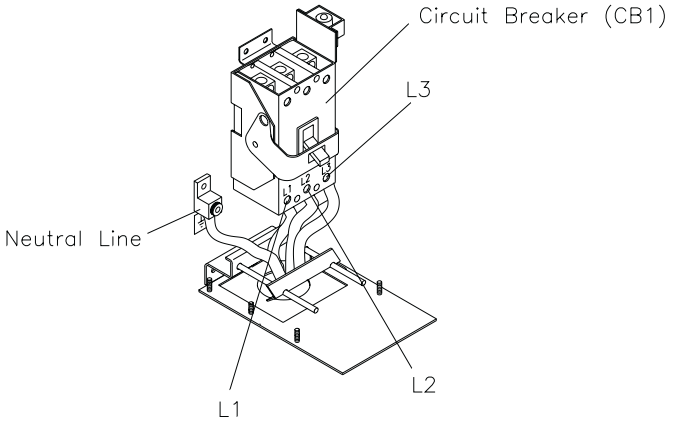
f. Remove the input cable from the unit.

g. Close and latch the front door, and open the rear door.

h. Disconnect the output cables from the output contactors. Disconnect the EF signal and remote control leads from the terminal strips near the rear of the unit.



DC Bus Test Points
Signal Conditioning PC Board
(Front Door)
Figure 1



Circuit Breaker
Grounding Lug
Figure 2

i. Loosen the cable clamp on the bottom panel and remove the output, EF signal, and remote control cables from the unit.

j. Be sure all leads are free and do not become entangled.

k. Attach a lifting hoist or forklift to the bottom of unit and remove the mounting screws or bolts which attach the converter to its mounting.

l. Carefully lower the converter.

m. Move the unit to a clear working area where it can be placed on a solid supporting structure.

n. Installation is in the reverse order of removal. See Section 1-2, Installation and Setup, for additional information on installing the converter.

5. Component Removal and Replacement

Most of the components in the converter are easily replaced when necessary. Figures 11 - 14 of Section 1-1 show the location of the components in the converter.

a. Preparation

Before removing or replacing any component, follow these steps:

(1) Turn off input power at the source. Make sure that power cannot be inadvertently turned back on. The converter draws a small amount of input power even when the unit is off. Components and PC boards throughout the unit can be permanently damaged if anything is removed or replaced while input power is present. Therefore, always make sure input power is off before removing or installing any parts inside the unit.

WARNING

High voltages may be present inside the cabinet, even when the unit is off. Exercise extreme caution or **FATAL SHOCK** may result.

(2) Open the front door by turning all three latches counterclockwise with a 8mm allen wrench.

(3) Test the DC bus with a voltmeter to be sure that it is fully discharged. The bus can be tested using test jacks TP1 and TP2 (Figure 1) on the upper left corner of the signal conditioning board inside the front door. If the bus is not discharged, close the converter door, wait at least 15 minutes, and test it again. Do not perform any work inside the converter while the DC bus remains charged.

b. Component Removal and Replacement

(1) DC Electrolytic Capacitors

The DC capacitor bank is located behind the rear door near the left of the unit. After determining which capacitor is defective, proceed as follows to remove and replace it.

a. Open the rear door by turning all three latches counterclockwise with an 8 mm allen wrench.

b. Remove the resistors, four or six depending on the unit, that are connected across the two vertical bus bars that are attached to the capacitors.

c. Remove the bus bars from the capacitor bank.

WARNING

Capacitors are **POLARITY SENSITIVE**. Make certain that capacitors are installed **EXACTLY** as they were previously installed.

d. Remove defective capacitor and replace it.

e. Installation is in the reverse order of removal. Make certain that components are installed exactly as they were previously installed, and make certain that screws and nuts are tightened securely. The mounting face of each aluminum terminal stud, but not the threads of the capacitors, must be coated with Penetrox or an equivalent anti-oxidation compound at installation.

(2) Output Contactors

One or two output contactors are used in all models of the ADV converter.

a. Output Contactors K1- K2

Refer to Section 1-1; Figure 14. Output contactors are mounted on bracket on the left side of the unit behind the rear door. Each is fastened with three 8 mm keps screws. To remove and install this contactor, follow these steps:

Open the rear door by turning all three latches counterclockwise with an 8 mm allen wrench.

Clearly label each of the leads connected to the contactor and disconnect each one.

Loosen, but do not remove, the three screws which hold the contactor in place, then slide up and to the left until the contactor can be removed.

b. Installation is in the reverse order of removal. If necessary, verify connections by referring to the pertinent connection diagram (See Chapter 5).

I

(3) Cooling Fan

Refer to Section 4-3; Figure 7 to view the various components of the cooling fan assembly, and proceed as follows to remove and install the fan.

a. Open the front door by turning all three latches counterclockwise with an 8 mm allen wrench.

b. Clearly label each of the leads connected to Input Control PC Board and Signal Conditioning PC Boards, then disconnect each one.

c. Remove the airduct plenum panel with the Input Control PC Board and Signal Conditioning PC Boards attached.

d. Use a socket wrench with 10 mm socket to remove the six screws that hold the panel in place.

e. Detach the wiring from the fan.

f. Behind the air-duct panel resides the cooling fan. Use a socket wrench with 10 mm socket to remove the four screws that mount the cooling fan.

g. Carefully pull out the fan and mounting plate.

h. Remove the fan from the mounting bracket panel by removing the four M4-0.7 X 7 mm pan-head cross-recess screws, along with the M4 flat washers, and lock washers that attach the fan to the mounting bracket.

i. Installation is in the reverse order of removal. If necessary, verify wiring by referring to the pertinent connection diagram (See Chapter 5).

(4) Input SCR/Diode Module

Section 1-1; Figure 13 shows the location of the power module assembly.

a. Open the front door by turning all three latches counterclockwise with an 8 mm allen wrench.

b. Remove the input SCR/Diode Module (SCR1 - SCR6) using an 8 mm socket, and a phillips head screw driver.

c. Remove all traces of heatsink pad/material from the heatsink plate.

d. Installation is in reverse order as shown above. Figure 3 shows the torque values recommended by the manufacturer for the rectifier modules used in this converter. Rectifier torque values are shown in inch-pounds (inch-lbs), Newton-meters (NM), and centimeter-kilograms (cm-kg).

Location	Torque Values		
Case to Heat Sink	44 inch-lbs	5 NM	51 cm-kg
Terminal, M6 Screws	53 inch-lbs	6 NM	61 cm-kg

Input Rectifier Torque Requirements
Figure 3

(5) IGBT - Power Modules

Section 1-1; Figure 13 shows the location of the IGBTs.

a. Open the front door by turning all three latches counterclockwise with an 8 mm allen wrench.

b. Remove the capacitor bank assembly using a 10 mm socket, and a phillips head screwdriver.

c. Remove the IGBTs as needed using a phillips head screwdriver.

d. Remove all traces of heatsink pad/material from the heatsink plate.

e. Installation is in reverse order as shown above. Figure 4 of this chapter shows the torque values recommended for the IGBTs. Power module torque values are shown in inch-pounds (inch-lbs), Newton-meters (NM), and centimeter-kilograms (cm-kg).

Location	Torque Values		
Case to Heat Sink	27 inch-lbs	3.0 NM	31 cm-kg
Terminal, M4 Screws	17 inch-lbs	1.9 NM	20 cm-kg
Terminal, M6 Screws	27 inch-lbs	3.0 NM	31 cm-kg

IGBT - Power Module Torque Values
Figure 4

(6) Resistors

a. DC Bus Discharge Resistor

The DC bus discharge resistor, R3, is positioned vertically on the right side of the unit behind the rear door. It is fastened with a long, threaded bar through its center. To remove and replace this resistor, follow these steps:

Open the rear door by turning all three latches counterclockwise with an 8mm allen wrench.

Disconnect the two leads from the resistor.

Using a 10 mm wrench, remove the nut, lock washer, and flat washer at the top end of the long threaded bar.

Slide the bar out from the unit while holding the resistor to prevent it from falling.

Installation is in the reverse order of removal. If necessary, verify connections by referring to the pertinent connection diagram(See Chapter 5).

b. DC Capacitor Bank Resistors

Refer to Figure 4, Section 4-3 to see location of the capacitor bank resistors. Any one of these resistors can be removed, simply by removing the two 10-32 X 5/8" pan-head screws and the washers which attach the resistor to the DC capacitor bus bars. Installation is in the reverse order of removal.

(7) Switches

a. Door Interlock Switches

The converter is equipped with two door interlock switches: S7 on the front door and S2 on the back door. To remove and replace a switch, follow these steps:

Open the front or rear door by turning all three latches counterclockwise with a 8mm allen wrench.

Disconnect the two leads from the switch.

Remove the two screws holding the switch to the frame of the converter.

Installation is in the reverse order of removal. Make sure that the leads are connected to the “COMMON” and “N.O.” terminals. If necessary, verify connections by referring to the pertinent connection diagram.

b. Heatsink Thermal Switch

One small thermal switch is located on the heat sink beside the power modules, which are behind the DC Capacitors inside the front door. To remove and replace a switch, follow these steps:

Open the front door by turning all three latches counterclockwise with a 8mm allen wrench.

Remove the capacitor bank assembly using an 10 mm socket, and a phillips head screwdriver.

Disconnect the two leads from the switch.

Remove the two small screws on each side of the switch.

Installation is in the reverse order of removal.

c. Transformer Thermal Switches

The main transformer has a thermal switch, tucked in the coils of its windings, that detects over temperature. The thermal switch has two wire leads connected to a terminal strip on the transformer.

To remove and replace one of these switches, carefully pull upward on the switch that is tucked in the coils of the transformer, then disconnect the thermal switch wire leads from the small terminal strip. Installation is in the reverse order of removal.

(8) Transformers

Except for physical damage, it is improbable that the main transformer or many other transformers in this unit will fail. In the unlikely event of failure, it is not recommended that attempts be made to remove and replace the main transformer in the field. Call the Hobart Brothers Service Department for assistance.

a. Output/Main Transformer

In the event that the main transformer fails, contact the Hobart Service Department for assistance.

b. Input Control Transformer

The Control Transformer (1-1; 4, Figure 12) is located directly behind the control panel. Proceed as follows to remove and replace the control transformer.

Clearly label each of the leads connected to the control transformer and disconnect each one.

Remove the four M10 nuts which attach the control transformer to the cabinet frame.

Remove the control transformer.

Installation is in the reverse order of removal. If necessary, verify connections by referring to the pertinent connection diagram.

6. PC Board Removal and Replacement

The ADV converter has printed circuit (PC) boards in various locations inside (Figure 6). They are:

Model 101 Control PC Board (CTL)

Driver PC Board (DRV)

Modulator PC Board (MOD)

Bus Discharge PC Board (BDC)

I/O (Input/Output) PC Board (IOB)

Signal Conditioning PC Board (SCB)

Input Power Control PC Board (IPC)

Section 1-1, Figure 11 provides a description and location of each board. Before inspecting, removing, or replacing any of the boards, follow these steps:

WARNING High voltages may be present inside the cabinet, even when the unit is off. Exercise extreme caution or **FATAL SHOCK** may result.

(1) Turn off input power at the source. Make sure that power cannot be inadvertently turned back on.

The converter draws a small amount of input power even when the unit is off. Components and PC boards throughout the unit can be permanently damaged if anything is removed or replaced while input power is present. Therefore, always make sure input power is off before removing or installing any parts inside the unit.

(2) Open the front door by turning all three latches counterclockwise with an 8 mm allen wrench.

(3) Test the DC bus (Figure 1) with a voltmeter to be sure that it is fully discharged.

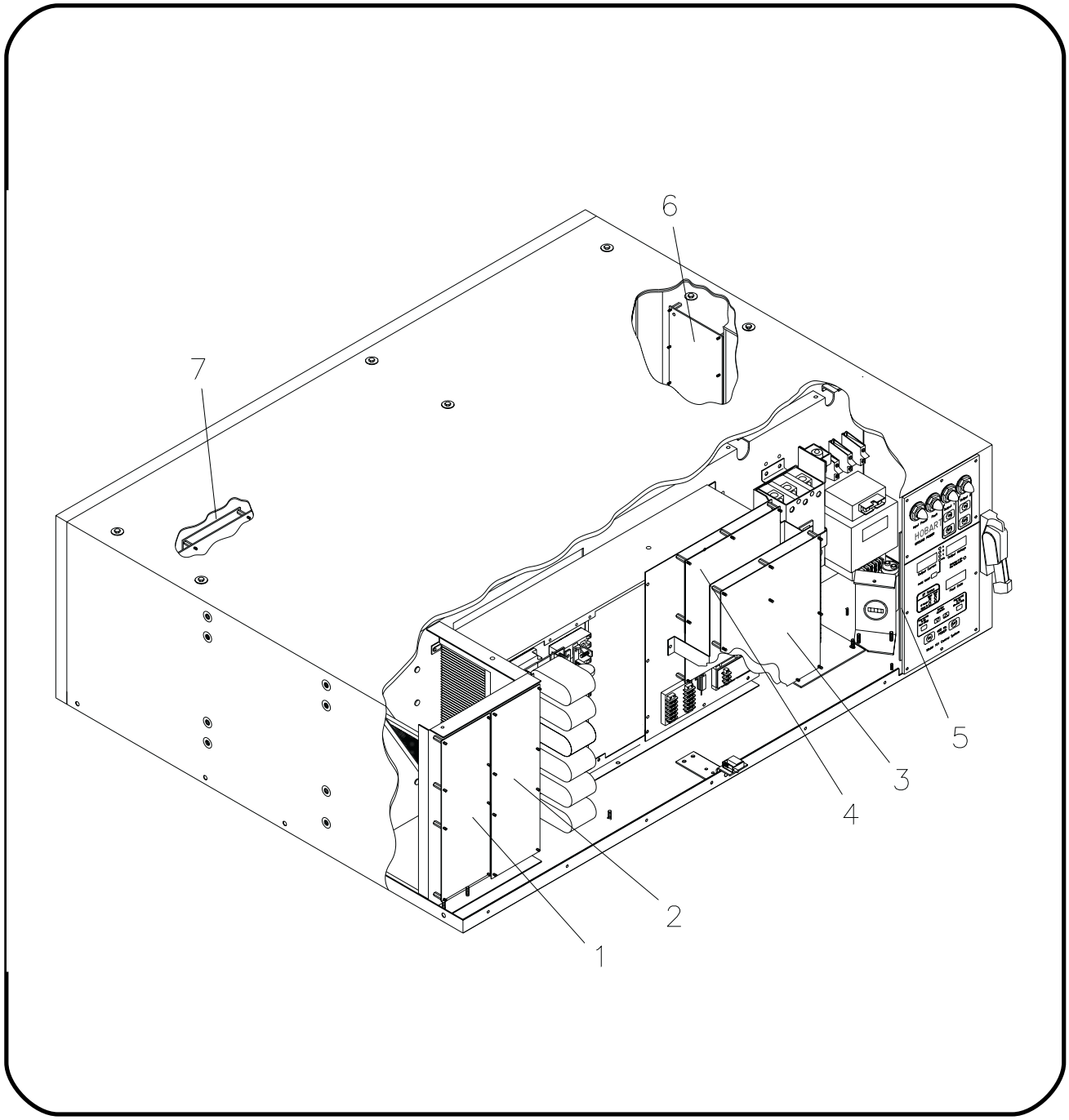
The bus can be tested using test jacks TP1 and TP2 on the upper left corner of the signal conditioning board inside the front door. If the bus is not discharged, close the converter door, wait at least 15 minutes, and test it again. Do not perform any work inside the converter while the DC bus remains charged. See Figure 1 for the proper test points.

(4) Remove and replace each board as follows.

a. Model 101 Control PC Board

The Model 101 Control PC Board (A2) is mounted on the back of the control panel (4, Figure 6). The board is mounted on six round aluminum spacers and fastened with six M7 x .7 x 16 keps machine screws. To remove and replace this board, follow these steps:

(1) Open the front door by turning all three latches counterclockwise with an 8 mm allen wrench.



1. Modulator PC Board (A3) (MOD)
2. Driver PC Board (A5) (DRV)
3. Signal Conditioning PC Board A6 (SCB)
4. Input Conditioning PC Board A4 (IPC)
5. Model 101 Control PC Board (A2) (CTL)
6. I/O (input/output) PC Board (A1) (IOB)
7. Bus Discharge PC Board (A7) (BDC)

PC Board Location
Figure 6

(2) Reach in through the door. Clearly label each of the cables connected to the Control PC Board, then disconnect each one by gently pulling the plug away from the board.

(3) While holding onto the control panel, unfasten the 10 screws that hold the control panel onto the front of the unit.

(4) Carefully remove the control panel, with PC Board attached, from the converter.

(5) Steady the assembly on a smooth clean surface, and unfasten the six keps screws that secure the two pieces.

Installation is in the reverse order of removal. If necessary, verify wiring by referring to the pertinent connection diagram.

b. Modulator PC Board

The Modulator PC board (A3) is located on the far left side behind the front door (1, Figure 6). The board has 8 keps nuts tightening it to aluminum spacers that are fasten to an internal panel. To remove and replace this board, follow these steps:

(1) To gain access to this PC board, open the front door by turning all three latches counterclockwise with an 8 mm allen wrench.

(2) Clearly label each of the cables connected to the PC board, then disconnect each one by gently pulling the plug away from the board.

NOTE: When removing the Modulator PC board, carefully guide it around the Driver PC board to avoid inadvertent damage to either board.

(3) Steady the board with one hand and remove the eight keps nuts (7 mm) that hold the board down.

Installation is in the reverse order of removal. If necessary, verify wiring by referring to the pertinent connection diagram.

c. Driver PC Board

The Driver PC board (A5) is located to the right of the Modulator PC Board (2, Figure 6). The board has eight keps nuts (8 mm) tightening it to aluminum spacers that are fasten to an internal panel. To remove and replace this board, follow these steps:

(1) To gain access to this PC board, open the front door by turning all three latches counterclockwise with an 8 mm allen wrench.

(2) Clearly label each of the cables connected to the PC board, then disconnect each one by gently pulling the plug away from the board.

(3) Steady the board with one hand and remove the eight keps nuts (7 mm) that hold the board down.

Installation is in the reverse order of removal. If necessary, verify wiring by referring to the pertinent connection diagram.

d. DC Bus Discharge PC Board

The Bus Discharge PC board (A13) is located above the DC capacitor bank behind the rear door (7, Figure 6). The board has four keps nuts tightening it to aluminum spacers that are fasten to an internal panel. To remove and replace this board, follow these steps:

(1) To gain access to this PC board, open the rear door by turning all three latches counterclockwise with an 8 mm allen wrench.

(2) Clearly label each of the cables connected to the PC board, then disconnect each one by gently pulling the plug away from the board.

(3) Steady the board with one hand and remove the four keps nuts (7 mm) that hold the board down.

Installation is in the reverse order of removal. If necessary, verify wiring by referring to the pertinent connection diagram.

e. Input/Output (I/O) Board

(1) The I/O PC Board (A1) is located behind the rear door, mounted against an interior panel beside the output connections (6, Figure 6). The board has seven keps nuts tightening it to aluminum spacers that are fastened to an internal panel. To remove and replace this board, follow these steps:

(2) To gain access to this PC board, open the rear door by turning all three latches counterclockwise with an 8 mm allen wrench.

(3) Clearly label each of the cables connected to the PC board, then disconnect each one by gently pulling the plug away from the board.

(4) Steady the board with one hand and remove the keps nuts (7 mm) that hold the board down.

Installation is in the reverse order of removal. If necessary, verify wiring by referring to the pertinent connection diagram.

f. Signal Conditioning PC Board

(1) The Signal Conditioning PC Board (A6) is located behind the front door, mounted against a hinged interior panel (3, Figure 6). The board has keps nuts tightening it to aluminum spacers that are fastened to the hinged internal panel. To remove and replace this board, follow these steps:

(2) To gain access to this PC board, open the front door by turning all three latches counterclockwise with an 8 mm allen wrench.

(3) Clearly label each of the cables connected to the PC board, then disconnect each one by gently pulling the plug away from the board.

(4) Steady the board with one hand and remove the keps nuts (7 mm) that hold the board down.

Installation is in the reverse order of removal. If necessary, verify wiring by referring to the pertinent connection diagram.

g. Input Power Control PC Board (IPC)

The Input Power Control PC Board is located behind the Signal Conditioning Board mounted against an interior panel in the center of the unit (4, Figure 6). The Signal Conditioning Board must swing out of the way, but not removed, to service the IPC PC Board. The IPC board has keps nuts tightening it to aluminum spacers that are fastened to an internal panel. To remove and replace this board, follow these steps:

(1) To gain access to this PC board, open the front door by turning all three latches counterclockwise with an 8 mm allen wrench.

(2) Remove the 8 mm screw that fastens down the HINGED Signal Conditioning Board panel. Swing the Signal Conditioning PC Board panel out of the way. DO NOT REMOVE THIS BOARD.

(3) Clearly label each of the cables connected to the IPC board, then disconnect each one by gently pulling the plug away from the board.

(4) Steady the board with one hand and remove the keps nuts (7 mm) that hold the board down.

Installation is in the reverse order of removal. If necessary, verify wiring by referring to the pertinent connection diagram.

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 the PoWerMaster ADV 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

. 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.

a. 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) AIRLINE PART NUMBER Column

This column will appear blank. Eleven character spaces have been reserved for filling in part numbers that may have been assigned by individual airlines.

(4) 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.

(5) 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 which 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 500048A-001 only.

Parts coded "B" are usable on Part Number 500048A-002 only.

Parts coded "C" are usable on Part Number 500048A-101 only.

Parts coded "D" are usable on Part Number 500048A-102 only.

(6) 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
00779	Amp Inc. 2800 Fulling Mill Rd. P.O. Box 3608 Harrisburg, PA 17105-3608
054W1	Talema Electronic Inc. 3 Industrial Park Dr. P.O. Box 306 Saint James, MO 65559
05YB3	Acon Inc. 22 Bristol Dr. South Easton, MA 02375
0H8R0	Magnetics 200 10TH St. P.O. Box 391 Butler, PA 16003-0391
0MR72	Power Devices Inc. 26941 Cablot Rd Suite 124 Laguna Hills, CA 92653-7006
1AA44	Collmer Semiconductor Inc. C/O NA-NA Co. 14368 Protopn Rd. Dallas, TX 75244-3511
1E045	Austin Hardware and Supply Co. 10220 E. 65TH St. P.O. Box 9550 Kansas City, MO 64133-5205
1E222	Furnas Electric Co. Richmond, VA 23200
1W134	Eaton Corp. 4201 N. 27TH Ave. Milwaukee, WI 53216-1807
24446	General Electric Co. 3135 Easton Tpke. Fairfield, CT 06431
27410	Harris Corp. 1025 Nasa Blvd. Melbourne, FL 32919
27694	Connectron Inc. 12 Industrial Dr. South Amboy, NJ 08879
28520	Heyco Molded Products Inc. 1800 Industrial Way N. P.O. Box 517 Toms River, NJ 08755
38151	Marathon Electric Mfg. Co. 100 E. Randolph St. P.O. Box 8003 Wausau, WI 54401-2568
3A054	McMaster Carr Supply Co. 9630 Norwalk Blvd. Santa Fe Springs, CA 90670-2932
44655	Heico Ohmite LLC 3601 W. Howard St. Skokie, IL 60076-4014
56365	Square D Company 1415 S. Roselle Rd. Palatine, IL 60067-7337

Code	Vendor's Name and Address
57347	Wall Industries Inc. 5 Watson Brook Rd. Exeter, NH 03833
5P059	Tech Products Corp. 2348 Sandridge Dr. Dayton, OH 45439
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
6H359	Hobbs Div., of Stewart Warner Corp. Highway 6 Spring Valley, IL 61362
6Y440	Micron Technologies Inc. 8000 S. Federal Way Boise, ID 83707
74829	Ilsco Corp. 4730 Madison Rd. Cincinnati, OH 45227-1426
79497	Western Rubber Co. 620 E. Douglas Goshen, IN 46526-4035
91637	Dale Electronics Inc. 1122 23RD St. Columbas, NE 68601-3647
94222	Southco Inc. 210 N. Brinton Lake Rd. Concordville, PA 19331
D0024	Semikron International Sigmundstrasse 200 P.O. Box 820251 Nuerengerg, Germany 90253
S7023	Bossard LTD Fasteners Steinhauserstrasse 70 Zug Switzerland, CH-6300

Section 3. Illustrated Parts List

1. Explanation of Parts List Arrangement

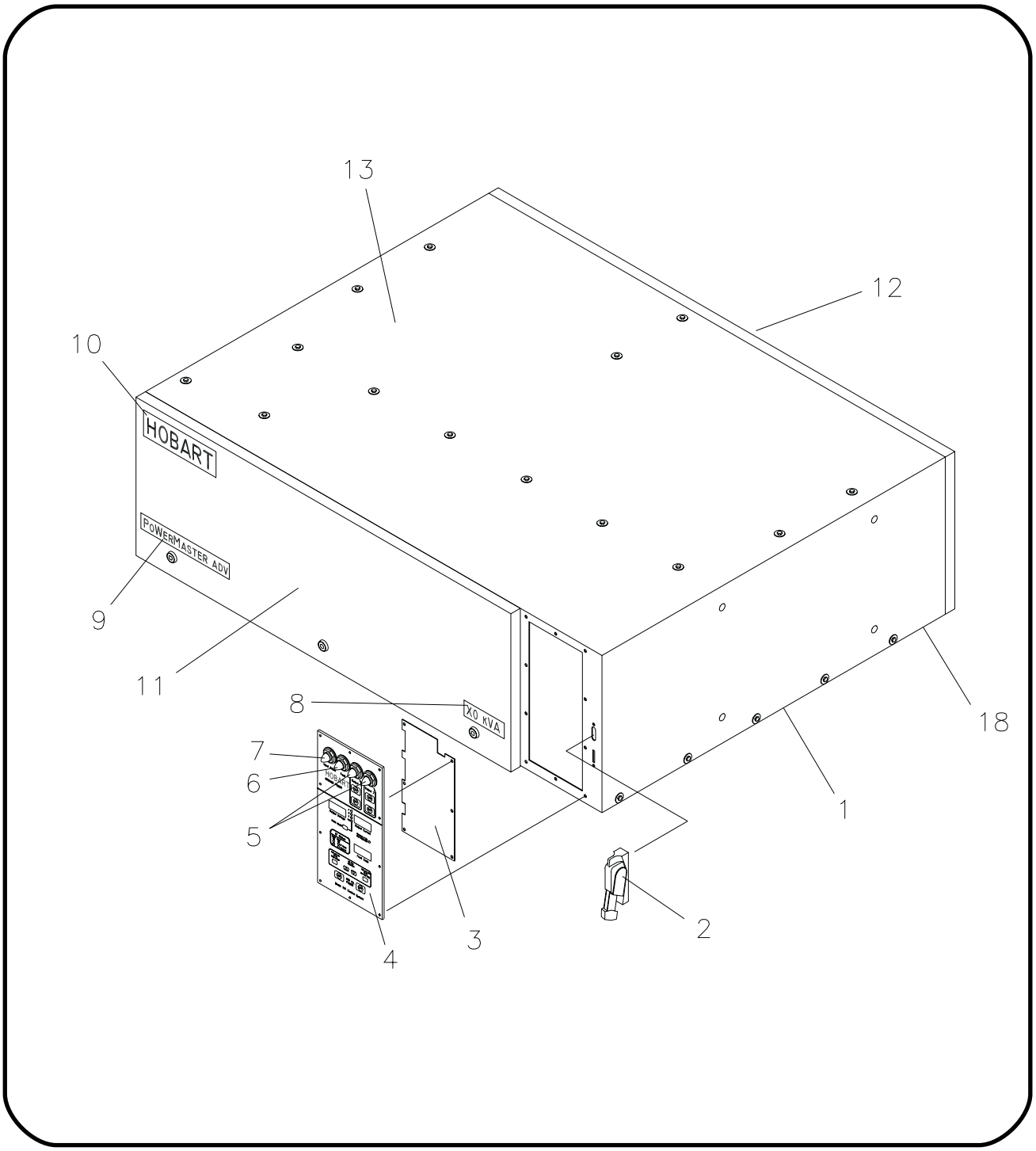
The parts list is arranged so that the illustration will appear on a left-hand page and the applicable parts list will appear on the opposite right-hand page. Unless the list is unusually long, the user will be able to look at the illustration and read the parts list without turning a page.

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
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
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)

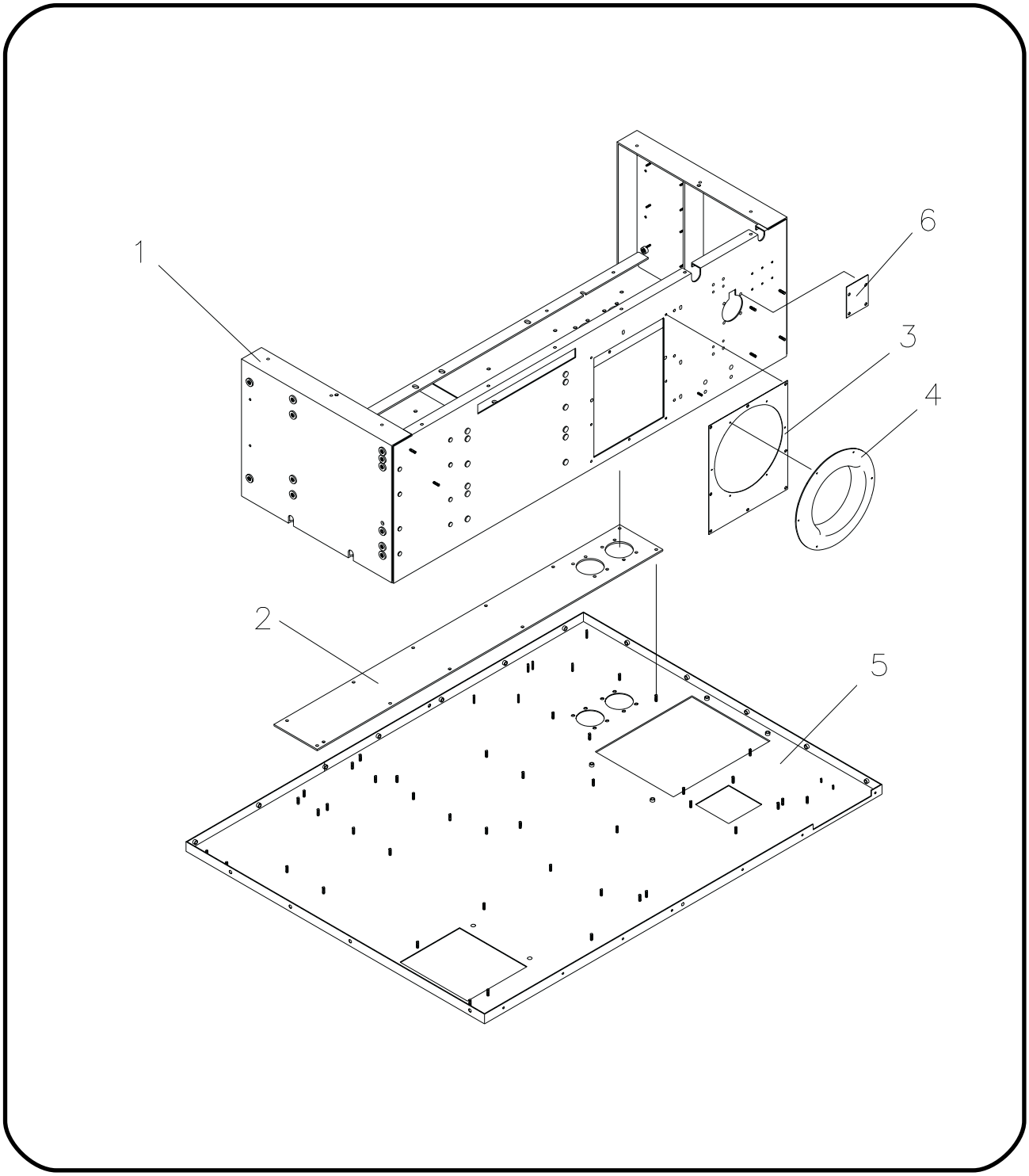
NOTE: An item which does not reflect an index number is an assembly which is not illustrated in its assembled state, or it is similar (right-hand, left-hand, top, etc.) to an item which is illustrated.



PoWerMaster ADV Converter
Figure 1

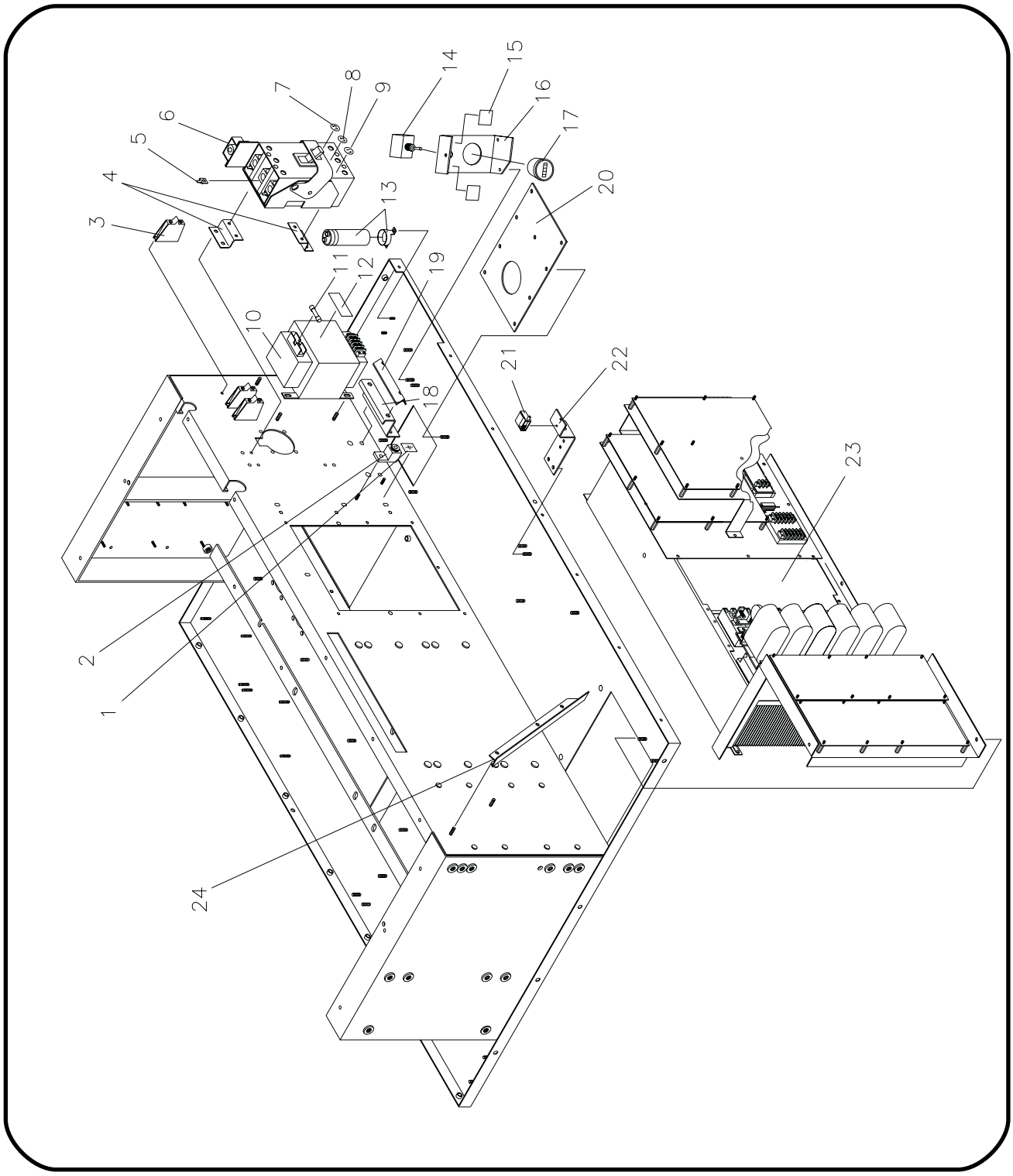
	FIGURE & ITEM NO.	HOBART PART NO.	AIRLINE PART NO.	NOMENCLATURE 1 2 3 4 5 6	EFF	UNITS PER ASSY
	1 -	**500048A-001**		**PoWerMaster ADV CONVERTER 60 KVA, SINGLE OUTPUT**	**A**	**1**
		500048A-002		**PoWerMaster ADV CONVERTER 60 KVA, DUAL OUTPUT**	**B**	**1**
		500048A-101		**PoWerMaster ADV CONVERTER 90 KVA, SINGLE OUTPUT**	**C**	**1**
		500048A-102		**PoWerMaster ADV CONVERTER 90 KVA, DUAL OUTPUT**	**D**	**1**
	1 - 1	No Number		. FRAME ASSEMBLY (SEE FIG. 2)		REF
	1 - 2	286416-001		. CIRCUIT BREAKER ACTUATOR HANDLE AY. (V56365 #9422A3)		1
	1 - 3	286411		. CONTROL P.C. BOARD ASSEMBLY		1
	1 - 4	286398-002		. MEMBRANE SWITCH PANEL ASSEMBLY		1
	1 - 5	82B1066-012		. AMBER PILOT LIGHT ASSEMBLY, 12V (V56365 #9001-SKP-32A9)	A,C	1
*		400613-004		. . BULB, 12V, TYPE 1815, BAYONET BASE, STYLE T-3-1/4	A,C	1
		82B1066-012		. AMBER PILOT LIGHT ASSEMBLY, 12V (V56365 #9001-SKP-32A9)	B,D	2
*		400613-004		. . BULB, 12V, TYPE 1815, BAYONET BASE, STYLE T-3-1/4	B,D	2
	1 - 6	82B1066-001		. RED PILOT LIGHT ASSEMBLY, 12V (V56365 #9001-SKP-32R9)		1
*		400613-004		. . BULB, 12V, TYPE 1815, BAYONET BASE, STYLE T-3-1/4		1
	1 - 7	82B1066-010		. GREEN PILOT LIGHT ASSEMBLY, 12V (V56365 #9001-SKP-32G9)		1
*		400613-004		. . BULB, 12V, TYPE 1815, BAYONET BASE, STYLE T-3-1/4		1
	1 - 8	283714-004		. LABEL, 60 KVA	A,B	1
		283714-002		. LABEL, 90 KVA	C,D	1
	1 - 9	286457		. LABEL, TRADEMARK		1
	1 - 10	283887		. LABEL, HOBART		2
	1 - 11	No Number		. FRONT INTERIOR COMPONENTS(SEE FIG. 3)		REF
	1 - 12	No Number		. REAR INTERIOR COMPONENTS(SEE FIG. 5)		REF
	1 - 13	No Number		. CANOPY COMPONENTS (SEE FIG. 10)		REF
*	1 - 14	283716		. LABEL, ID		1
*	1 - 15	287460		. LABEL, SHOCK		2
*	1 - 16	286441		. LABEL, GENERAL		2
*	1 - 17	287341		. WIRING HARNESS ASSEMBLY		1
	1 - 18	No Number		. BOTTOM EXTERIOR COMPONENTS(SEE FIG. 11)		REF
*	1- 19	286377		. LABEL, FAULT CODE		1
*	1 - 20	286442		. LABEL, RAINPROOF		1
*	1 -21	282658		. LABEL, WARNING, CLEARANCE		2
*	1 - 22	286475-001		. CABLE SUMMARY, STANDARD		1

* NOT ILLUSTRATED



Frame Assembly
Figure 2

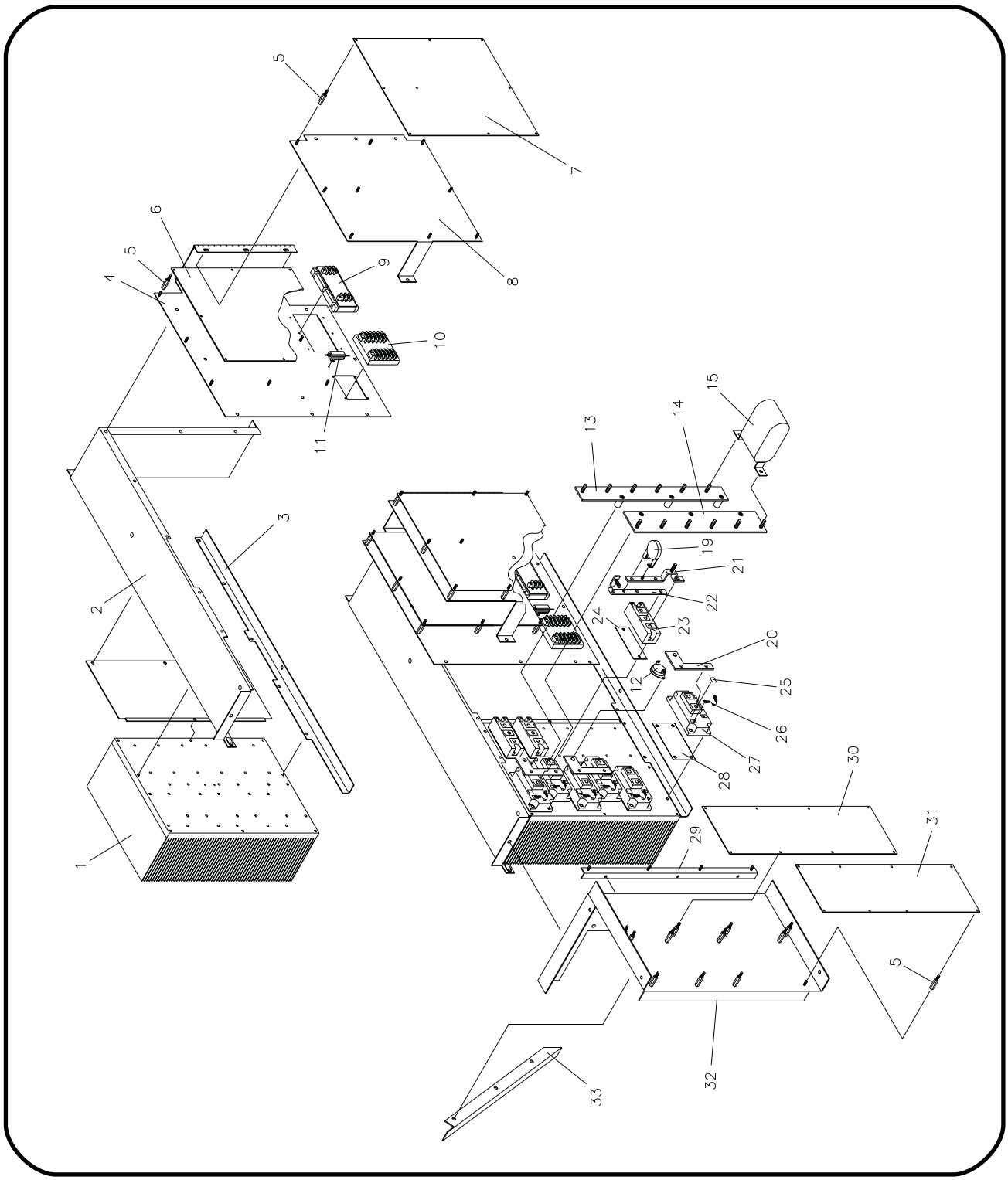
FIGURE & ITEM NO.	HOBART PART NO.	AIRLINE PART NO.	NOMENCLATURE 1 2 3 4 5 6	EFF	UNITS PER ASSY
2 -	No Number		FRAME ASSEMBLY		REF
2 - 1	287845		. FRAME		1
2 - 2	286354		. BOTTOM FRAME SPACER		1
2 - 3	286376		. INLET RING PANEL		1
2 - 4	283157-003		. IMPELLER INLET RING (V62292 #9621-2-4013)		1
2 - 5	287852		. BASE		1
2 - 6	287836		. COVER, FAN HOLE		1



Front Interior Components
Figure 3

FIGURE& ITEM NO.	HOBART PART NO.	AIRLINE PART NO.	NOMENCLATURE 1 2 3 4 5 6	EFF	UNITS PER ASSY
3 -	No Number		FRONT INTERIOR COMPONENTS		REF
3 - 1	280807		. LABEL, GROUND		1
3 - 2	285104-001		. GROUNDING LUG (V74829 #TA-250)		1
3 - 3	285315-001		. MOV. SUPPRESSOR (V27410 #V661DA40)		3
3 - 4	287838		. CIRCUIT BREAKER SUPPORT		2
3 - 5	282653		. WIRE TERMINAL (V67529 #FA-T)		3
3 - 6	280966-002		. CIRCUIT BREAKER (V56365 #KAL-36150-26M)		1
*	286415-001		. ACTUATOR, CIRCUIT BREAKER (V56365 #9422-CKA30)		1
3 - 7	83A1114		. LABEL, L3		1
3 - 8	83A1113		. LABEL, L2		1
3 - 9	83A1112		. LABEL, L1		1
3 - 10	404960-034		. CONTROL TRANSFORMER, 115V (V6Y440 #B750-1213-1)		1
3 - 11	W10502-031		. FUSE, 15A		1
3 - 12	285968		. LABEL, FUSE		1
3 - 13	281848-002		. CAPACITOR, 1800UF, 250 VDC		1
3 - 14	402682		. TOGGLE SWITCH		1
3 - 15	286447		. VOLTAGE SELECTION LABEL		1
3 - 16	286448		. METER SUPPORT BRACKET		1
3 - 17	181358		. HOUR METER (V6H359 #80001)		1
3 - 18	287856		. CABLE CLAMP SUPPORT		1
3 - 19	285568		. CABLE CLAMP BRACKET		1
3 - 20	286423		. INPUT CABLE PLATE		1
3 - 21	280673		. DOOR INTERLOCK SWITCH (V1W134 #SSI2ET10-20Y3)		1
3 - 22	286445		. FRONT DOOR SWITCH SUPPORT		1
3 - 23	No Number		. HEATSINK PANEL ASSEMBLY, (SEE FIGURE 4)		REF
3 - 24	287841		. LEFT HAND INPUT FILTER GUIDE		1

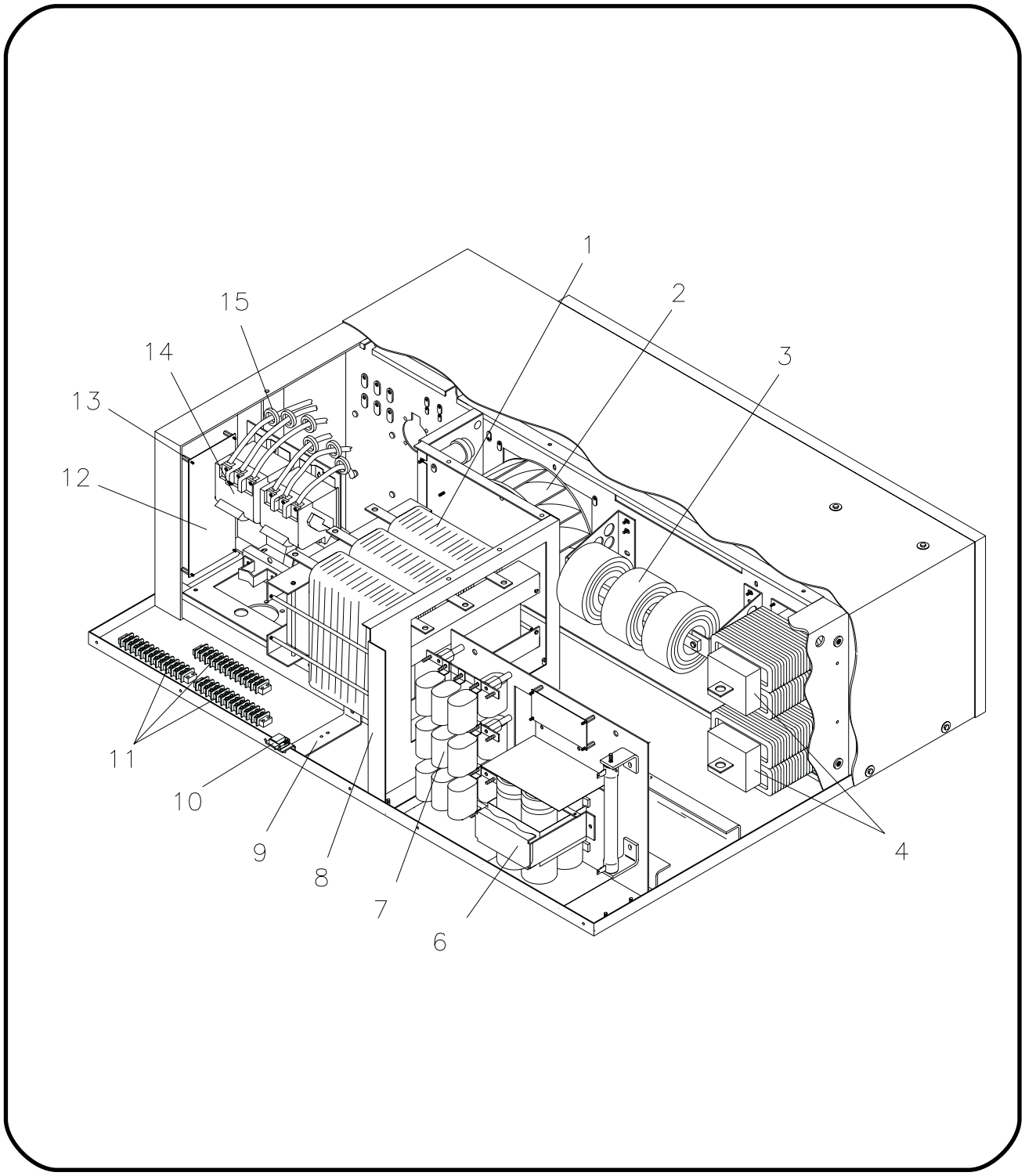
* NOT ILLUSTRATED



Heatsink Panel Assembly
Figure 4

	FIGURE& ITEM NO.	HOBART PART NO.	AIRLINE PART NO.	NOMENCLATURE 1 2 3 4 5 6	EFF	UNITS PER ASSY
	4 -	**No Number**		**HEATSINK PANEL ASSEMBLY**		**REF**
	4 - 1	287857		. BONDED FIN HEATSINK		1
	4 - 2	287844		. HEATSINK WRAPPER		1
	4 - 3	287843		. ANGLE, HEATSINK PANEL		1
	4 - 4	287833		. HEATSINK COVER		1
	4 - 5	284316-002		. METAL STANDOFF		34
	4 - 6	286246		. IPC P.C. BOARD ASSY.		1
	4 - 7	286400		. SIGNAL CONDITIONING P.C. BOARD ASSY.		1
*		192266-001		. SUPPRESSOR		1
	4 - 8	286443		. SCB P.C.B. SUPPORT		1
	4 - 9	286528		. POWER SUPPLY		1
	4 - 10	286367-001		. POWER SUPPLY (V05YB3 #M30D1205-12TS)		1
	4 - 11	286482-001		. RESISTOR, 50W (V91637 #RH-50)		1
	4 -12	404044-004		. OVERLOAD THERMAL SWITCH		1
	4 -13	287825		. BUS BAR, DC, POSITIVE,		1
*		402674-002		. LABEL, POSITIVE		1
	4 -14	287826		. BUS BAR, DC, NEGATIVE, IGBT		1
*		402674-001		. LABEL, NEGATIVE		1
	4 -15	286389-001		. CAPACITOR, DC, 50MFD		6
	4 - 16	NOT USED				
	4 - 17	NOT USED				
	4 - 18	NOT USED				
	4 - 19	403955-021		. SEMICONDUCTOR SUPPRESSOR (V24446 #751HA40)		1
	4 - 20	287824		. BUS BAR, AC OUT,		3
	4 - 21	287830		. BUS BAR, , POSITIVE		1
	4 - 22	287831		. BUS BAR, SCR, NEGATIVE		1
	4 - 23	286285-001		. SCR DIODE (V66844 #CD62 16 15)		3
	4 - 24	283196-003		. SCR THERMAL PAD (V0MR72 #AL-370-134)		3
	4 - 25	407970		. LABEL, STATIC SENSITIVE		6
	4 - 26	285170		. SUPPRESSOR		6
	4 - 27	283867-005		. IGBT TRANSISTOR (V #CM400HA-24H)		6
	4 - 28	283196-002		. THERMAL TRANSISTOR PAD (V0MR72 #AL-425-244)		6
	4 - 29	286274		. SUPPORT, DRIVER BOARD		1
	4 - 30	286144		. DRIVER P.C. BOARD ASSEMBLY		1
	4 - 31	287353		. MODULATOR P.C. BOARD ASSEMBLY		1
	4 - 32	286273		. AIR DUCT ASSEMBLY		1
	4 - 33	286420		. RH INPUT FILTER GUIDE		1
*	4 - 34	77A1109		. LABEL, “C”		1
*	4 - 35	77A1108		. LABEL, “B”		1
*	4 - 36	77A1107		. LABEL, “A”		1

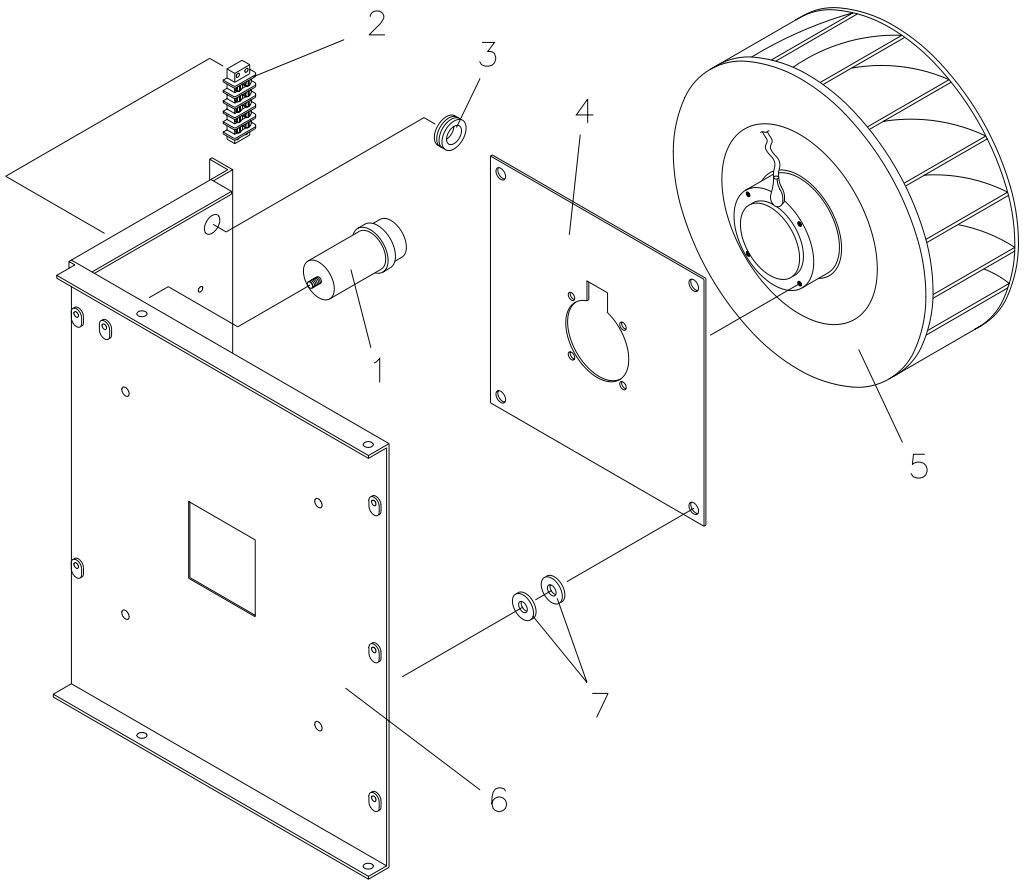
* NOT ILLUSTRATED



Rear Interior Components
Figure 5

	FIGURE& ITEM NO.	HOBART PART NO.	AIRLINE PART NO.	NOMENCLATURE 1 2 3 4 5 6	EFF	UNITS PER ASSY
	5 -	**No Number**		**REAR INTERIOR COMPONENTS**		**REF**
	5 - 1	286480-001		. MAIN TRANSFORMER		1
*		281971-004		. TRANSFORMER RESISTOR ASSY., 60 KVA	A,B	1
*		281971-002		. TRANSFORMER RESISTOR ASSY., 90 KVA	C,D	1
*		286449		. TRANSFORMER AIR BAFFLE		1
*		286438		. TRANSFORMER STUD .		4
*		286316-001		. UNIVERSAL MOUNT (V5P059 #60013)		4
	5 - 2	No Number		. FAN ASSEMBLY COMPONENTS (SEE FIGURE 6)		REF
	5 - 3	286492-001		. AIR CORE INDUCTOR, 3 PHASE		1
	5 - 4	493712		. DC CHOKE		2
*	5 - 5	286281		. SPACER, DC CHOKE		8
	5 - 6	No Number		. DC ELEC. CAPACITOR ASSY., (SEE FIGURE 7)		REF
	5 - 7	No Number		. AC CAPACITOR ASSY., (SEE FIGURE 8)		REF
	5 - 8	287847		. MAIN TRANSFORMER BAFFLE		1
	5 - 9	286444		. REAR DOOR SWITCH SUPPORT		1
	5 - 10	280673		. DOOR INTERLOCK SWITCH (V1W134 #SSI2ET10-20Y3)		1
	5 - 11	283066-002		. TERMINAL BLOCK, 12 STATION (V27694 #KUH12C)		3
*		286380		. TERMINAL BLOCK CONNECTIONS LABEL		1
*		286382		. TERMINAL BLOCK FUSE LABEL		1
	5 - 12	286392-001		. I/O P.C. BOARD ASSEMBLY		1
*		286383		. I/O P.C. BOARD LABEL		1
	5 - 13	284316-002		. METAL STANDOFF		6
	5 - 14	No Number		. CONTACTOR PANEL ASSEMBLY (SEE FIGURE 9)		REF
	5 - 15	285102-001		. CURRENT TRANSFORMER (V054W1 #2245CT)	A,C	4
		285102-001		. CURRENT TRANSFORMER (V054W1 #2245CT)	B,D	7

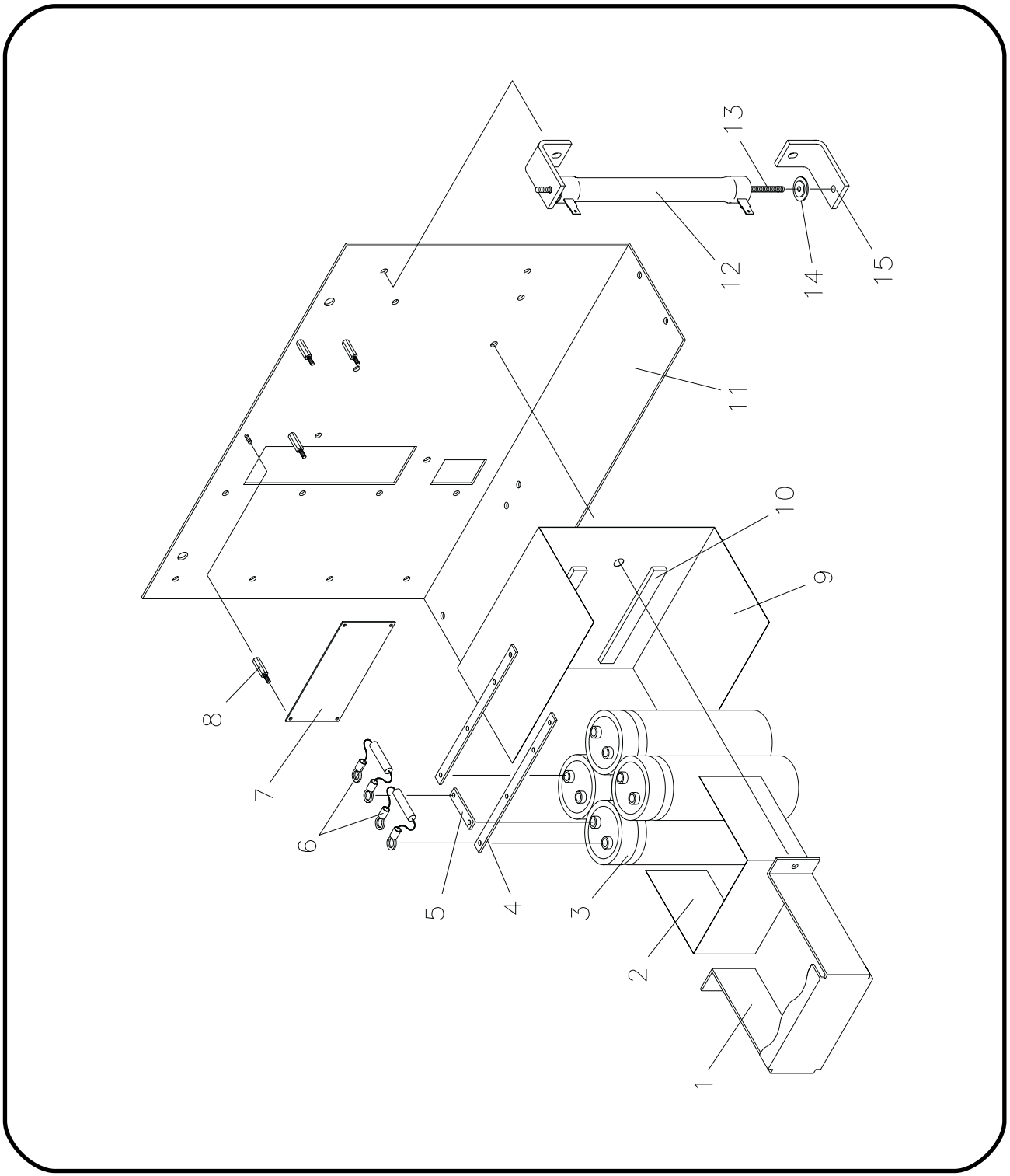
* NOT ILLUSTRATED



Fan Assembly Components
Figure 6

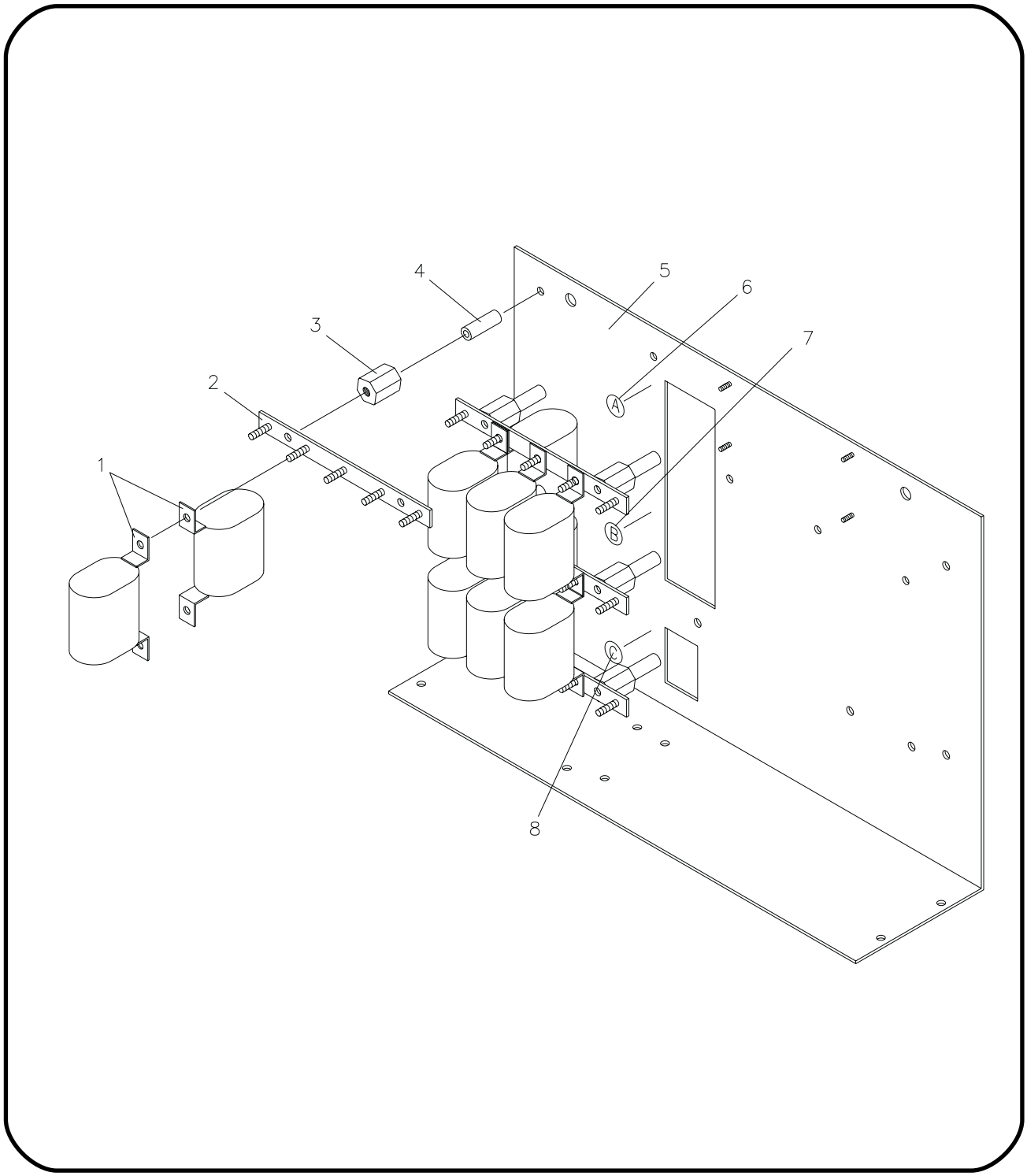
FIGURE& ITEM NO.	HOBART PART NO.	AIRLINE PART NO.	NOMENCLATURE 1 2 3 4 5 6	EFF	UNITS PER ASSY
	6 -	**No Number**	**FAN ASSEMBLY COMPONENTS**		**REF**
	6 - 1	283156-003	. MOTOR START CAPACITOR, 12MFD (V62292 #2167-4-7320)		1
	6 - 2	401911-005	. TERMINAL BLOCK, 5 STATION (V38151 #0205081)		1
*		400792-001	. SPADE TERMINAL (V00779 #2-34080-1)		6
*		286486-001	. CABLE TIE ANCHOR		2
	6 - 3	402037-006	. GROMMET (V79497 #G-1068)		1
	6 - 4	287846	. FAN MOUNTING PLATE		1
	6 - 5	283155-003	. MOTORIZED IMPELLER (V62292 #R4E310-AE13-16)		1
	6 - 6	287842	. FAN MOUNTING BRACKET		1
	6 - 7	281929-015	. SPACER, 1/4” WASHER		8

* NOT ILLUSTRATED



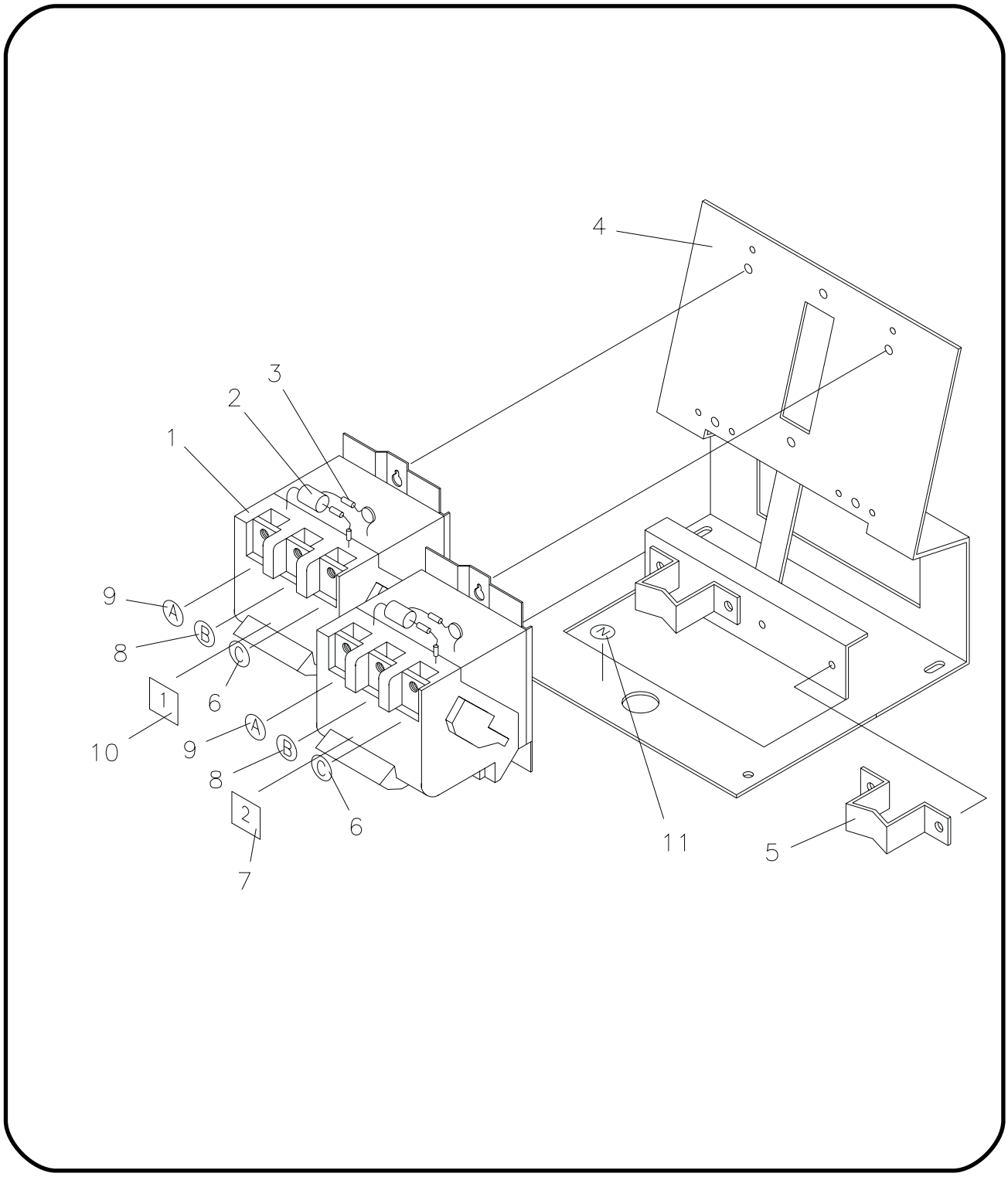
DC Electrolytic Capacitors Assembly
Figure 7

FIGURE& ITEM NO.	HOBART PART NO.	AIRLINE PART NO.	NOMENCLATURE 1 2 3 4 5 6	EFF	UNITS PER ASSY
7 -	**No Number**		**DC ELEC. CAPACITORS ASSY.**		**REF**
7 - 1	286429		. DC CAPACITOR CLAMP		1
7 - 2	286440-001		. SIDES AND FRONT INSULATOR		1
7 - 3	281848-001		. DC CAPACITORS, 6800MFD		4
7 - 4	286433		. LONG BUS BAR		2
7 - 5	286431		. SHORT BUS BAR		2
7 - 6	281971-001		. RESISTOR ASSEMBLY		4
7 - 7	286250		. BUS DISCHARGE P.C. BOARD ASSY.		1
7 - 8	284316-002		. METAL STANDOFF		4
7 - 9	286434		. BOTTOM AND BACK INSULATOR		1
7- 10	056210		. NEOPRENE RUBBER STRIP		1.5FT
7 - 11	286258		. DC CAPACITORS BRACKET		1
7 - 12	404249-003		. RESISTOR, 225W, 50 OHM		1
7 - 13	283387-002		. THREADED ROD		1
7 - 14	286489-001		. CENTERING WASHER (V44655 #6003)		2
7 - 15	286468		. RESISTOR BRACKET		2



AC Capacitor Assembly
Figure 8

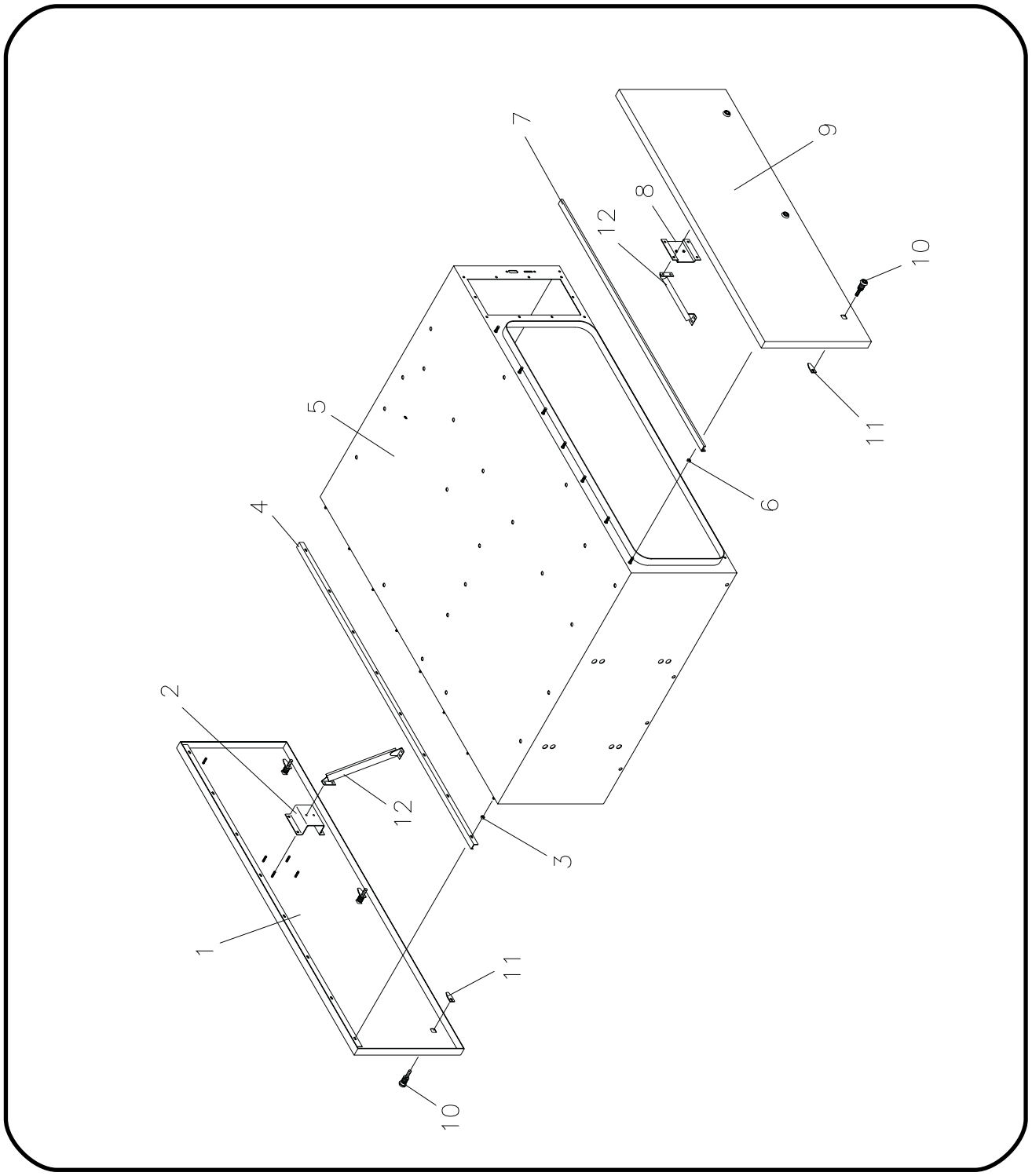
FIGURE& ITEM NO.	HOBART PART NO.	AIRLINE PART NO.	NOMENCLATURE 1 2 3 4 5 6	EFF	UNITS PER ASSY
8 -	**No Number**		**AC CAPACITORS ASSY**		**REF**
8 - 1	286389-002		. AC CAPACITOR		12
8 - 2	286406		. AC CAP. BUS BAR		4
8 - 3	404033		. STANDOFF INSULATOR		8
8 - 4	286386-001		. INSULATOR, TUBING		8
8 - 5	286258		. AC CAP. PANEL		REF
8 - 6	77A1107		. LABEL, “A”		1
8 - 7	77A1108		. LABEL, “B”		1
8 - 8	77A1109		. LABEL, “C”		1



Contactor Panel Assembly
Figure 9

FIGURE& ITEM NO.	HOBART PART NO.	AIRLINE PART NO.	NOMENCLATURE 1 2 3 4 5 6	EFF	UNITS PER ASSY
9 -	**No Number**		**CONTACTOR PANEL ASSEMBLY**		**REF**
9 - 1	282130-001		. CONTACTOR (V1E222 #MAIN 42IF109137R)	A,C	1
	282130-001		. CONTACTOR (V1E222 #MAIN 42IF109137R)	B,D	2
9 - 2	287018		. CAPACITOR ASSEMBLY	A,C	1
	287018		. CAPACITOR ASSEMBLY	B,D	2
9 - 3	283067-002		. VARISTOR ASSEMBLY	A,C	1
	283067-002		. VARISTOR ASSEMBLY	B,D	2
9 - 4	286450		. OUTPUT PANEL ASSEMBLY		1
9 - 5	284397		. CABLE CLAMP	A,C	1
	284397		. CABLE CLAMP	B,D	2
*	284359		. CABLE CLAMP	A,C	1
*	284359		. CABLE CLAMP	B,D	2
9 - 6	77A1109		. LABEL, “C”	A,C	1
	77A1109		. LABEL, “C”	B,D	2
9 - 7	402422-002		. LABEL, “2”	B,D	1
9 - 8	77A1108		. LABEL, “B”	A,C	1
	77A1108		. LABEL, “B”	B,D	2
9 - 9	77A1107		. LABEL, “A”	A,C	1
	77A1107		. LABEL, “A”	B,D	2
9 - 10	402422-001		. LABEL, “1”	B,D	1
9 - 11	78A1035		. LABEL, “N”		1

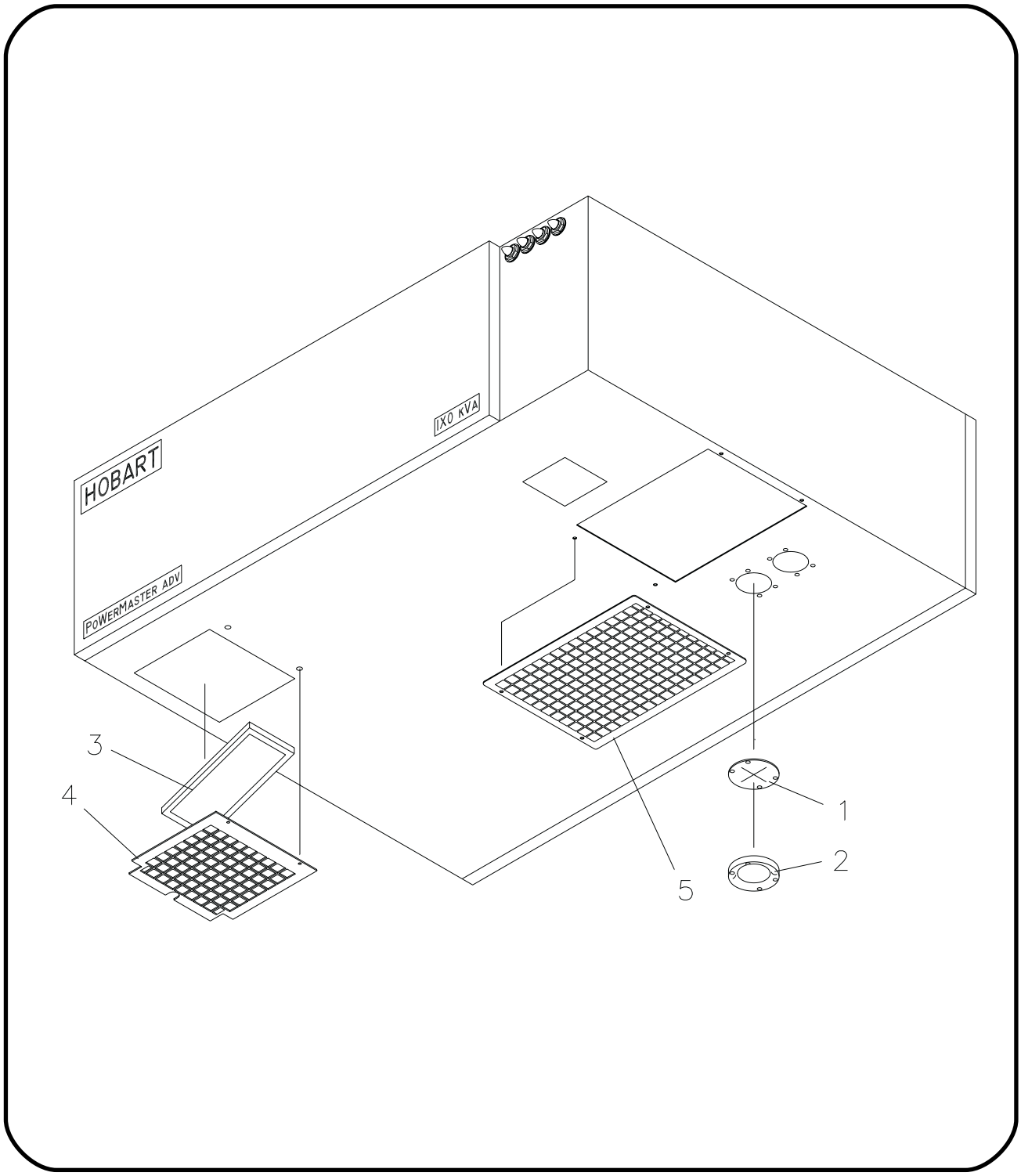
* Not Illustrated



Canopy Components
Figure 10

FIGURE& ITEM NO.	HOBART PART NO.	AIRLINE PART NO.	NOMENCLATURE 1 2 3 4 5 6	EFF	UNITS PER ASSY
10 -	**No Number**		**CANOPY COMPONENTS**		**REF**
10 - 1	286518		. REAR DOOR ASSEMBLY		1
*	286485-001		. DOOR SEAL		11FT.
*	286474-010		. REAR PARTS LOCATION LABEL		1
10 - 2	286515		. REAR DOOR STAY SUPPORT		1
10 - 3	286279-001		. SPACER, DOOR HINGE		8
10 - 4	286277		. REAR DOOR HINGE		1
10 - 5	286519		. CANOPY TOP		1
10 - 6	286279-001		. SPACER, DOOR HINGE		7
10 - 7	286278		. FRONT DOOR HINGE		1
10 - 8	286498		. FRONT DOOR STAY SUPPORT		1
10 - 9	286517		. FRONT DOOR ASSEMBLY		1
*	286485-001		. DOOR SEAL		11FT.
*	286474-009		. FRONT PARTS LOCATION LABEL		1
10 - 10	287542-001		. DOOR LATCH (V94222 #E3-16-15)		6
10 - 11	287546-001		. LATCH PAWL (V94222 #E3-28-203-12)		6
10 - 12	284606-001		. DOOR SUPPORT (V1E045 #AE7/25621)		2

* NOT ILLUSTRATED



Bottom Exterior Components
Figure 11

	FIGURE& ITEM NO.	HOBART PART NO.	AIRLINE PART NO.	NOMENCLATURE 1 2 3 4 5 6	EFF	UNITS PER ASSY
	11 -	**No Number**		**BOTTOM EXTERIOR COMPONENTS**		**REF**
	11 - 1	286469		. RUBBER OUTPUT COVER	A,C	1
		286469		. RUBBER OUTPUT COVER	B,D	2
	11 - 2	286478		. OUTPUT CABLE GUARD	A,C	1
		286478		. OUTPUT CABLE GUARD	B,D	2
	11 - 3	283159-003		. AIR FILTER		1
	11 - 4	286455		. AIR DUCT INLET COVER		1
*		283168-002		. CAPTIVE SCREW .		2
*		283171-002		. CAPTIVE SCREW RECEPTACLE		2
*		283172-001		. RETAINER		4
	11 - 5	287853		. GRILL, OUTPUT		1
*	11 - 6	286479		. COVER, CLOSED OUTPUT HOLE	A,C	1

* NOT ILLUSTRATED

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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 numeric-alpha sequence. Thus, any part number beginning with the number 1 would be located at or near the top of the index list. Likewise, a part beginning with the letter A 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.

FIG-ITEM	PART NUMBER	FIG-ITEM	PART NUMBER
7- 10	056210	1 - 14	283716
3 - 17	181358	4 - 27	283867-005
4 - 7	192266-001	1 - 10	283887
3 - 21	280673	4 - 5	284316-002
5 - 10	280673	5 - 13	284316-002
3-1	280807	7 - 8	284316-002
3 - 6	280966-002	9 - 5	284359
7-3	281848-001	9 - 5	284397
3 - 13	281848-002	10 - 12	284606-001
6 - 7	281929-015	5 - 15	285102-001
7 - 6	281971-001	3-2	285104-001
5-1	281971-002	4 - 26	285170
5-1	281971-004	3-3	285315-001
9 -1	282130-001	3 - 19	285568
3 - 5	282653	3 - 12	285968
1 -21	282658	4 - 30	286144
5 - 11	283066-002	4 - 6	286246
9-3	283067-002	7 - 7	286250
6 - 5	283155-003	7 - 11	286258
6-1	283156-003	8 - 5	286258
2 - 4	283157-003	4 - 32	286273
11 - 3	283159-003	4 - 29	286274
11 - 4	283168-002	10 - 4	286277
11 - 4	283171-002	10 - 7	286278
11 - 4	283172-001	10 - 6	286279-001
4 - 28	283196-002	10-3	286279-001
4 - 24	283196-003	5 - 5	286281
7 - 13	283387-002	4 - 23	286285-001
1 - 8	283714-002	5-1	286316-001
1 - 8	283714-004	2-2	286354

FIG-ITEM	PART NUMBER
4 - 10	286367-001
2 - 3	286376
1- 19	286377
5 - 11	286380
5 - 11	286382
5 - 12	286383
8 - 4	286386-001
4 -15	286389-001
8-1	286389-002
5 - 12	286392-001
1 - 4	286398-002
4 - 7	286400
8-2	286406
1-3	286411
3 - 6	286415-001
1-2	286416-001
4 - 33	286420
3 - 20	286423
7-1	286429
7 - 5	286431
7 - 4	286433
7 - 9	286434
5-1	286438
7-2	286440-001
1 - 16	286441
1 - 20	286442
4 - 8	286443
5 - 9	286444
3 - 22	286445
3 - 15	286447
3 - 16	286448
5-1	286449
9 - 4	286450
11 - 4	286455
1 - 9	286457
7 - 15	286468
11-1	286469
10 - 9	286474-009
10 -1	286474-010
1 - 22	286475-001

FIG-ITEM	PART NUMBER
11-2	286478
5-1	286480-001
4 - 11	286482-001
10 - 9	286485-001
10 -1	286485-001
6-2	286486-001
7 - 14	286489-001
5-3	286492-001
10 - 8	286498
10-2	286515
10 - 9	286517
10 -1	286518
10 - 5	286519
4 - 9	286528
9-2	287018
1 - 17	287341
4 - 31	287353
1 - 15	287460
10 - 10	287542-001
10 - 11	287546-001
4-20	287824
4 -13	287825
4 -14	287826
4 - 21	287830
4 - 22	287831
4 - 4	287833
2 - 6	287836
3 - 4	287838
3 - 24	287841
6 - 6	287842
4 - 3	287843
4 - 2	287844
2-1	287845
6 - 4	287846
5 - 8	287847
2 - 5	287852
11 - 5	287853
3 - 18	287856
4-1	287857
1 - 5	400613-004

FIG-ITEM	PART NUMBER
1 - 5	400613-004
1 - 6	400613-004
1 - 7	400613-004
6-2	400792-001
6-2	401911-005
6-3	402037-006
9 - 10	402422-001
9 - 7	402422-002
4 -14	402674-001
4 -13	402674-002
3 - 14	402682
4-19	403955-021
8-3	404033
4 -12	404044-004
7 - 12	404249-003
3 - 10	404960-034
4 - 25	407970
5 - 4	493712
1-	500048A-001
1-	500048A-002
1-	500048A-101
1-	500048A-102
4 - 36	77A1107
8 - 6	77A1107
9 - 9	77A1107
4 - 35	77A1108
8 - 7	77A1108
9 - 8	77A1108
4 - 34	77A1109
8 - 8	77A1109
9 - 6	77A1109
9 - 11	78A1035
1 - 6	82B1066-001
1 - 7	82B1066-010
1 - 5	82B1066-012
1 - 5	82B1066-012
3 - 9	83A1112
3 - 8	83A1113
3 - 7	83A1114
3 - 11	W10502-031

FIG-ITEM	PART NUMBER	FIG-ITEM	PART NUMBER

Chapter 5. Manufacturer's Literature

DIAGRAM NUMBER	TYPE OF DIAGRAM
286550	Schematic/Connection Diagram, Series 500048A;
286495	Dimensional Outline Drawing, Series 500048A;

Contact Hobart Ground Power if either copy of these drawings are not with this manual. Refer to Appendix Section for specific information on converter optional equipment.

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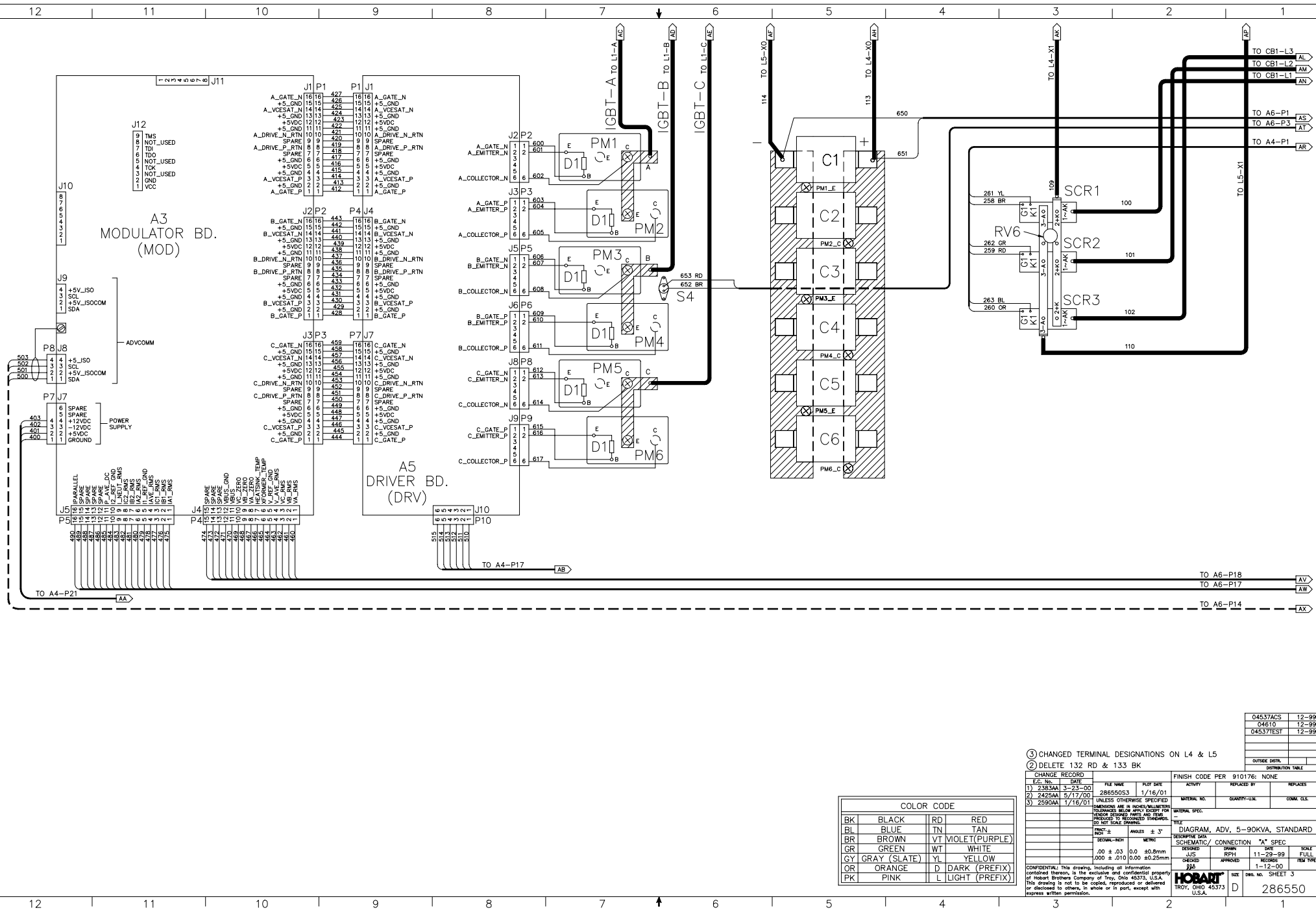

COLOR CODE			
BK	BLACK	RD	RED
BL	BLUE	TN	TAN
BR	BROWN	VT	VIOLET(PURPLE)
GR	GREEN	WT	WHITE
GY	GRAY (SLATE)	YL	YELLOW
OR	ORANGE	D	DARK (PREFIX)
PK	PINK	L	LIGHT (PREFIX)

04537ACS	12-99
04610	12-99
04537TEST	12-99

OUTSIDE DISTR.

DISTRIBUTION TABLE

(3) CHANGED TERMINAL DESIGNATIONS ON L4 & L5
(2) DELETE 132 RD & 133 BK

CHANGE RECORD			
E.C. No.	DATE	FILE NAME	PLOT DATE
1) 2383AA	3-23-00	286550S3	1/16/01
2) 2425AA	5/17/00		
3) 2590AA	1/16/01		

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

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

FINISH CODE PER 910176: NONE

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

MATERIAL SPEC.
–

TITLE
DIAGRAM, ADV, 5-90KVA, STANDARD

DESCRIPTIVE DATA
SCHEMATIC/ CONNECTION "A" SPEC

DESIGNED	DRAWN	DATE	SCALE
JJS	RPH	11-29-99	FULL
CHECKED	APPROVED	RECORDS	ITEM TYPE
jjs		1-12-00	

HOBART
TROY, OHIO 45373
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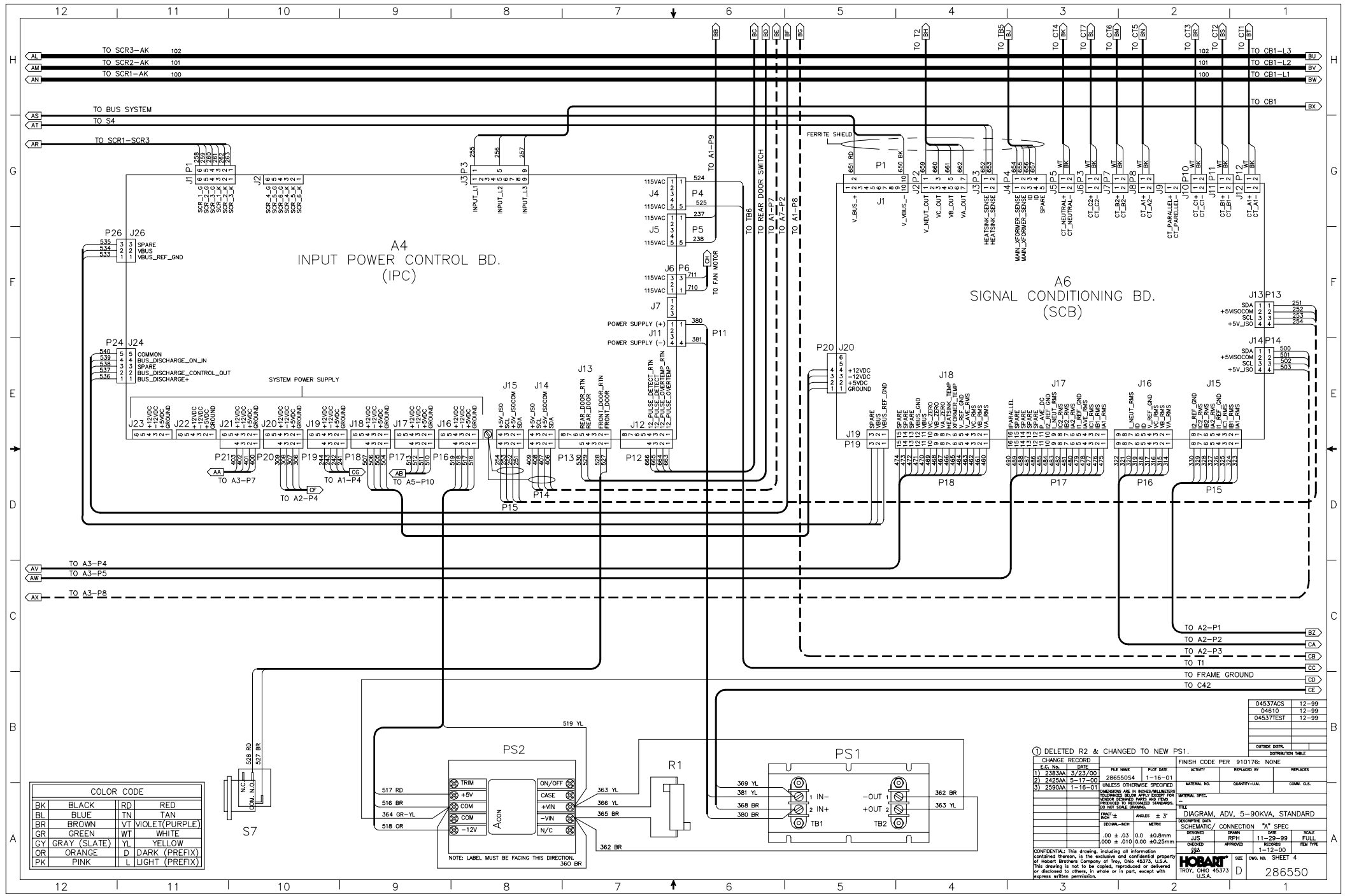
SIZE D

DWG. NO. SHEET 3
286550



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)

04537ACS	12-99
04610	12-99
04537TEST	12-99

OUTSIDE DISTRIB.

DISTRIBUTION TABLE

① DELETED R2 & CHANGED TO NEW PS1.

CHANGE RECORD					
E.C. No.	DATE	FILE NAME	PLOT DATE	ACTIVITY	REPLACED BY	REPLACES
1) 2383AA	3/23/00	286550S4	1-16-01			
2) 2425AA	5-17-00	UNLESS OTHERWISE SPECIFIED		MATERIAL NO.	QUANTITY-U.M.	COMM. CLS.
3) 2590AA	1-16-01	DIMENSIONS ARE IN INCHES/MILLIMETERS TOLERANCES BELOW APPLY EXCEPT FOR VENDOR DESIGNED PARTS AND ITEMS SUBJECTED TO REDUCED STANDARDS. DO NOT SCALE DRAWING.		MATERIAL SPEC. –		
		FRACT. ±	ANGLES ± 3°	TITLE		
		DECIMAL-INCH	METRIC	DIAGRAM, ADV, 5-90KVA, STANDARD		
		.00 ± .03	0.0 ±0.8mm	DESCRIPTIVE DATA		
		.000 ± .010	0.00 ±0.25mm	SCHEMATIC/ CONNECTION "A" SPEC		
				DESIGNED JJS	DRAWN RPH	DATE 11-29-99	SCALE FULL
				CHECKED jja	APPROVED	RECORDS 1-12-00	ITEM TYPE

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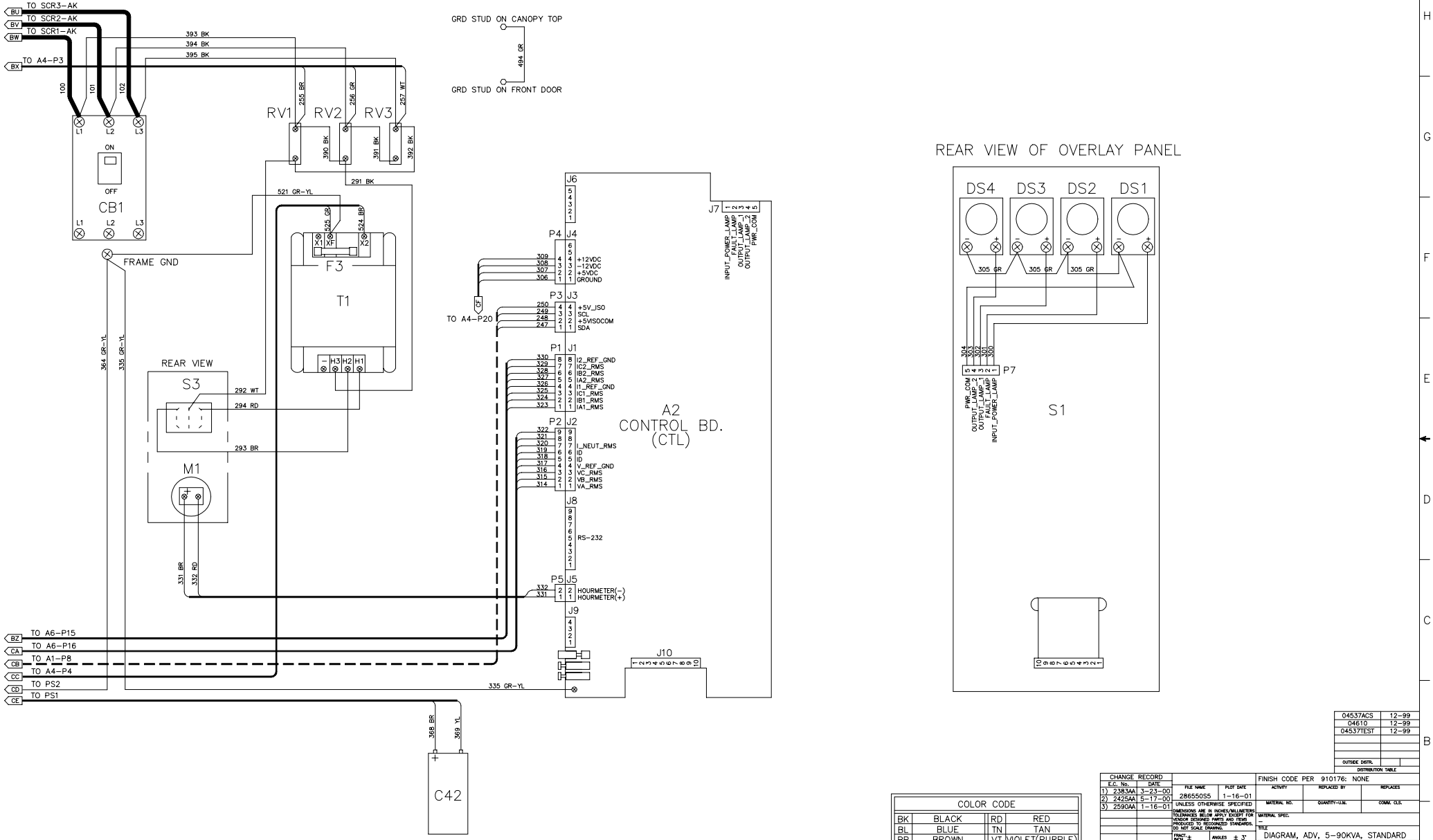
SIZE D | DWG. NO. 286550 | SHEET 4



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.C. No.	DATE
1) 2383AA	3-23-00
2) 2425AA	5-17-00
3) 2590AA	1-16-01

	FILE NAME	PLOT DATE
	286550S5	1-16-01

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.

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

FINISH CODE PER 910176: NONE

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

MATERIAL SPEC.
–

TITLE
DIAGRAM, ADV, 5-90KVA, STANDARD

DESCRIPTIVE DATA
SCHEMATIC/ CONNECTION "A" SPEC

DESIGNED	DRAWN	DATE	SCALE
JJS	RPH	11-29-99	FULL
CHECKED	APPROVED	RECORDS	ITEM TYPE
JJA		1-12-00	

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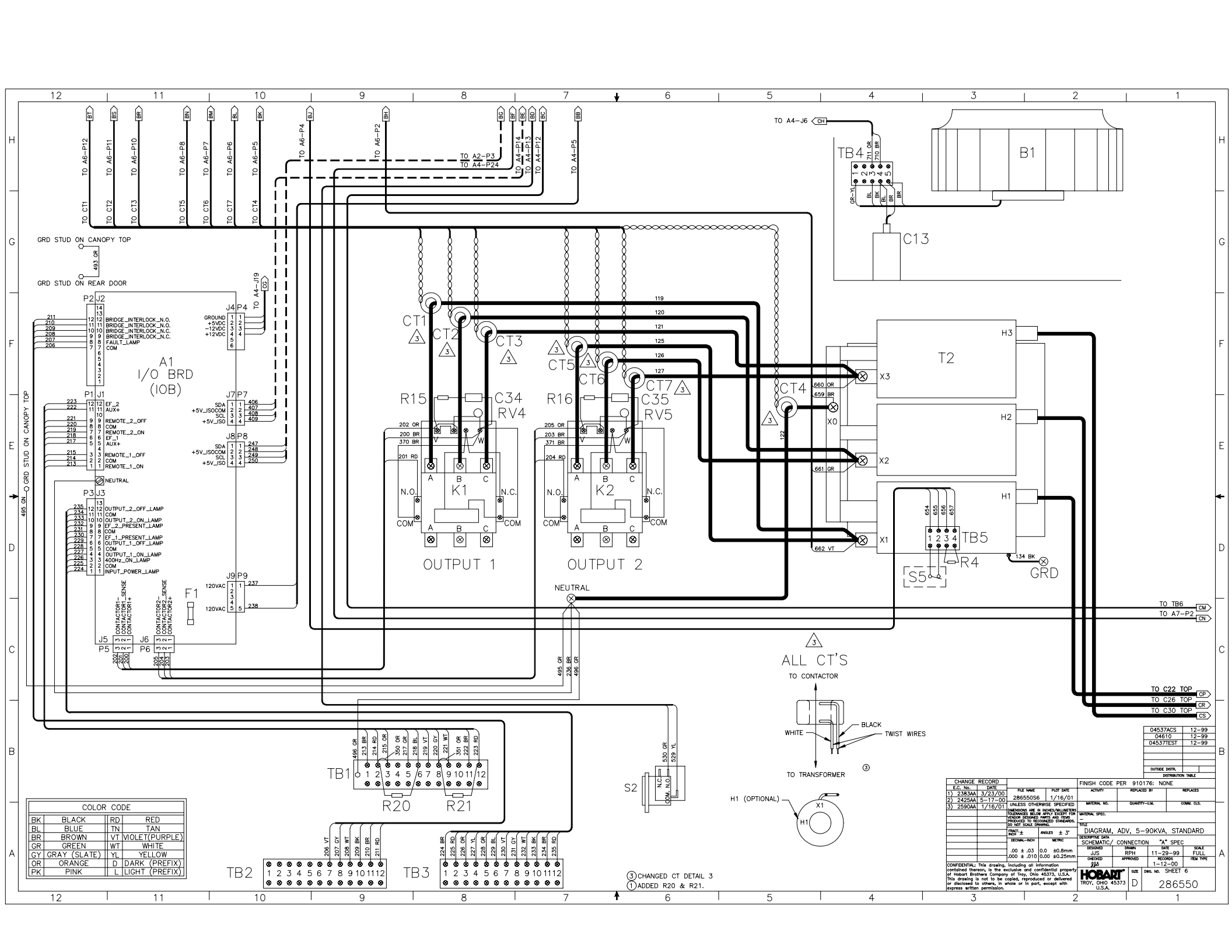
SIZE D | DWG. NO. 286550 | SHEET 5

04537ACS	12-99
04610	12-99
04537TEST	12-99

OUTSIDE DISTR.
DISTRIBUTION TABLE



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)

04537ACS	12-99
04610	12-99
04537TEST	12-99

OUTSIDE DISTR.
DISTRIBUTION TABLE

CHANGE RECORD	
E.C. No.	DATE
1) 2383AA	3/23/00
2) 2425AA	5-17-00
3) 2590AA	1/16/01

FILE NAME: 286550S6 | PLOT DATE: 1/16/01

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES/MILLIMETERS
TOLERANCES BELOW APPLY EXCEPT FOR VENDOR DESIGNED PARTS AND ITEMS PURCHASED 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

FINISH CODE PER 910176: NONE

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

MATERIAL SPEC.
–
TITLE
DIAGRAM, ADV, 5-90KVA, STANDARD
DESCRIPTIVE DATA
SCHEMATIC/ CONNECTION "A" SPEC

DESIGNED	DRAWN	DATE	SCALE
JJS	RPH	11-29-99	FULL
CHECKED	APPROVED	RECORDS	ITEM TYPE
jjs		1-12-00	

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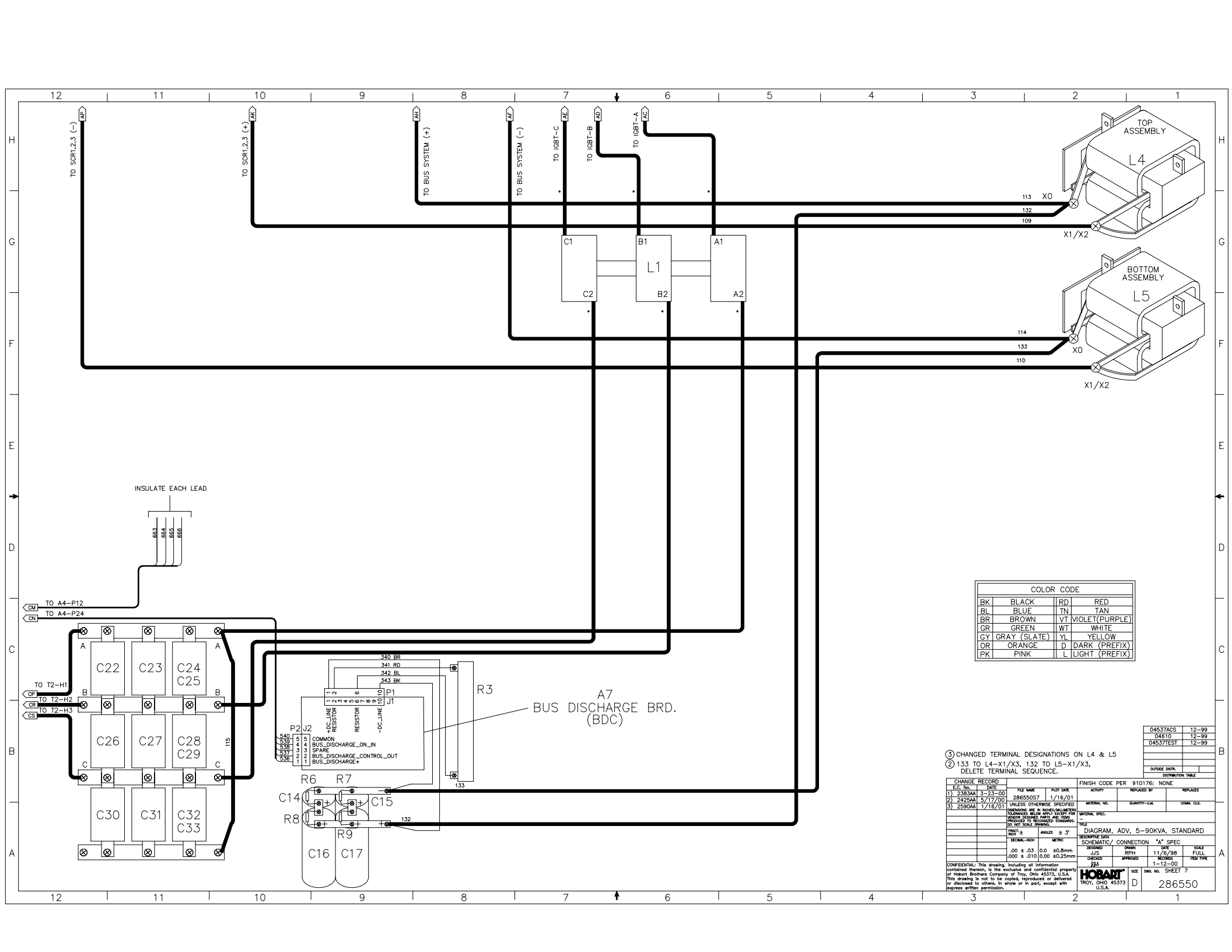
SIZE D | DWG. NO. 286550 | SHEET 6



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)

04537ACS	12-99
04610	12-99
04537TEST	12-99

OUTSIDE DISTR.

DISTRIBUTION TABLE

(3) CHANGED TERMINAL DESIGNATIONS ON L4 & L5

(2) 133 TO L4-X1/X3, 132 TO L5-X1/X3, DELETE TERMINAL SEQUENCE.

CHANGE RECORD			
E.C. No.	DATE		
1) 2383AA	3-23-00	FILE NAME	PLOT DATE
2) 2425AA	5/17/00	286550S7	1/16/01
3) 2590AA	1/16/01	UNLESS OTHERWISE SPECIFIED	

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

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

FINISH CODE PER 910176: NONE

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

MATERIAL SPEC.
–

TITLE
DIAGRAM, ADV, 5-90KVA, STANDARD

DESCRIPTIVE DATA
SCHEMATIC/ CONNECTION "A" SPEC

DESIGNED	DRAWN	DATE	SCALE
	JJS	RPH	11/6/98	FULL
CHECKED	APPROVED	RECORDS	ITEM TYPE
jjs		1-12-00	

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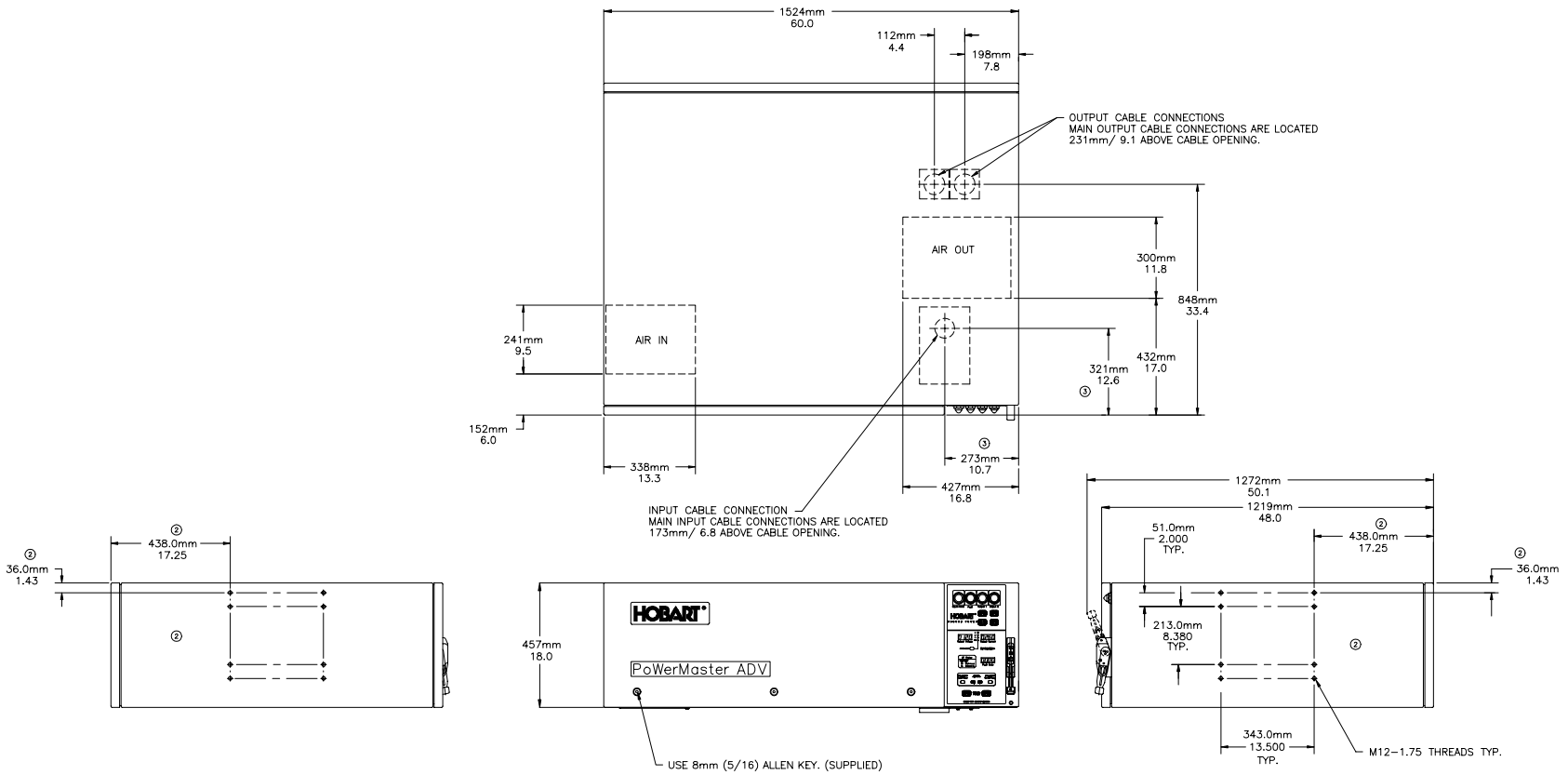
SIZE D

DWG. NO. SHEET 7

286550



DIMENSIONS IN MILLIMETERS AND INCHES.

WEIGHTS

	MODEL	STANDARD	WITH 12 PULSE OPTION
①	60/90SX200	1020 lbs. 463 kg.	1270 lbs. 576 kg.
①	45SX200	1020 lbs. 463 kg	
②	160SX200	1330 lbs. 603 kg.	1782 lbs. 808 kg.

CHANGE RECORD	
E.C. No.	DATE
1) 2125AA	3-17-99
2) 2243AA	8-12-99
3) 2284AA	11-17-99

FILE NAME	PLOT DATE
286495	11-17-99

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

FINISH CODE PER 910176: NONE

ACTIVITY	REPLACED BY	REPLACES
MATERIAL NO.	QUANTITY–U.M.	COMM. CLS. 610D

MATERIAL SPEC. –

TITLE
OUTLINE, DIMENSIONAL

DESCRIPTIVE DATA
ADV CONVERTER

DESIGNED	DRAWN	DATE	SCALE
RPH	RPH	11/7/97	EIGHTH
CHECKED	APPROVED	RECORDS	ITEM TYPE
jdbf		2-27-98	

DISTRIBUTION TABLE
OUTSIDE DISTR.

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SIZE D | DWG. NO. 286495 | SHEET 1 OF 1

Appendix A. Options/Features

The following is a list of options available for Series 500048A. This chart contains the description, part number, and document number of the option. There is also a column to identify which option is contained in this Appendix.

OPTIONS / FEATURES AVAILABLE			
DESCRIPTION	**PART NUMBER**	**DOCUMENT NUMBER**	**IN THIS SECTION**
Trailer with Cable Hangers	286494-001	TO-266	
Trailer with Shelf Assy.	286493-001		
Hand Pull Trailer	286362-001		
Bridge Mount Kit	286284-001 & -002	TO-277	
Floor Stand Kit	286464-001		
Kit, CE Certification (Trailer Mount)	287589-005		
Kit, CE Certification (Bridge Mount)	287589-006		
Low Input Harmonics Kit (12 Pulse)	286409-004	TO-269	
2 & 4 Station Remote Pushbutton Kit	285440-001 & -002	TO-278	

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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:

Combustible, explosive, abrasive or conducting dusts.

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

Chemical fumes, flammable or explosive gases.

Nuclear radiation.

Steam, salt-laden air, or oil vapor.

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

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

Low and/or high ambient temperatures.

2. Operation at:

Voltages above or below rated voltage.

Frequency other than rated frequency.

Unbalanced voltages.

Operation at loads greater than rated.

3. Operation where low acoustical noise levels are required.

4. Operation with:

Improper lubricants.

Parts or elements unauthorized by the manufacturer.

Unauthorized modifications.

5. Operation in poorly ventilated areas.

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