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Operation and Maintenance Manual
with
Illustrated Parts List
for

POWERMASTER® ADV

Series
500048A



45 and 60 kVA AC
208 / 230 Voltage Input
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. 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, or by disconnecting battery, 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 fans or hot spots inside some equipment. Shut **DOWN** such equipment for inspection and routine maintenance. When equipment is in operation, use extreme care in doing necessary troubleshooting and adjustment. Do not remove guards while equipment is operating.

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.

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Introduction

This manual contains operation and maintenance information for a 400 Hz Solid State Converter 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 that have never operated this equipment. It is the intent of this manual to guide and assist operators and maintenance personnel in the proper use and care of the equipment.

Use of the manual should not be put off until trouble or a 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, a chapter, section, and paragraph or figure number identify its location.

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 Road East Troy, Ohio 45373 U.S.A.
Call Inside U.S.A.:	(800) 422-4166 (Parts) (800) 422-4177 (Service)
Call From Foreign Countries:	(937) 332-5050 (Parts) (937) 332-5060 (Service)
FAX Inside U.S.A.	(800) 367-4945
FAX From Foreign Countries:	(937) 332-5121
E-Mail :	service@hobartgroundpower.com
Web Page :	www.hobartgroundpower.com

Table of Contents

Chapter 1 Description/Operation Chapter-Section/Page#

Section 1	**Description**	**1-1/1**
	General	1-1/1
	Optional Equipment - Appendix A	1-1/1
	Orientation	1-1/1
	Mounting for the Converter	1-1/1
	Safety Features	1-1/4
	Bridge Interlock Circuit	1-1/5
	Converter Cabinet	1-1/5
	Theory of Operation	1-1/5
	ADV Control System	1-1/7
	Event Records/Fault Monitoring	1-1/9
	Detailed Description of Converter Components	1-1/10
Section 2	**Preparation for Use, Storage or Shipping**	**1-2/1**
	Receipt and Inspection of Equipment	1-2/1
	Unpacking the Unit	1-2/1
	Installation	1-2/1
	Input Cable Size and Temperature Requirements	1-2/1
	Preparation for Storage	1-2/7
	Preparation for Shipment	1-2/7
Section 3	**Operation**	**1-3/1**
	General	1-3/1
	Basic Converter Operation	1-3/1

Chapter 2 Servicing / Troubleshooting Chapter-Section/Page#

Section 1	**Maintenance Inspection/Check**	**2-1/1**
	General	2-1/1
	ADV Control Monitoring	2-1/2
	Troubleshooting Tables	2-1/7
	Troubleshooting Procedures	2-1/16

Section 2	**Calibration**	**2-2/1**
	Test Preparation	2-2/1
	Calibration	2-2/2
Section 3	**Scheduled Maintenance**	**2-3/1**
	General	2-3/1
	Scheduled Maintenance Procedure	2-3/1

Chapter 3 Overhaul / Major Repair Chapter-Section/Page#

Section 1	**Unscheduled Repair**	**3-1/1**
	General	3-1/1
	Service Information and Factory Repair	3-1/1
	Workmanship	3-1/2
	Converter Bridge Mount Removal and Installation	3-1/2
	Component Removal and Replacement	3-1/4
	PC Board Removal and Replacement	3-1/9

Chapter 4 Illustrated Parts List Chapter-Section/Page#

Section 1	**Introduction**	**4-1/1**
	General	4-1/1
	Purpose	4-1/1
	Arrangement	4-1/1
	Explanation of Parts List	4-1/1
Section 2	**Manufacture's Codes**	**4-2/1**
	Explanation of Manufacture's (Vendor) Code List	4-2/1
Section 3	**Illustrated Parts List**	**4-3/1**
	Explanation of Parts List Arrangement	4-3/1
	Symbols and Abbreviations	4-3/1
	Figure 1: PoWerMaster ADV Converter	4-3/2
	Figure 2: Frame Assembly	4-3/4
	Figure 3: Front Interior Components	4-3/6
	Figure 4: Heat Sink Panel Assembly	4-3/8
	Figure 5: Rear Interior Components	4-3/10

Section 3 (cont.)	*Figure 6: Fan Assembly Components*	4-3/12
	Figure 7: DC Electrolytic Capacitors Assembly	4-3/14
	Figure 8: AC Capacitor Assembly	4-3/16
	Figure 9: Control Panel Assembly	4-3/18
	Figure 10: Canopy Components	4-3/20
	Figure 11: 400 Hz. Power Module Components	4-3/22
Section 4	**Numerical Index**	**4-4/1**
	Explanation of Numerical Index	4-4/1

Chapter 5 Manufacture's Literature

Appendix A Options/Features

Unusual Service Conditions

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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 AC.

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 input voltages, amps, and frequency will change with each dash number. Figure 1 uses the part number to identify the variations possible covered by this manual.

Part & Dash Number	kVA Rating	Outputs	Input Voltage	Frequency
500048A-021	60	1	208 / 230	50 / 60
500048A-022	60	2	208 / 230	50 / 60
500048A-311	45	1	208 / 230	50 / 60
500048A-312	45	2	208 / 230	50 / 60

Series 500048A 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

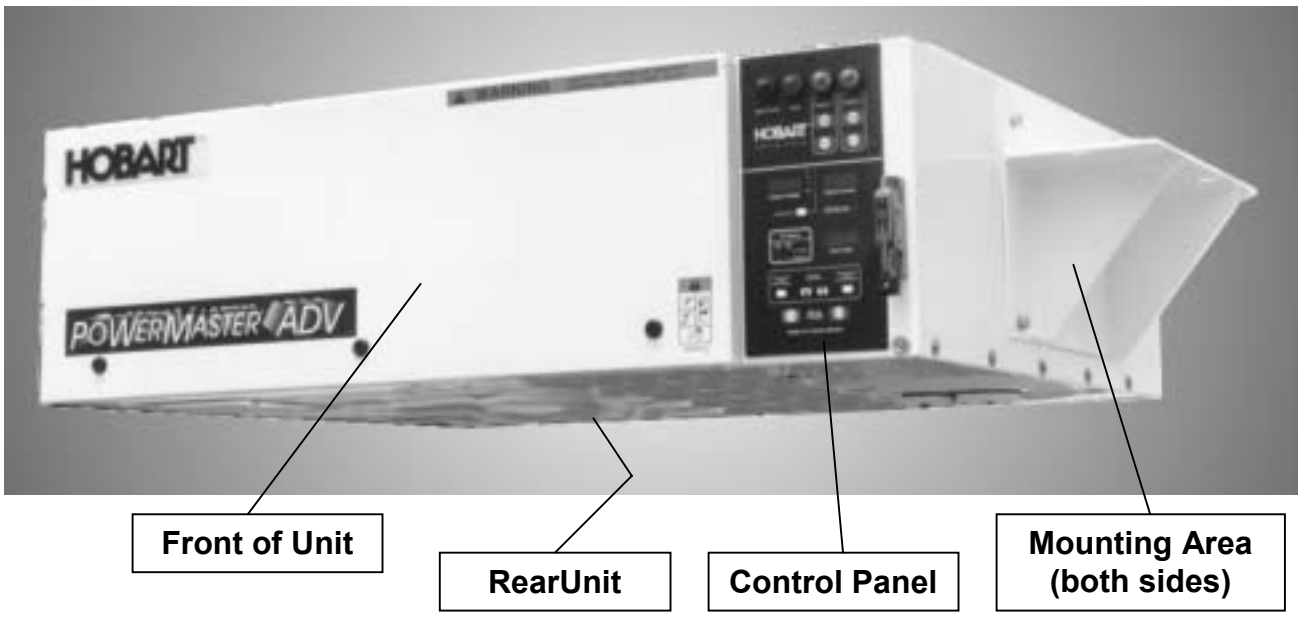
Chapters 1 through 5 of this Operation and Maintenance Manual identify only the basic version of a Series 500048A converter. Component differences between the different machines will be listed when necessary. A list of optional equipment, which makes this manual unique to the converter that you have purchased, appears in Appendix A. Examples of items located Appendix A are trailer mount kits and bridge mount brackets.

3) Orientation (See Figure 2)

To avoid confusion in the location of components, for the 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) Mounting for the Converter

The ADV converter must be mounted horizontally in one of three ways:
a) Under a passenger boarding bridge.
b) On a trailer to make it mobile.
c) On a floor stand.



Hobart PoWerMaster® ADV Solid State Frequency Converter
Figure 2

PHYSICAL			
Enclosure	NEMA 3R or IEC IP 54		
Weight (Approximate)	**1 Output**	**2 Output**	
…Standard	1220 lb. (553 kg)	1228 lb. (557 kg)	
…Bridge Mount Unit (with Brackets)	1300 lb. (590 kg)	1308 lb. (593 kg)	
…Trailer Mount Unit (Towable)	1707 lb. (773 kg)	1713 lb. (777 kg)	
SIZE			
	Length	Width	Height
Bridge Mount Unit	60 inches 152.4 (cm)	49 inches 124.5 (cm)	18 inches 45.7 (cm)
Trailer Mount Unit Towbar Raised (Towable)	80.6 inches 204.7 (cm)	56 inches 142.2 (cm)	54.6 inches 138.7 (cm)
Trailer Mount Unit Towbar Lower (Towable)	116.7 inches 296.4 (cm)	56 inches 142.2 (cm)	54.6 inches 138.7 (cm)
Trailer Mount Unit Hand Bar Raised (Hand Pull)	75.75 inches 192.4 (cm)	49 inches 124.5(cm)	45 inches 114.3(cm)
Trailer Mount Unit Towbar Lower (Hand Pull)	111 inches 281.9 (cm)	49 inches 124.5 (cm)	45 inches 114.3 (cm)
ENVIRONMENTAL			
Acoustical noise	Less than 65 dBA @ 1.5 m high, 2 m distance		
Operating temperature	-40° to +52° C (-40° to +125° F)		
Storage temperature	-40° to +62° C (-40° to +140° F)		
Relative humidity	10 to 100% non-condensing		
ELECTRICAL INPUT			
kVA Rating	**45 (36 kW)**	**60 (48 kW)**	
Voltage (nominal) VAC	208 / 230		
Frequency (Hz)	50 / 60		
Amperes (rated load)	120 / 108	155 / 140	
Voltage Range (maximum)	177-240 / 195-264	177-240 / 195-264	
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		
kVA Rating (continuous)	**45 (36 kW)**	**60 (48 kW)**
Voltage VAC	115/200	
Frequency (Hz)	400	
Amperes (at rated load per power ratings)	130	174
Overload Trips	• at 125% after 10 minutes • at 150% after 30 seconds • at 200% after 10 seconds	
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)	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-940, 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 (continued)
Figure 3

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.

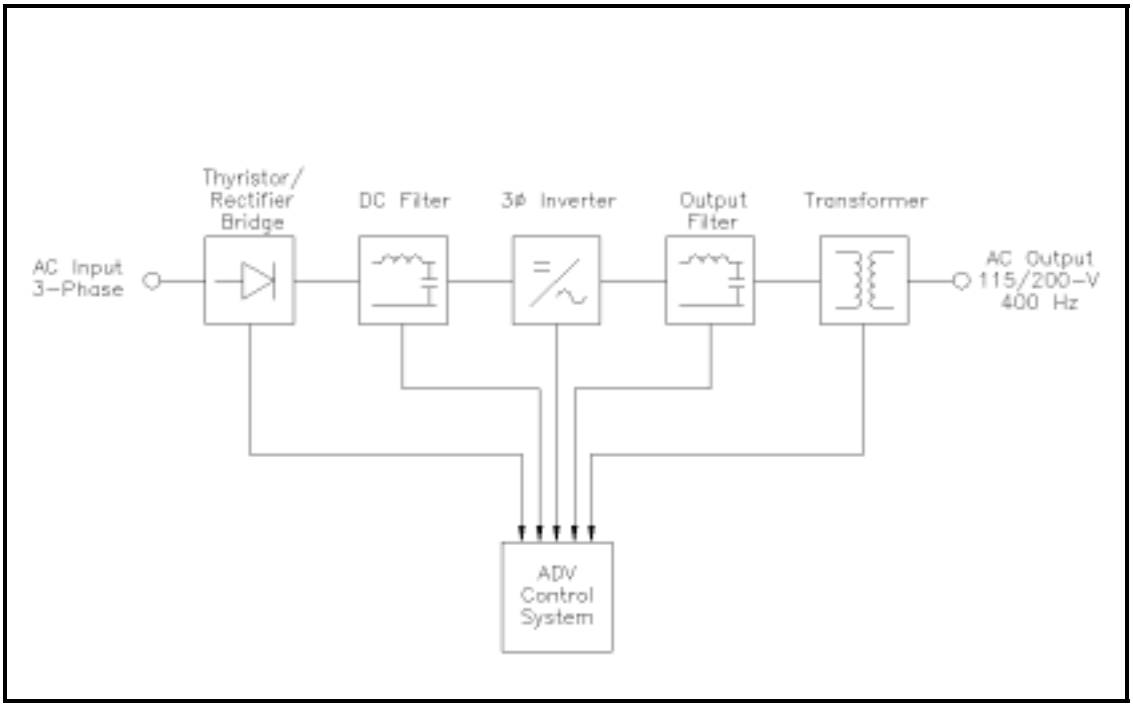
7) Converter Cabinet (See Figure 2)

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.

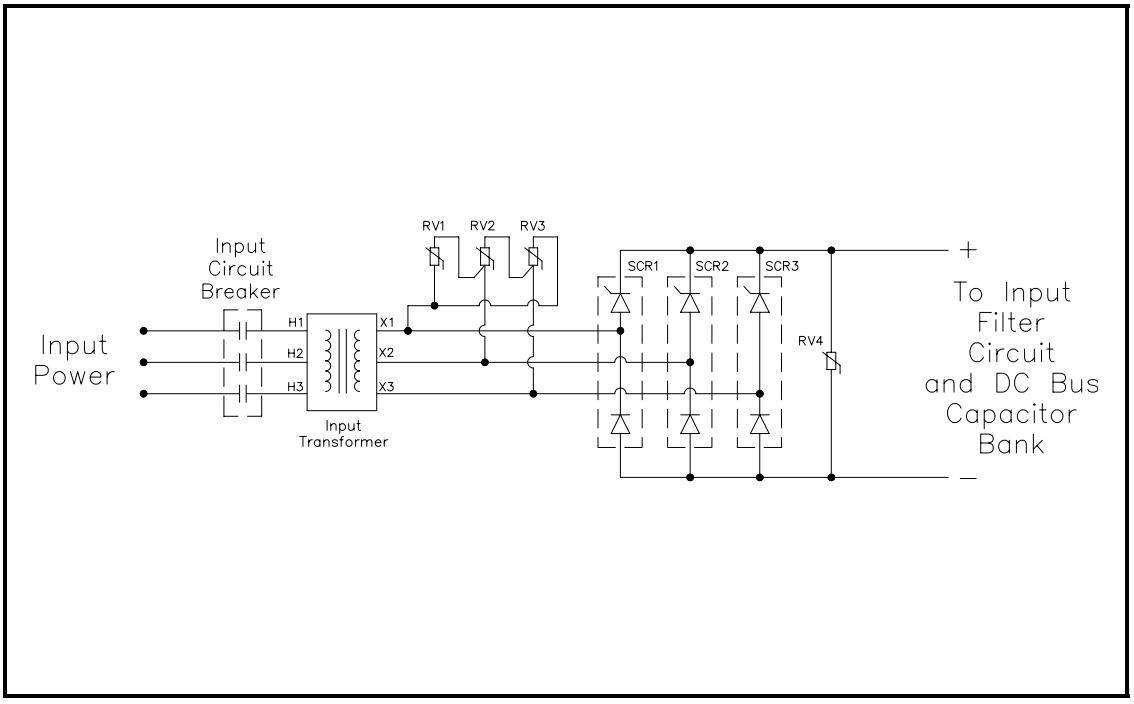
8) Theory of Operation (See Figure 4)

a) Input Rectifier (See Figure 5)

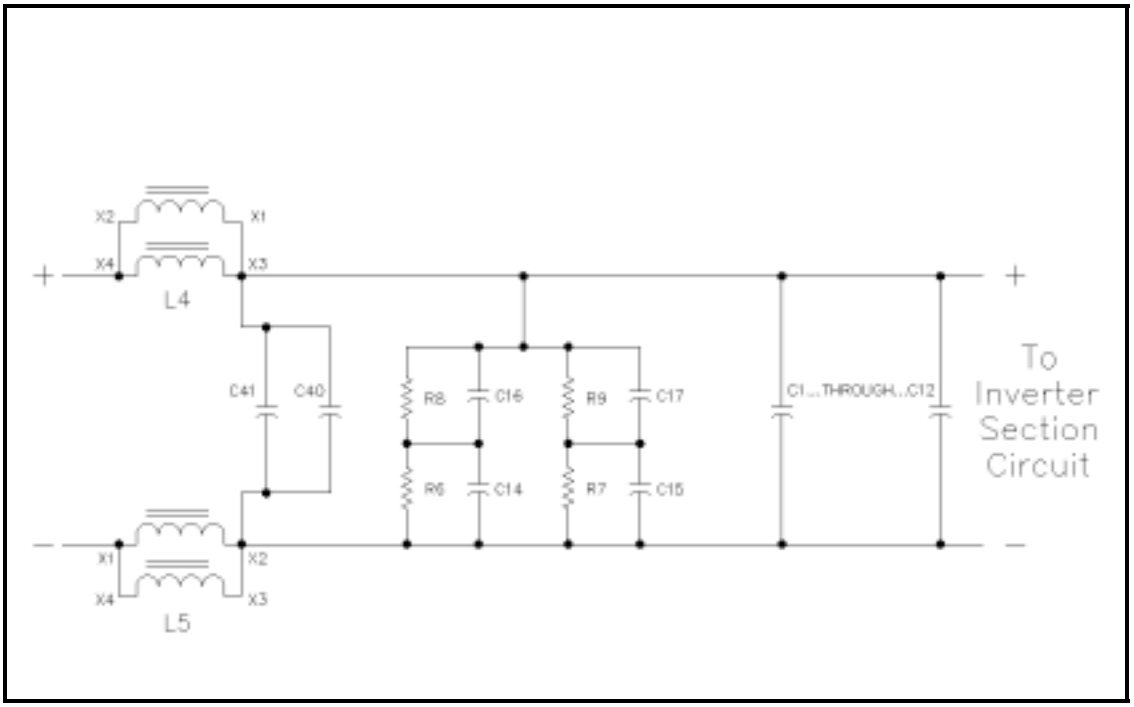
The input rectifier consists of a three phase thyristor/rectifier bridge which is phase angle regulated during startup providing a soft start of the converter. This limits the inrush current to less than the full rated value of the converter. During normal operation, the thyristor/rectifiers operate 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 4



Input Thyristor/Rectifier Circuit
Figure 5



Input Filter Circuit and DC Bus Capacitor Bank
Figure 6

b) Input Filter and DC Bus Capacitor Bank (See Figure 6)

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 30 volts) across the bus.

d) Inverter and Output Filter Section (See Figure 7)

The inverter section consists of three pairs of high power IGBTs (6 total) connected in a 3-phase array; each pair consists of two IGBT's in series 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 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 8)

The output of the main transformer is connected to a 3-phase contactor that provides the connection point for the AC output cables.

9) ADV Control System

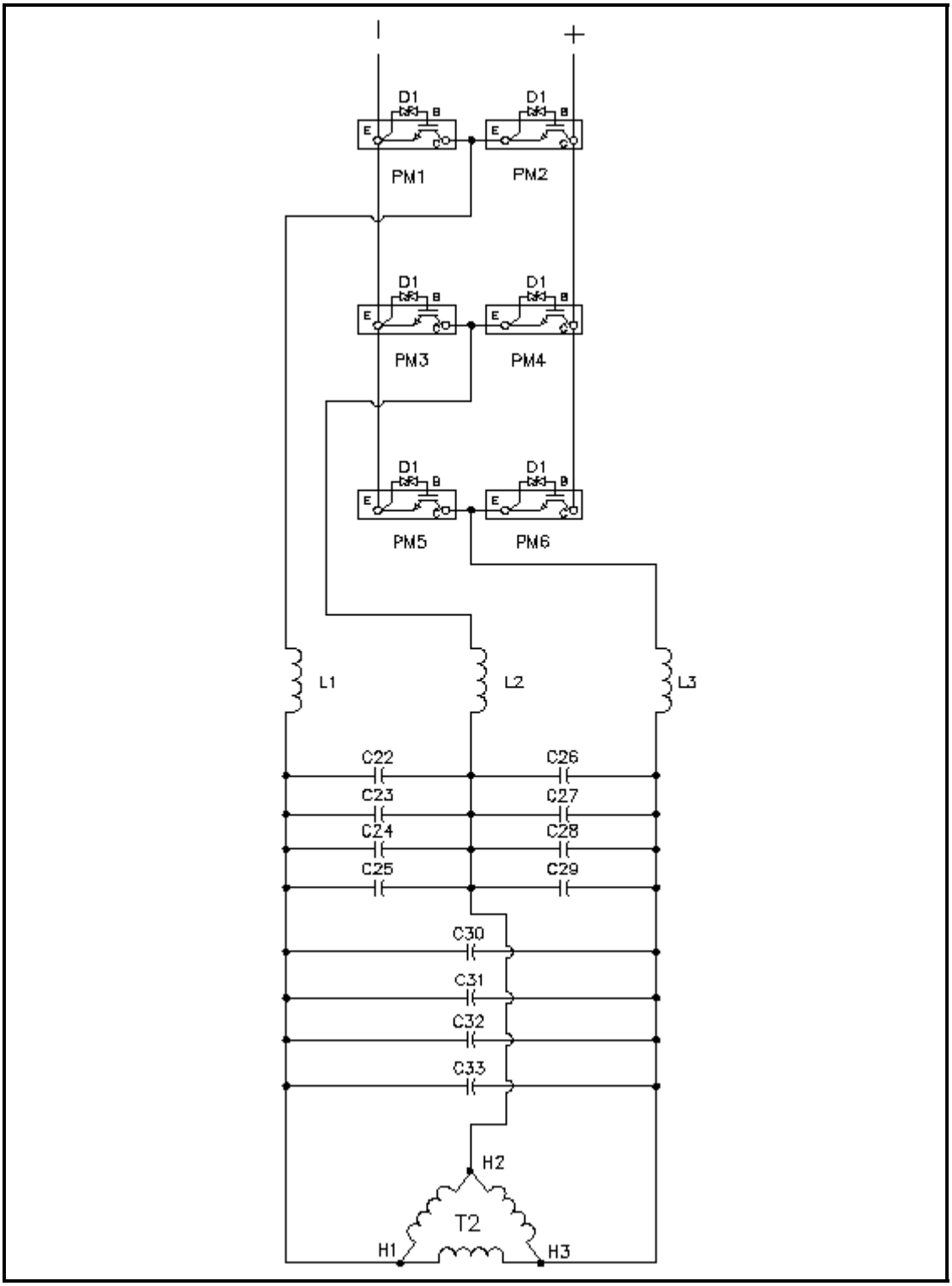
The ADV Control System performs complete diagnostic testing upon each startup and continuous monitoring of all critical circuits and operating electrical values. Functions of the converter are selected through the control panel. Specifically, the Control System performs the following:

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

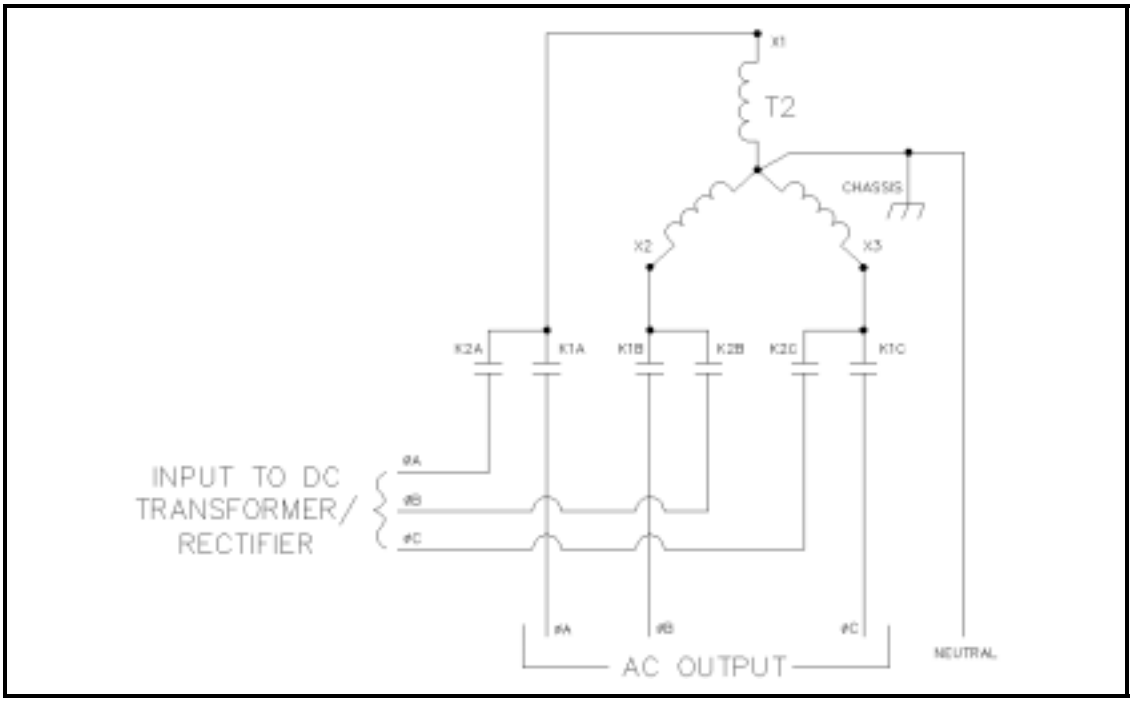
b) Monitors all critical operating parameters during operation.

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.



Inverter Section Circuit
Figure 7



Output Transformer Circuitry
Figure 8

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 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.

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

11) Detailed Description of Converter Components

a) Control Panel (See Figure 9)

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

(1) 400 Hz POWER ON push button (1, Figure 9)

Pressing this 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 (17).

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

(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.

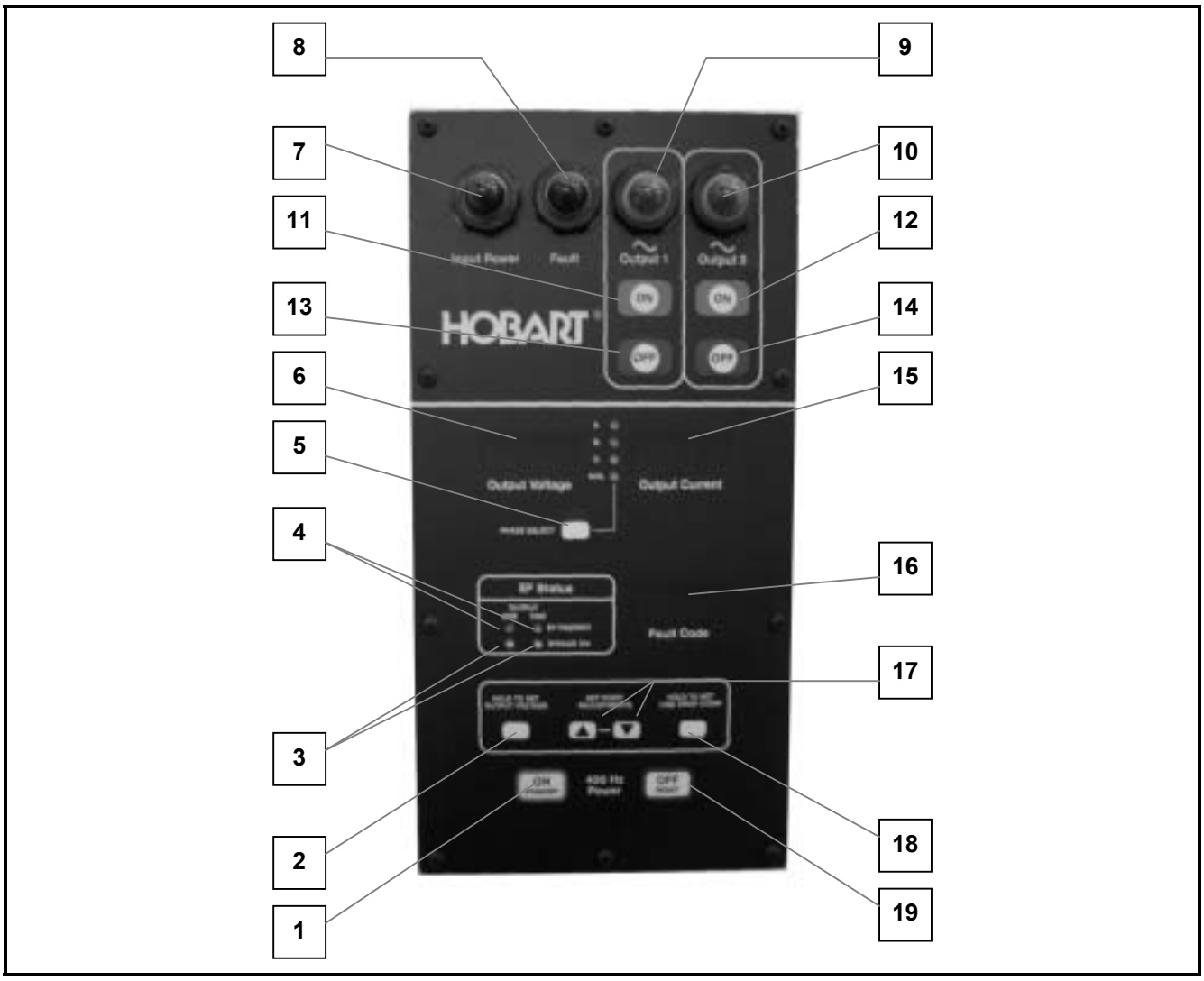
These lamps indicate that EF bypass (Section 1-3, 2 and 3, Figure 2), has been turned on for that output. Once the EF bypass is activated, the need for a returned EF Signal from the aircraft is disabled, therefore allowing 400 Hz power to be sent uncontested to the output cables(s). Because “Live” unattended 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 one or both of the EF Present lamps in the EF status box.

(5) PHASE SELECT push button

With each press of this push button the A, B, C, or AVG. 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.



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. Fault Code Display
17. Set Point Up And Down Adjustment Push Buttons
18. Line Drop Compensation Adjustment Push Button
19. 400 Hz Power Off Push Button

Control Panel
Figure 9

(6) Output Voltage display

Displays the output voltage value 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.

(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 contactor.

(12) Output 2 On Push button

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

(13) Output 1 Off Push button

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

(14) Output 2 Off Push button

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

(15) Output Current display

Displays the output current at the output connection of the converter.

(16) Fault Code display

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

(17) 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 corresponding output voltage or line drop compensation push buttons.

(18) Line Drop Compensation Adjustments Push Button

To adjust the line drop compensation value, depress and hold the line drop compensation adjustment push button while simultaneously pressing a set point up and down adjustment push button (17). The line drop compensation value, in percentage, will be shown in the fault code display (16).

(19) 400 Hz OFF Push Button

Shuts off output power. Pressing this push button opens all output contactor(s), if closed, and turns the converter off. If a fault condition is present, pressing this button will clear the fault and initiate converter self-test.

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 disconnect 400 Hz power from the aircraft. If 400 Hz power is on and 2 contactors are closed, turning off output 1 or output 2 will not turn off 400 Hz power to both contactors.

b) Printed Circuit Boards (See Figure 10)

The units have 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)

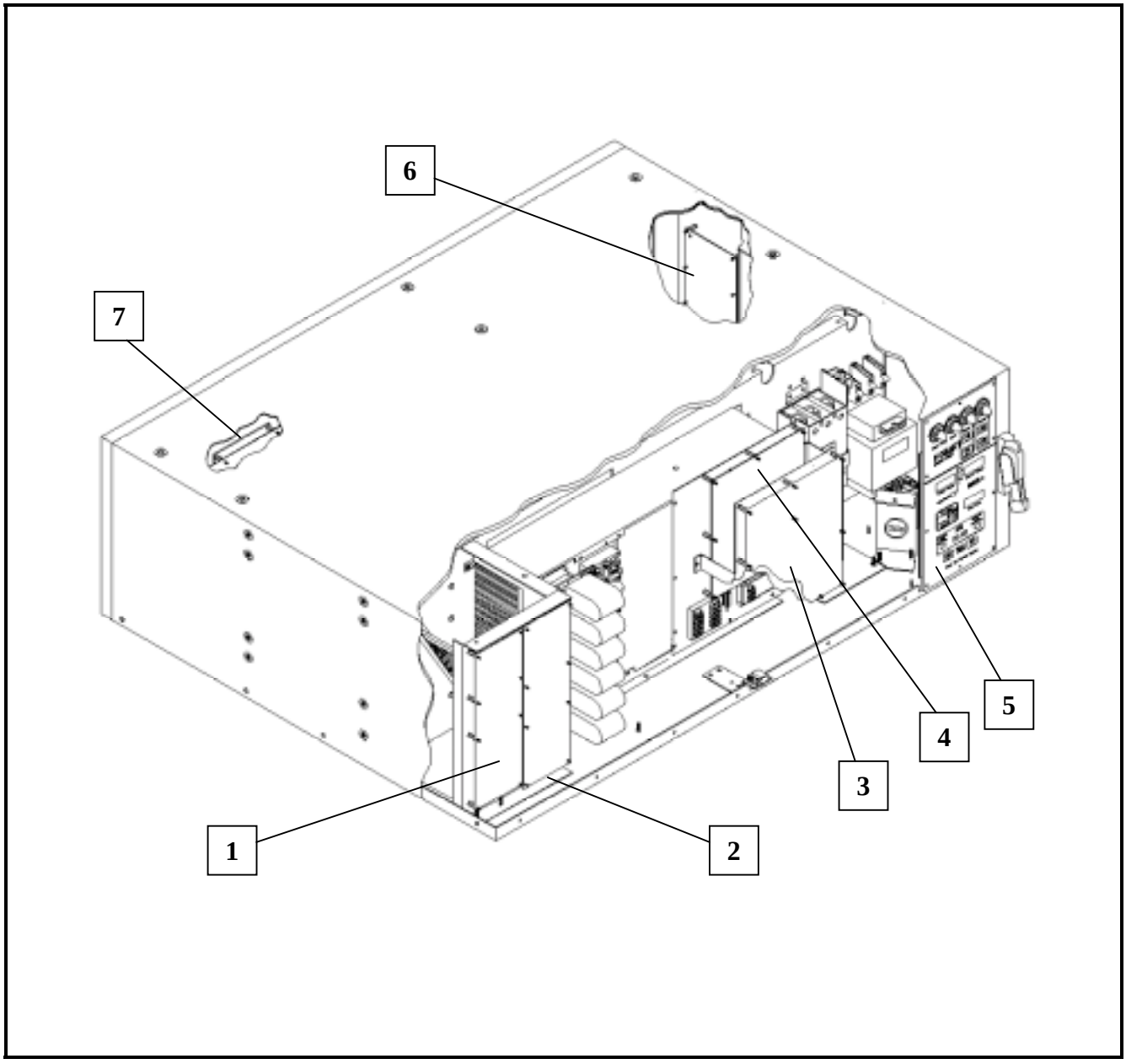
The modulator PC board generates the pulse-width-modulated switching patterns that produce the output voltage sine wave. It has circuitry to produce a stable output voltage, voltage ramp-up and ramp-down, soft start, no break power transfer NBPT, active transistor diagnostics, output voltage/output current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

(2) Driver PC Board A5

The Driver PC board translates the input drive signals from the modulator board into optically isolated drive signals 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 the 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.



1. Modulator PC Board A3
2. Driver PC Board A5
3. Signal Conditioning PC Board A6
4. Input Power Control PC Board A4
5. Control PC Board A2
6. Input/Output PC Board A1
7. Bus Discharge PC Board A7

PC Board Locations
Figure 10

(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, 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, and operator remote 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.

c) Components Inside Front Door (See Figure 11)

(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

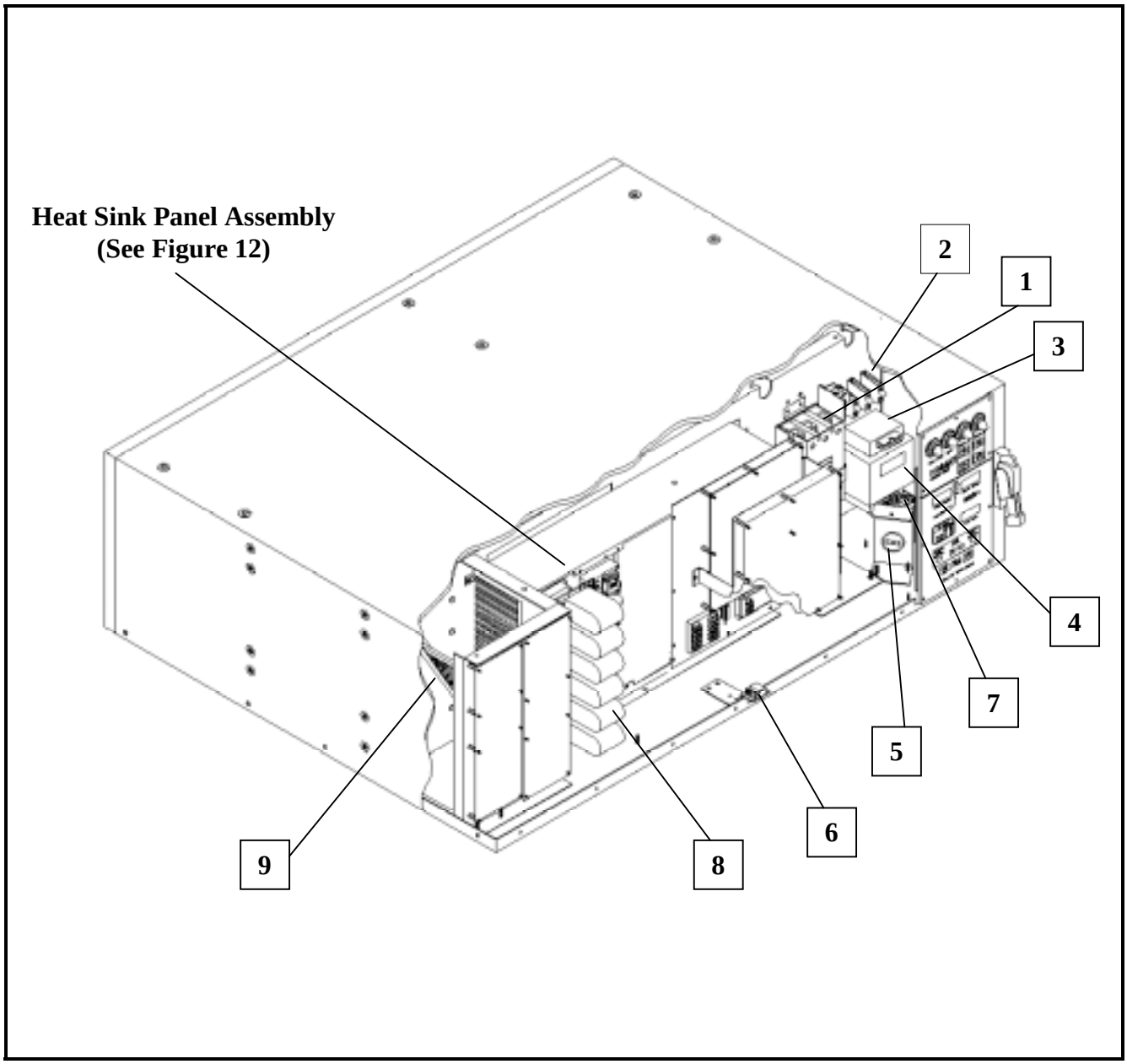
This fuse protects the control transformer secondary circuit. Its size and rating is FNQ 2A, 125-V.

(4) Input/Control Transformer

This transformer steps the input voltage down to 115-V AC for operation of the converter's 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.



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
9. Air Filter

Components Inside Front Door
Figure 11

(6) Door Interlock Switch S7

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

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

This capacitor enables the converter to withstand a 50 millisecond power interruption (micro break). The capacitor will discharge into the power supply circuitry to maintain power to the control system.

(8) DC Bus Capacitor Bank C1-C6

The DC capacitor bank, along with the input filter reactors and a number of other components, provide filtering of the rectified AC input voltage. The bank consists of six 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 and helps to maintain proper airflow.

CAUTION	To maintain a uniform air flow through the power module heat sink, the air filter MUST be in place at ALL TIMES during operation of the converter.

d) Heat Sink Panel Assembly Details (See Figure 12)

(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 suppressers RV4 - RV5

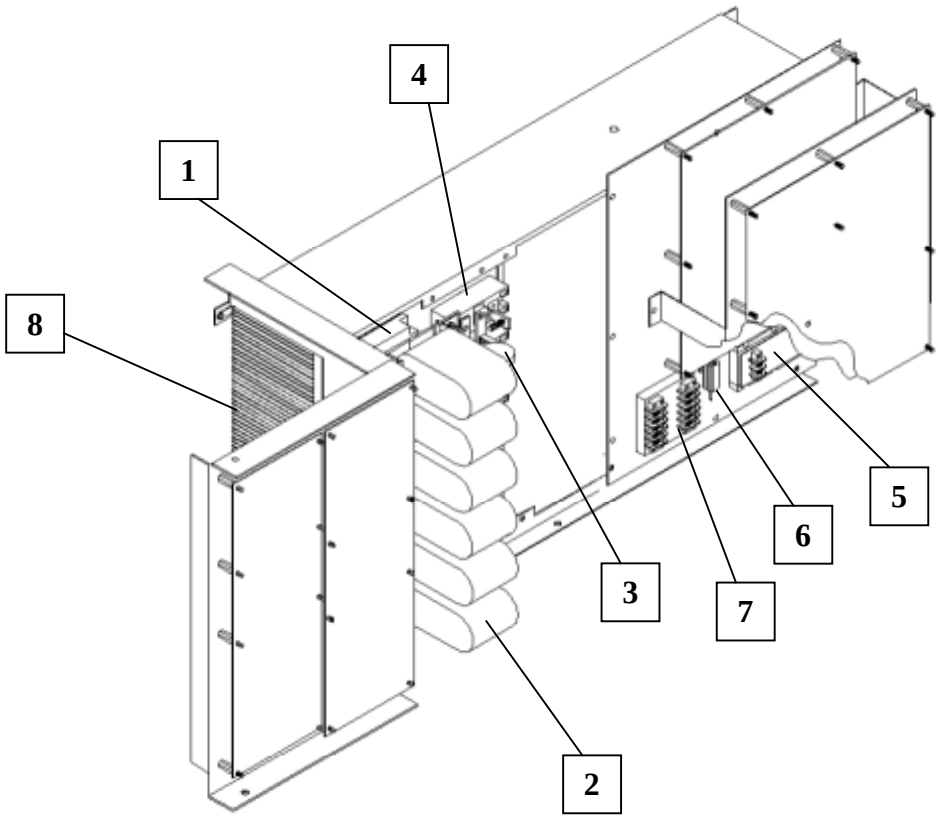
These suppressers are connected across the rectified input to protect the SCR-Diode Modules from voltage surges.

(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 PS1

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.



1. IGBT PM1 – PM6
2. Power Module Thermal Switch S4
3. Voltage Surge suppressers RV6 - RV7
4. SCR-Diode Modules SCR1 - SCR3 (or SCR6)
5. Input Step-down Power Supply PS1
6. Resistor, Power Supply Load R1
7. Control Logic Power Supply PS2
8. Heat Sink

Heat Sink Panel Assembly
Figure 12

(6) Power Supply Load Resistor R1

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

(7) Control Logic Power Supply PS2

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

(8) Heat Sink

The heat sink provides cooling for the power components on the heat sink panel assembly.

e) Components Inside Rear Door (See Figure 13)

(1) Output Contactor(s) K1 AND K2

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

(2) Output Current Sensing Transformers CT1- CT7

The cables, which conduct output power to each output contactor, 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. The Neutral Line Current Sensing Transformer CT4 (2, Figure 13) is used to detect excessive current through the neutral line, 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

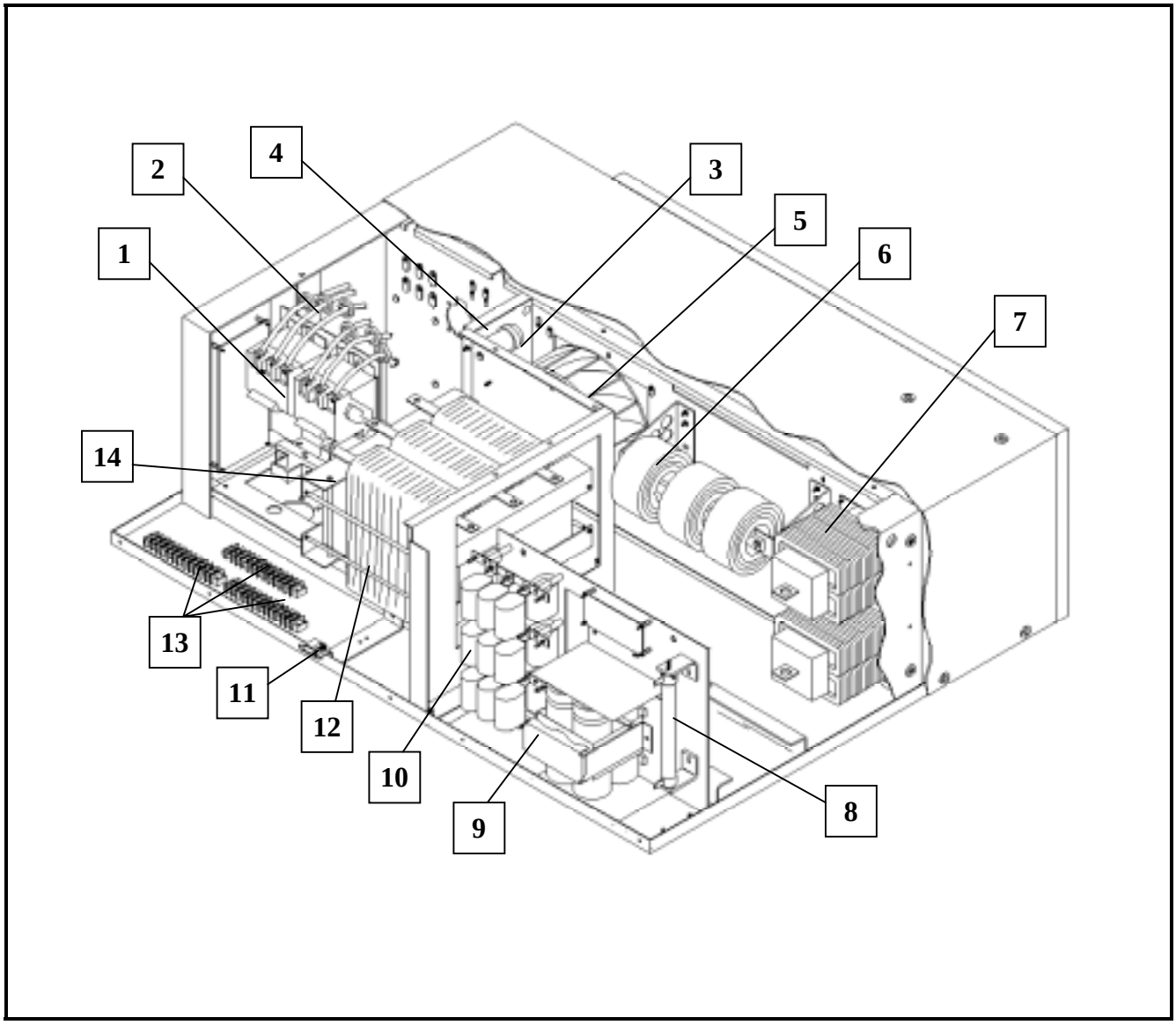
Provides a connection point for the cooling fan and the Fan Motor Start Capacitor (3, Figure 13) with power coming from the IPC PC Board

(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, than leaves through the louvers next to the output cables.

(6) Three Phase AC Filter Inductors L1 - L3

These inductors, in conjunction with the AC filter capacitors (10, Figure 13), act as a filter for the Pulse Width Modulated voltage produced by the inverter.



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 Charging Resistor R3
9. Electrolytic DC Capacitors C14 - C19
10. AC Filter Capacitor C22 - C33
11. Door Interlock Switch S2
12. Output/Main Transformer T2
13. 12 Station Terminal Strips TB1 - TB3
14. Terminal Strip TB5
15. Input Transformer [alternate voltage input units only] (Not Shown)

Components Inside Rear Door
Figure 13

(7) DC Filter Inductors L4 - L5

These inductors work with the electrolytic DC capacitors (9, Figure 13) to smooth the DC current leaving the SCR Modules.

(8) DC Bus Discharge Resistor R3

This resistor works in conjunction with the Bus Discharge PC Board, to completely drain the electrolytic DC capacitors (9, Figure 13) in less than 3 seconds. The instances that trigger this immediate discharge are:

a Opening either canopy door during POWER ON.
b Fault occurrences.
c Removal of converter input power.

(9) Electrolytic DC Capacitors C14 - C19

These capacitors work in conjunction with the DC filter inductors (7, Figure 13) to filter the DC voltage from the SCR Modules.

(10) AC Filter Capacitor C22 – C33

The AC capacitor bank and the 3-phase AC filter inductors (6, Figure 13) provide filtering of the pulse-width-modulated voltage provided by the inverter.

(11) Door Interlock Switch S2

The converter cannot be turned on unless both doors are closed securely, and will shut down immediately upon opening either door.

(12) Output/Main Transformer T2

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

(13) 12 Station Terminal Strips TB1 - TB3

These three terminal strips connect the ADV to the outside world, remote controls, bridge interlock circuitry, EF circuitry and other external connections are maintained here.

(14) Terminal Strip TB5

a Connection point for the transformer temperature sensor.
b Connects the unit identification resistor. There is a unique resistor for each converter configuration.

(15) Input Transformer (alternate voltage input units only)

Transforms nominal input voltage to the internal working voltage.

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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. Qualified persons shall do all installation wiring and machine reconnection.

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.

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.

kVA Rating	Input Voltage	Input Current	COPPER LINE WIRE SIZE	
			In Conduit (*)	In Flexible Cable (**)
45	208	120	# 1 AWG (50 mm^2)	# 2 AWG (35 mm^2)
45	230	108	# 1 AWG (50 mm^2)	# 3 AWG (35 mm^2)
60	208	155	# 2/0 AWG (70 mm^2)	# 1/0 AWG (70 mm^2)
60	230	140	# 2/0 AWG (70 mm^2)	# 1 AWG (50 mm^2)

* Values given in this chart assume that 90° C cables will be used, with typical wire sizing per chart 310-16 of the 1999 National Electric Code for insulation types such as **FEB, FEPH, RHH,** and **THHN**. Wire sizes should be verified by a qualified electrician and should conform to local electrical codes. This chart assumes operation at 50° C ambient temperature.

** Values given in this chart assume that 90° C cables will be used, with typical wire sizing per table 400-5(B) of the 1999 National Electric Code for insulation types such as **SC, SCE, SCT, PPE, G, G-GC,** and **W**. Wire sizes should be verified by a qualified electrician and should conform to local electrical codes. This chart assumes operation at 50° 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

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 2)

(1) Make sure electrical service is off.

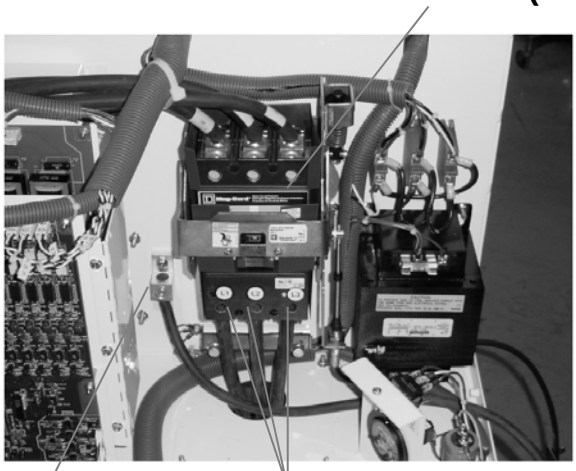
(2) Open the front door of the unit by turning all three latches counterclockwise with an 8 mm Allen wrench

(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.



Input Cable Connections
Figure 2

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

d) Check Converter No-Load Operation (See Figure 3)

A no-load check should be made before the output cables are connected to the converter. 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 (19). The INPUT POWER lamp will remain 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 the 28-V DC interlocks (EF signals) and the remote control lines.

NOTE: To determine the appropriate output cable size, consult your local electrical code. For most applications, an industry standard aircraft cable is recommended. Use No. 12 AWG for the interlock signal (E and F terminals). The output cable leads (A,B,C,N) should be equipped with terminals suited for a 3/8" diameter terminal stud. The 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. Pull enough of the cables through to allow working space.

(4) The output contactors can be seen inside the rear door on the far left. An identification label identifies each terminal stud on the contactor. A band-type marker should identify each cable. Connect cable lead “A” to terminal marked “A”, “B” to terminal “B”, and “C” to terminal “C” on the appropriate contactor (see Figure 5). 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.

(5) Three 12-station terminal strips (Figure 4) are 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.

(6) At the rear of the unit, connect the three remote control leads to the terminals for each corresponding output.

(7) 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.

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

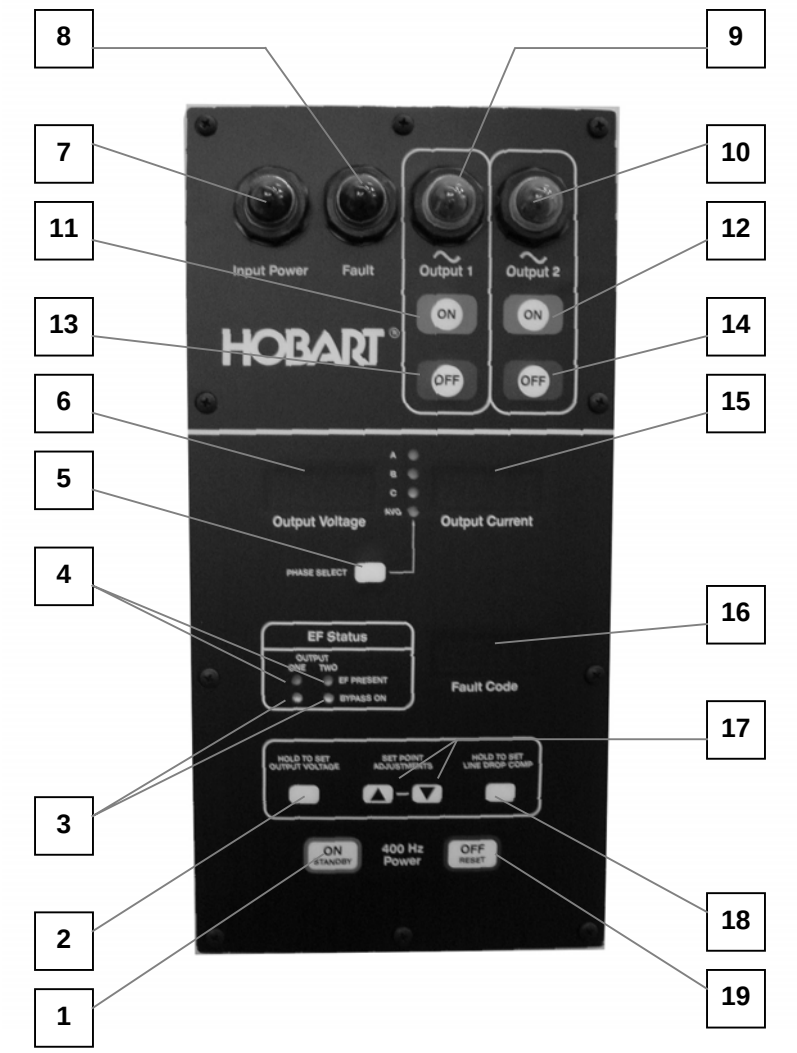
(9) The converter is now ready for service. See Section 1-3, Operation, for operating instructions.

5) Preparation for Storage

a) General

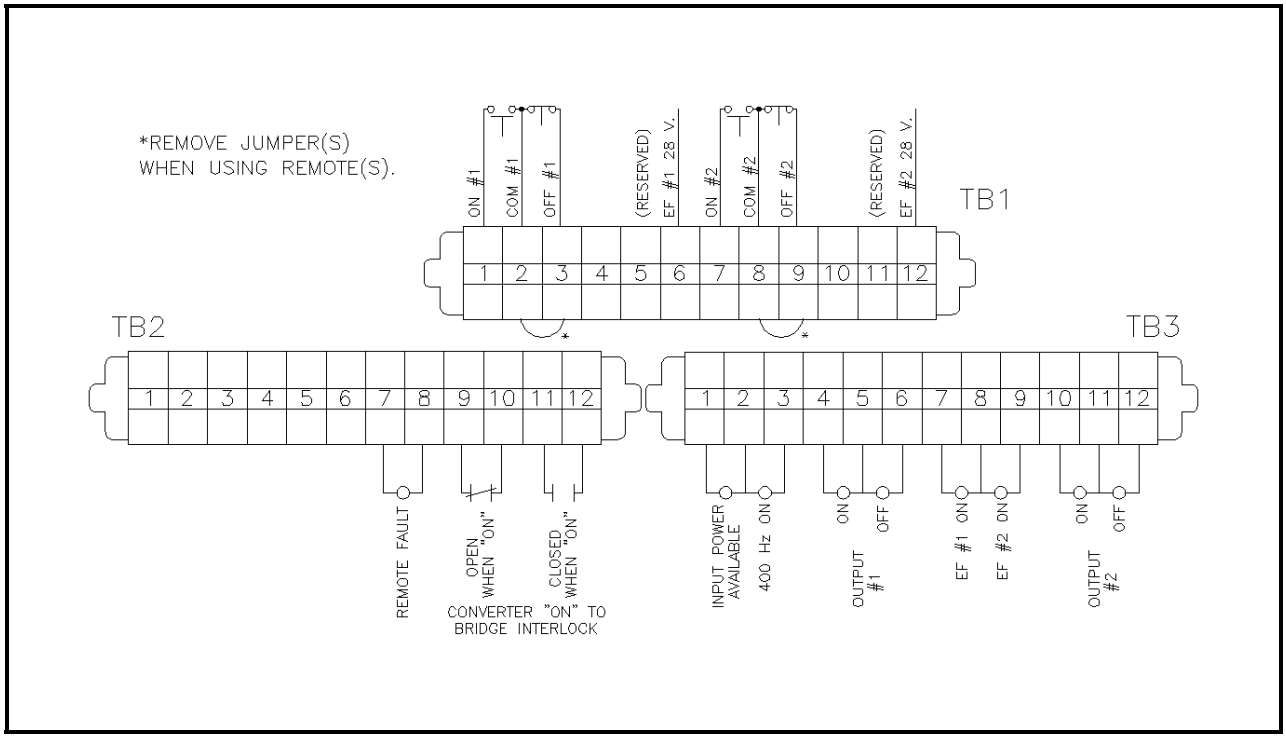
(1) The unit should be prepared for storage before installation or as soon as possible after being removed from service.

(2) The unit should be stored in a building which is dry and which may be heated during winter months.

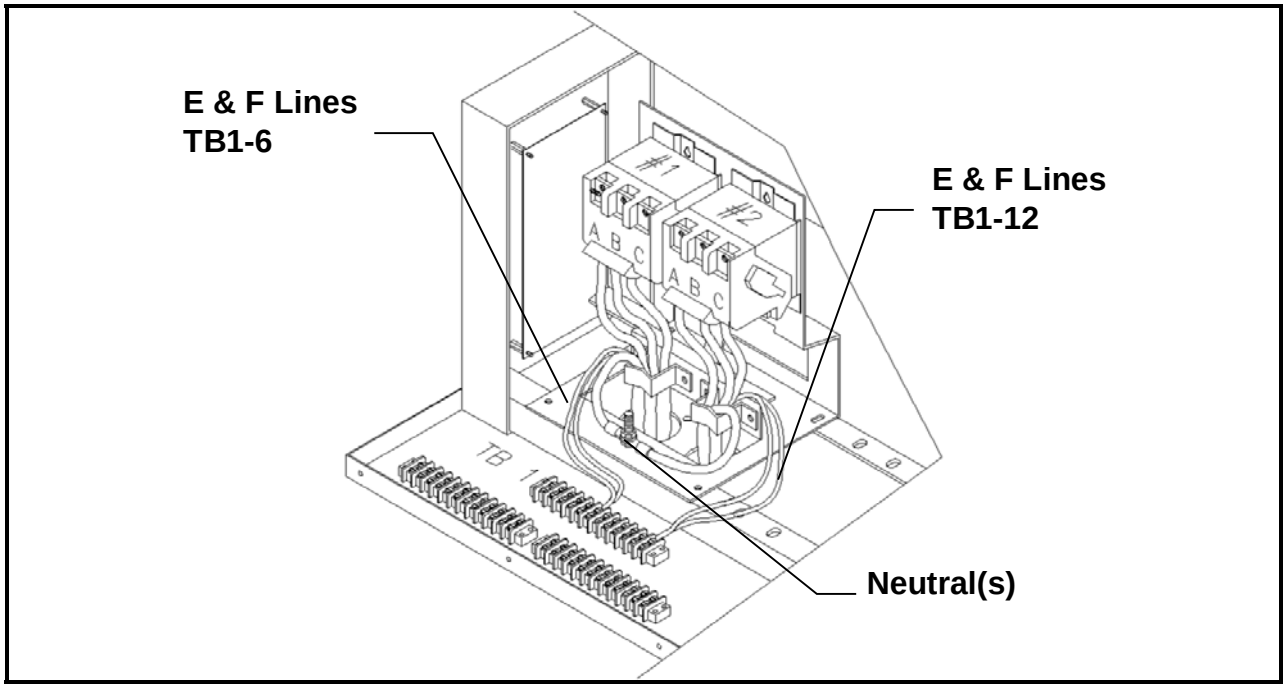


1. 400 Hz Power On Push Button
2. Output Voltage Adjustment Push Button
3. Bypass On Lamp
4. EF Present Lamp
5. Phase Select Push Button
6. Output Voltage Display
7. Input Power Lamp
8. Fault Lamp
9. Output 1 Lamp
10. Output 2 Lamp
11. Output 1 On Push Button
12. Output 2 On Push Button
13. Output 1 Off Push Button
14. Output 2 Off Push Button
15. Output Current Display
16. Fault Code Display
17. Set Point Up And Down Adjustment Push Buttons
18. Line Drop Compensation Adjustment Push Button
19. 400 Hz Power Off Push Button

Control Panel
Figure 3



EF Signal and Remote START/STOP Control Connections
Figure 4



Output Contactor(s) Connection
Figure 5

(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. The unit must be completely packaged and sealed if moisture absorbing chemicals are to be effective. Seal all openings. Use a waterproof, vapor proof material that is strong enough to resist puncture damage from air pressures.

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

c) Long Term 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, vibration, jolting, etc may loosen the converter's retaining hardware. Check this hardware periodically during the shipment to make certain that retaining hardware is secure.

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Section 3 Operation

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

1) General

This section contains 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 is in place (Hobart Brothers Replacement Part No. 283159-003). The air filter helps provide clean air for circulation and uniform airflow through the power module heat sink. With a missing air filter, the air will flow through unevenly through the heat sink causing the power modules to cool improperly. **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 output voltage can be checked without power delivery to an aircraft.

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

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

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

(3) 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.

(4) Press the 400 Hz POWER ON push button (11) to turn converter on without power delivery. 400 Hz power is now present within the machine. To turn the converter off, simply press the 400 Hz POWER OFF push button (19).

(5) The output 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 (17) 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.

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.

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

(2) 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.

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

If the output cable from the converter is connected properly to an aircraft, a EF DC interlock signal (EF signal) will be sent back to the converter to allow the converter to operate as normal.

d) Line Drop Compensation Setting

Line drop compensation must be set the first time the converter is operated. Line drop compensation allows the converter to automatically compensate for the voltage drop caused by the resistance of long output cables.

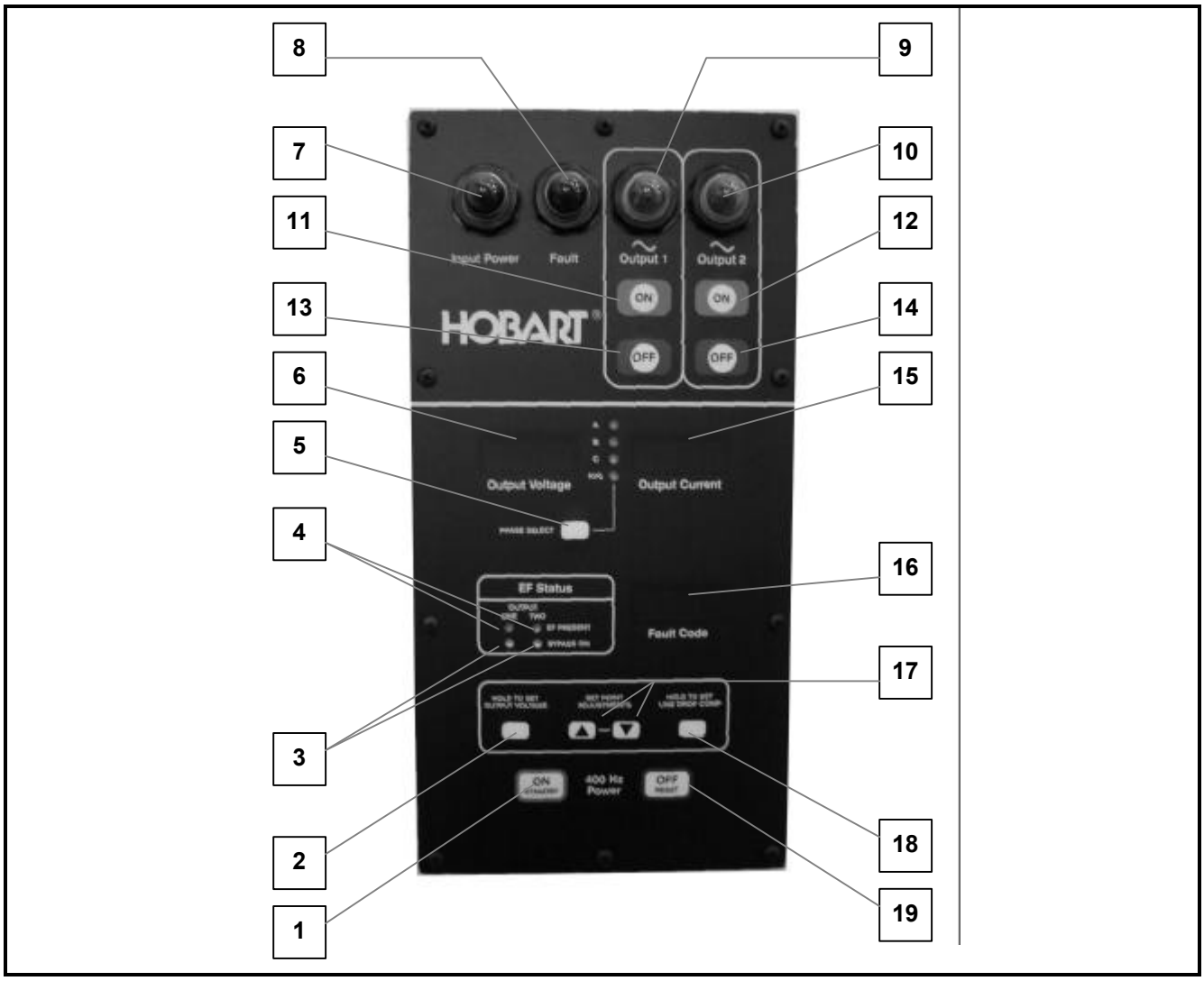
When operating under no-load, the line drop compensation will be zero therefore the output voltage display (6) will read 115 volts (factory setting).

When operating the converter under a load, with line drop compensation present, the output voltage display (6) will display the voltage at the output contactor. The value displayed will read higher than the no-load value because it is adding extra voltage to compensate for power lost through the output cables.

To check the line drop compensation percentage value, simply press the line drop compensation push button (18). The value given, which appears in the Fault Code display (16), will be the percentage of voltage over the normal 115 volts the converter is adding to the output contactors. From the contactors, the voltage gradually decreases through resistance over the length of the 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, the value will remain the same for all 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 line drop compensation value should be changed, perform the following steps:



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. Fault Code Display
17. Set Point Up And Down Adjustment Push Buttons
18. Line Drop Compensation Adjustment Push Button
19. 400 Hz Power Off Push Button

Control Panel
Figure 1

(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 through the No. 1 output 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 (18) while simultaneously depressing the set point up or down adjustment push buttons (17) on the control panel to change the line drop compensation value. Have the assistant report when the measured value matches the desired value.

(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.

b To check the line drop compensation for a multi-output converter, press the line drop compensation adjustment push button (18).

e) Phase Select

Press the phase select push button (5) to display the output voltage and current values of phase A, B, or C or to check 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

To discontinue power from either output, press the corresponding OUTPUT 1 OFF (13) and/or OUTPUT 2 OFF (14) push button(s). The corresponding lamp, Output 1 lamp (9) and Output 2 lamp (10), will no longer glow.

WARNING

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

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 cables are in use and if both the cables are accidentally disconnected from the aircraft, 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 the connected 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

(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 (19), or press all remote control STOP push buttons on each remote connected to the converter. The amber output power lamp(s), (9) and (10), will shut off when no power is being delivered through any of the corresponding outputs.

WARNING

Never disconnect an output cable while output power is on.

(2) Be sure 400 Hz power is not being delivered through output cables.

(3) Disconnect the output power delivery cable(s) from the aircraft.

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. If desired, shut off power at the input power source and the green input power lamp (7) will shut off.

j) EF Bypass switches

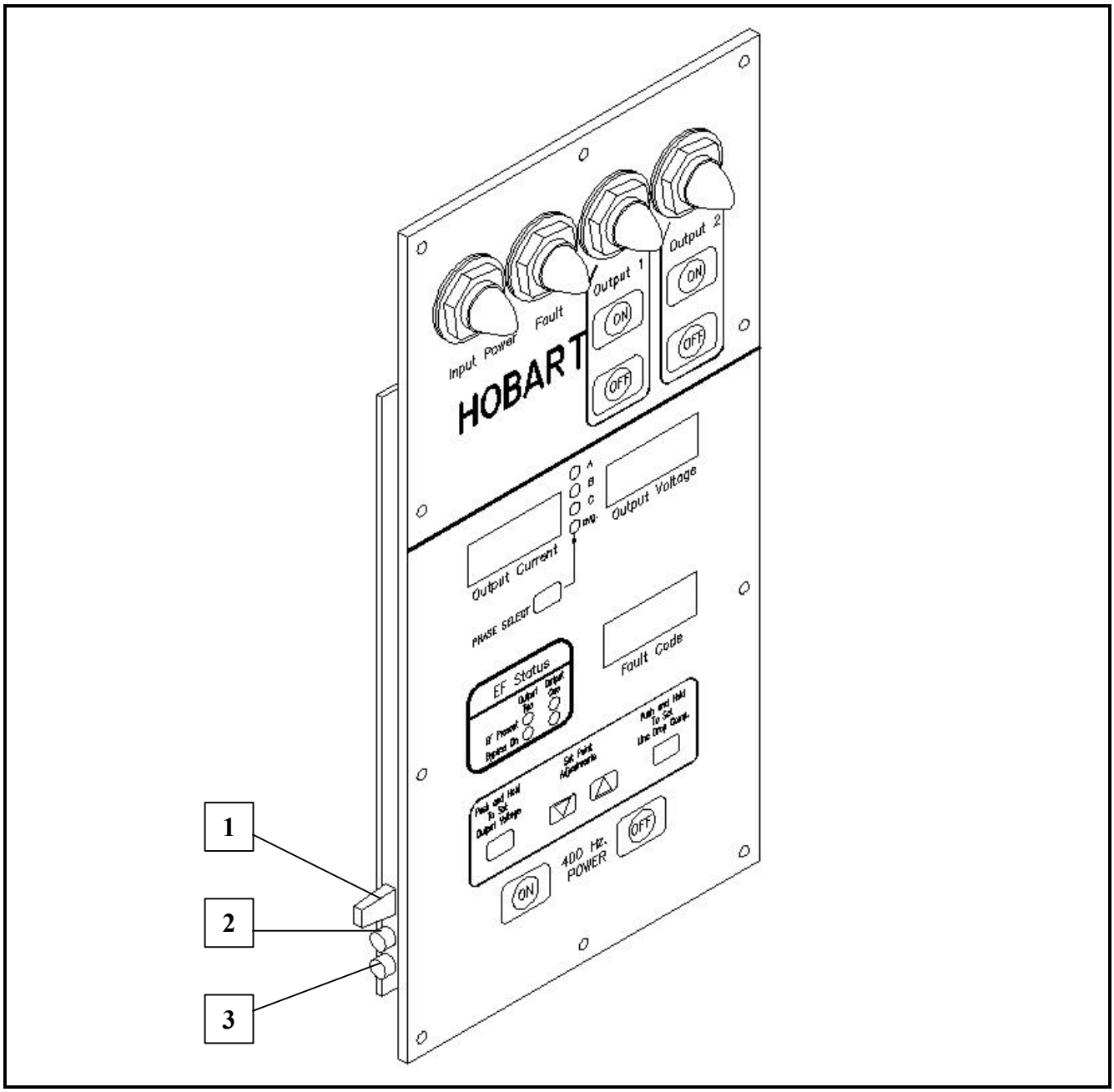
WARNING

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.



1. Key Pad Disable Switch
2. #1 EF Bypass Push Button
3. #2 EF Bypass Push Button

Control Panel
Figure 2

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 (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.

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.

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

(2) Reach inside and depress either of the two bypass/normal push button switches to change the setting for that output.

(3) Close and latch the front door.

k) Keypad Disable switch

Once the operator sets the output voltage and line drop compensation values for the ADV, it is possible to lock both values to restrict change by the operator from 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 toggled, the output voltage adjustment push button (2, Figure 1) and line drop compensation adjustment push button (18, Figure 1) on the control panel will be disabled.

If this switch is pointed back 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 back towards the Control PC Board to activate the switch and 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 Brother Company Ground Power Division Service Department 1177 Trade Square East Troy, Ohio 45373 U.S.A.
Call Inside U.S.A.:	(800) 422-4166 (Parts) (800) 422-4177 (Service)
Call From Foreign Countries:	(937) 332-5050 (Parts) (937) 332-5060 (Service)
FAX Inside U.S.A.	(800) 367-4945
FAX From Foreign Countries:	(937) 332-5121
E-Mail :	service@hobartgroundpower.com
Web Page :	www.hobartgroundpower.com

2) ADV Control Monitoring

The Hobart PoWerMaster ADV 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 ADV 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. The converter will continue to operate normally and will display the warning in the Fault Code Display (See Figure 1).

When delivering AC power, an EF Bypass warning may occur when an output cable is removed from an aircraft before that output is turned off. EF Bypass 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 (16, Section 2-2, Figure 2) and the FAULT LAMP (8, Section 2-2, Figure 2) will illuminate to alert the operator that something has gone wrong during operation. Faults are also stored in memory as event records. The fault limits and conditions are preset at the factory.

c) Fault Codes (See Figure 1)

The numbers that appear in the FAULT CODE display 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

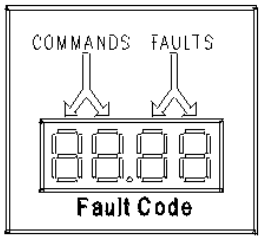
The ongoing operations conducted by the ADV are driven by the list of commands in figure 1. The control PC board communicates these commands to all of the PC boards in the converter. The first half of the fault code identifies the command that was present when the fault occurred, as well as the PC board,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

Fault Code Quick Reference Chart V2.02

COMMANDS		FAULTS
INVALID COMMAND	00 , 00	INVALID FAULT
ADV SELF TEST	01 , 07	IPC REAR DOOR SWITCH TRIP FAULT
CTL LAMP TEST	02 , 08	IPC FRONT DOOR SWITCH TRIP FAULT
IPC STATUS CHECK	04 , 09	IPC POS 5VDC FAULT
SCB STATUS CHECK	05 , 10	IPC POS 12VDC FAULT
MOD STATUS CHECK	06 , 11	IPC NEG 12VDC FAULT
IOB STATUS CHECK	07 , 12	IPC SELF TEST FAULT
CTL STATUS CHECK	08 , 13	IPC DISCHARGE BOARD FAULT
TRB STATUS CHECK	09 , 14	IPC DISCHARGE FAULT
IPC INPUT VOLTAGE TEST	11 , 15	IPC 12 PULSE OVERHEAT FAULT
IPC SYSTEM POWER SUPPLY TEST	12 , 16	IPC SCR FAULT
IOB AUX POWER SUPPLY TEST	13 , 17	IPC BUS VOLTAGE LOW FAULT
TRB POWER SUPPLY TEST	14 , 18	IPC BUS VOLTAGE HIGH FAULT
CTL ID CHECK	15 , 19	IPC INPUT VOLTAGE TOO HIGH FAULT
IPC ID CHECK	16 , 20	IPC INPUT VOLTAGE TOO LOW FAULT
IOB CONTACTOR CHECK	17 , 21	IPC INPUT PHASE LOSS FAULT
CTL MEMBRANE CHECK	18 , 23	IPC COMM FAULT
TRB ID CHECK	19 , 27	SCB SELF TEST FAULT
TRB CONTACTOR TEST	20 , 28	SCB OUTPUT OVER FREQ FAULT
CTL REPORT CONFIG	22 , 29	SCB OUTPUT UNDER FREQ FAULT
CTL INPUT CONTACTOR TEST	23 , 30	SCB COMM FAULT
IOB PENDENT CHECK	26 , 34	MOD DRIVER BOARD 2 FAULT
IPC TEST DOOR SWITCHES	27 , 35	MOD SELF TEST FAULT
IPC 12 PULSE OVERHEAT TEST	28 , 36	MOD NBPT CURRENT TRIP FAULT
MOD OVERHEAT TEST	30 , 37	MOD VBUS OVER VOLTAGE FAULT
TRB OVERHEAT TEST	31 , 38	MOD DRIVER BOARD FAULT
IPC BUS DISCHARGE PCB TEST	32 , 39	MOD IGBT PAIR A FAULT
IPC DISCHARGE BUS	33 , 40	MOD IGBT PAIR A2 FAULT
IPC BUS VOLTAGE TEST	34 , 41	MOD IGBT PAIR B FAULT
MOD DRIVER TEST	41 , 42	MOD IGBT PAIR B2 FAULT
MOD IGBT A PAIR TEST	42 , 43	MOD IGBT PAIR C FAULT
MOD IGBT B PAIR TEST	43 , 44	MOD IGBT PAIR C2 FAULT
MOD IGBT C PAIR TEST	44 , 47	MOD HEATSINK OVERTEMP FAULT
ADV STANDBY	52 , 48	MOD TRANSFORMER OVERTEMP FAULT
ADV RAMP UP	54 , 49	MOD NBPT FAULT
IPC RAMP TO MINUMUM	59 , 50	MOD COMM FAULT
IPC RAMP TO 25 PERCENT	61 , 51	MOD VCESAT FAULT
IPC RAMP TO 50 PERCENT	63 , 52	TRB HEATSINK OVERTEMP FAULT
IPC RAMP TO FULL OUTPUT	67 , 53	TRB TRANSFORMER OVERTEMP FAULT
MOD RAMP TO FULL OUTPUT	79 , 54	TRB POS 5VDC FAULT
SCB TEST OUTPUT FREQUENCY	82 , 55	TRB POS 12VDC FAULT
TRB REGULATE DC	83 , 56	TRB NEG 12VDC FAULT
CTL TEST OUTPUT	85 , 58	CTL TRANSFORMER ID FAULT
ADV 400HZ ON	87 , 59	CTL INPUT CONTACTOR FAULT
ADV DC ON	88 , 60	CTL OUTPUT OVER VOLTAGE FAULT
ADV DC RAMP DOWN	89 , 61	CTL OUTPUT UNDER VOLTAGE FAULT
ADV RAMP DOWN	91 , 62	CTL OUTPUT 1 OVERLOAD FAULT
ADV SHUTDOWN	93 , 65	CTL OUTPUT 2 OVERLOAD FAULT
ADV FAULT SHUTDOWN	99 , 67	CTL SELF TEST FAULT
	, 68	CTL MACHINE OVERLOAD FAULT
	, 69	CTL DC OVER VOLTAGE FAULT
	, 70	CTL DC UNDER VOLTAGE FAULT
	, 72	CTL OUTPUT VOLTAGE IMBALANCE FAULT
	, 73	CTL MEMORY FAULT
	, 74	CTL UNBALANCED LOAD FAULT
	, 75	CTL MEMBRANE FAULT
	, 76	TRB SELF TEST FAULT
	, 77	TRB COMM FAULT
	, 78	TRB DC CONTACTOR 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
	, 85	IOB SELF TEST 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
	, 95	TRB ID FAULT
	, 96	TRB OUTPUT OVER VOLTAGE FAULT
	, 97	TRB OUTPUT UNDER VOLTAGE FAULT
	, 98	TRB OUTPUT OVERLOAD FAULT
	, 99	ADV COMM FAULT



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

See Operation and Maintenance Manual for detailed troubleshooting procedures.

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.

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 400 Hz 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.

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) Operation Monitoring

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

During 400 Hz AC operation, the converter continually performs ADV Command “87” (ADV 400Hz ON). When a fault is detected during AC 400Hz operation, this **Command** and the detected **Fault** are indicated in the FAULT CODE display.

During 28.5 VDC operation (if supplied), the converter continually performs ADV Command “88” (ADV DC ON). When a fault is detected during DC operation, this **Command** and the detected **Fault** are indicated in the FAULT CODE display.

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 on the following pages in this section.

h) Troubleshooting examples:

(1) Example 1:

The converter is operating and delivering AC 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 numeral “.08” on the right of the fault code display indicates that the IPC PC board detected a front door switch trip during operation.

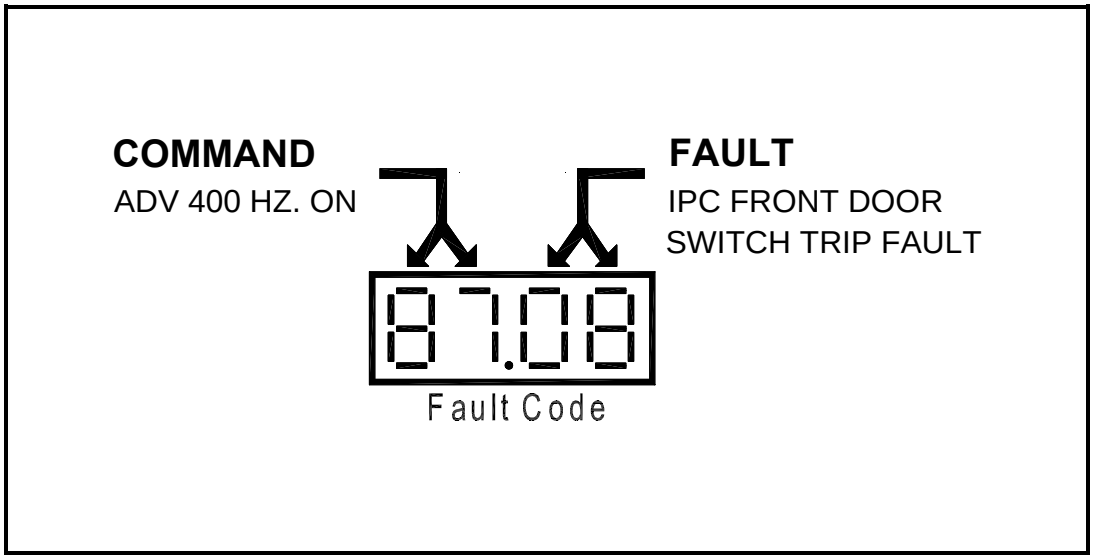


Figure 2

(2) Example 2:

Now with the door still open, the fault is reset by pressing the OFF/RESET push 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 converter 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 pendants, etc., are functioning properly.

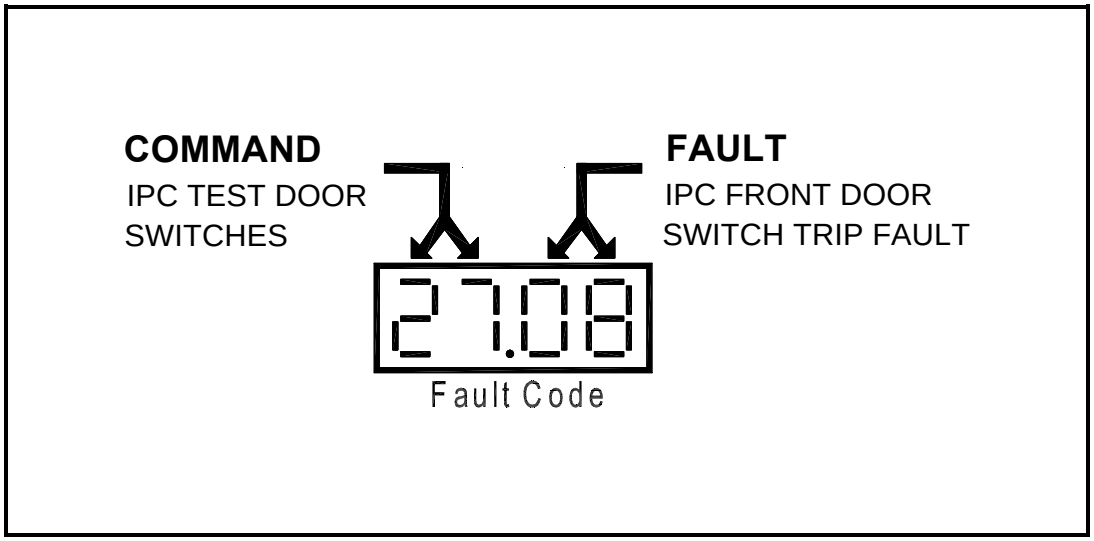


Figure 3

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

Latch the door properly and press the 400 Hz. OFF/RESET push button. 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.

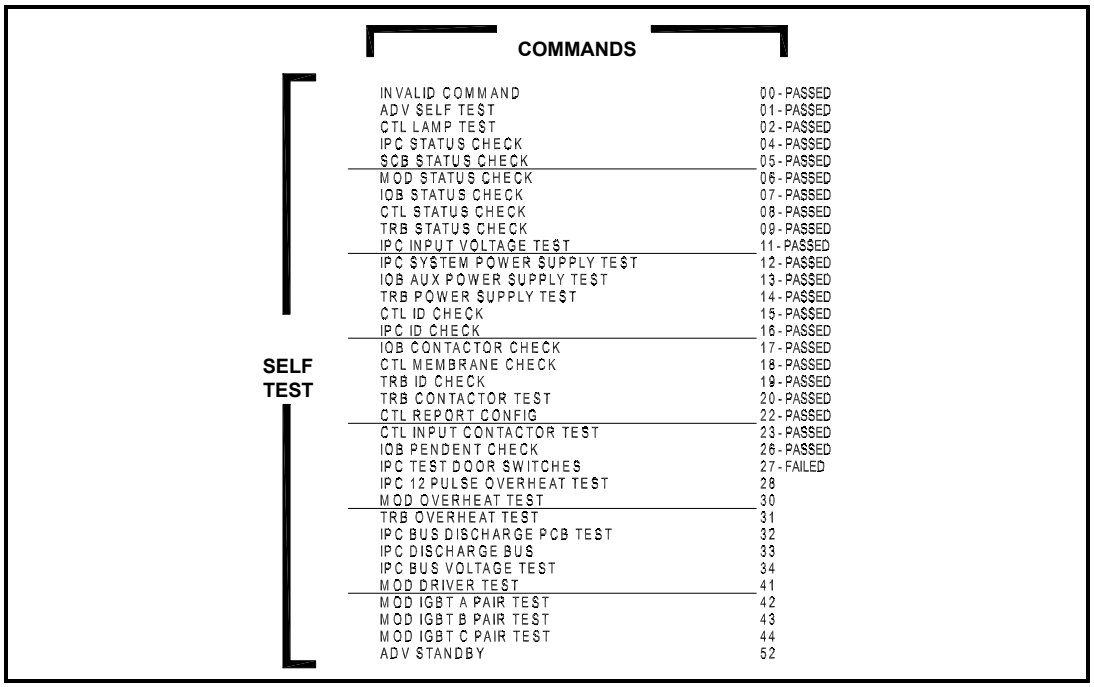


Figure 4

Troubleshooting Table ADV Commands		
Fault code	**Name**	**Description**
00. _ _	Invalid Command	
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. _ _	TRB STATUS CHECK	TRB check PC board status.
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 auxiliary power supply within limits.
14. _ _	TRB POWER SUPPLY TEST	TRB test PC board power supply within limits.
15. _ _	CTL ID CHECK	CTL detect main transformer rating.
16. _ _	IPC ID CHECK	IPC detect 12 pulse transformer rating.
17. _ _	IOB CONTACTOR CHECK	IOB detect contactors.
18. _ _	CTL MEMBRANE CHECK	CTL check front switch panel for shorts.
19. _ _	TRB ID CHECK	TRB detect DC option presence.
20. _ _	TRB CONTACTOR CHECK	TRB check for contactor open.
21. _ _		
22. _ _	CTL REPORT CONFIG.	CTL display kVA rating and number of contactors.
23. _ _	CTL INPUT CONTACTOR TEST	CTL check for DC option input contactor open.
24. _ _		
25. _ _		
26. _ _	IOB PENDENT CHECK	IOB check for stuck pendent button.
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. _ _		
30. _ _	MOD OVERHEAT TEST	MOD test heat sink and main transformer for overheat.

Troubleshooting Table

ADV Commands

Fault code	Name	Description
31. _ _	TRB OVERHEAT TEST	TRB test T/R heat sink and transformer for overheat.
32. _ _	IPC BUS DISCHARGE PCB TEST	IPC test bus discharge 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. _ _		
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. _ _		
54. _ _	ADV RAMP UP	All boards go to ramp up mode
55. _ _		
56. _ _		
57. _ _		
58. _ _		
59. _ _	IPC RAMP TO MINIMUM	IPC ramp SCR duty cycle to minimum bus voltage.
60. _ _		
61. _ _	IPC RAMP TO 25%	IPC ramp SCR duty cycle to 25% duty cycle.

Troubleshooting Table ADV Commands		
Fault code	**Name**	**Description**
62. _ _		
63. _ _	IPC RAMP TO 50%	IPC ramp SCR duty cycle to 50% 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 400 Hz. voltage to full.
80. _ _		
81. _ _		
82. _ _	SCB TEST OUTPUT FREQUENCY	SCB test 400 Hz. frequency within limits.
83. _ _	TRB REGULATE DC	TRB regulate DC, if DC option activated.
84. _ _		
85. _ _	CTL TEST OUTPUT	CTL test 400 Hz. voltage within limits.
86. _ _		
87. _ _	ADV 400 HZ. ON	All boards go to 400 Hz. on mode.
88. _ _	ADV DC ON	All boards go to DC ON mode, if DC activated.
89. _ _	ADV DC RAMP DOWN	All boards ramp down from DC operation.
90. _ _		
91. _ _	ADV RAMP DOWN	All boards ramp down from AC operation.
92. _ _		

Troubleshooting Table ADV Commands		
Fault code	**Name**	**Description**
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	Invalid Fault		
_ _.01			
_ _.02			
_ _.03			
_ _.04			
_ _.05			
_ _.06			
_ _.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 5 VDC FAULT	Power supply PS2 is defective.	Replace PS2.
_ _.10	IPC POS 12 VDC FAULT	Power supply PS1 is defective.	Replace PS1.
_ _.11	IPC NEG 12 VDC FAULT	Power supply PS2 is defective.	Replace PS2.
_ _.12	IPC SELF TEST FAULT	IPC board failed self-test.	Replace IPC board.
_ _.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 transfers (NBPT).	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	Communications 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	Communications fault on signal conditioning board.	Replace signal conditioning board A6.
_ _.31			
_ _.32			
_ _.33			
_ _.34	MOD DRIVER BOARD 2 FAULT	Defective driver board.	Replace driver board A10.
_ _.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 VOLTAGE FAULT	Faulty no break power transfer.	Reset and restart converter.
_ _.38	MOD DRIVER BOARD FAULT	Defective driver board.	Replace drive board A5.
_ _.39	MOD IGBT A FAULT	Phase A IGBT defective.	Replace PM1 & PM2
_ _.40	MOD IGBT A2 FAULT	Phase A2 IGBT defective.	Replace PM7 & PM8
_ _.41	MOD IGBT B FAULT	Phase B IGBT defective.	Replace PM3 & PM4
_ _.42	MOD IGBT B2 FAULT	Phase B2 IGBT defective.	Replace PM9 & PM10
_ _.43	MOD IGBT C FAULT	Phase C IGBT defective.	Replace PM5 & PM6
_ _.44	MOD IGBT C2 FAULT	Phase C2 IGBT defective.	Replace PM11 & PM12
_ _.45			
_ _.46			

Troubleshooting Table

Faults

Fault code	Name	Possible Cause(s)	Corrective Action
_ _.47	MOD HEATSINK OVETEMP FAULT	Filter clogged Fan inoperable Defective thermal switch	Clean or replace filter. Check fan. Replace switch S4.
_ _.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	Communications 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	TRB HEAT SINK OVERTEMP FAULT	Filter clogged Fan inoperable Defective thermal switch	Clean or replace filter. Check fan. Replace switch S10.
_ _.53	TRB TRANSFORMER OVERTEMP FAULT	Filter clogged Fan inoperable Defective thermal switch	Clean or replace filter. Check fan. Replace switch S11.
_ _.54	TRB POS 5 VDC FAULT	T/R PCB is defective.	Replace T/R PC board A8
_ _.55	TRB POS 12 VDC FAULT	T/R PCB is defective.	Replace T/R PC board A8
_ _.56	TRB NEG 12 VDC FAULT	T/R PCB is defective.	Replace T/R PC board A8
_ _.57			
_ _.58	CTL TRANSFORMER ID FAULT	Transformer ID resistor is missing, open, or incorrect value.	Replace resistor R4
_ _.59	CTL RS232 FAULT	RS232 Communications Fault	Replace control board A2.
_ _.60	CTL OUTPUT OVER VOLTAGE FAULT	Voltage set too high. Line drop comp. set too high. Signal conditioning board defective. Modulator board defective.	Reset and restart converter. Reset and restart converter. Replace signal conditioning board A6. Replace modulator board A3.
_ _.61	CTL OUTPUT UNDER VOLTAGE FAULT	Voltage set too low. Signal conditioning board defective. Modulator board defective.	Reset and restart converter. Replace signal conditioning board A6. Replace modulator board A3.
_ _.62	CTL OUTPUT 1 OVERLOAD FAULT	Overload on Output 1	Reset and restart converter.

Troubleshooting Table

Faults

Fault code	Name	Possible Cause(s)	Corrective Action
_ _.63			
_ _.64			
_ _.65	CTL OUTPUT 2 OVERLOAD FAULT.	Overload on Output 2	Reset and restart converter.
_ _.66			
_ _.67	CTL SELF TEST FAULT	Control board defective.	Replace control board A2.
_ _.68	CTL MACHINE OVERLOAD FAULT	Load over rating of converter.	Reset and restart converter.
_ _.69	CTL DC OVERVOLTAGE FAULT	Voltage set too high. Control board defective.	Reset and restart converter. Replace control board A2.
_ _.70	CTL DC UNDERVOLTAGE FAULT.	Voltage set too low. Control board defective.	Reset and restart converter. Replace control board A2.
_ _.71			
_ _.72	CTL OUTPUT VOLTAGE IMBALANCE FAULT	Load is unbalanced. Modulator board is defective. Signal conditioning board is defective.	Reset and restart converter. Replace modulator board A3. Replace signal conditioning board A6.
_ _.73	CTL MEMORY FAULT	Control board is defective.	Replace control board A2.
_ _.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	TRB SELF TEST FAULT	T/R board defective	Replace T/R board A8.
_ _.77	TRB COMM FAULT	Communications fault on T/R board.	Replace T/R board A8.
_ _.78	TRB DC CONTACTOR FAULT	DC contactor stuck.	Replace DC contactor.
_ _.79	IOB SELF TEST FAULT	I/O board failed self test.	Replace I/O board A1.
_ _.80	IOB 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 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 is too low. Output cable is defective.	Reset and restart converter. Check output cable.

Troubleshooting Table

Faults

Fault code	Name	Possible Cause(s)	Corrective Action
_ _.83	IOB EF 2 VOLTAGE TOO HIGH FAULT.	EF voltage being sent from aircraft on output 2 to the converter on TB1-6 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 TB1-6 is too low. Output cable is defective.	Reset and restart converter. Check output cable.
_ _.85	IOB SELF TEST FAULT	I/O board defective.	Replace I/O board A1.
_ _.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 and replace remote pushbuttons.
_ _.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 and replace remote pushbuttons.
_ _.91	IOB CONTACTOR SENSE FAULT	Contactor coil open.	Replace contactor.
_ _.92	IOB COMM FAULT	Communications 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 contactor K1.
_ _.94	IOB CONTACTOR 2 CONTACTS STUCK FAULT	Contactor on output 2 stuck closed.	Replace output contactor K2.
_ _.95	TRB ID FAULT	Transformer ID resistor is missing, open, or incorrect value.	Replace resistor R56.
_ _.96	TRB OUTPUT OVERVOLTAGE FAULT.	Voltage set too high. T/R board defective.	Reset and restart converter. Replace T/R board A8
_ _.97	TRB OUTPUT UNDERVOLTAGE FAULT.	Voltage set too low. T/R board defective.	Reset and restart converter. Replace T/R board A8
_ _.98	TRB OUTPUT OVERLOAD FAULT	DC load over rating of converter.	Reset and restart converter.
_ _.99	ADV COMM FAULT	Converter communications fault.	Replace control board A2.

AC 400 Hz Converter Protective Output Faults	
AC Over Voltage	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
AC 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.
AC 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.
AC 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.
AC Overloads	Trips in approximately 10 minutes at 125% load of converter rating. Trips in approximately 30 seconds at 150% load of converter rating. Trips in approximately 10 seconds at 200% load of converter rating.

Fault Limits
Figure 5

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 can not 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.

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 400 Hz. OFF/RESET (1, Section 2-2, Figure 2) push 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.

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 are 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 (Section 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.

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 ohms 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.

a) 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 400 Hz. OFF/RESET button to reset the converter.

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

c) Neutral Line Current Fault

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 may cause a neutral line current fault. 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 400 Hz. OFF/RESET 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 ADV 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.

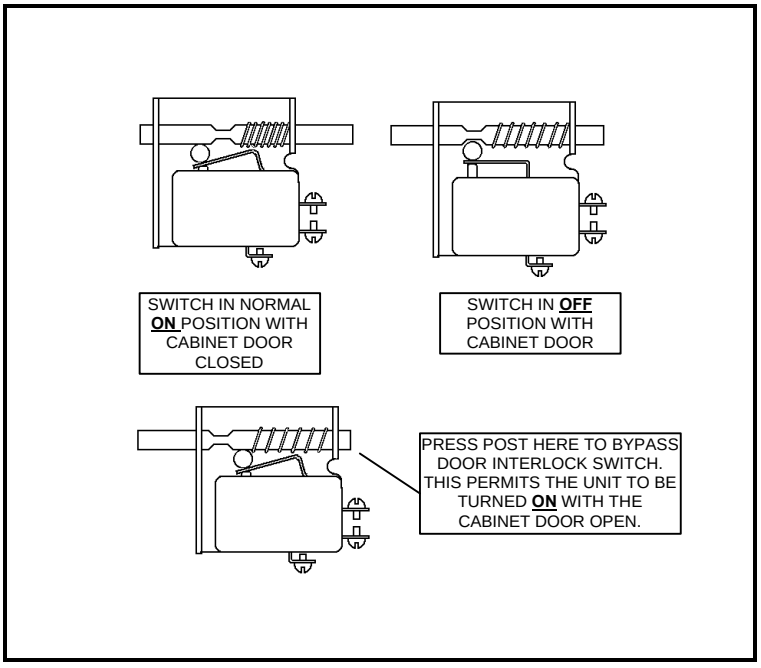
1) Test Preparation

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 (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 8 mm Allen wrench.

d) Pull the end of the white post next to the (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.

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

WARNING

Do not perform any work inside the converter when input power is applied.

f) Use output cable of proper size and length for the converter's power output rating. Connect output cable plug connector to aircraft receptacle or load bank. 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

The ADV 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.

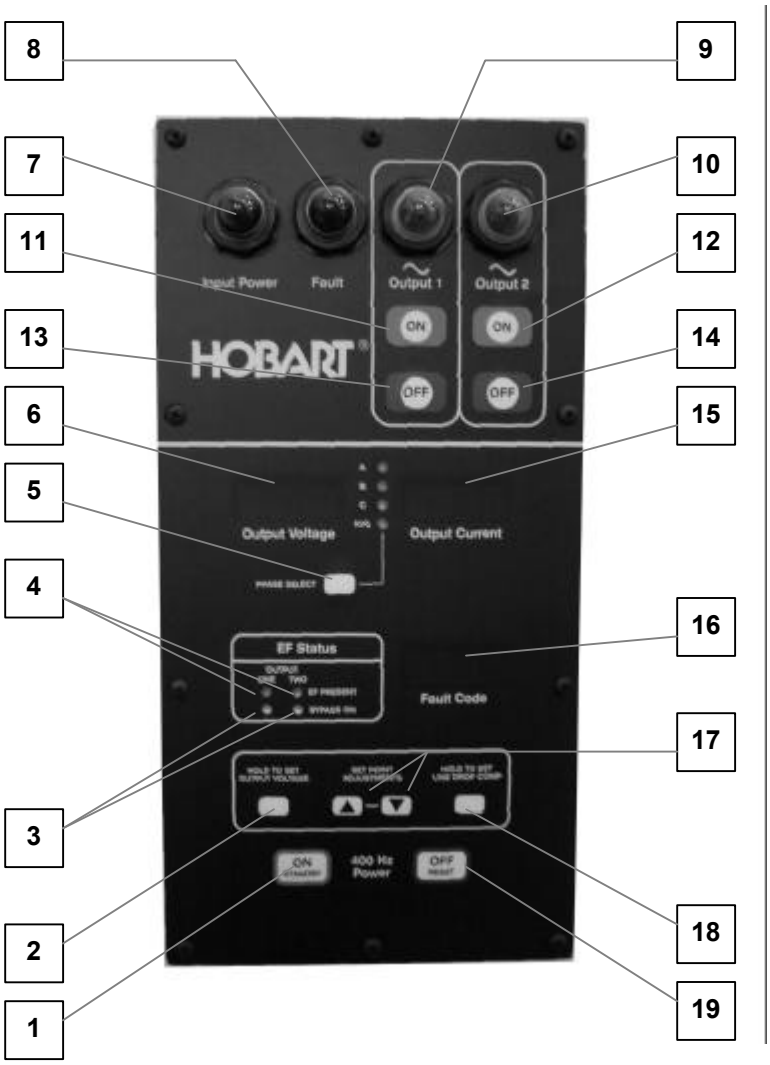
If a qualified technician, after measuring various voltage or current values with their own testing equipment, discovers that the readings obtained do not match the values displayed by the ADV Control, it is possible to change the calibration of the unit to bring the displayed values into agreement with 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.

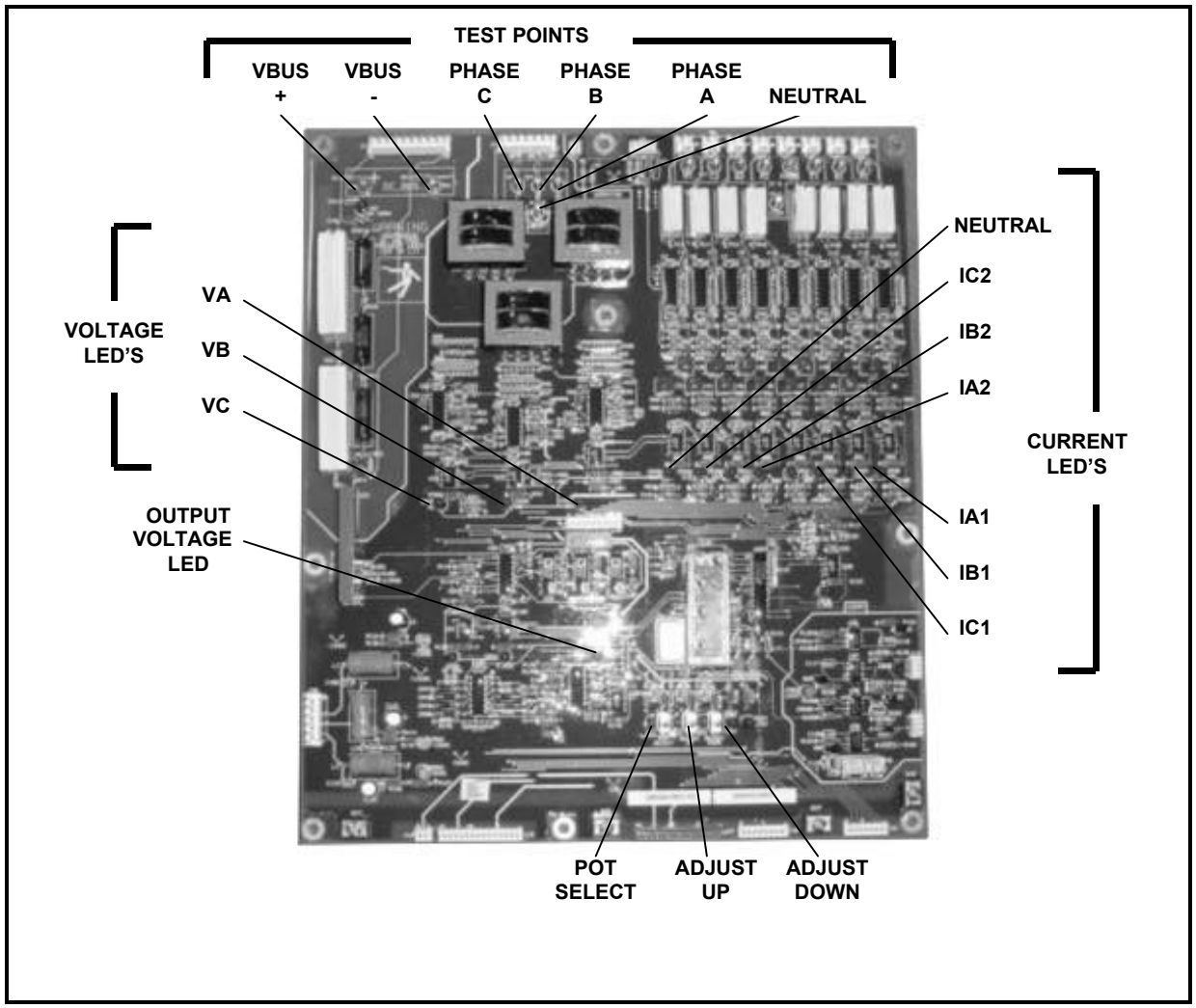
a) Voltage Calibration Procedure (See Figure 3)

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



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. Fault Code Display
17. Set Point Up And Down Adjustment Push Buttons
18. Line Drop Compensation Adjustment Push Button
19. 400 Hz Power Off Push Button

Control Panel
Figure 2



Signal Conditioning Board
Figure 3

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 converter output.

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 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 (5, Figure 2) 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 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 AVE; use the control panel PHASE SELECT push button (5, Figure 2) 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 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 on-site 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 are being adjusted.

WARNING

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

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.

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

(2) 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.

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

(4) Check that the control panel displays PHASE A; use the PHASE SELECT push button (5, Figure 2) if needed. When power is being delivered, the amperage reading on the control panel (15, Figure 2) should match the amperage reading on the ammeter.

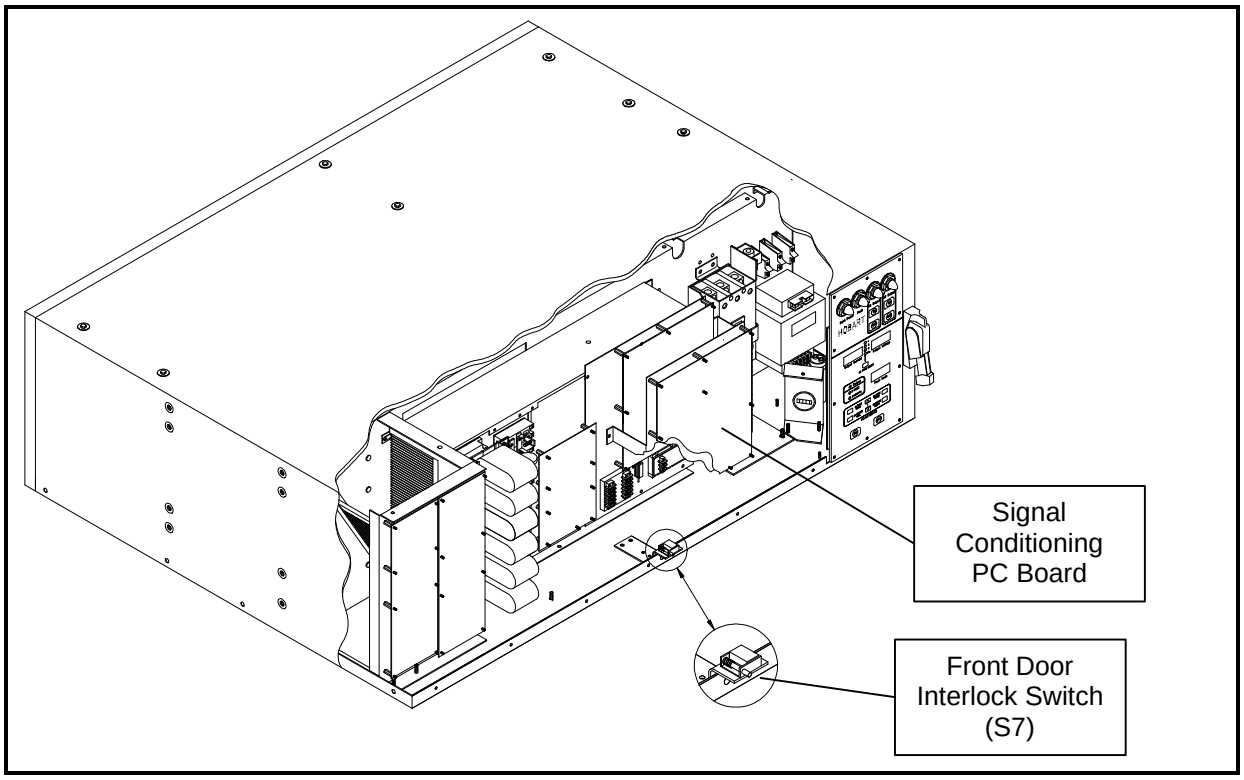
(5) If the ammeter and the control panel amperage readings match, calibration is complete.

(6) If the ammeter and the control panel amperage readings do not match, use the ADJUST UP and ADJUST DOWN push buttons (17, Figure 2) to change the control panel reading until both values match.

(7) Depress and release the POT SELECT push button repeatedly until the next desired signal for calibration is indicated.

(8) Repeat the above 6 steps to calibrate for each signal to be calibrated.

(9) 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 Ground Power, or to an authorized service shop of Hobart Ground Power, 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.

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 affectivity 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.

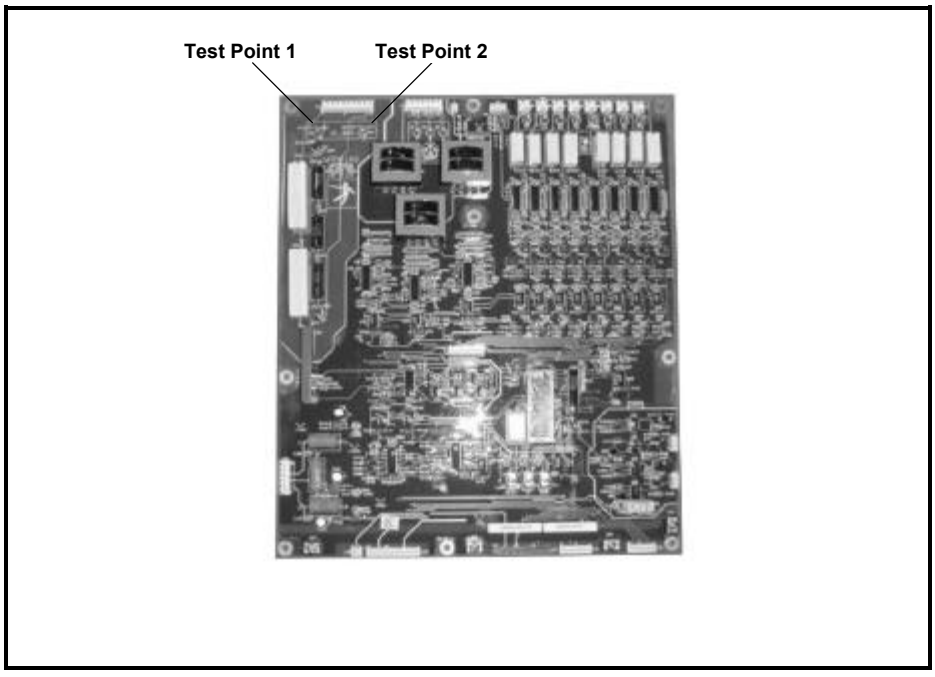
j) Check and inspect all front panel components, including indicator lamps.

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.



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

3) 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 the purchased components, such as contactors, switches, transformers, etc., may have standard size hardware (SAE). 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 likewise, 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 an 8 mm 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.

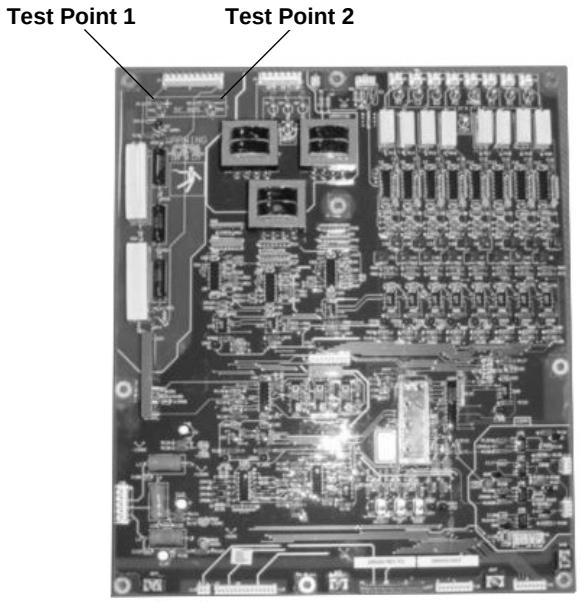
d) Disconnect the three AC input leads at terminals L1, L2, and L3 of circuit breaker CB1 and the grounding wire at the grounding lug (Figure 2).

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

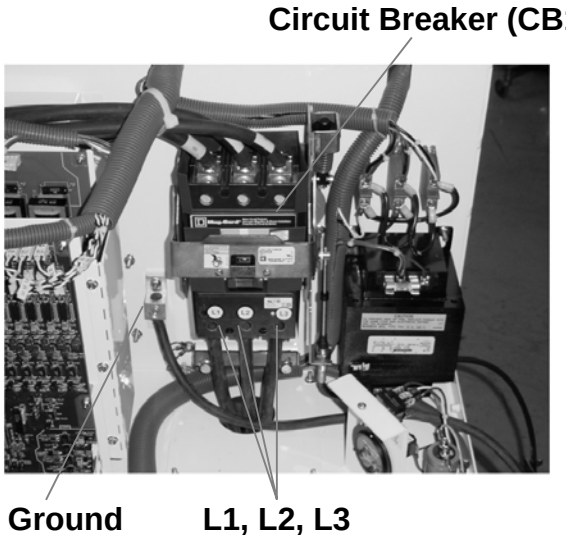
f) Remove the input cable from the unit.

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 Board (Front Door)
Figure 1



Input Cable Connections
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 that 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 10-13 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 an 8 mm 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 front 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) AC Output Contactor K1 (or K2)

The AC output contactor (13, Section 1-1, Figure 13) is mounted on bracket on the right side of the unit behind the rear door. It is fastened with three 8 mm keps screws. To remove and install this contactor, follow these steps:

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

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

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

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

(3) Control Panel

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

b The control PC Board is fastened to the backside of the control panel. Reach in through the door and carefully detach the many leads that are attached to the control panel PC Board.

c While holding onto the control panel, unfasten the 10 screws that hold the control panel onto the unit.

d Slowly pull the control panel, with PC Board attached, out of the unit from the outside.

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

(4) Cooling Fan

Refer to Section 4-3; Figure 6 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 air duct 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).

Note: If the fan blades rotate in the wrong direction, reverse connection of any two fan input leads.

(5) Input SCR/Diode Module

Section 1-1; Figure 12 shows the location of the SCR/diode modules (SCR1-SCR3 or SCR6).

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

b Remove the input SCR/Diode Module using an 8 mm socket, and a Phillips head screw driver.

c Remove all traces of heat sink pad/material from the heat sink 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

(6) IGBT - Power Modules

Section 1-1; Figure 12 shows the location of the IGBT's (PM1-PM6 or PM12).

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

b Remove the capacitor bank assembly, in front of the IGBT's, 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 heat sink pad/material from the heat sink 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 N-m	31 cm-kg
Terminal, M4 Screws	17 inch-lbs.	1.9 N-m	20 cm-kg
Terminal, M6 Screws	27 inch-lbs.	3 N-m	31 cm-kg

IGBT - Power Module Torque Values
Figure 4

(7) DC Bus Discharge Resistor

Section 1-1; Figure 13 shows the location of the DC Bus Discharge Resistor (R3).

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

b Disconnect the two leads from the resistor.

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

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

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

(8) Door Interlock Switches

The converter is equipped with two door interlock switches: S7 on the front door and S2 on the back door. Section 1-1; Figure 11 shows the location of the interlock switches. To remove and replace a switch, follow these steps:

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

b Disconnect the two leads from the switch.

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

d 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.

(9) Heat Sink Thermal Switch

One thermal switch (Section 1-1, Figure 12) is located on the heat sink beside the power modules, which are behind the DC Capacitors inside the front door. To remove and replace the switch, follow these steps:

a Open the rear 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 bus bar located behind the DC capacitors.

d Disconnect the two leads from the switch.

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

a Installation is in the reverse order of removal.

(10) 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.

a Carefully pull upward on the switch that is tucked in the coils of the transformer.

b Disconnect the thermal switch wire leads from the small terminal strip.

c Installation is in the reverse order of removal.

(11) Main Transformers

Except for physical damage, it is improbable that the main transformer (12, Section 1-1, Figure 13) in this unit will fail. In the unlikely event of failure, it is not recommended that attempts be made to remove and replace the transformer in the field. Call the Hobart Brothers Service Department for assistance.

(12) Input Transformer

In the event that the input transformer (15, Section 1-1; Figure 13) fails, contact the Hobart Service Department for assistance.

(13)Input Control Transformer

The Control Transformer (4, Section 1-1, Figure 11) is located directly behind the control panel. Proceed as follows to remove and replace the control transformer.

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

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

c Remove the control transformer.

d 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:

- ADV 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)

Figure 5 provides a description and location of each board. Before inspecting, removing, or replacing any of the boards, follow these steps:

WARNING

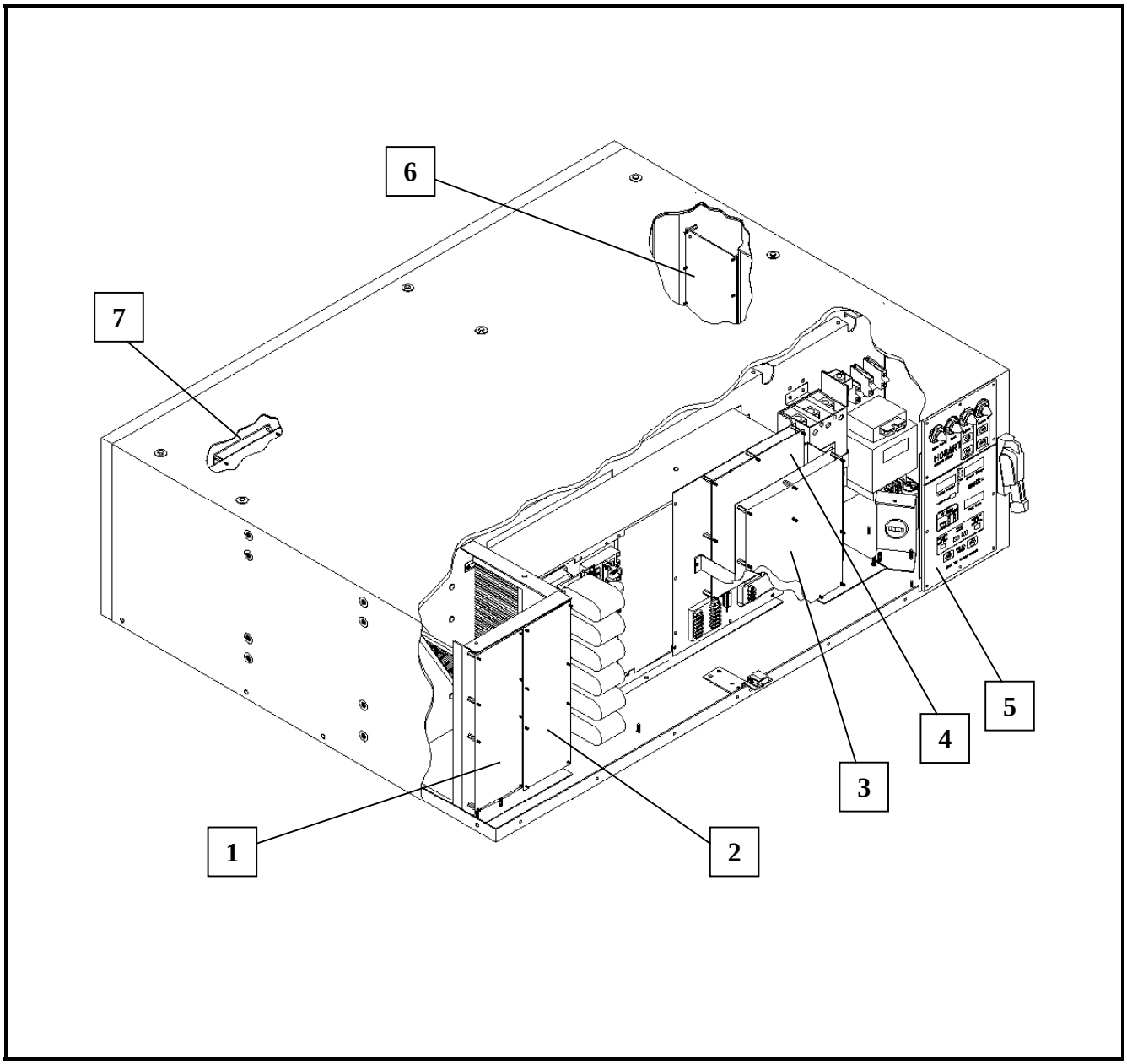
High voltages may be present inside the cabinet, even when the unit is off. Exercise extreme caution or **FATAL SHOCK** may result.

a) 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.

b) Open the front door by turning all three latches counterclockwise with an 8 mm 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. See Figure 1 for the proper test points.



1. Modulator PC Board A3
2. Driver PC Board A5
3. Signal Conditioning PC Board A6
4. Input Power Control PC Board A4
5. Control PC Board A2
6. Input / Output PC Board A1
7. Bus Discharge PC Board A7

PC Board Locations
Figure 5

d) Remove and replace each board as follows.

(1) ADV Control PC Board

The ADV Control PC Board (A2) is mounted on the back of the control panel (5, Figure 5). 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:

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

b 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.

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

d Carefully remove the control panel, with PC Board attached, from the converter.

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

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

(2) Modulator PC Board

The Modulator PC board (A3) is located on the far left side behind the front door (1, Figure 5). The board has eight keps nuts tightening it to aluminum spacers that are fasten to an internal panel. To remove and replace this board, follow these steps:

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

b 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.

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

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

(3) Driver PC Board

The Driver PC board (A5) is located to the right of the Modulator PC Board (2, Figure 5). 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:

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

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

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

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

(4) DC Bus Discharge PC Board

The Bus Discharge PC board (A13) is located above the DC capacitor bank behind the rear door (7, Figure 5). 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:

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

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

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

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

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

The I/O PC Board (A1) is located behind the rear door, mounted against an interior panel beside the output connections (6, Figure 5). 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:

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

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

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

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

(6) Signal Conditioning PC Board

The Signal Conditioning PC Board (A6) is located behind the front door, mounted against a hinged interior panel (3, Figure 5). The board has nine keps nuts tightening it to aluminum spacers that are fastened to the hinged internal panel. To remove and replace this board, follow these steps:

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

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

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

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

(7) 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 5). The Signal Conditioning Board must swing out of the way, but not removed, to service the IPC PC Board. The IPC board has nine keps nuts tightening it to aluminum spacers that are fastened to an internal panel. To remove and replace this board, follow these steps:

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

b 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.

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

d Steady the board with one hand and remove the nine 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.

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Chapter 4 Illustrated Parts List

Section 1 Introduction

1) General

The Illustrated Parts List identifies, describes, and illustrates main assemblies, subassemblies, and detail parts of a 400 Hz. Solid State Converter manufactured by Hobart Brothers Company, Ground Power Division, 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 - Parts List
Section 4 - Numerical index

4) Explanation of Parts List

a) Contents

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

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

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

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

b) Parts List Form

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

(1) FIGURE-ITEM NO. Column

This column lists the figure number of the illustration applicable to a particular parts list and also identifies each part in the list by an item number. These item numbers also appear on the illustration. Each item number on an illustration is connected to the part to which it pertains by a leader line. Thus the figure and item numbering system ties the parts lists to the illustrations and

vice-versa. The figure and index numbers are also used in the numerical index to assist the user in finding the illustration of a part when the part number is known.

(2) HOBART PART NUMBER Column

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

(3) 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 that are used on only one model. This column is used for insertion of a code letter A, B, etc., to indicate these parts and to identify the particular model they are used on.

Parts coded "A" are usable on Part Number 500048A-021 only.
Parts coded "B" are usable on Part Number 500048A-022 only.
Parts coded "C" are usable on Part Number 500048A-311 only.
Parts coded "D" are usable on Part Number 500048A-312 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	Code	Vendor's Name and Address
00779	Amp Inc. 2800 Fulling Mill Rd. P.O. Box 3608 Harrisburg, PA 17105-3608	0HZP9	Diesel Radiator Co. 1985 Janice Ave. Melrose Park, IL 60160
01428	Tuthill Corp. Superior Linkage Div. 2110 Summit St. New Haven, IN 46774-9524	0H8R0	Magnetics 200 10TH St. P.O. Box 391 Butler, PA 16003-0391
016T7	Amaton Inc. 446 Blake St. New Haven, CT 06515	0MR72	Power Devices Inc. 26941 Cablot Rd Suite 124 Laguna Hills, CA 92653-7006
01989	Dana Corp Weatherhead Div U.S. 24 E. Antwerp, OH 45813	1AA44	Collmer Semiconductor Inc. C/O NA-NA Co. 14368 Protopn Rd. Dallas, TX 75244-3511
02660	Amphenol Corp. 720 Sherman Ave Hamden, CT 06514-1146	1DG36	E. M. Products Inc. 220 W. 90th St. Minneapolis, MN 55420
02768	Illinois Tool Works Inc. Fastex Division 19 S. Algonguin Rd. Des Plaines, IL 60016	1E045	Austin Hardware and Supply Co. 10220 E. 65TH St. P.O. Box 9550 Kansas City, MO 64133-5205
05277	Westinghouse Electric Company Semiconductor Division Hill Street Youngwood, PA 15697	1E222	Furnas Electric Co. Richmond, VA 23200
054W1	Talema Electronic Inc. 3 Industrial Park Dr. P.O. Box 306 Saint James, MO 65559	1FQ83	Newark Electronics Div 3033 Kettering Blvd Dayton OH 45439
05YB3	Acon Inc. 22 Bristol Dr. South Easton, MA 02375	1SPJ9	Hobart Ground Power 1177 Trade Road East Troy, OH 45373

Code	Vendor's Name and Address	Code	Vendor's Name and Address
1W134	Eaton Corp. 4201 N. 27TH Ave. Milwaukee, WI 53216-1807	2B664	All-Phase Electric Supply Co 1620 W Main St P.O. Box 149 Springfield OH 45501-0149
1Y498	F B Wright 100 E Wilson Bridge Rd Columbus Oh 43085-2334	2B928	Barber Colman Co. Pasadena, TX 77501
12662	Peterson Mfg Co. 4200 E 135th St Grandview MO 64030-2821	2N562	Power Transmission Sales Inc. 351 Washington P.O. Box 229 Chagrin Falls, OH 44022-4446
13445	Cole-Herse 20 Old Colony Ave. Boston, MA 02127	23826	Furnas Electric Company 1004 McKee Street Batavia, IL 60510
13902	Smith Valve Corp. 1 Apple HL Suite 316 Natick, MA 01760-2072	24161	Gates Rubber Co 900 S Broadway Denver CO 80217-5887
14552	Microsemi Corp 2830 S. Fairview St. Santa Ana, CA 92704-5948	24446	General Electric Co. 3135 Easton Tpke. Fairfield, CT 06431
14799	Square D Co. Chicago Assembly Plant 9522 W. Winona Schiller Park, IL 60176-1025	25710	Deka Plastics Inc. 914 Westfield Ave. Elizabeth, NJ 07208-1222
14604	Elmwood Sensors, Inc. Subsidary Fasco Ind. 1655 Elmwood Avenue Cranston, RI 02907	26794	Connectron Inc. 12 Industrial Dr. South Amboy, NJ 08879
16238	Lord Mfg. Co. Inc. Sterling Road South Lancaster, Mass 01561	27410	Harris Corp. 1025 Nasa Blvd. Melbourne, FL 32919
16476	Datcon Instrument Co. P.O. Box 128 East Petersburg, PA 17520	28520	Heyco Molded Products Inc. 1800 Industrial Way N. P.O. Box 517 Toms River, NJ 08755
18265	Donaldson Co. Inc. 1400 W. 94th St. P.O. Box 1299 Minneaplis, MN 55440-1299	3A054	McMaster Carr Supply Co. 9630 Norwalk Blvd. Santa Fe Springs, CA 90670-2932

Code	Vendor's Name and Address	Code	Vendor's Name and Address
3Y208	Taylor And Summerville Battery Co 3485 Successful Way Dayton Oh 45414-4319	50508	Magnetic Components Inc. 9520 Ainslie St. Schiller Park, IL 60176-1116
30104	Automotive Controls Corp. 1300 W. Oak St. P.O. Box 788 Independence, KS 67301-2347	55752	Parker Hannifin Corp. Racor Div. 3400 Finch Rd. Modesto, CA 95353-3208
30327	Imperial Eastman Corporation 6300 W. Howard Street Chicago, IL 60648	56289	Sprague Electric Company 87 Marshall St. North Adams, MA, 01247
30430	Marathon Electric Mfg. Corp. 398 Beach Rd. Burlingame, CA 94010-2004	56365	Square D Company 1415 S. Roselle Rd. Palatine, IL 60067-7337
38151	Marathon Electric Mfg. Co. 100 E. Randolph St. P.O. Box 8003 Wausau, WI 54401-2568	57347	Wall Industries Inc. 5 Watson Brook Rd. Exeter, NH 03833
40121	Peterson Mfg. Co. Inc. 700 W. 143rd St. P.O. Box 8 Plainfield, IL 60544-9733	57448	Stephens & Adamson Mfg. Company 275 Ridgeway Avenue Aurora, Illinois 60507
41197	Modine Manufacturing Company 1500 Dekoven Avenue Racine, Wisconsin 53401	57733	Stewart-Warner Corporation 1826 Diversey Parkway Chicago, Illinois 60614
44655	Heico Ohmite LLC 3601 W. Howard St. Skokie, IL 60076-4014	6H359	Hobbs Div., of Stewart Warner Corp. Highway 6 Spring Valley, IL 61362
49234	Protectoseal Company 1920 S. Western Chicago, Illinois 60608	6S553	Wes-Garde Components Group Inc 300 Enterprise Dr Westerville OH 43081-8840
5P059	Tech Products Corp. 2348 Sandridge Dr. Dayton, OH 45439	6Y440	Micron Technologies Inc. 8000 S. Federal Way Boise, ID 83707
5U553	Wes-Garde Components Group Inc 300 Enterprise Dr Westerville OH 43081-8840	6Y481	Hamilton Avnet Electronics Corp 777 Brooksedge Blvd Westerville OH 43081-2821

Code	Vendor's Name and Address	Code	Vendor's Name and Address
61706	EAO Switch Corp. 198 Pepes Farm Rd. P.O. Box 552 M O Milford, CT 06460-3670	74545	Hubbell Harvey Inc. 584 Derby Milford Rd. Orange, CT 06477
66180	Automatic Timing and Controls 3312 Bloomingdale Melrose Park, IL 60160-1030	74829	Ilsco Corp. 4730 Madison Rd. Cincinnati, OH 45227-1426
66844	Powerex Inc. E. Hillis St. Youngwood, PA 15697-1176	75418	Kysor Industrial Corporation 1100 W. Wright Street Cadillac, Michigan 49601
62292	EBM Industries Inc. 110 Hyde Rd. P.O. Box 4009 Farmington, CT 06034-4009	77166	Pass and Seymour P.O. Box 4822 Syracuse, NY 13221
67529	All-Phase Electric Supply Co. 875 Riverview Dr. P.O. Box 67 Benton Harbor, MI 49022-0067	77342	Potter and Brumfield Inc 200 S. Richland Creek Dr. Princeton, IN 47671-0001
7M613	Wright F.B. Co. of Cincinnati 4689 Ashley Dr. Hamilton, Oh 45011-9706	79497	Western Rubber Co. 620 E. Douglas Goshen, IN 46526-4035
71400	Bussman Manufacturing Division of McGraw-Edison Company 114 Old State Road St. Louis, MO 63178	8A334	Cummins Interstate Power Inc 4000 Lyman Dr Hilliard Oh 43026
71774	General Electric Corp. Lamp Division 4433 N. Ravenswood Ave. Chicago, IL 60640	81074	Holub Industries, Inc. 413 DeKalb Avenue Sycamore, Illinois 60178
72582	Detroit Diesel Corp 13400 W. Outer Dr. Redford, MI 48239-4001	81703	Mulberry Metal Products Inc. 2199 Stanley Terrace Union , NJ 07083
72619	Amperex Electronic Corp. Dialight Division 203 Harrison Place Brooklyn, NY 11237	86797	Rogan Corp 3455 Woodhead Dr. Northbrook, IL 60062-1812
74542	Hoyt Electrical Instruments P.O. Box 8798 Penacook, NH 03303	90201	Emhart Ind., Inc. Mallory Capacitor Co. 4760 Kentucky Ave. Indianapolis, IN 46206

Code	Vendor's Name and Address	Code	Vendor's Name and Address
91637	Dale Electronics Inc. 1122 23RD St. Columbas, NE 68601-3647		
91929	Honeywell Inc. Microswitch Div. 11 W. Spring St. Freeport, IL 61032		
94222	Southco Inc. 210 N. Brinton Lake Rd. Concordville, PA 19331		
97520	Basler Electric Company Route 143 P.O. Box 269 Highland, IL 62249		
D0024	Semikron International Sigmundstrasse 200 P.O. Box 820251 Nuerengerg, Germany 90253		
E0615	Kraus and Naimer 42 Miramar Avenue P.O. Box 15-009 Wellington, New Zealand		
S7023	Bossard LTD Fasteners Steinhauserstrasse 70 Zug Switzerland, CH-6300		

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Section 3 Illustrated Parts List

1) Explanation of Parts List Arrangement

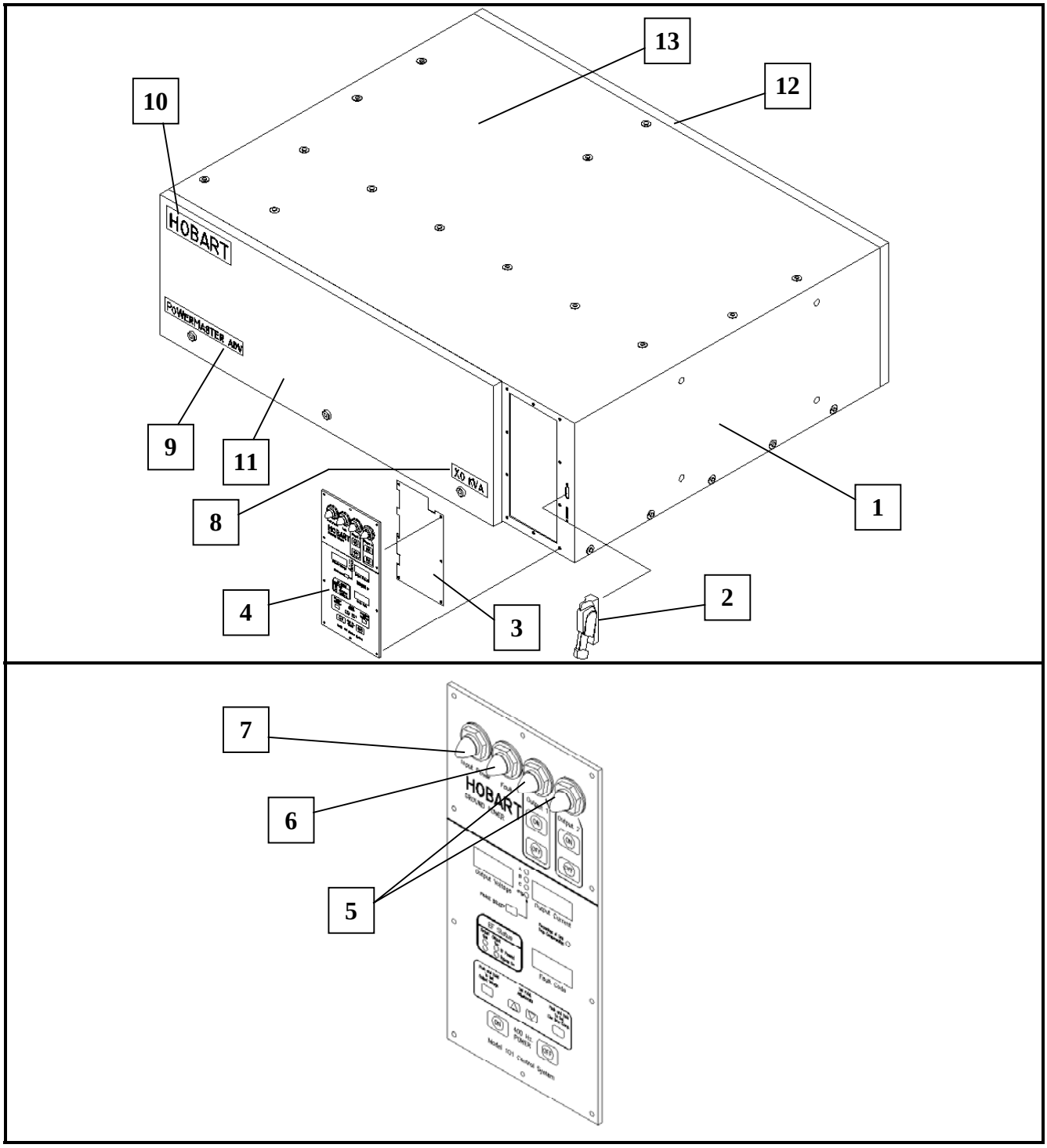
The parts list is arranged so that the illustration will appear on a left-hand page and the applicable parts list will appear on the opposite right-hand page. Unless the list is unusually long, the user will be able to look at the illustration and read the parts list without turning a page.

2) Symbols and Abbreviations

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

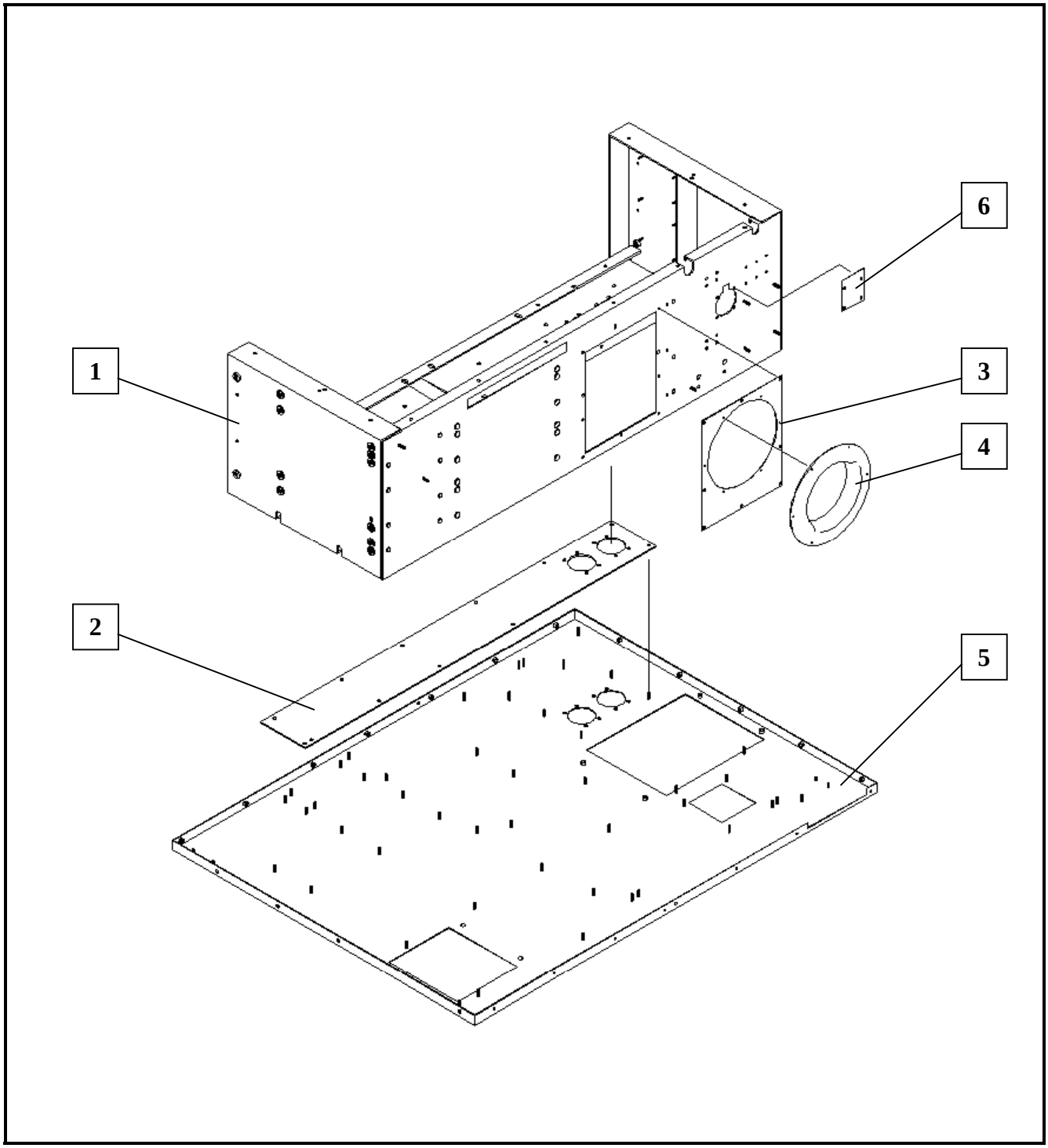
*	-	Item not illustrated
A, or AMP	-	Ampere
AC	-	Alternating current
AR	-	As required
DC	-	Direct current
Fig.	-	Figure
hd.	-	Head
hex	-	Hexagon
Hz	-	Hertz (cycles-per-second)
I.D.	-	Inside diameter
IN	-	Inch
KVA	-	Kilovolt-ampere
uF	-	Microfarad
No.	-	Number
NHA	-	Next higher assembly
PRV	-	Peak reverse voltage
PSI	-	Pounds per square inch
Ref	-	Reference (the item has been listed previously)
RH	-	Right Hand
LH	-	Left Hand
TM	-	Technical Manual
T-R	-	Transformer-rectifier
V	-	Volt or used as a prefix indicating vendor code

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



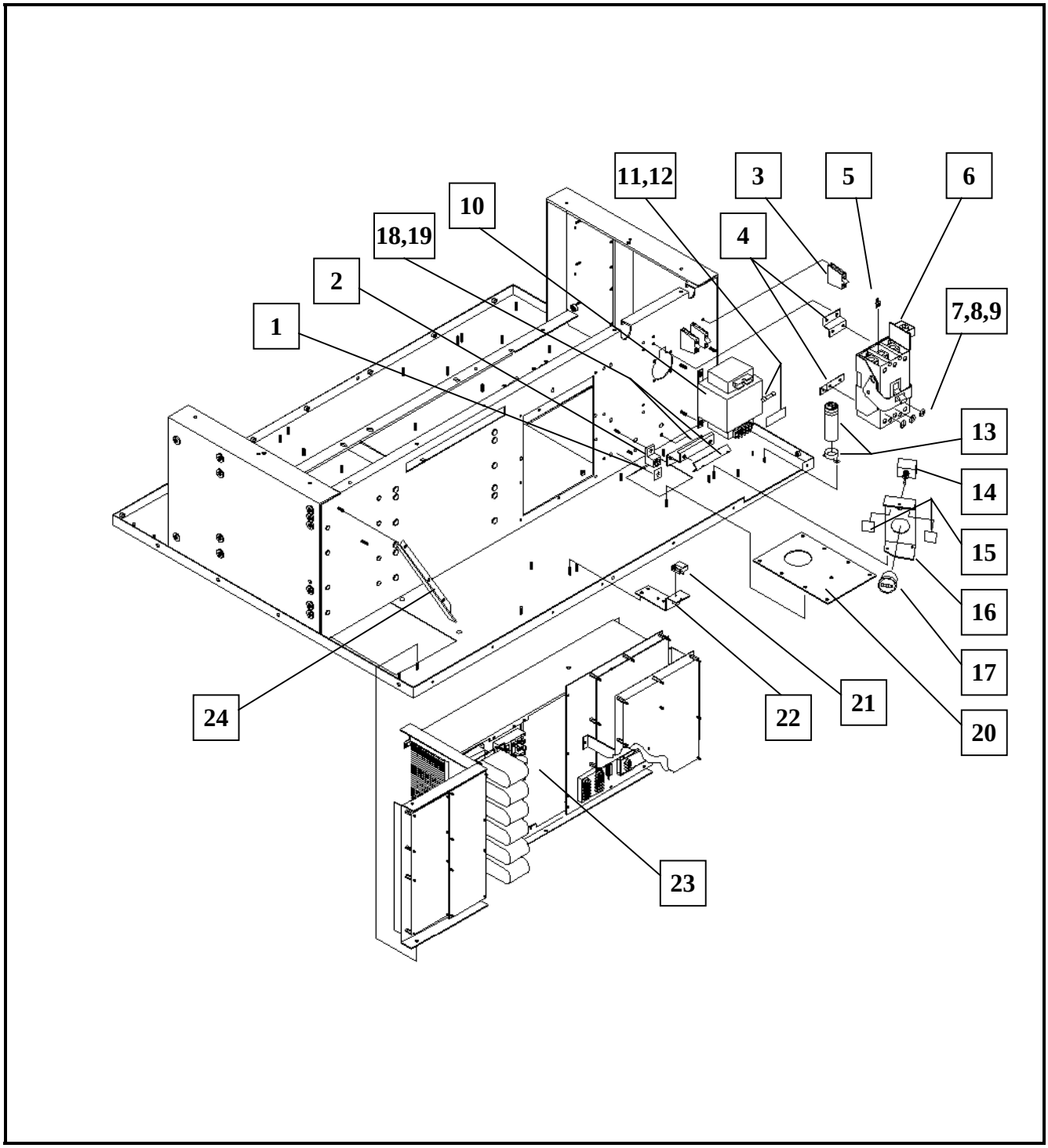
PoWerMaster ADV Converter
Figure 1

FIGURE ITEM NO.		HOBART PART NO.	NOMENCLATURE	EFF	UNIT PER ASSY.
1 -		**500048A-021**	**PoWerMaster ADV Converter, 60 kVA, 1 Output**	**A**	**Ref.**
		500048A-022	**PoWerMaster ADV Converter, 60 kVA, 2 Outputs**	**B**	**Ref.**
		500048A-311	**PoWerMaster ADV Converter, 45 kVA, 1 Output**	**C**	**Ref.**
		500048A-312	**PoWerMaster ADV Converter, 45 kVA, 2 Outputs**	**D**	**Ref.**
*	1		Frame Assembly (See Figure 2)		Ref.
	2	286416-001	Circuit Breaker Actuator Handle *(V56365 #9422A3)*		1
	3	286411	Control P.C. Board Assembly		1
	4	286398-002	Membrane Switch Panel Assembly		1
	5	82B1066-012	Amber Pilot Light Ay., 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, 12V *(V56365 #9001-SKP-32A9)*	B, D	2
*		400613-004	…Bulb, 12v, Type 1815, Bayonet Base, Style T-3-1/4	B, D	2
	6	82B1066-001	Red Pilot Light Ay., 12V *(V56365 #9001-SKP-32R9)*		1
*		400613-004	…Bulb, 12v, Type 1815, Bayonet Base, Style T-3-1/4		1
	7	82B1066-001	Green Pilot Light Ay., 12V *(V56365 #9001-SKP-32G9)*		1
*		400613-004	…Bulb, 12v, Type 1815, Bayonet Base, Style T-3-1/4		1
	8	283714-005	Label, 45 KVA	C, D	1
		283714-004	Label, 60 KVA	A, B	1
	9	286457	Label, Trademark		1
	10	402987	Label, Hobart		1
	11		Front Interior Components (See Figure 3)		Ref.
	12		Rear Interior Components (See Figure 5)		Ref.
	13		Canopy Components (See Figure 10)		Ref.
*	14	283716	Label, Id		1
*	15	287460	Label, Shock		2
*	16	286441	Label, General		2
*	17	287341	Wiring Harness Assembly		1
	18		Bottom Exterior Components (See Figure 11)		Ref.
*	19	286377	Label, Fault Code		1
*	20	286442	Label, Rainproof		1
*	21	282658	Label, Warning, Clearance		2
*	22	286475-009	Cable Summary, Standard	A,B	1
*	23	286580-003	Lead Wire, Ay.		1
*	24	286475-002	Cable Summary, Dual Output	B,D	1
*	25	286475-005	Cable Summary, Standard	C,D	1



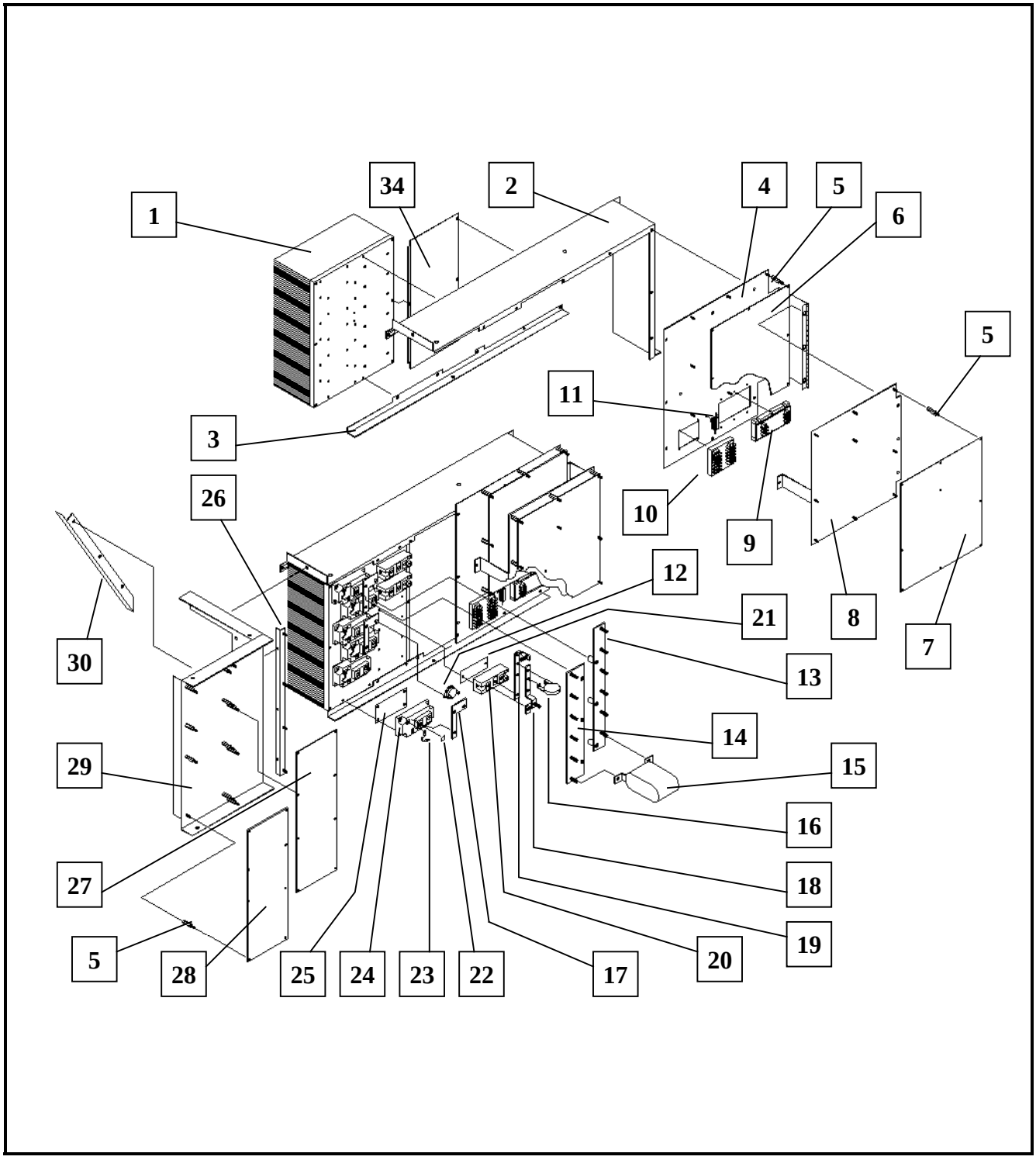
Frame Assembly
Figure 2

FIGURE ITEM NO.	HOBART PART NO.	NOMENCLATURE	EFF	UNIT PER ASSY.
2 - 1	286535	Frame		1
2	286354	Bottom Frame Spacer		1
3	287376	Inlet Ring Panel		1
4	283157-003	Impeller Inlet Ring *(V62292 #9621-2-4013)*		1
5	287852	Base		1
6	287836	Cover, Fan Hole		1



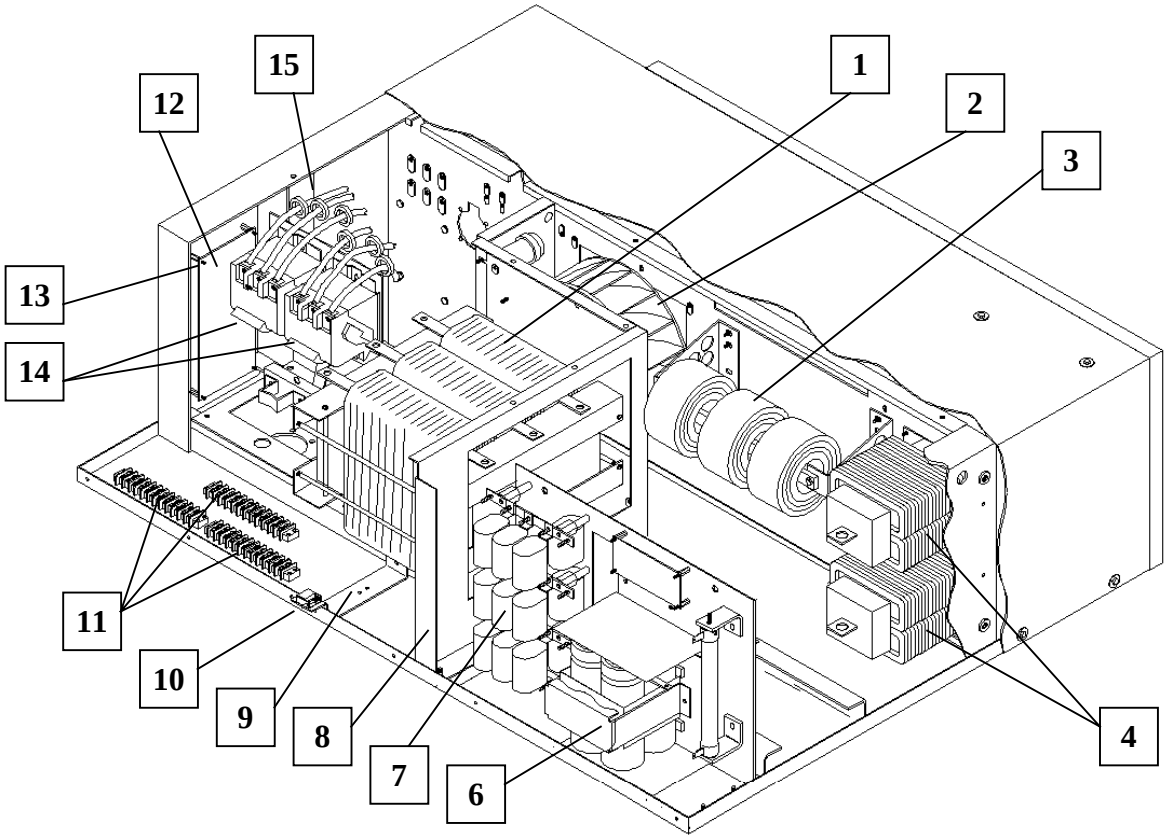
Front Interior Components
Figure 3

FIGURE ITEM NO.		HOBART PART NO.	NOMENCLATURE	EFF	UNIT PER ASSY.
3 -	1	280807	Label, Ground		1
	2	285104-001	Grounding Lug *(V74829 #TA-250)*		1
	3	285315-001	Mov. Suppressor *(V27410 #V661DA40)*		3
	4	287838	Circuit Breaker Support		2
	5	282653	Wire Terminal *(V67529 #FA-T)*		3
	6	280966-001	Circuit Breaker *(V56365 #KAL-36250-26M)*	A, C	1
		280966-002	Circuit Breaker *(V56365 #KAL-36150-26M)*	B, D	1
		286415-001	…Actuator, Circuit Breaker *(V56365 #9422-CKA30)*		1
	7	83A1114	Label, L3		1
	8	83A1113	Label, L2		1
	9	83A1112	Label, L1		1
	10	404960-034	Control Transformer, 115 V *(V6Y440 #B750-1213-1)*		1
	11	W10502-031	Fuse, 15 A		1
	12	285968	Label, Fuse		1
	13	281848-002	Capacitor, 1800 UF, 250 VDC		1
	14	402682	Toggle Switch		1
	15	286447	Voltage Selection Label		1
	16	286448	Meter Support Bracket		1
	17	181358	Hour Meter *(V6H359 #80001)*		1
	18	287856	Cable Clamp Support		1
	19	285568	Cable Clamp Bracket		1
	20	286423	Input Cable Plate		1
	21	280673	Door Interlock Switch *(V1W134 #SSI2ET10-20Y3)*		1
	22	286445	Front Door Switch Support		1
	23		Heatsink Panel Assembly, (See Figure 4)		Ref.
	24	287841	Left Hand Input Filter Guide		1



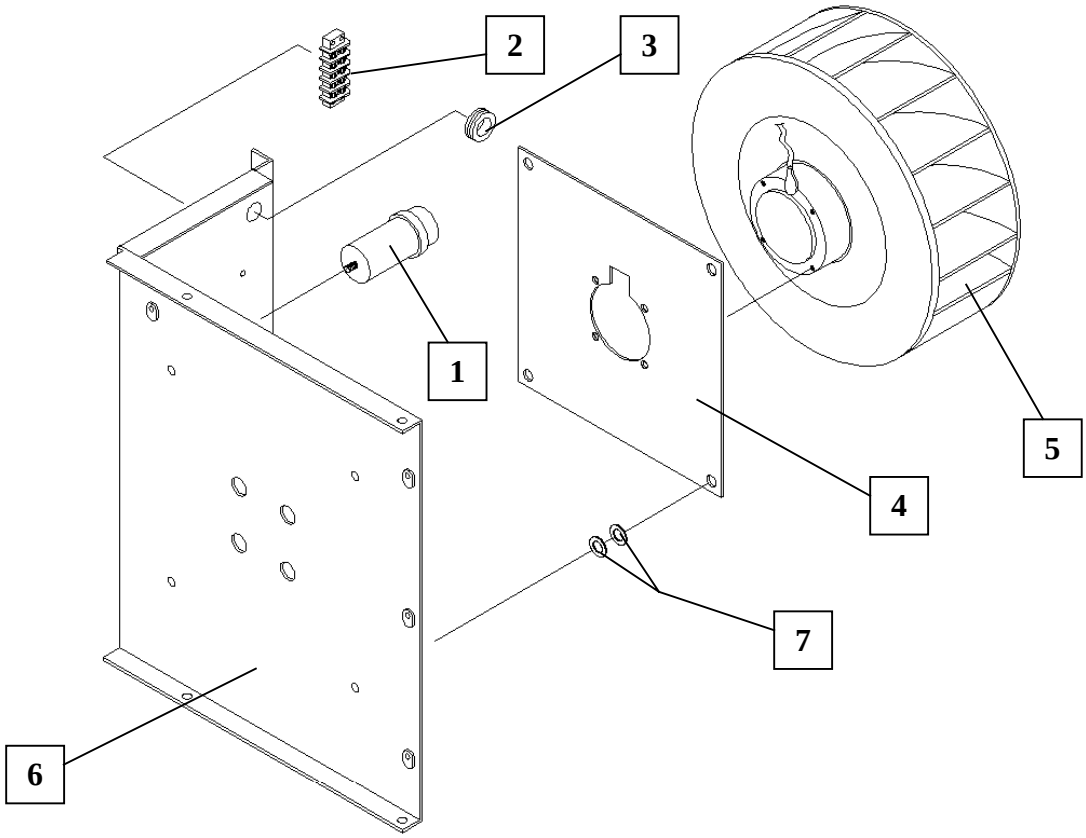
Heat Sink Panel Assembly
Figure 4

FIGURE ITEM NO.		HOBART PART NO.	NOMENCLATURE	EFF	UNIT PER ASSY.
4 -	1	287857	Bonded Fin Heatsink		1
	2	287844	Heatsink Wrapper		1
	3	287843	Angle, Heatsink Panel		1
	4	287833	Heatsink Cover		1
	5	284316-002	Metal Standoff		34
	6	286246B	IPC PC Board Assembly		1
	7	286400	Signal Conditioning PC Board Assembly		1
*		192266-001	…Suppressor		1
	8	286443	SCB PC Board Support		1
	9	286528	Power Supply		1
	10	286367-001	Power Supply *(V05YB3 # M30D1205-12TS)*		1
	11	286482-001	Resistor, 50 W *(V91637 #RH-50)*		1
	12	404044-004	Overload Thermal Switch		1
	13	287825	Bus Bar, DC, Positve		1
*		402674-002	…Label, Positive		1
	14	287826	Bus Bar, DC, Negative, IGBT		1
*		402674-001	…Label, Negative		1
	15	286389-001	Capacitor, DC, 50 mFD		6
	16	403955-021	Semiconductor Suppressor *(V24446 #751HA40)*		1
	17	287824	Bus Bar, AC Out		3
	18	287830	Bus Bar, Positive		1
	19	287831	Bus Bar, SCR, Negative		1
	20	286285-001	SCR Diode *(V66844 #CD621615)*		3
	21	283196-003	SCR Thermal Pad *(V0MR72 #AL-370-134)*		3
	22	407970	Label, Static Sensitive		6
	23	285170	Suppressor		6
	24	283867-005	IGBT Transistor *(V6Y481 #CM400HA-24H)*		6
	25	283196-002	Thermal Transistor Pad (V0MR72 #AL-425-244)		6
	26	286274	Support, Driver Board		1
	27	286144	Driver PC Board Assembly		1
	28	287353A	Modulator PC Board Assembly		1
	29	286533	Air Duct Assembly		1
	30	286420	RH Input Filter Guide		1
*	31	77A1109	Label, “C”		1
*	32	77A1108	Label, “B”		1
*	33	77A1107	Label, “A”		1
	34	286269	Panel, Spacer, Heatsink		1



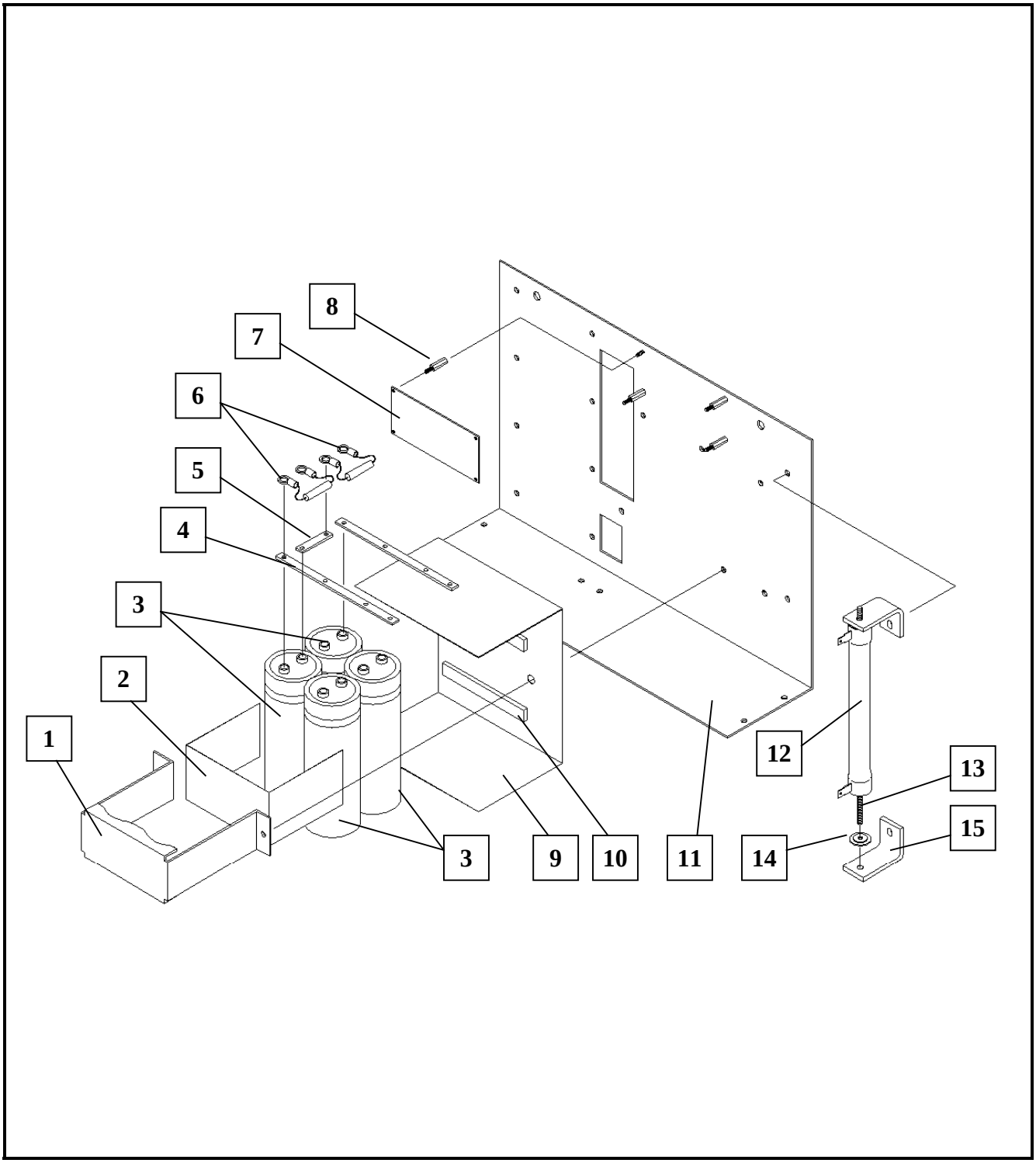
Rear Interior Components
Figure 5

FIGURE ITEM NO.		HOBART PART NO.	NOMENCLATURE	EFF	UNIT PER ASSY.
5 -	1	286480-001	Main Transformer		1
*		281971-004	…Transformer Resistor Assembly, 60 kVA	A, B	1
*		281971-005	…Transformer Resistor Assembly, 45 kVA	C, D	1
*		286449	…Transformer Air Baffle		1
*		286438	…Transformer Stud		4
*		286316-001	…Universal Mount *(V5P059 #60013)*		4
	2		Fan Assembly Components (See Figure 6)		Ref.
	3	286492-001	Air Core Inductor, 3 Phase		1
	4	493712	DC Choke		2
	5	286281	Spacer, DC Choke		8
	6		DC Electrolytic Capacitor Assembly (See Figure 7)		Ref.
	7		AC Capacitor Assembly (See Figure 8)		Ref.
	8	287847	Main Transformer Baffle		1
	9	286444	Rear Door Switch Support		1
	10	280673	Door, Interlock Switch *(V1W134 #SSI2ET10-20Y3)*		1
	11	283066-002	Terminal Block, 12 Station *(V26794 #KUH12C)*		3
*		286380	…Terminal Block Connections Label		1
*		286382	…Terminal Block Fuse Label		1
	12	286392-001	I/O PC Board Assembly		1
*		286383	…I/O PC Board Label		1
*		16DA4252-037	…Fuse, 1A, 250V, I/O Board		1
	13	284316-002	Metal Standoff		6
	14		Contactor Panel Assembly (See Figure 9)		Ref.
	15	285102-001	Current Transformer *(V054W1 #2245CT)*	A, C	4
		285102-001	Current Transformer *(V054W1 #2245CT)*	B, D	7
*	16	286333-002	Input Transformer, 60 kVA 208/240 V	A, B	1
*		286333-001	Input Transformer, 45 kVA 208/240 V	C, D	1
*		286316-001	…Universal Mount		4
*		286438	…Transformer Mounting Stud		4
*	17	286531-001	Resistor, Terminal Block		2



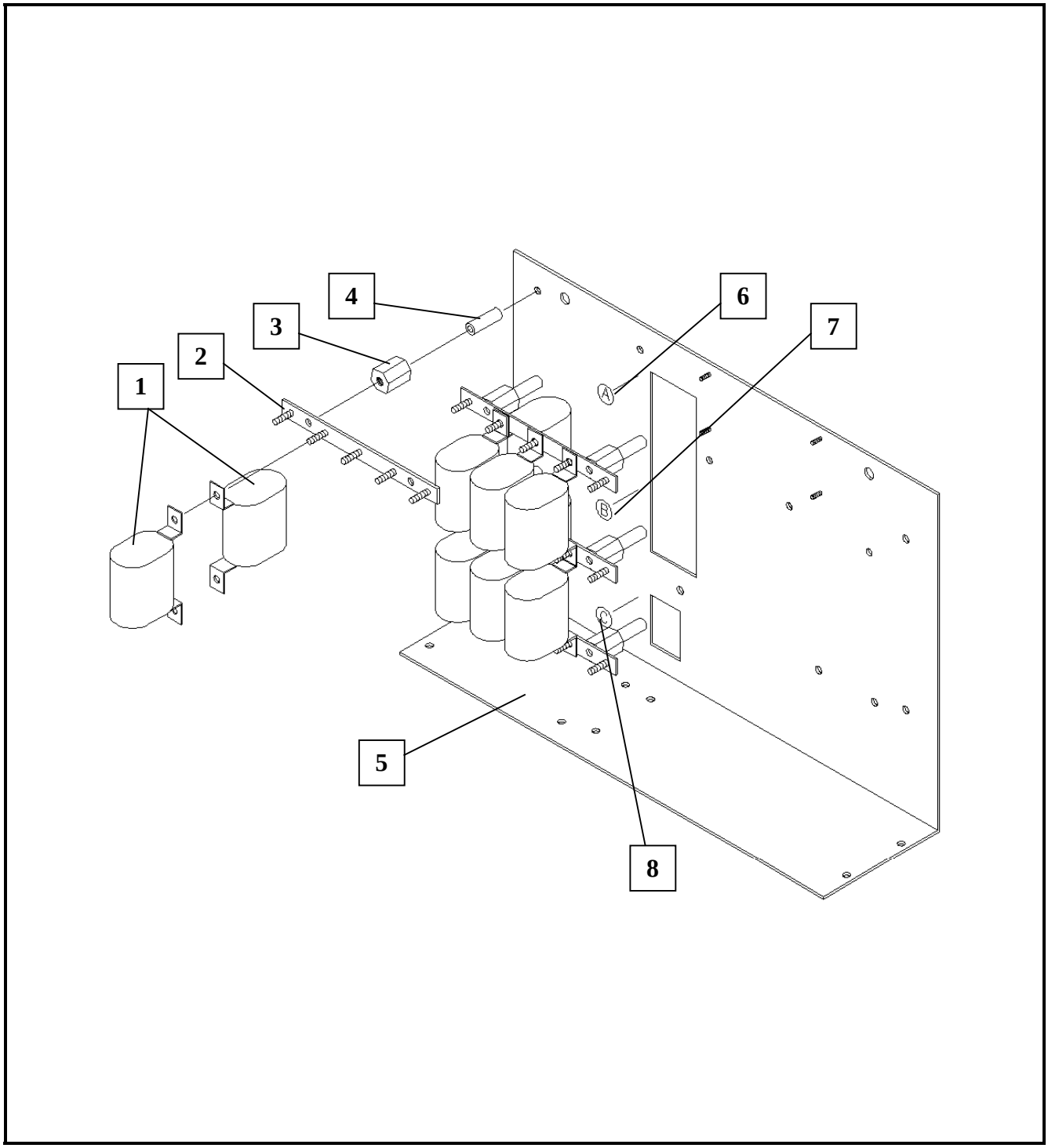
Fan Assembly Components
Figure 6

FIGURE ITEM NO.		HOBART PART NO.	NOMENCLATURE	EFF	UNIT PER ASSY.
6 -	1	283156-003	Motor Start Capacitor, 12 MFD *(V62292 #216747320)*		1
	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
	3	402037-006	Grommet *(V79497 #G-1068)*		1
	4	287846	Fan Mounting Plate		1
	5	283155-003	Motorized Impeller *(V62292 #R4E310-AE13-16)*		1
	6	287842	Fan Mounting Bracket		1
	7	281929-005	Spacer, ¼" Washer		8



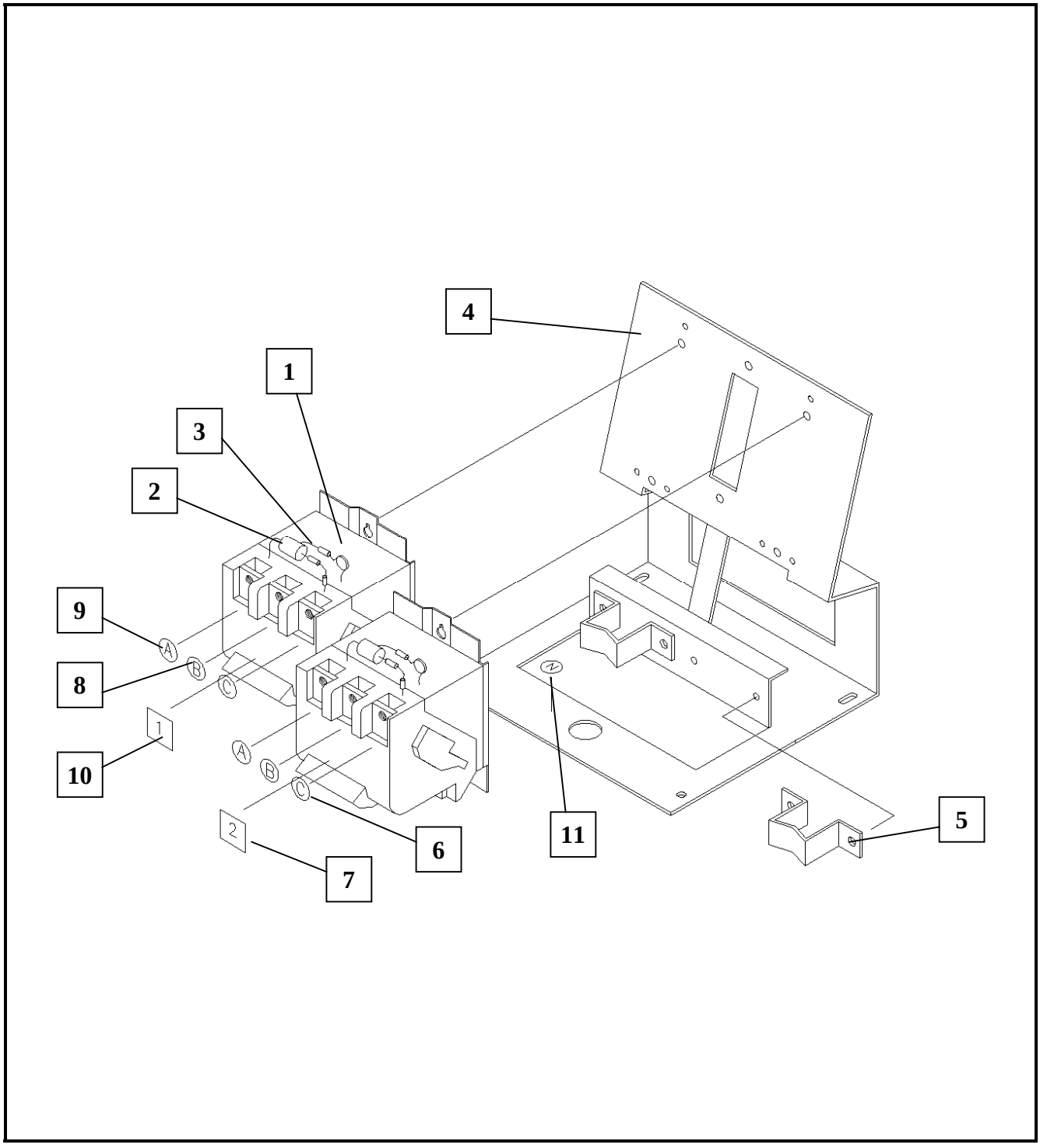
DC Electrolytic Capacitors Assembly
Figure 7

FIGURE ITEM NO.	HOBART PART NO.	NOMENCLATURE	EFF	UNIT PER ASSY.
7 - 1	286429	DC Capacitor Clamp		1
2	286440-001	Side and Front Insulator		1
3	281848-001	DC Capacitors, 6800 MFD		4
4	286443	Long Bus Bar		2
5	286431	Short Bus Bar		2
6	281971-001	Resistor Assembly		4
7	286250	Bus Discharge PC Board Assembly		1
8	284316-002	Metal Standoff		4
9	286434	Bottom and Back Insulator		1
10	056210	Neoprene Rubber Strip		1.5 ft.
11	286534	DC Capacitors Bracket		1
12	404249-003	Resistor, 225 W, 50 ohm		1
13	283387-002	Threaded Rod		1
14	286489-001	Centering Washer *(V44655 #6003)*		2
15	286468	Resistor Bracket		2



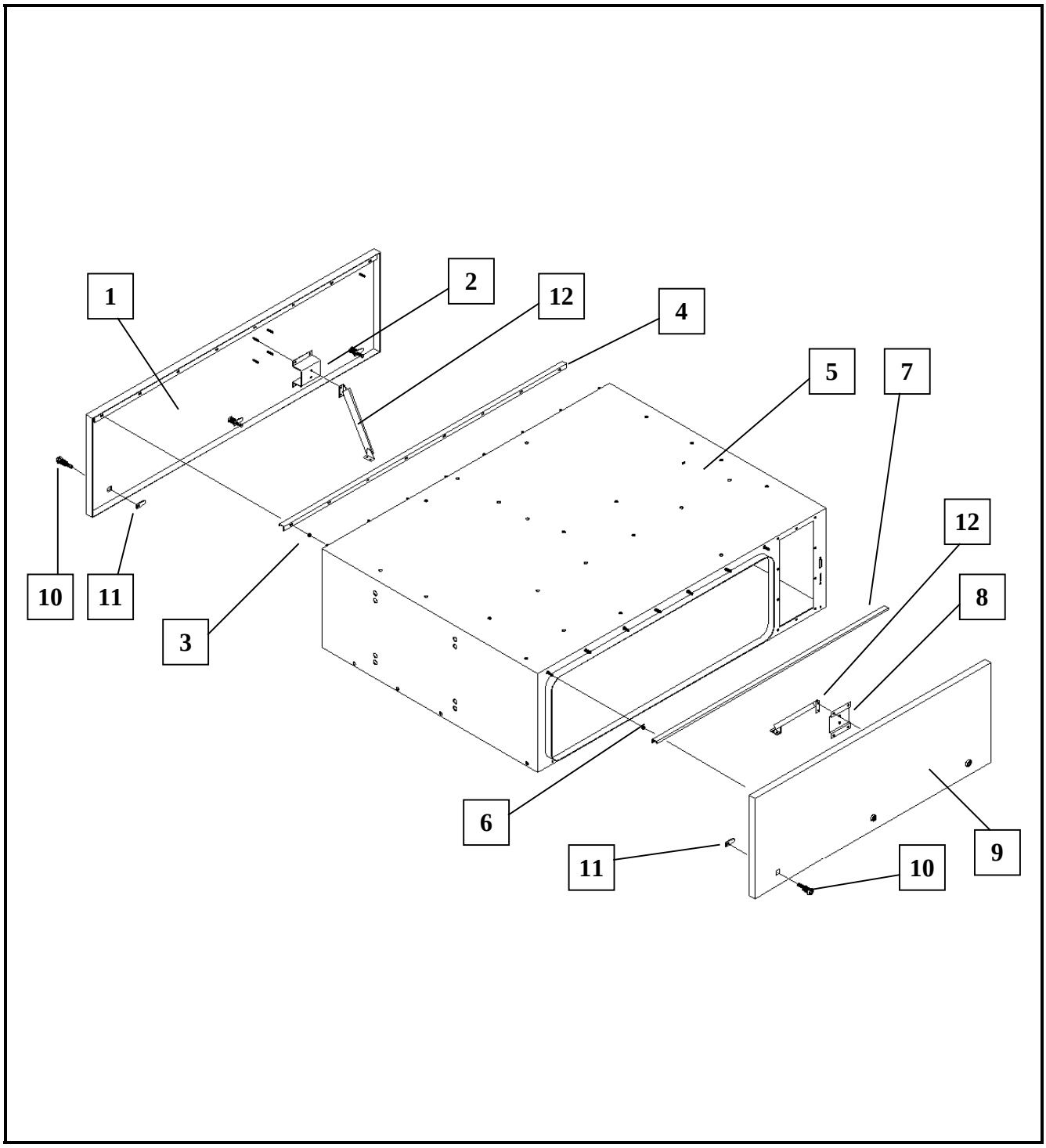
AC Capacitor Assembly
Figure 8

FIGURE ITEM NO.		HOBART PART NO.	NOMENCLATURE	EFF	UNIT PER ASSY.
8 -	1	286389-002	AC Capacitor		12
	2	286406	AC Capacitor Bus Bar		4
	3	404033	Standoff Insulator		8
	4	286386-001	Insulator, Tubing		8
	5	286534	AC Capacitor Panel		1
	6	77A1107	Label “A”		1
	7	77A1108	Label “B”		1
	8	77A1109	Label “C”		1



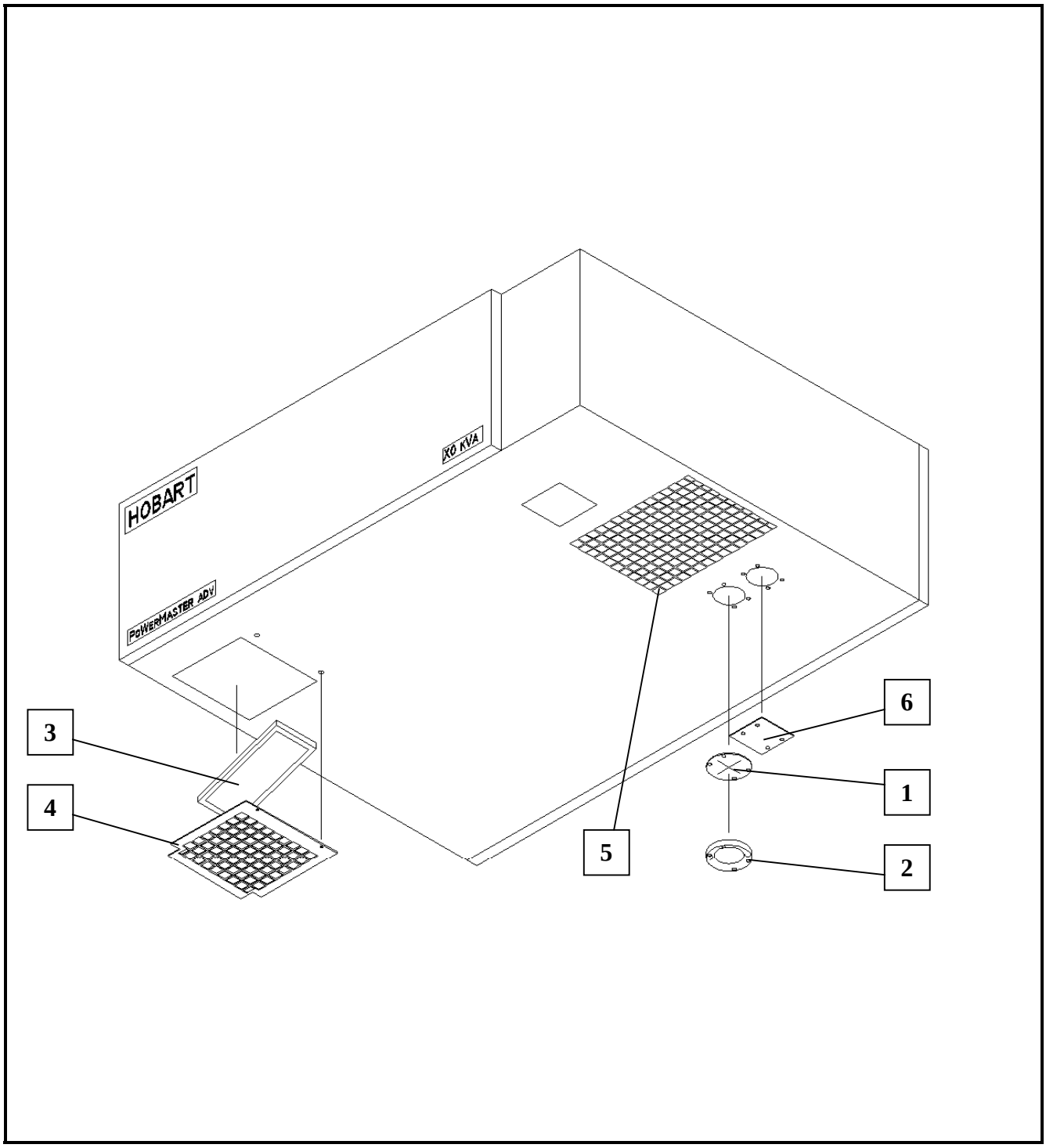
Contactor Panel Assembly
Figure 9

FIGURE ITEM NO.	HOBART PART NO.	NOMENCLATURE	EFF	UNIT PER ASSY.
9 - 1	282130-001	Contactor *(V1E222 #MAIN 42IF109137R)*	A, C	1
	282130-001	Contactor *(V1E222 #MAIN 42IF109137R)*	B, D	2
2	287018	Capacitor Assembly	A, C	1
	287018	Capacitor Assembly	B, D	2
3	283067-002	Varistor Assembly	A, C	1
	283067-002	Varistor Assembly	B, D	2
4	286450	Output Panel Assembly		1
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
6	77A1109	Label “C”	A, C	1
	77A1109	Label “C”	B, D	2
7	402422-002	Label “2”	B, D	1
8	77A1108	Label, “B”	A, C	1
	77A1108	Label, “B”	B, D	2
9	77A1107	Label, “A”	A, C	1
	77A1107	Label, “A”	B, D	2
10	402422-001	Label, “1”		1
11	78A1035	Label, “N”		1



Canopy Components
Figure 10

FIGURE ITEM NO.		HOBART PART NO.	NOMENCLATURE	EFF	UNIT PER ASSY.
10 -	1	286518	Rear Door Assembly		1
		286485-001	…Door Seal		11 ft.
		286474-010	…Rear Parts Location Label		1
	2	286515	Rear Door Stay Support		1
	3	286279-001	Spacer, Door Hinge		8
	4	286277	Rear Door Hinge		1
	5	286519	Canopy Top		1
	6	286279-001	Spacer, Door Hinge		7
	7	286278	Front Door Hinge		1
	8	286498	Front Door Stay Support		1
	9	286517	Front Door Assembly		1
		286485-001	…Door Seal		11 ft.
		286474-009	…Rear Parts Location Label		1
	10	287542-001	Door, Latch *(V94222 #E-16-15)*		6
*		288225	…Gasket, Latch		6
	11	287546-001	Latch Pawl *V94222 #E-28-203-12)*		6
	12	284606-001	Door Support *(V1E045 #AE7/25621)*		2



400 Hz. Power Module Components
Figure 11

FIGURE ITEM NO.		HOBART PART NO.	NOMENCLATURE	EFF	UNIT PER ASSY.
11-	1	286469	Rubber Output Cover	A,C	1
		286469	Rubber Output Cover	B,D	2
	2	286478	Output Cable Guard	A,C	1
		286478	Output Cable Guard	B,D	2
	3	283159-003	Air Filter		1
	4	286455	Air Duct Inlet Cover		1
		283168-002	…Captive Screw		2
		283171-002	…Captive Screw Receptacle		2
		283172-001	…Retainer		4
	5	287853	Grill, Output		1
	6	286479	Cover, Closed Output Hole	A,C	1

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Section 4 Numerical Index

1) Explanation of Numerical Index

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

FIGURE ITEM NO.	HOBART PART NO.	FIGURE ITEM NO.	HOBART PART NO.
3-11	W10502-031	4-5	284316-002
7-10	056210	5-13	284316-002
5-12	16DA4252-037	7-8	284316-002
3-17	181358	9-	284359
4-	192266-001	9-	284359
3-21	280673	9-5	284397
5-10	280673	9-	284397
3-1	280807	10-12	284606-001
3-6	280966-002	5-15	285102-001
3-13	281848-002	5-	285102-001
7-3	281848-001	3-2	285104-001
6-7	281929-005	4-23	285170
5-	281971-005	3-3	285315-001
5-	281971-004	3-19	285568
5-	281971-002	3-12	285968
7-6	281971-001	4-27	286144
9-1	282130-001	4-6	286246B
9-	282130-001	7-7	286250
3-5	282653	4-34	286269
1-21	282658	4-26	286274
5-11	283066-002	10-4	286277
9-3	283067-002	10-3	286279-001
9-	283067-002	10-6	286279-001
6-5	283155-003	10-7	286278
6-1	283156-003	5-5	286281
2-4	283157-003	4-20	286285-001
11-3	283159-003	5-	286316-004
11-	283168-002	5-	286316-001
11-	283171-002	2-2	286354
11-	283172-001	4-10	286367-001
4-25	283196-002	1-19	286377
4-21	283196	5-	286380
7-13	283387-002	5-	286382
1-8	283714-005	5-	286383
1-	283714-004	8-4	286386-001
1-	283714-002	8-1	286389-002
1-14	283716	4-15	286389-001
4-24	283867-005	5-12	286392-001

FIGURE ITEM NO.	HOBART PART NO.	FIGURE ITEM NO.	HOBART PART NO.
1-4	286398-002	5-17	286531-001
4-7	286400	4-29	286533
8-2	286406	7-11	286534
1-3	286411	8-5	286534
3-	286415-001	2-1	286535
1-2	286416-001	5-16	286553-001
4-30	286420	1-23	286580-003
3-20	286423	1-	286580-001
7-1	286429	9-2	287018
7-5	286431	9-	287018
7-9	286434	1-17	287341
5-	286438	4-28	287353A
5-	286438	2-3	287376
7-2	286440-001	1-15	287460
1-16	286441	10-10	287542-001
1-20	286442	10-11	287546-001
4-8	286443	4-17	287824
7-4	286443	4-13	287825
5-9	286444	4-14	287826
3-22	286445	4-18	287830
3-15	286447	4-19	287831
3-16	286448	4-4	287833
5-	286449	2-6	287836
9-4	286450	3-4	287838
11-4	286455	3-24	287841
1-9	286457	6-6	287842
10-	286474-010	4-3	287843
10-	286474-009	4-2	287844
7-15	286468	6-4	287846
11-1	286469	5-8	287847
11	286469	2-5	287852
1-24	286475-002	11-5	287853
1-25	286475-005	3-18	287856
1-22	286475-009	4-1	287857
11-2	286478	10-	288225
11-	286478	1-	400613-004
5-1	286480-001	1-	400613-004
11-6	286479	1-	400613-004
4-11	286482-001	1-	400613-004
10-	286485-001	6-	400792-001
10-	286485-001	6-2	401911-005
6-	286486-001	6-3	402037-006
7-14	286489-001	9-7	402422-002
5-3	286492-001	9-10	402422-001
10-8	286498	4-	402674-002
10-2	286515	4-	402674-001
10-9	286517	3-14	402682
10-1	286518	1-10	402987
10-5	286519	4-16	403955-001
4-9	286528	8-3	404033

FIGURE ITEM NO.	HOBART PART NO.	FIGURE ITEM NO.	HOBART PART NO.
4-12	404044-004		
7-12	404249-003		
3-10	404960-034		
4-22	407970		
5-4	493712		
4-31	77A1109		
4-32	77A1108		
4-33	77A1107		
8-6	77A1107		
8-7	77A1108		
8-8	77A1109		
9-6	77A1109		
9-	77A1109		
9-8	77A1108		
9-	77A1108		
9-9	77A1107		
9-	77A1107		
9-11	78A1035		
1-6	82B1066-001		
1-7	82B1066-001		
1-5	82B1066-012		
1-	82B1066-012		
3-7	83A1114		
3-8	83A1113		
3-9	83A1112		

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Chapter 5 Manufacturer's Literature

Manufacturer's Literature

Diagram Number	Diagram Description
286552	Diagram, Schematic & Connection, W/O 12 Pulse
286495	Outline, Dimensional

Contact Hobart Ground Power if either copy of these drawings or manuals are not with this manual (unless otherwise noted above). Refer to Appendix A for specific information on the 400 Hz. Solid State Converter, optional equipment.

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T4 Input Transformer connections for 208 V. Input

T4 Input Transformer connections for 240 V. Input

T4 Input Transformer connections for 600 V. Input

CB1 Input Circuit Breaker

T4 Input Transformer

SCR1 SCR2 SCR3

RV1 RV2 RV3 RV6

S3 208–240 50/60 Hz.

L4 L5

C1 THROUGH C6

C16 C17 C14 C15 R8 R9 R6 R7

D1 D2 D3 D4 D5 D6

PM1 PM2 PM3 PM4 PM5 PM6

R3

A7 BUS DISCHARGE BD. (BDC)

BUS CONNECTIONS J1

BUS DISCHARGE CTL J2

THERMAL SWITCH S8 TB8

L1

C22 THROUGH C25

C26 THROUGH C29

C30 THROUGH C33

T2

CT1 CT2 CT3 CT4 CT5 CT6 CT7

K1 K2 OPTIONAL

R15 R16 C34 C35 RV4 RV5

THERMAL SWITCH S5 I.D. RESISTOR R4 TB5

HEATSINK THERMAL SWITCH S4

A5 DRIVER BD. (DRV)

FROM A4–J17 IPC

POWER SUPPLY J10

DRIVE A J1 DRIVE B J4 DRIVE C J7

J3 HEATSINK SENSE

J4 MAIN TRANSFORMER SENSE

J5 NEUTRAL CURRENT

J2 OUTPUT VOLTAGE

J6 J7 J8 OUTPUT #2 CURRENT

J10 J11 J12 OUTPUT #1 CURRENT

J1 DC BUS

A6 SIGNAL CONDITIONING BD. (SCB)

TO A5–J10 DRIVER BD J17

TO A6–J20 SIGNAL CONDITIONING BD. J18

TO A1–J4 I/O BD. J19

TO A2–J4 CONTROL BD. J20

TO A3–J7 MODULATOR BD. J21 J22 J23

POWER SUPPLY OUT

A4 INPUT POWER CONTROL BD. (IPC)

INPUT VOLTAGE J3

115VAC IN J4

SCR DRIVE J1

SCR DRIVE J2

XFORMER SENSE J12

BUS DISCHARGE CTL J24

A3 MODULATOR BD. (MOD)

POWER SUPPLY J7

FROM A4–J21 IPC

COND. CURRENT COND. POWER J17

COND. VOLTAGE COND. V BUS J4

ADVCOMM J8 SHIELD

COND. V BUS J26

ADVCOMM J15 SHIELD

COND. V BUS J13

COND. VOLTAGE COND. V BUS J18

COND. CURRENT COND. POWER J17

COND. V BUS J19

COND. VOLTAGE J16

COND. CURRENT J15

POWER SUPPLY J20

FROM A4–J18 IPC

NEUTRAL

CONTACTORS J5 J6

FROM A4–J5 IPC 115 VAC IN J9

FROM A4–J19 IPC POWER SUPPLY J4

A1 I/O BOARD (IOB)

ADVCOMM J7 J8

USER TERMINAL BLOCK J1 J2 J3

R20 R21 TB1 TB2 TB3

DOOR SWITCHES J13

POWER SUPPLY IN J16

RECTIFIED 115V OUT J11

115 VAC OUT J5

TO A1–J9 I/O BD.

FAN DRIVE J6 J14

N.C. COM N.O. S7 FRONT DOOR

N.C. COM N.O. S2 REAR DOOR

PS1 C42

PS2 R1

TB4 C13

FAN MOTOR B1

S1 CTL MEMBRANE PANEL

R25

MEMBRANE PANEL J9 J10

HOUR METER M1 J5

POWER ON DS1 FAULT DS2 OUTPUT #1 DS3 #2 DS4

PANEL LAMPS J7

COND. VOLTAGE J2

COND. CURRENT J1

ADVCOMM J3 SHIELD

FROM A4–J20 IPC POWER SUPPLY J4

DE–9 RS–232 J8

A2 CONTROL BD. (CTL)

④ CHANGED CONN. TO L4 & L5. WAS A6–J1–1 NOW –2
① DELETE C40 & C41, CHANGED TERMINAL DESIGNATIONS ON L4 & L5
① ADD R35, ADD 600V T4, CHANGE PS1

04537ACS	12–99
04610	12–99
04537TEST	12–99
OUTSIDE DISTR.	

DISTRIBUTION TABLE

CHANGE RECORD

E.C. No.	DATE
1) 2395AA	4/13/00
2) 2590AA	1/16/01
3) 2684AA	5–4–01
4) 2914AA	4/30/02

FILE NAME 286552S1 PLOT DATE 5–4–01

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES/MILLIMETERS. TOLERANCES BELOW APPLY EXCEPT FOR VENDOR DESIGNED PARTS AND ITEMS PRODUCED TO RECOGNIZED STANDARDS. DO NOT SCALE DRAWING.
FRACT.± INCH ANGLES ± 3°
DECIMAL–INCH .00 ± .03 .000 ± .010
METRIC 0.0 ±0.8mm 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 ,SPECIAL INPUT VOLTAGE

DESCRIPTIVE DATA
SCHEMATIC/ CONNECTION "A" SPEC, 0–90 KVA

DESIGNED	DRAWN	DATE	SCALE
JJS	RPH	11–29–99	NONE
CHECKED JJS	APPROVED	RECORDS 1–12–00	ITEM TYPE

HOBART® TROY, OHIO 45373 U.S.A.

SIZE D DWG. NO. 286552 SHEET 1 OF 7

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A1	BOARD, P.C., I / O
A2	BOARD, P.C., CONTROL
A3	BOARD, P.C., MODULATOR
A4	BOARD, P.C., INPUT POWER CONTROL
A5	BOARD, P.C., DRIVER
A6	BOARD, P.C., SIGNAL CONDITIONING
A7	BOARD, P.C., BUS DISCHARGE
B1	IMPELLER, MOTORIZED, 115 V.A.C.
C1–C6	CAPACITOR, DC, 50 MFD
C13	CAPACITOR, MOTOR START, 12 MFD
C14–C17	CAPACITOR, DC, 6800 MFD
C22–C33	CAPACITOR, AC, 21 MFD
C34	CAPACITOR, AY, CONTACTOR COIL
C35	CAPACITOR, AY, CONTACTOR COIL
C42	CAPACITOR, 1800 UF, 250 VDC
CB1	CIRCUIT BREAKER
CT1	CURRENT TRANSFORMER, PHASE A, OUTPUT 1
CT2	CURRENT TRANSFORMER, PHASE B, OUTPUT 1
CT3	CURRENT TRANSFORMER, PHASE C, OUTPUT 1
CT4	CURRENT TRANSFORMER, NEUTRAL OUTPUT
CT5	CURRENT TRANSFORMER, PHASE A, OUTPUT 2
CT6	CURRENT TRANSFORMER, PHASE B, OUTPUT 2
CT7	CURRENT TRANSFORMER, PHASE C, OUTPUT 2
D1	SUPPRESSOR
DS1	LIGHT. PILOT. GREEN, 12–14 VDC (INPUT POWER)
DS2	LIGHT, PILOT, RED, 12–14 VDC (FAULT)
DS3	LIGHT, PILOT, AMBER, 12–14 VDC (OUTPUT 1 ON)
DS4	LIGHT, PILOT, AMBER, 12–14 VDC (OUTPUT 2 ON)
F1	FUSE, 1A
F3	FUSE, 15A
K1	CONTACTOR
K2	CONTACTOR
L1	INDUCTOR, AIR CORE, 3 PHASE, AY
L4, L5	CHOKE, DC
M1	HOUR METER
PM1–PM6	TRANSISTOR, IGBT
PS1	POWER SUPPLY, 12 VDC
PS2	POWER SUPPLY, 5 VDC, –12 VDC
R01	RESISTOR, 50W, POWER SUPPLY LOAD
R03	RESISTOR, 225W, 50 OHM
R04	RESISTOR, TRANSFORMER I.D.
R6–R9	RESISTOR, AY
R15, R16	RESISTOR, AY, CONTACTOR COIL
R20, R21	RESISTOR, 5W., 1K OHM
R25	RESISTOR, 1/4W. CONTROL PANEL
RV1–RV3	SUPPRESSOR, MOV
RV4, RV5	VARISTOR, AY, CONTACTOR COIL
RV6	SUPPRESSOR, SEMICONDUCTOR
S1	SWITCH, MEMBRANE, SUPPORT PANEL
S2, S7	SWITCH, DOOR INTERLOCK
S3	SWITCH, TOGGLE
S4	SWITCH, OVERLOAD, THERMAL
S5	THERMAL SWITCH, MAIN TRANSFORMER
S8	THERMAL SWITCH, INPUT TRANSFORMER
SCR1–SCR3	DIODE, SCR
T1	TRANSFORMER, CONTROL
T2	TRANSFORMER, MAIN
T4	TRANSFORMER, 208/ 240 V. INPUT OR 600 V. INPUT
TB1–TB3	BLOCK, TERMINAL, 12 STATION
TB4	TERMINAL BLOCK, 5 STATION, OUTPUT IMPELLER
TB5	TERMINAL BLOCK, 4 STATION, MAIN TRANSFORMER SENSE
TB8	TERMINAL BLOCK, 4 STATION, INPUT TRANSFORMER SENSE

③ REVISE DESCRIPTION ON R25
① DELETE R2, ADD R20, R21 R25, CHANGE T4

DISTRIBUTION TABLE	
04537ACS	12–99
04610	12–99
04537TEST	12–99
OUTSIDE DISTR.	

CHANGE RECORD	
E.C. No.	DATE
1) 2395AA	4/13/00
2) 2590AA	1–16–01
3) 2684AA	5/4/01
4) 2914AA	4/30/02

FILE NAME	PLOT DATE
286552S2	4/30/02

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

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

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FINISH CODE PER 910176: NONE

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

MATERIAL SPEC.
–

TITLE
DIAGRAM, ADV, SPECIAL INPUT VOLTAGE

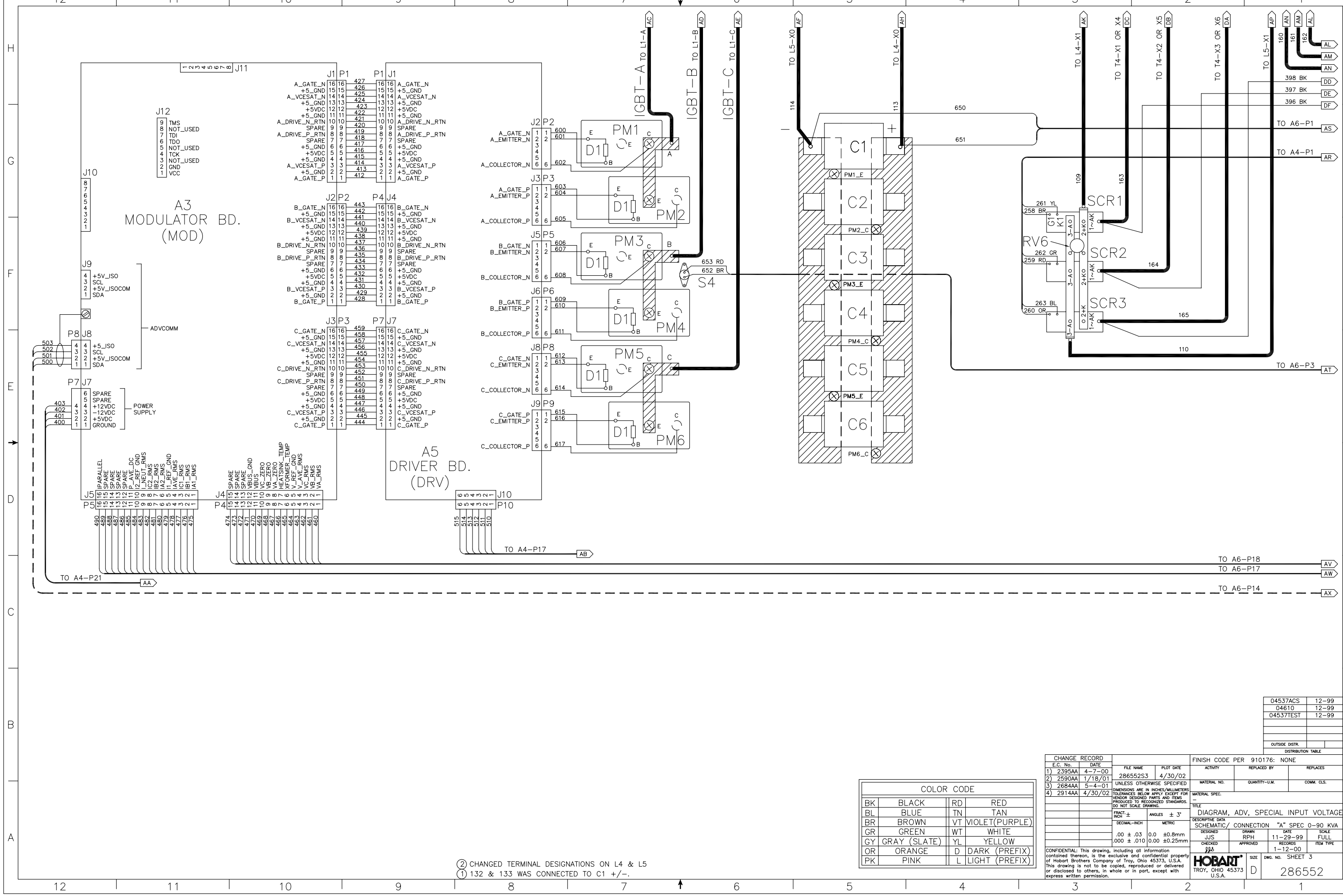
DESCRIPTIVE DATA
SCHEMATIC/ CONNECTION "A" SPEC, 0–90 KVA

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

HOBART®
TROY, OHIO 45373
U.S.A.

SIZE C

DWG. NO. 286552 SHEET 2 OF 7



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)

(2) CHANGED TERMINAL DESIGNATIONS ON L4 & L5
(1) 132 & 133 WAS CONNECTED TO C1 +/−.

04537ACS	12−99
04610	12−99
04537TEST	12−99
OUTSIDE DISTR.	

DISTRIBUTION TABLE

CHANGE RECORD	
E.C. No.	DATE
1) 2395AA	4−7−00
2) 2590AA	1/18/01
3) 2684AA	5−4−01
4) 2914AA	4/30/02

FILE NAME: 286552S3 | PLOT DATE: 4/30/02

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

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FINISH CODE PER 910176: NONE

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

MATERIAL SPEC.
−
TITLE
DIAGRAM, ADV, SPECIAL INPUT VOLTAGE
DESCRIPTIVE DATA
SCHEMATIC/ CONNECTION "A" SPEC 0−90 KVA

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

HOBART®
TROY, OHIO 45373 U.S.A.
SIZE D
DWG. NO. 286552
SHEET 3

A4 INPUT POWER CONTROL BD. (IPC)

A6 SIGNAL CONDITIONING BD. (SCB)

TO T4–H3 162
TO T4–H2 161
TO T4–H1 160
TO SCR3–AK 398 BK
TO SCR2–AK 397 BK
TO SCR1–AK 396 BK
TO BUS SYSTEM
TO SCR1–SCR3
TO S4
TO A1–P9
TO TB6
TO REAR DOOR SWITCH
TO A1–P7
TO A7–P2
TO A1–P8
TO T2
TO TB5
TO CT4
TO CT7
TO CT6
TO CT5
TO CT3
TO CT2
TO CT1
TO CB1–L3
TO CB1–L2
TO CB1–L1
TO RV3 TOP
TO RV2 TOP
TO RV1 TOP
TO CB1
FERRITE SHIELD
TO FAN MOTOR
SYSTEM POWER SUPPLY
TO A3–P7
TO A1–P4
TO A5–P10
TO A2–P4
TO A3–P4
TO A3–P5
TO A3–P8
TO A2–P1
TO A2–P2
TO A2–P3
TO T1
TO FRAME GROUND
TO C42

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)

S7 N.C. COM. N.O. 528 RD 527 BR

PS2 TRIM +5V COM COM –12V ON/OFF CASE +VIN –VIN N/C ACON
519 YL 517 RD 516 BR 364 GR–YL 518 OR 363 YL 366 YL 365 BR 360 BR
NOTE: LABEL MUST BE FACING THIS DIRECTION.

R1

PS1 TB1 1 IN– 2 IN+ TB2 –OUT 1 +OUT 2
369 YL 381 YL 368 BR 380 BR 362 BR 363 YL
362 BR

① CHANGE PS1

CHANGE RECORD	
E.C. No.	DATE
1) 2395AA	4/13/00
2) 2590AA	1–16–01
3) 2684AA	5–4–01
4) 2914AA	4/30/02

FILE NAME	PLOT DATE
286552S4	4/30/02

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES/MILLIMETERS
TOLERANCES BELOW APPLY EXCEPT FOR VENDOR DESIGNED PARTS AND ITEMS PRODUCED TO RECOGNIZED STANDARDS.
DO NOT SCALE DRAWING.
FRACT. ± INCH · ANGLES ± 3°
DECIMAL–INCH · METRIC
.00 ± .03 · 0.0 ±0.8mm
.000 ± .010 · 0.00 ±0.25mm

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04537ACS	12–99
04610	12–99
04537TEST	12–99
OUTSIDE DISTR.	
DISTRIBUTION TABLE	

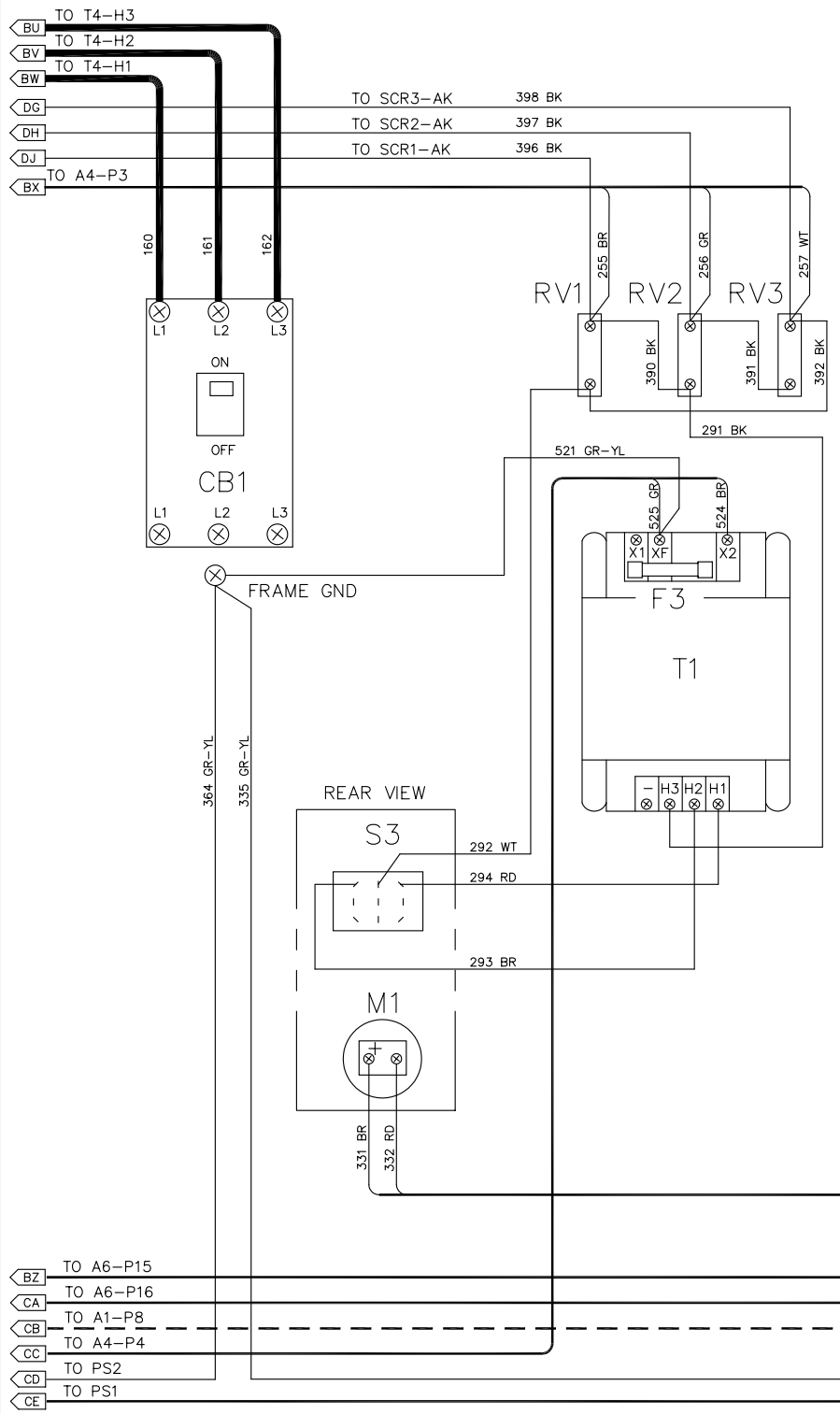
FINISH CODE PER 910176: NONE

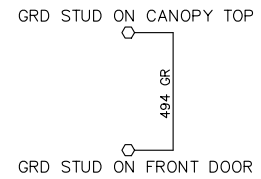
ACTIVITY	REPLACED BY	REPLACES
MATERIAL NO.	QUANTITY–U.M.	COMM. CLS.

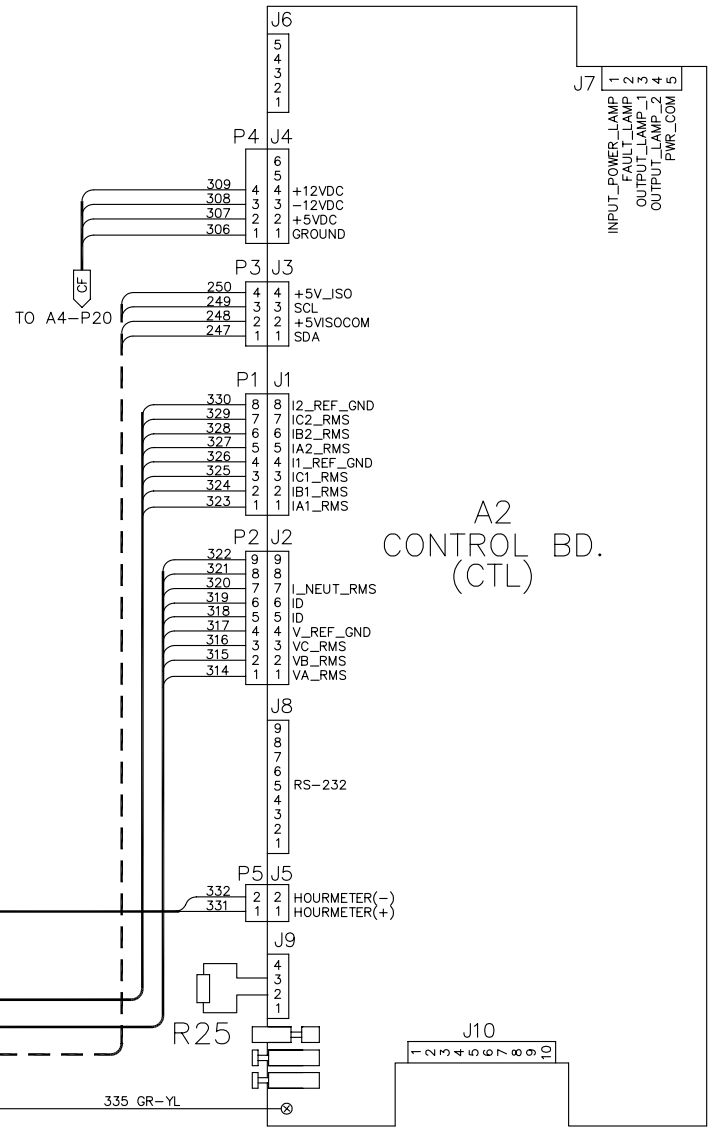
MATERIAL SPEC. —
TITLE
DIAGRAM, ADV, SPECIAL INPUT VOLTAGE
DESCRIPTIVE DATA
SCHEMATIC/ CONNECTION "A" SPEC, 0–90 KVA

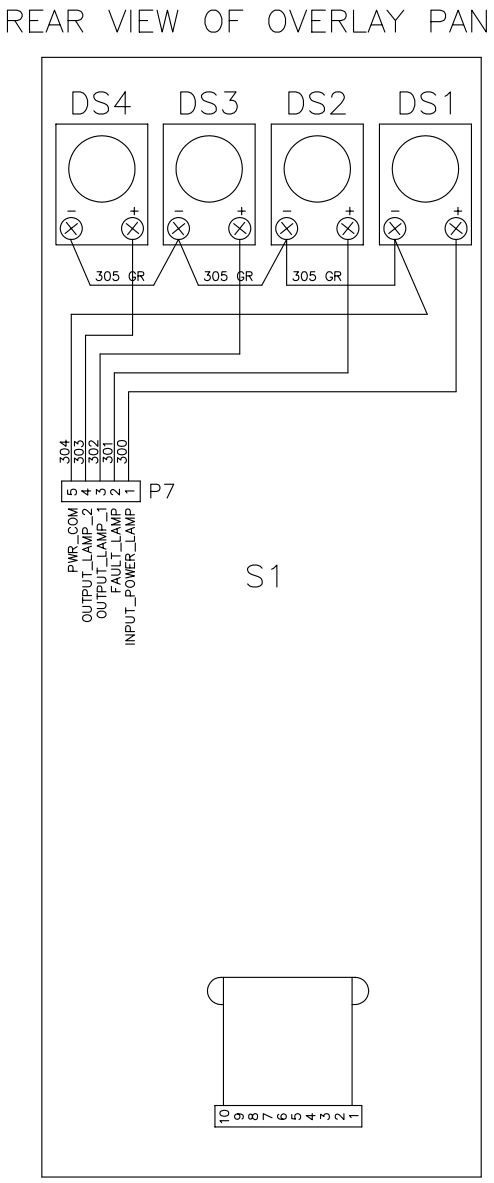
DESIGNED	DRAWN	DATE	SCALE
JJS	RPH	11–29–99	FULL
CHECKED	APPROVED	RECORDS 1–12–00	ITEM TYPE

HOBART® TROY, OHIO 45373 U.S.A. · SIZE D · DWG. NO. 286552 · SHEET 4 OF 7









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

① ADD R25

CHANGE RECORD	
E.C. No.	DATE
1) 2395AA	4/13/00
2) 2590AA	1–16–01
3) 2684AA	5–4–01
4) 2914AA	4/30/02

FILE NAME: 286552S5 — PLOT DATE: 4/30/02

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

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

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FINISH CODE PER 910176: NONE

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

MATERIAL SPEC.
–

TITLE
DIAGRAM,ADV, SPECIAL INPUT VOLTAGE

DESCRIPTIVE DATA
SCHEMATIC/ CONNECTION "A" SPEC 0–90 KVA

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

HOBART® TROY, OHIO 45373 U.S.A.

SIZE D

DWG. NO. 286552 SHEET 5 OF 7

TO A6-P12 TO CT1 (BT)
TO A6-P11 TO CT2 (BS)
TO A6-P10 TO CT3 (BR)
TO A6-P8 TO CT5 (BN)
TO A6-P7 TO CT6 (BM)
TO A6-P6 TO CT7 (BL)
TO A6-P5 TO CT4 (BK)
TO A6-P4 (BJ)
TO A6-P2 (BH)
TO A2-P3 / TO A4-P24 (BG)
TO A4-P14 (BF)
TO A4-P13 (BE)
TO A4-P12 (BD)
TO A4-P5 (BC)
(BB)

TO A4-J6 (CH)

TB4: 1 2 3 4 5 — GR-YL, 711 OR, 710 BK, BL, BK, BL, BR, BR

B1

C13

GRD STUD ON CANOPY TOP
493 GR
GRD STUD ON REAR DOOR

TO A4-J19 (CG)

A1 I/O BRD (IOB)

P2 J2
211 BRIDGE_INTERLOCK_N.O.
210 BRIDGE_INTERLOCK_N.O.
209 BRIDGE_INTERLOCK_N.C.
208 BRIDGE_INTERLOCK_N.C.
207 FAULT_LAMP
206 COM

J4 P4
GROUND
+5VDC
−12VDC
+12VDC

P1 J1
223 EF_2
222 AUX+
221 REMOTE_2_OFF
220 COM
219 REMOTE_2_ON
218 EF_1
217 AUX+
215 REMOTE_1_OFF
214 COM
213 REMOTE_1_ON

J7 P7
SDA
+5V_ISOCOM
SCL
+5V_ISO
406 407 408 409

J8 P8
SDA
+5V_ISOCOM
SCL
+5V_ISO
247 248 249 250

NEUTRAL

P3 J3
235 OUTPUT_2_OFF_LAMP
234 COM
233 OUTPUT_2_ON_LAMP
232 EF_2_PRESENT_LAMP
231 COM
230 EF_1_PRESENT_LAMP
229 OUTPUT_1_OFF_LAMP
228 COM
227 OUTPUT_1_ON_LAMP
226 400Hz_ON_LAMP
225 COM
224 INPUT_POWER_LAMP

J9 P9
120VAC 237
120VAC 238

F1

J5 P5 CONTACTOR1−, CONTACTOR1_SENSE, CONTACTOR1+ — 202 201 200
J6 P6 CONTACTOR2−, CONTACTOR2_SENSE, CONTACTOR2+ — 205 204 203

495 GN — TO GRD STUD ON CANOPY TOP

CT1 CT2 CT3 CT5 CT6 CT7 CT4 (3)

119 120 121 125 126 127 122

R15 C34 RV4
R16 C35 RV5

202 OR 370 BR 201 RD
205 OR 371 BR 204 RD
200 BR 203 BR

K1 K2 — A B C — N.O. N.C. COM

OUTPUT 1
OUTPUT 2

660 OR 659 BR 661 GR 662 VT

T2 — H3 H2 H1 — X3 X0 X2 X1

S5 R4 TB5 — 1 2 3 4

654 655 656 657

134 BK GRD
166 BK CY

NEUTRAL

TO TB6 CM
TO A7-P2 CN

TO C22 TOP CP
TO C26 TOP CR
TO C30 TOP CS

495 GR 236 BR 496 GR

TB1: 496 GR, 213 BR, 214 RD, 215 OR, 350 OR, 217 GR, 218 BL, 219 VT, 220 GY, 221 WT, 351 OR, 222 BR, 223 RD — 1 2 3 4 5 6 7 8 9 10 11 12
R20 R21

S2: 530 GR, 529 YL — N.C. N.O. COM

TB2: 206 VT, 207 GY, 208 WT, 209 BK, 210 BR, 211 RD — 1 2 3 4 5 6 7 8 9 10 11 12

TB3: 224 BR, 225 RD, 226 OR, 227 YL, 228 GR, 229 BL, 230 VT, 231 GY, 232 WT, 233 BK, 234 BR, 235 RD — 1 2 3 4 5 6 7 8 9 10 11 12

(3) ALL CT'S
TO CONTACTOR
WHITE — BLACK — TWIST WIRES
TO TRANSFORMER (2)

H1 (OPTIONAL) — X1 H1

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)

(4) CHANGED 200BR, 203BR, & R15/R16 CONN.
(2) CHANGE CT DETAIL 3
(1) ADD R20 & R21

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

OUTSIDE DISTR. — DISTRIBUTION TABLE

CHANGE RECORD

E.C. No.	DATE
1) 2395AA	4/13/00
2) 2590AA	1/16/01
3) 2684AA	5-4-01
4) 2914AA	4/30/02

FILE NAME 286552S6 — PLOT DATE 5-4-01

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES/MILLIMETERS. TOLERANCES BELOW APPLY EXCEPT FOR VENDOR DESIGNED PARTS AND ITEMS PRODUCED TO RECOGNIZED STANDARDS. DO NOT SCALE DRAWING.
FRACT. ± — 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, SPECIAL INPUT VOLTAGE
DESCRIPTIVE DATA
SCHEMATIC/ CONNECTION "A" SPEC 0-90 KVA

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

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HOBART® TROY, OHIO 45373 U.S.A. — SIZE D — DWG. NO. 286552 — SHEET 6 of 7

TO CB1-L3 (AL)
TO CB1-L2 (AM)
TO CB1-L1 (AN)
TO SCR3 (-) (AP)
TO SCR3-AK (DA)
TO SCR2-AK (DB)
TO SCR1-AK (DC)
TO SCR1 (+) (AK)
TO BUS SYSTEM (+) (AH)
TO BUS SYSTEM (-) (AF)
TO IGBT-C (AE)
TO IGBT-B (AD)
TO IGBT-A (AC)

C1 B1 A1
L1
C2 B2 A2

TOP ASSEMBLY
L4
X0 X1 X2

BOTTOM ASSEMBLY
L5
X0 X1 X2

113
132
109
114
133
110

T4
TB8
4 3 2 1
666 665 664 663
S8
X1 X4 X2 X5 X3 X6
H1 H2 H3
160 161 162
165 164 163

166 BK (CY)
SEE CHART FOR CONNECTIONS
TO A4-P12 (CM)
TO A4-P24 (CN)

TO T2-H1 (CP)
TO T2-H2 (CR)
TO T2-H3 (CS)
115

C22 C23 C24 C25
C26 C27 C28 C29
C30 C31 C32 C33

340 BR
341 RD
342 BL
343 BK
P1 J1
+DC_LINE RESISTOR
RESISTOR
-DC_LINE

P2 J2
540 5 5 COMMON
539 4 4 BUS_DISCHARGE_ON_IN
538 3 3 SPARE
537 2 2 BUS_DISCHARGE_CONTROL_OUT
536 1 1 BUS_DISCHARGE+

R3
A7
BUS DISCHARGE BRD.
(BDC)

R6 R7
C14 C15
R8
R9
C16 C17
133
132

T4 CONNECTIONS

CONNECTIONS FOR 208 V. INPUT:	CONNECTIONS FOR 240 V. INPUT:	CONNECTIONS FOR 600 V. INPUT:
CABLE 163 TO T4-X4 CABLE 164 TO T4-X5 CABLE 165 TO T4-X6 JUMPER TOGETHER T4-X1, X2, X3	CABLE 163 TO T4-X1 CABLE 164 TO T4-X2 CABLE 165 TO T4-X3 JUMPER TOGETHER T4-X4, X5, X6	CABLE 163 TO T4-X1 CABLE 164 TO T4-X2 CABLE 165 TO T4-X3

SELF LEAD L4 OR L5
CABLE
CABLE
(1)

TERMINAL SEQUENCE L4/L5

POSITION TERMINALS TOGETHER AS SHOWN

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	FILE NAME	PLOT DATE
1) 2395AA	4/13/00	286552S7	4/30/02
2) 2590AA	1/16/01	UNLESS OTHERWISE SPECIFIED	
3) 2684AA	5-4-01	DIMENSIONS ARE IN INCHES/MILLIMETERS. TOLERANCES BELOW APPLY EXCEPT FOR VENDOR DESIGNED PARTS AND ITEMS PRODUCED TO RECOGNIZED STANDARDS. DO NOT SCALE DRAWING.	
4) 2914AA	4/30/02	FRACT. ±	ANGLES ± 3°
		DECIMAL-INCH	METRIC
		.00 ± .03	0.0 ±0.8mm
		.000 ± .010	0.00 ±0.25mm

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FINISH CODE PER 910176: NONE

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

MATERIAL SPEC.
–

TITLE
DIAGRAM,ADV, SPECIAL INPUT VOLTAGE

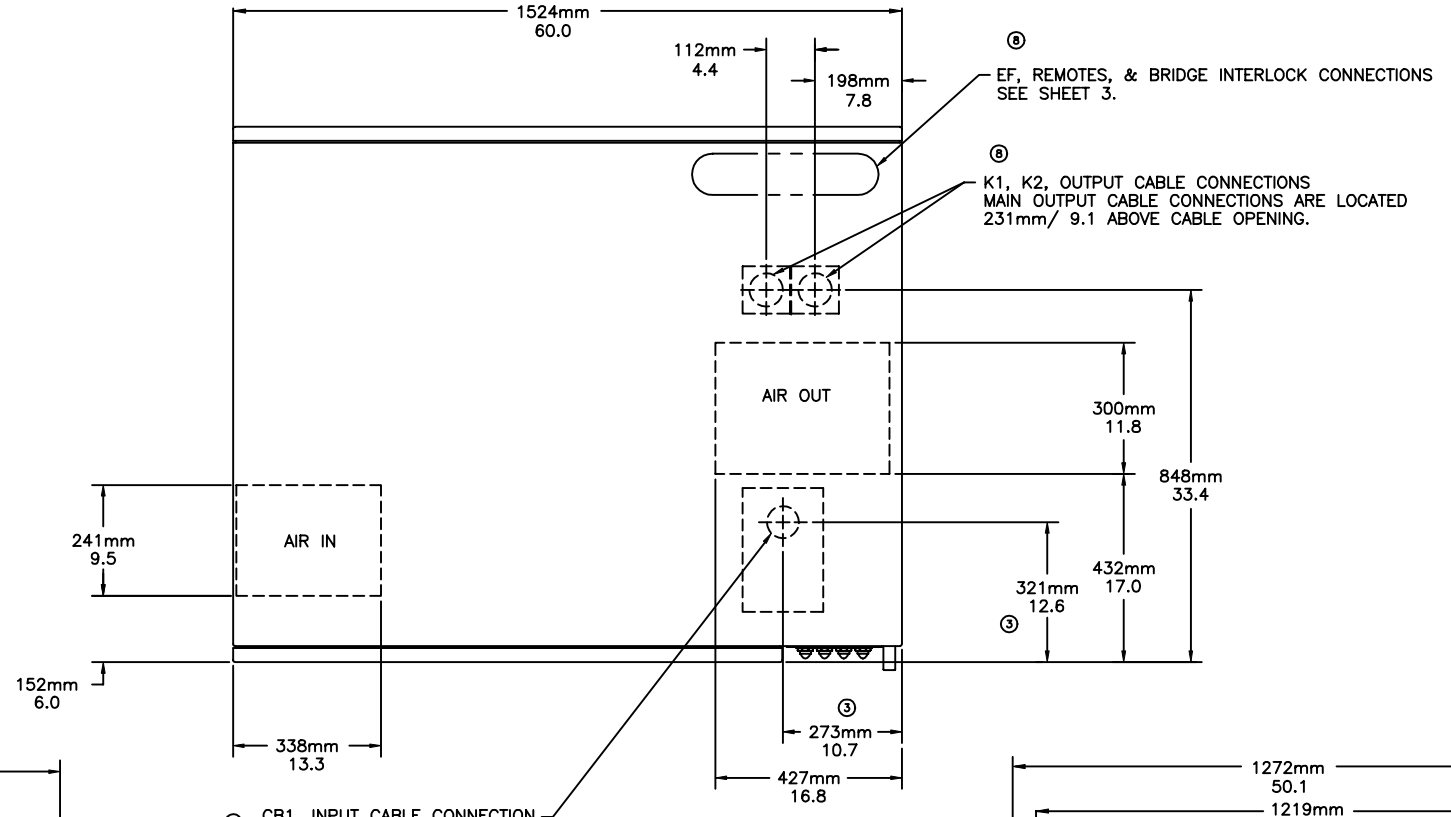
DESCRIPTIVE DATA
SCHEMATIC/ CONNECTION "A" SPEC 0-90 KVA

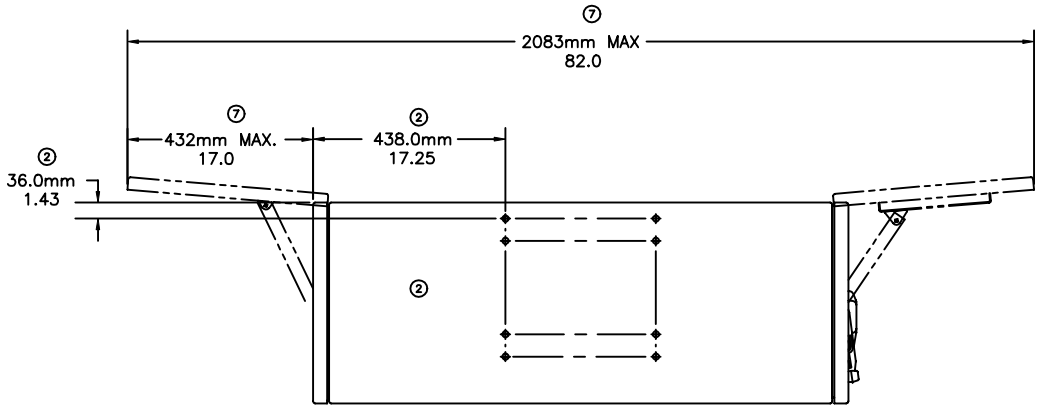
DESIGNED	DRAWN	DATE	SCALE
JJS	RPH	11-29-99	FULL
CHECKED	APPROVED	RECORDS	ITEM TYPE
jjs		1-12-00	

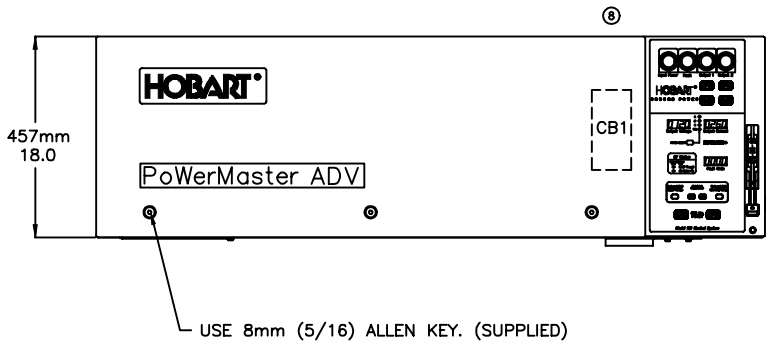
HOBART®
TROY, OHIO 45373
U.S.A.

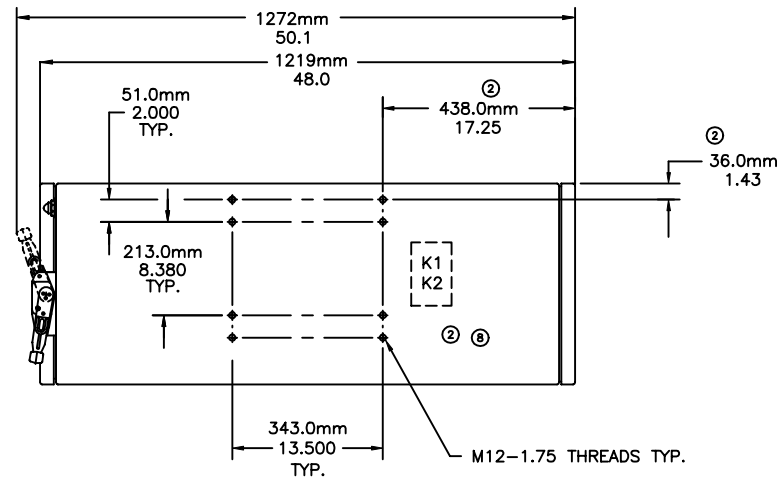
SIZE D | DWG. NO. 286552 | SHEET 7 OF 7

(4) CHANGED CONN. TO L4 & L5
(2) CHANGED TERMINAL DESIGNATIONS ON L4 & L5
(1) ADDED TO T4 CONNECTIONS, DELETED JUMPER ON TB7, REROUTED 132 & 133 TO L4 & L5.









DIMENSIONS IN MILLIMETERS AND INCHES.

WEIGHTS

	MODEL	STANDARD	WITH 12 PULSE OPTION	WITH 208,240, OR 600 VOLT INPUT OPTION ⑧	WITH 28 V DC OPTION ⑧
①	60/90SX200	1020 lbs. 463 kg.	1270 lbs. 576 kg.	1228 lbs. 557 kg.	1203 lbs. 546 kg.
①	45SX200	1020 lbs. 463 kg	———	1228 lbs. 557 kg.	1203 lbs. 546 kg.
④ ②	120/160SX200	1330 lbs. 603 kg.	1782 lbs. 808 kg.	1710 lbs. 776 kg.	———

⑧ * ADD 80 lbs./36 kg FOR BRIDGE BRACKETS

OUTSIDE DISTR.

DISTRIBUTION TABLE

CHANGE RECORD				
E.C. No.	DATE		FILE NAME	PLOT DATE
1) 2125AA	3–17–99		286495	1/2/02
2) 2243AA	8–12–99		UNLESS OTHERWISE SPECIFIED	
3) 2284AA	11–17–99		DIMENSIONS ARE IN INCHES/MILLIMETERS TOLERANCES BELOW APPLY EXCEPT FOR VENDOR DESIGNED PARTS AND ITEMS PRODUCED TO RECOGNIZED STANDARDS. DO NOT SCALE DRAWING.	
4) 2460AA	8/3/00			
5) 2594AA	1/22/01			
6) 2670AA	3–20–01			
7) 2683AA	4/5/01		FRACT.±	ANGLES ± 3°
8) 2849AA	1/2/02		DECIMAL–INCH	METRIC
			.00 ± .03	0.0 ±0.8mm
			.000 ± .010	0.00 ±0.25mm

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FINISH CODE PER 910176: NONE

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

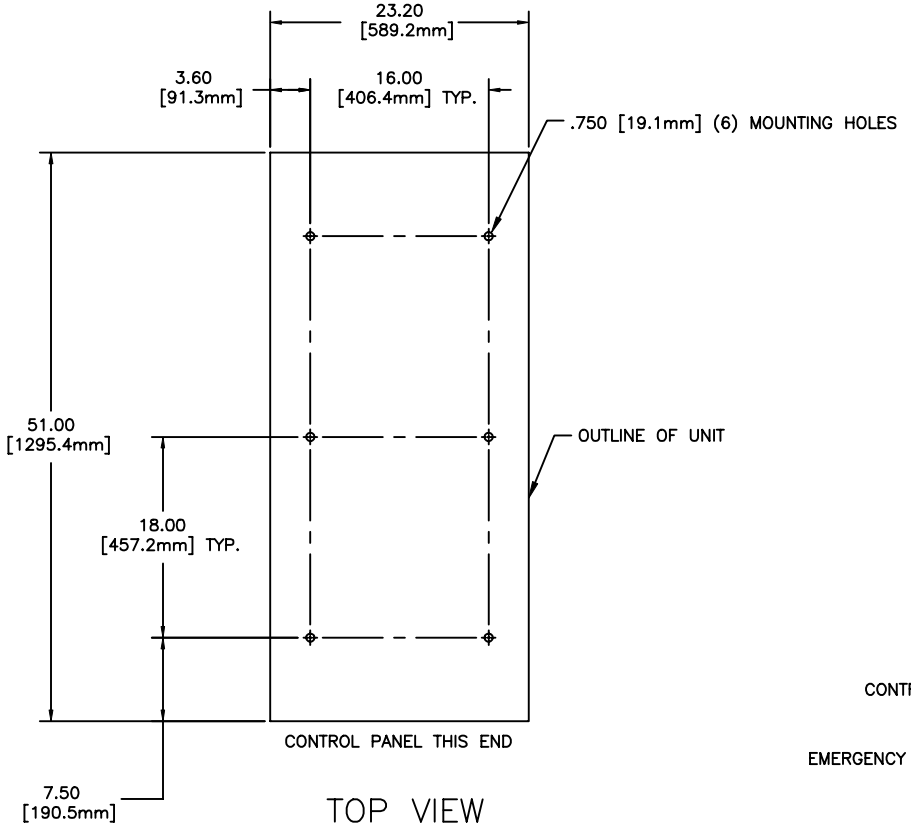
MATERIAL SPEC. –

TITLE: OUTLINE, DIMENSIONAL

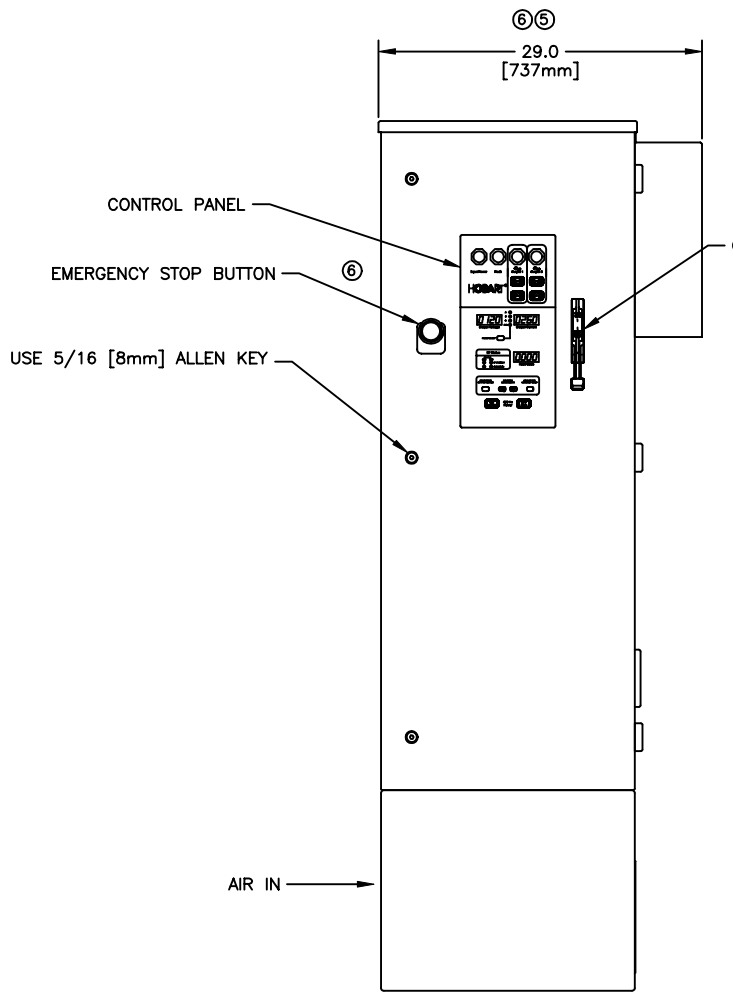
DESCRIPTIVE DATA: ADV CONVERTER

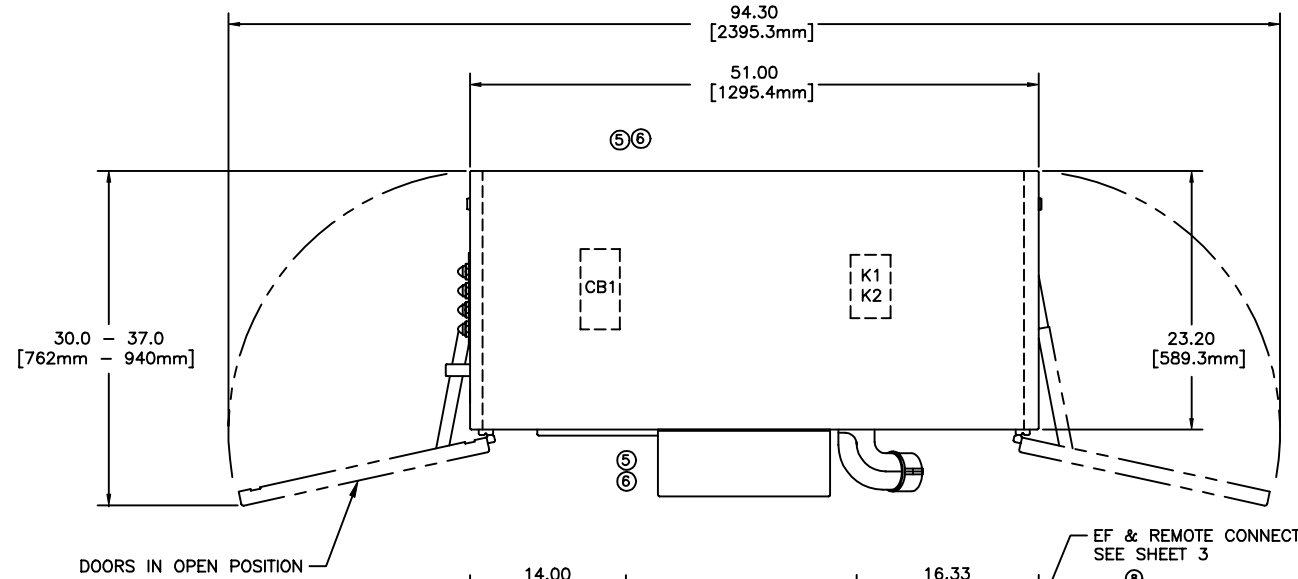
DESIGNED	DRAWN	DATE	SCALE
RPH	RPH	11/7/97	EIGHTH
CHECKED	APPROVED	RECORDS 2–27–98	ITEM TYPE

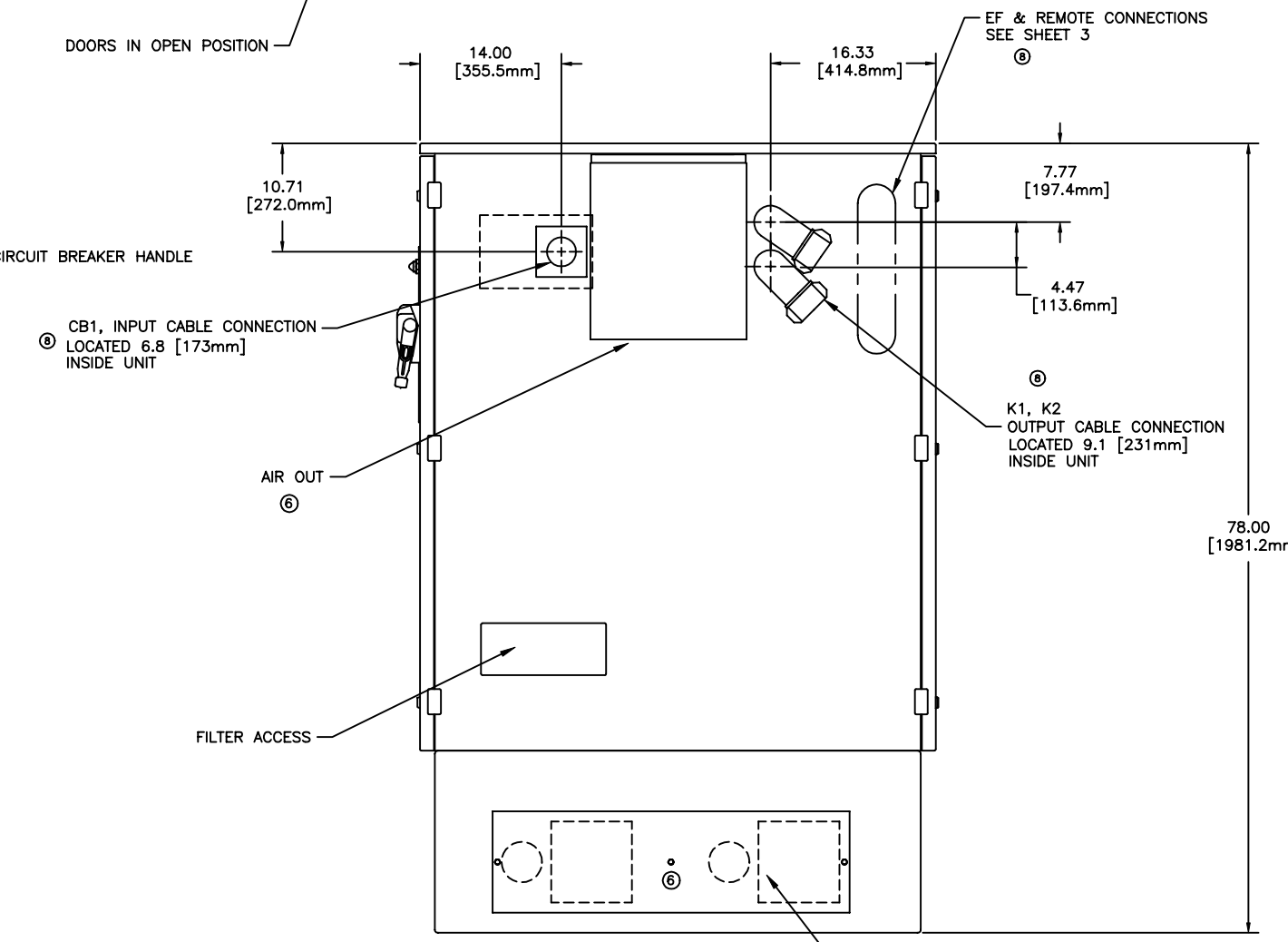
HOBART TROY, OHIO 45373 U.S.A. | SIZE D | DWG. NO. 286495 | SHEET 1 OF 3 ④ ⑧



TOP VIEW







FLOOR MOUNTED UNIT WEIGHTS ⑧

MODEL	STANDARD	WITH 12 PULSE OPTION	WITH 208, 240, OR 600 VOLT INPUT OPTION
60/90SX200	1299 lbs. 589 kg.	1549 lbs. 703 kg.	1507 lbs. 684 kg.
120/160SX200	1601 lbs. 726 kg.	2053 lbs. 931 kg.	1981 lbs. 899 kg.

FLOOR MOUNTED

CHANGE RECORD	
E.C. No.	DATE
1) N/A	
2) N/A	
3) N/A	
4) 2460AA	8/3/00
5) 2594AA	1/22/01
6) 2670AA	3/20/01
7) 2683AA	4/5/01
8) 2849AA	1/2/02

FILE NAME: 286495S2 | PLOT DATE: 1/2/02

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

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

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DISTRIBUTION TABLE	
OUTSIDE DISTR.	

FINISH CODE PER 910176: NONE

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

MATERIAL SPEC.
–

TITLE
OUTLINE, DIMENSIONAL

DESCRIPTIVE DATA
VERTICAL ADV

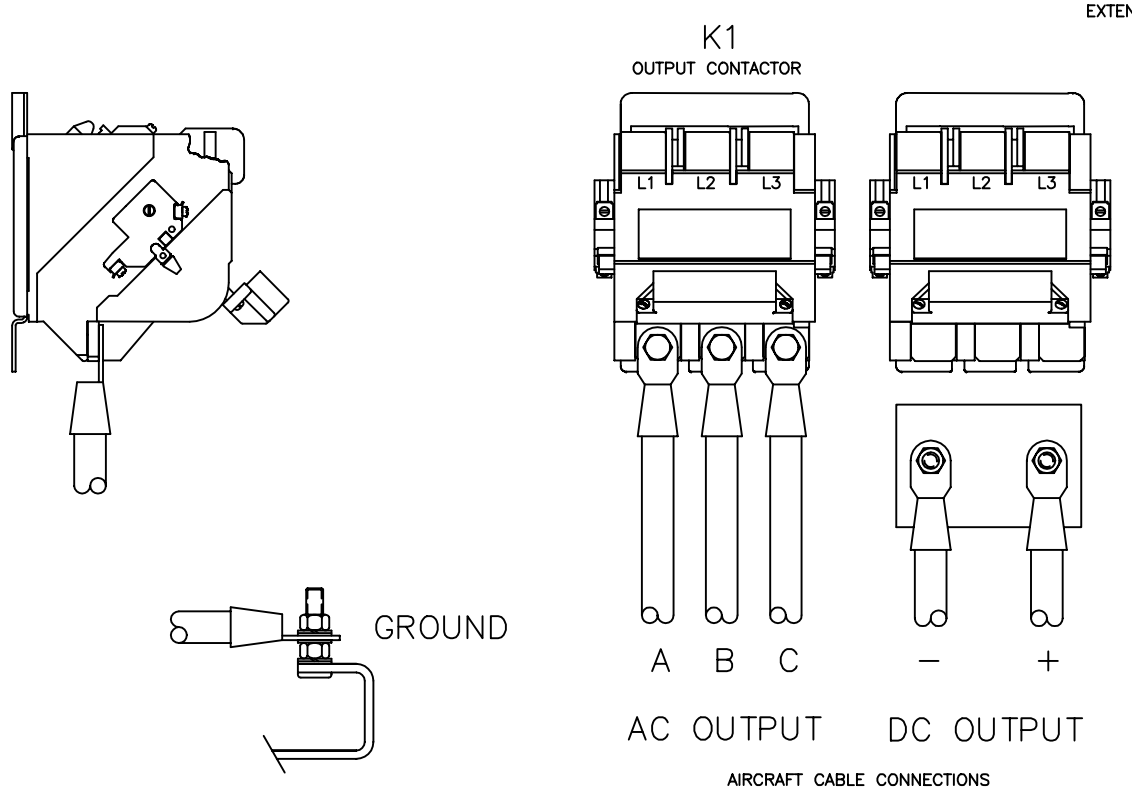
DESIGNED	DRAWN	DATE	SCALE
RPH	RPH	8/3/00	NONE
CHECKED	APPROVED	RECORDS	ITEM TYPE

HOBART® TROY, OHIO 45373 U.S.A.

SIZE D | DWG. NO. 286495 | SHEET 2 OF 3 ④⑧

AIRCRAFT CABLE CONNECTIONS:
9/16 SOCKET WITH EXTENSION REQUIRED

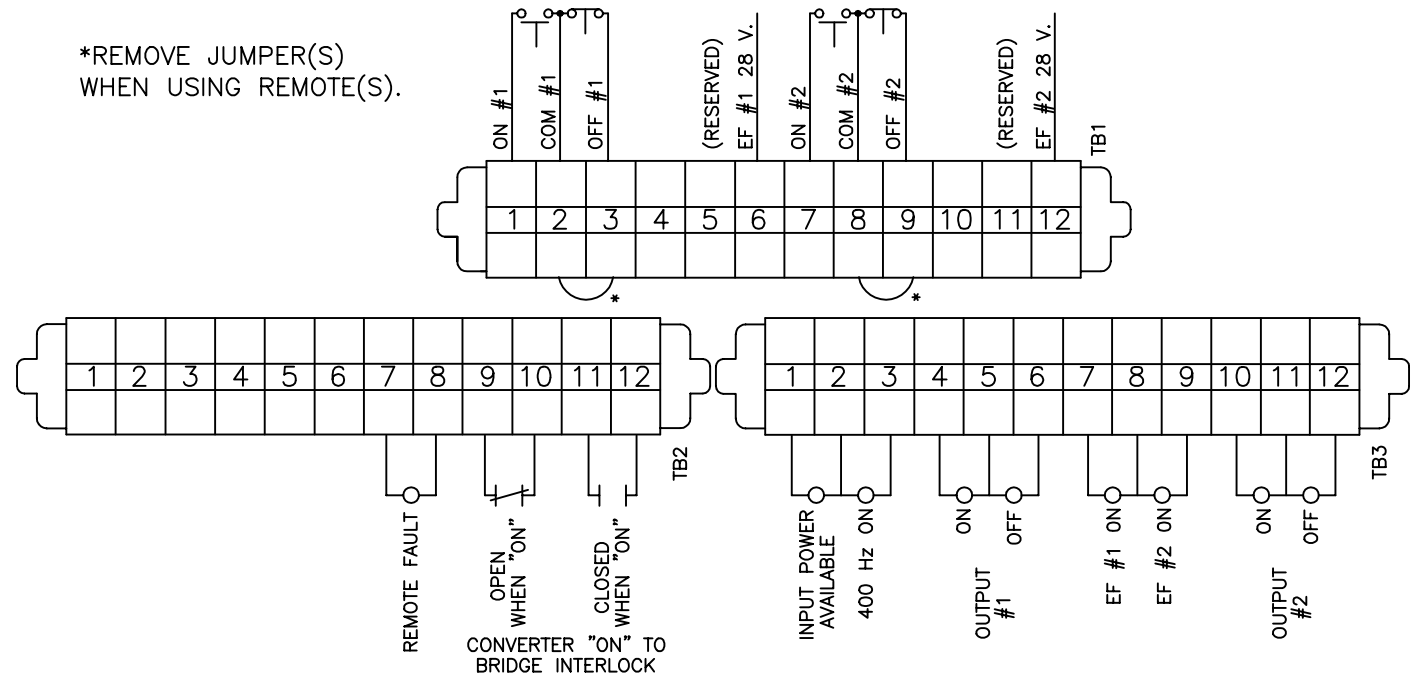
CABLE CLAMPS: 10mm SOCKET WITH EXTENSION REQUIRED



AIRCRAFT CABLE CONNECTIONS FOR AC/DC OUTPUT UNITS

FLAT BLADED SCREW DRIVER REQUIRED

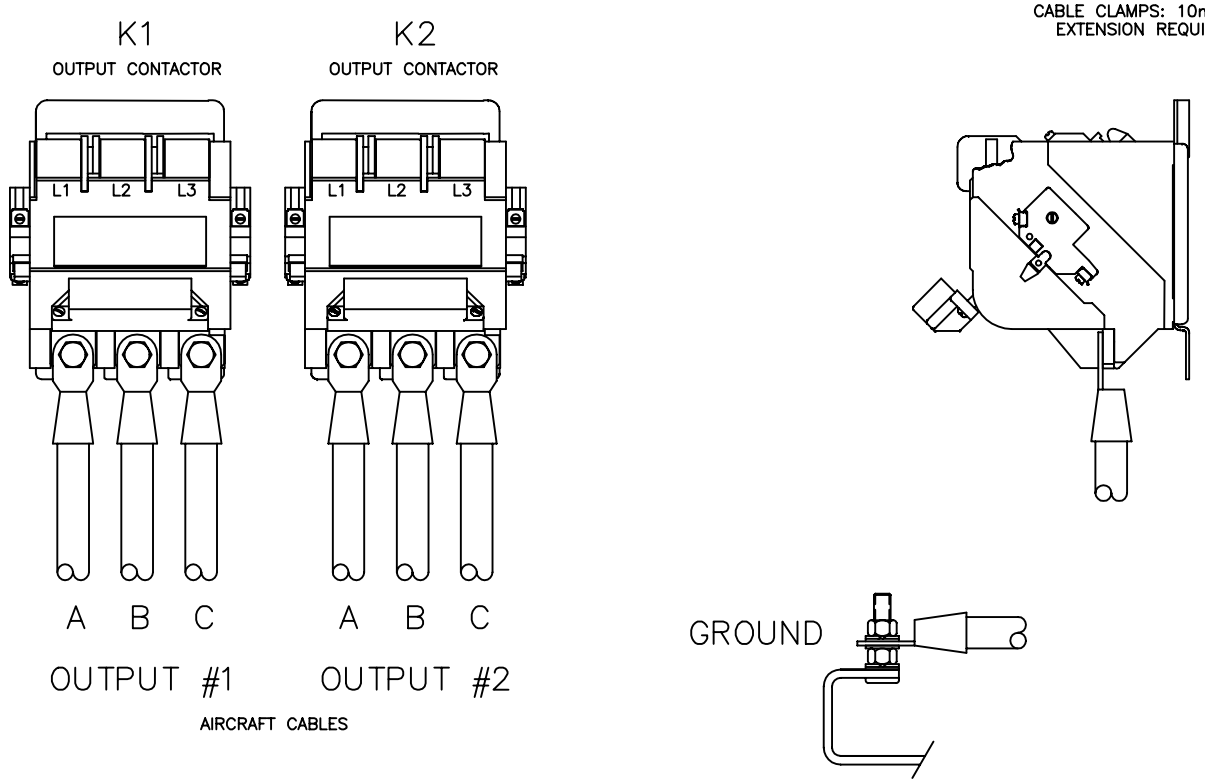
*REMOVE JUMPER(S)
WHEN USING REMOTE(S).



EF, REMOTES, & BRIDGE INTERLOCK CONNECTIONS

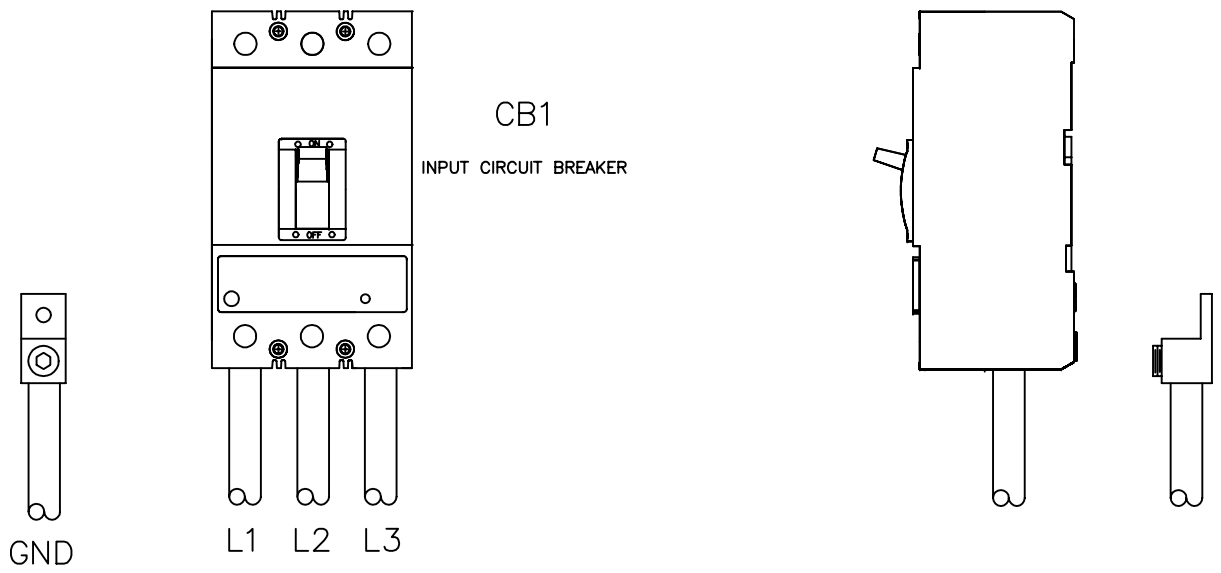
AIRCRAFT CABLE CONNECTIONS:
9/16 SOCKET WITH EXTENSION REQUIRED

CABLE CLAMPS: 10mm SOCKET WITH EXTENSION REQUIRED



AIRCRAFT CABLE CONNECTIONS FOR 1 OR 2 OUTPUT UNITS

INPUT CABLE CONNECTIONS



CONTACTOR CONNECTOR #6–350kcmil
3/8 ALLEN WRENCH REQUIRED

GROUND CONNECTOR #6–250mcm
5/16 OR M8 ALLEN WRENCH REQUIRED

13mm SOCKET WITH EXTENSION FOR CABLE CLAMP REQUIRED

CHANGE RECORD		
E.C. No.	DATE	
1) N/A		
2) N/A		
3) N/A		
4) N/A		
5) N/A		
6) N/A		
7) N/A		
8) 2849AA	1/2/02	

FILE NAME	PLOT DATE
286495S3	1/3/02

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

FRACT. INCH ±
ANGLES ± 3°

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

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FINISH CODE PER 910176: NONE

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

MATERIAL SPEC.
–

TITLE
OUTLINE, DIMENSIONAL

DESCRIPTIVE DATA
ADV CONVERTER

DESIGNED	DRAWN	DATE	SCALE
RPH	RPH	1/2/02	HALF
CHECKED	APPROVED	RECORDS	ITEM TYPE

HOBART®
TROY, OHIO 45373
U.S.A.

SIZE D | DWG. NO. 286495 | SHEET 3 OF 3

DISTRIBUTION TABLE
OUTSIDE DISTR.

Appendix A Options / Features

Option/Features Available			
Description	**Part Number**	**Document Number**	**In This Section**
Trailer with Cable Hangers	286494-001	TO-266	
Trailer with Shelf Assembly	286493-001		
SCR Diode Kit	286501-001	TO-261	
IGBT Transistor Kit	286502-001	TO-262	
Kit, CE Certification (Trailer Mount)	287589-005		
Kit, CE Certification (Bridge Mount)	287589-006		
Bridge Mount Kit	286284-1 & -2	TO-277	
2 & 4 Station Pushbutton Kit	285440-1 & -2	TO-228	

* – A large number of variations exist under this part number. Call the factory for details.

The following is a list of options/features available for the 400 Hz. Solid State Converter. This chart contains the description, part number, and document number (if applicable) of the option/feature. There is also a column to identify which option/feature document is contained in this Appendix.

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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:

a) Combustible, explosive, abrasive or conducting dusts.

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

c) Chemical fumes, flammable, or explosive gases.

d) Nuclear radiation.

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

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

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

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

i) Low and/or high ambient temperatures.

j) High electromagnetic fields

2) Operation at:

a) Voltages above or below rated voltage.

b) Speeds other than rated speed.

c) Frequency other than rated frequency.

d) Standstill with rotating equipment windings energized.

e) Unbalanced voltages.

f) Operation at loads greater than rated.

3) Operation where low acoustical noise levels are required.

4) Operation with:

a) Improper fuel, lubricants or coolant.

b) Parts or elements unauthorized by the manufacturer.

c) Unauthorized modifications.

5) Operation in poorly ventilated areas.