

Change Sheet Plus 18

Change Sheet Plus 18

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Table of Contents

chapter 1	1-1
System Overview	1-1
1.1 SYSTEM DESCRIPTION	1-1
1.2 MODES OF OPERATION	1-2
1.3 MODES OF OPERATION/ALARMS	1-3
Normal Mode	1-3
On Battery Mode	1-3
overload	1-3
Bypass Mode	1-3
Emergency Power Off (EPO)	1-3
1.4 SPECIFICATIONS	1-8
1.4.1 Ratings	1-8
1.4.2 Input	1-8
1.4.3 system Output	1-8
1.4.4 Environmental	1-9
1.4.5 Battery	1-10
1.4.6 Dimensions	1-10
Chapter 2	2-1
Safety	2-1
2.1 GENERAL SAFETY CONSIDERATIONS'	2-1
2.1.1 Tools, Equipment and Expendable Field Service Supplies	2-1
2.1.2 General Safety Rules	2-1
2.2 ENVIRONMENTAL SAFETY	2-1
2.3 ELECTRICAL SAFETY	2-2
2.4 MECHANICAL SAFETY	2-3
2.5 EYE SAFETY	2-3
2.6 UPS SAFETY	2-4
2.6.1 Operating Environment	2-4
2.6.2 Normal Operation	2-4
2.6.3 Maintenance/Service	2-4
2.6.4 Batteries	2-5
2.7 SITE SAFETY	2-5
2.8 SUMMARY	2-6
Quality Control Procedure	2-7
QCP - 211	2-7
2.9 ELECTROSTATIC DISCHARGE (ESD) PROCEDURE AND EQUIPMENT REQUIREMENTS	2-7
2.9.1 Purpose.....;	2-7
2.9.2 Scope	2-7
2.9.3 Responsibility	2-7

2.9.4	Applicable Documents and Materials	2-7
2.9.5	Definitions	2-7
2.9.6	Procedure	2-8
2.9.7	Removal of Boards	2-9
2.9.8	Packaging of Boards	2-9
2.10	GENERAL GUIDELINES FOR ESD PROTECTION	2-10
Chapter 3		3-1
Installation and Initial Startup		3-1
3.1	UNPACIUNG INSTRUCTIONS	3-1
3.2	INSTALLATION (CABINET JOINING)	3-1
3.3	INSTALLATION OF OPTIONS (IF APPLICABLE)	3-2
3.4	CONNECTION OF UPS	3-2
3.5	SYSTEM START-UP AND SITE ACCEPTANCE PROCEDURE	3-3
3.5	SYSTEM START-UP AND SITE ACCEPTANCE CHECK SHEET	3-4
Chapter 4		4-1
System Operation		4-1
4.1	CONTROLS AND INDICATORS	4-1
4.1.1	Operating Controls	4-1
4.1.2	Indicator Lights	4-1
4.2	FRONT PANEL DISPLAY	4-36
4.3	EXPLANATION OF MENUS	4-36
4.3.1	UPS Status	4-36
4.3.2	Meters Menu	4-36
4.3.3	Alarm Queue	4-36
4.3.4	Active Alarms	4-36
4.3.5	Password	4-37
4.3.6	System Set-up	4-37
4.3.7	Select Type	4-37
4.3.8	H.W. Modules	4-37
4.3.9	Sync Range	4-37
4.3.10	Adj Out Volts	4-37
4.3.11	comm setup	4-38
4.3.12	Relay Setup	4-38
4.3.13	Set Language	4-38
4.3.14	Set Time/Date	4-38
4.3.15	Contrast Adjust	4-38
4.3.16	Horn Volume	4-38
4.3.17	Clear Alarm Queue	4-39
4.3.18	Set User PW	4-39
4.3.19	Battery Type	4-39
4.4	SET TYPE (FULL FEATURE)	4-39
4.5	SYSTEM START-UP	4-40
4.6	SYSTEM SHUT-DOWN (WITHOUT BYPASS)	4-40

4.7 SYSTEM SHUT-DOWN (WITH BYPASS)	4-40
4.8 MAINTENANCE BYPASS	4-40
chapter 5	5-1
Functional Description	5-1
5.1 RECTIFIER FRU	5-1
5.2 INVERTER FRU	5-1
5.3 POWER CONVERSION	5-2
Circuit Board Descriptions	5-4
5.4 A1A2 AND A2A2 GATE DRIVE BOARD	5-4
5.5 A1A3 POWER SUPPLY BOARD	5-5
5.6 A8A1 BYPASS CONTROL BOARD	5-6
5.7 A3A2 FULL FEATURE FRONT PANEL BOARD	5-8
5.7.1 Front Panel Interface Board	5-a
5.7.1.1 Relay Drivers	5-8
5.7.1.2 DB-25 Connector	5-8
5.7.1.3 RJ-11 Interface	5-9
5.7.1.4 Power consumption	5-9
5.7.2 Daughterboard	5-9
5.7.2.1 Isolated Power Supply	5-9
5.7.2.2 Relay Drivers	5-10
5.7.2.3 26-Pin Header Connector	5-10
5.7.3 Front Control Panel Interface	5-11
5.8 EXPANDER INTERFACE BOARD	5-12
5.8.1 Isolated Power Supply	5-12
5.8.2 Relay Drivers	5-13
5.8.3 RS-232 Signals	5-13
5.8.4 AS400 Expansion	5-13
5.8.5 26-Pin Header Connector	5-14
5.8.6 Front Control Panel Interface (Expander Interface)	5-14
5.8.6.1 Power Consumption	5-14
5.9 A1A1 RECTIFIER CONTROL BOARD	5-16
5.10A2A1 SINGLE AND THREE PHASE INVERTER CONTROL BOARD	5-16
Chapter6	6 - 1
options	6-1
6.1 OPTIONS	6-1
6.1.1 Extended Battery Cabinets	6-1
6.1.2 Output Power Distribution	6-2
6.1.3 Communications Interface	6-5
6.1.4 Local Emergency Power Off	6-5
6.1.5 Remote Emergency Power Off	6-5
6.1.6 LAN Relay Interface	6-5
communications	6-6
6.2 RS-232 OPTION	6-6

6.2.1	Introduction	6-6
6.2.2	Communications Setup	6-6
6.2.3	Terminal Mode	6-10
6.2.3.1	Meters Screen	6-10
6.2.3.2	Active Alarms	6-10
6.2.3.3	Alarm/Event Queue	6-10
6.2.3.4	Battery Data	6-10
6.2.3.5	Mimic Screen	6-10
6.2.3.6	Set Time and Date	6-10
6.2.4	Printer Mode	6-11
6.2.4.1	Options Mode	6-11
6.2.5	Configuration Screen	6-1¹
6.2.5.1	Meters Screen	6-11
6.2.5.2	Active Alarms Screen	6-11
6.2.5.3	Alarm/Event History Screen	6-11
6.2.6	Logging Mode	6-12
6.3	ASCII COMPUTER MODE	6-14
6.3.1	Data Block Format	6-15
6.3.1.1	JD Block (S1)	6-16
6.3.1.2	Alarm History Block (S2)	6-16
6.3.1.3	Status Block (S3)	6-16
6.3.1.4	Meter Block (S4)	6-17
6.3.1.5	Alarm Block (S5)	6-17
6.3.2	Binary Mode	6-17
6.3.3	Date Format	6-18
6.3.4	Time Format	6-20
6.3.5	UPS to CPU Communications	6-20
6.3.6	Data Block Descriptions	6-21
6.3.6.1	ID Block	6-21
6.3.6.2	Meter Map	6-22
6.3.6.3	Alarm Map	6-25
6.3.6.4	Alarm History Block	6-31
6.3.6.5	Status Block	6-32
6.3.7	Meter Block	6-33
6.3.7.1	Alarm Block	6-36
6.4	RELAY SETUP	6-38
6.4.1	Introduction	6-38
6.4.2	Main Relay Menu Screen	6-38

Figure 8-5 Output Panel "B"	8-5
Figure 8-6 Output Panel "E"	8-6
Figure 8-7 Output Panel "F"	8-7
Figure 8-8 Output Panel "G"	8-8
Figure 8-9 Output Panel "J"	8-9
Figure 8-10 Output Panel "K"	8-10
Figure 8-11 Output Panel "L"	8-11
Figure 8-12 Output Panel "MM" and "NN"	8-12
Figure 8-13 Output Panels "000", "PPP", and "QQQ"	8-13
Figure 8-14 Top Assembly	8-15
Figure 8-15 Inverter Assembly	8-17
Figure 8-16 Inverter Assembly	8-18
Figure 8-17 Inverter Assembly	8-19
Figure 8-18 Inverter Assembly	8-21
Figure 8-19 Inverter Assembly	8-22
Figure 8-20 Inverter Assembly	8-23
Figure 8-21 Inverter Assembly	8-24
Figure 8-22 I/O Assembly	8-26
Figure 8-23 I/O Assembly	8-27
Figure 8-24 Full Feature Front Panel Assembly	8-29
Figure 8-25 HV Transformer Cabinet Assembly	8-30
Figure 8-26 HV Transformer Cabinet Assembly	8-31

Figures

Figure 1-1 Front View	1-4
Figure 1-2 Rear View	1-5
Figure 1-3 Top View	1-6
Figure 1-4 Power Flow	1-7
Figure 4-1 Front Panel	4-3
Figure 4-2 Menu Screen - UPS Status	4-4
Figure 4-3 Menu Screen - Meters	4-5
Figure 4-4 Menu Screen - Alarm Queue	4-6
Figure 4-5 Menu Screen - Active Alarms	4-7
Figure 4-6 Menu Screen - Battery Data	4-8
Figure 4-7 Menu Screen - S.W. Versions	4-9
Figure 4-8 Menu Screen - System Setup	4-10
Figure 4-9 Menu Screen - Select Type	4-11
Figure 4-10 Menu Screen - H.W. Modules	4-12
Figure 4-11 Menu Screen - Sync Range	4-13
Figure 4-12 Menu Screen - Adj. Out Volts	4-14
Figure 4-13 Menu Screen - Comm Setup	4-15
Figure 4-14 Menu Screen - Comm Setup - Output Mode	4-16
Figure 4-15 Menu Screen - Comm Setup - I/O Port Setup	4-17
Figure 4-16 Menu Screen - Comm Setup - Customize I/O	4-18
Figure 4-17 Menu Screen - Relay Setup	4-19
Figure 4-18 Menu Screen - Relay Setup - Display current setup	4-20
Figure 4-19 Menu Screen - Relay Setup - AS/400	4-21
Figure 4-20 Menu Screen - Relay Setup - Novell	4-22
Figure 4-21 Menu Screen - Relay Setup - Default #1	4-23
Figure 4-22 Menu Screen - Relay Setup - Custom	4-24
Figure 4-23 Menu Screen - Relay Setup - Custom - Relay 1	4-25
Figure 4-24 Menu Screen - Set Language	4-26
Figure 4-25 Menu Screen - Set Time/Date	4-27
Figure 4-26 Menu Screen - Contrast Adj.	4-28
Figure 4-27 Menu Screen - Horn Volume	4-29

Figure 4-28 Menu Screen - Clear Alarm Queue	4-30
Figure 4-29 Menu Screen - Set User P.W.	4-31
Figure 4-30 Menu Screen - Battery Configuration	4-32
Figure 4-31 Menu Screen - Set Service PW.	4-33
Figure 4-32 Menu Screen - Battery Time Calibration	4-34
Figure 4-33 Menu Screen - Battery Time Feature	4-35
Figure 5-1 One-line Diagram	5-3
Figure 5-2 Gate Drive Board Block Diagram	5-4
Figure 5-3 Power Supply Board Block Diagram	5-5
Figure 5-4 Auto Bypass Control Board Block Diagram ..	5-7
Figure 6-1 Output Panels	6-3
Figure 6-2 Output Panels (continued)	6-4
Figure 6-3 Communications Menu Configurations	6-6
Figure 6-4 Location of Communication Connector	6-7
Figure 6-5 Communications Pin Assignments	6-8
Figure 6-6 Communications Pin Assignments	6-9
Figure 6-7 RMP Installation	6-47
Figure 6-8 High Voltage Transformer Cabinet Installation.	6-49
Figure 7-1 Q5 (Battery SCR) Gate Signal	7-3
Figure 7-2 I/O Power Supply Board	7-4
Figure 7-3 I/O Rectifier Control Board	7-5
Figure 7-4 Inverter Output	7-7
Figure 7-5 I/O Inverter Control Board	7-8
Figure 7-6 I/O Gate Drive Board	7-9
Figure 7-7 I/O Front Panel Board	7-11
Figure. 7-8 I/O EPO Control Board	7-13
Figure 7-9 I/O Bypass Control Board	7-15
Figure 7-10 Rectifier FRU Connections	7-35
Figure 7-11 Inverter FRU Connections	7-36
Figure 7-12 Switch Connections	7-37
Figure 8-1 Output Panel "C"	8-1
Figure 8-2 Output Panel "H"	8-2
Figure 8-3 Output Panel "A"	8-3
Figure 8-4 Output Panel "D"	8-4

6.4.2.1 Display Current Relay Configuration	6-39
6.4.2.2 AS/400 Configuration	6-39
6.4.2.3 Novell Configuration	6-41
6.4.2.4 AT & T/Default 1	6-42
6.4.2.5 Custom Configuration	6-42
6.4.2.6 Relay Number Setup	6-43
6.5 REMOTE MONITOR PANEL	6-45
6.6 HIGH VOLTAGE TRANSFORMER CABINET	6-48
chapter7	7-1
Troubleshooting and Maintenance	7-1
7.1 RECTIFIER TROUBLESHOOTING	7-1
7.1.1 Power Supply Test	7-1
7.1.2 Battery Voltage	7-1
7.1.3 Battery SCR	7-2
7.1.4 IGBTs	7-2
7.1.5 Fan Power	7-2
7.1.6 Thermistor	7-3
7.2 DIVERTER TROUBLESHOOTING	7-6
7.2.1 IGBTs	7-6
7.2.2 Fan Power	7-7
7.2.3 Inverter Sensing	7-7
7.2.4 Sync..	7-7
7.3 COMMUNICATION TROUBLESHOOTING	7-10
7.4 EPO OPTION	7-12
7.5 BYPASS CONTROL TROUBLESHOOTING	7-14
7.5.1 Relays..	7-14
7.5.2 "GO TO BYPASS" and "GO TO INVERTER " command	7-14
7.6 FRU FAILURE DISPLAY	7-16
7.7 RECTIFIER STATUS LEDS	7-16
7.8 INVERTER STATUS LEDS	7-17
7.9 MAINTENANCE MODE	7-18
7.10 FRU ISOLATION	7-18
7.11 PHASE RELATIONSHIP WITH VOLTMETER	7-19
7.12 BATTERY TEST INFORMATION	7-19
7.13 ALARM INFORMATION/ACTION ITEM LIST	7-20
7.14 FRU REPLACEMENT	7-30
7.14.1 Rectifier FRU Removal	7-30
7.14.2 Rectifier FRU Replacement	7-31
7.14.3 Inverter FRU Removal	7-31
7.14.4 Inverter FRU Replacement	7-32
7.14.5 Front Panel FRU Removal	7-32
7.14.6 Front Panel FRU Replacement	7-32
7.14.7 J/O FRU Removal	7-32

7.14.8	I/O	FRU	Replacement	7-33
Chapter 8				8-1
Parts List				8-1
Chapter 9				9-1
Prints				9-1
Appendix A				A-1
Lockout/Tagout Procedures				A-1
A.1 LOCKOUT				A-1
A.2 TAGOUT				A-1
A.3 USE OF LOCKOUT AND TAGOUT DEVICES.				A-2
A.4 REMOVAL OF LOCKOUT OR TAGOUT DEVICES.				A-2
A.5 DOCUMENTATION				A-2
A.6 INSPECTIONS				A-3
Appendix B				B-1
Fuke 97 Scopemeter				B-1
B.1 DESCRIPTION				B-1
B.2 METER FUNCTIONS				B-1
B.3 AC VOLTAGE				B-1
B.4 FREQUENCY				B-1
B.5 DCVOLTAGE				B-2
B.6 DIODE AND OHMIC CHECKS				E-2
B.7 SCOPEFUNCTIONS				B-2
B.8 CALIBRATION				B-2
B.9 AUTO SET				B-2
B.10 ZEROINGSCOPE				B-2
B.11 RECORDING A WAVEFORM				B-2
B.12 VIEWING A STORED WAVEFORM				B-3
B.13 POWER SYNC				B-3
B.14 MEASURING TRANSFERS				B-3
B.15 ZERO CROSSINGS				B-3
B.16 UV TRANSFERS				B-3
B.17 RECOMMENDED PARTS				B-3
Appendix C				C-1
Receptacles Chart				C-1

Figure 8-5 Output Panel "B"	8-5
Figure 8-6 Output Panel "E"	8-6
Figure 8-7 Output Panel "F"	8-7
Figure 8-8 Output Panel "G"	8-8
Figure 8-9 Output Panel "J"	8-9
Figure 8-10 Output Panel "K"	8-10
Figure 8-11 Output Panel "L"	8-11
Figure 8-12 Output Panel "MM" and "NN"	8-12
Figure 8-13 Output Panels "OOO" , "PPP" , and "QQQ"	8-13
Figure 8-14 Top Assembly	8-15
Figure 8-15 Inverter Assembly	8-17
Figure 8-16 Inverter Assembly	8-18
Figure 8-17 Inverter Assembly	8-19
Figure 8-18 Inverter Assembly	8-21
Figure 8-19 Inverter Assembly	8-22
Figure 8-20 Inverter Assembly	8-23
Figure 8-21 Inverter Assembly	8-24
Figure 8-22 I/O Assembly	8-26
Figure 8-23 I/O Assembly	8-27
Figure 8-24 Full Feature Front Panel Assembly	8-29
Figure 8-25 HV Transformer Cabinet Assembly	8-30
Figure 8-26 HV Transformer Cabinet Assembly	8-31

1

System Overview

1.1 SYSTEM DESCRIPTION

The **POWERWARE PLUS** product original **design was** based on the FRU (field replaceable unit) concept of repair. The basis **of** this concept is complete assemblies are replaced to repair the system. This reduces both service costs and the time needed to repair **the** unit. The major **FRUs** of the standard system are:

- A1 RECTIFIER**
- A2 INVERTER**
- A3 I/O ASSEMBLY**
- A4 FRONT PANEL**
- A5 REAR PANEL**
- BATTERY**

PDM POWER DISTRIBUTION MODULE (OPTION)

All **FRUs** can be serviced as a unit or major individual component level repair can be made. The **FRUs** are **connected** together by **inter-FRU harness and** are held in the system enclosure. The major components internal to each FRU and their basic functions are listed below:

A1 - The Rectifier FRU contains the system power supply, **Rectifier** control, and Gate Drive **PCBs**. This FRU also **contains the** necessary power components for the DC conversion, **trap circuit**, and DC filtering.

A2 - The Inverter FRU contains the Inverter Control board, Gate Drive board, Output Filter, **CTs**, and the **power** switching **components**.

A3 - The I/O contains the input, output, and battery breakers; including FCC **filter**, autobypass, and the **EPO** option.

A4 - The Front Panel FRU is not enclosed and the Front Panel board is the only board **designed** to be replaced without removing a complete sealed subassembly.

This panel **contains** the **customer** conkols and diagnostic information interface.

BATTERY - The system battery is in a cabinet the size of the UPS itself and is connected to the system by connector **A3J1**. Batteries may also be **connected** to the I/O via **A3TB 1-9 & 10**. The Battery Cabinet contains 6 **trays** (2 cabinets) **standard**, 120 volt kays (240 VDC).

There is also an optional battery enclosed in a cabinet the same size as the standard battery cabinet. This cabinet is mounted on the right side of the **unit** and the batteries are **paralleled** with the standard cabinet. The optional battery cabinet is **connected** by an Anderson **connector** to the standard battery cabinet.

1.2 MODES OF OPERATION.

There are three **modes** of operation in the UPS **system**, **NORMAL**, **ON BATTERY**, and **BYPASS**. Each mode supplies power to the critical load. The heart the LIPS is a **Rectifier/Inverter** which provides a **clean, quality** sine wave for the critical load. In **Normal mode** incoming utility AC is **processed** by the **Rectifier/Inverter** and also supplies charging current for the battery. **In** the **On Battery mode**, the Rectifier is supported by the battery. **Bypass mode** allows utility AC to supply the Load directly. The **UPS** automatically switches between **Normal**, **On Battery**, and **Bypass modes**, as required, with no operator **intervention**. Automatic detection and switching logic is used to ensure any change in mode of operation is automatic and transparent to the load, The **UPS monitoring system** indicates **the current mode of** operation and various critical parameters.

In NORMAL MODE, **conditioned power** is supplied to the **critical** load provided utility power and system load **are** within **specified** parameters. In addition, charging current is provided to the DC power source. During this mode, the battery charge condition **is** monitored. If the utility AC fails or goes **"out of specification"**, the UPS automatically, and instantaneously, switches to **On Battery mode**. **The UPS** will automatically return to **Normal mode** **when** the utility power returns to within **specified** limits.

In ON BATTERY mode, an **associated** battery system provides DC power which is converted to conditioned AC by the UPS. **The system operates** in **On Battery mode** for a predetermined time, **depending** on loading, the battery condition, and the amount of available DC power (number of battery cabinets). When the discharging battery **reaches** the lower **limit** of battery discharge, the UPS **will** shut down and the load **will** be **"dropped."** **If incoming power returns to within specified parameters** before shutdown, then the **UPS** will automatically return to **Normal mode** the system battery will supply a 18 KVA load for 3.5 **minutes** (refer to section 1.4.5 for additional battery time remaining information on other battery **configurations**).

In **BYPASS mode**, the UPS **transfers** the load power directly to the utility AC power provided the bypass source is available, and the bypass option is installed. A **transfer** will occur due to one of the following conditions:

- **Load** current exceeds 106% of rating (up to 125%) for 10 min.
- Load current exceeds 125% of rating (up to 150%) for 30 sec.
- Load **current** exceeds **150%** of rating (up to 300%) for **10** cycles
- **internal temperature** **limits** **(90°C)**.
- **UPS output** **limits**

If an overload condition exists for the times indicated above or three transfer attempts have occurred in ten minutes a transfer lock-out will be initiated and return to Normal mode. must be done manually. Automatic **return** to Normal mode occurs **after** any other **condition**. The UPS will make three. attempts to auto-start. If auto-start fails, the **UPS** will remain in Bypass **mode** and must be restarted **manually**.

13 MODES OF OPERATION/ALARMS

Normal Mode

The system NORMAL (Green) light will be **illuminated** during Normal operation. If the utility fails (but **still** within specified parameters) and Bypass is unavailable, the NORMAL light **flashes, indicating** a low utility.

On Battery Mode

When the utility *fails* (not within **specified** parameters) and the unit switches to battery, the NORMAL (Green) light **will** go off, the **BATTERY(yellow)** light will illuminate, and **the HORN will sound. Press the HORN button to silence the horn. At the DCUV trip point, the horn will sound again and the unit will attempt to continue to run for approximately one minute, depending on the condition of the batteries. When the battery time has run out the BATTERY (yellow) light will go OFF and the unit will turn off, removing power to the load.**

Overload

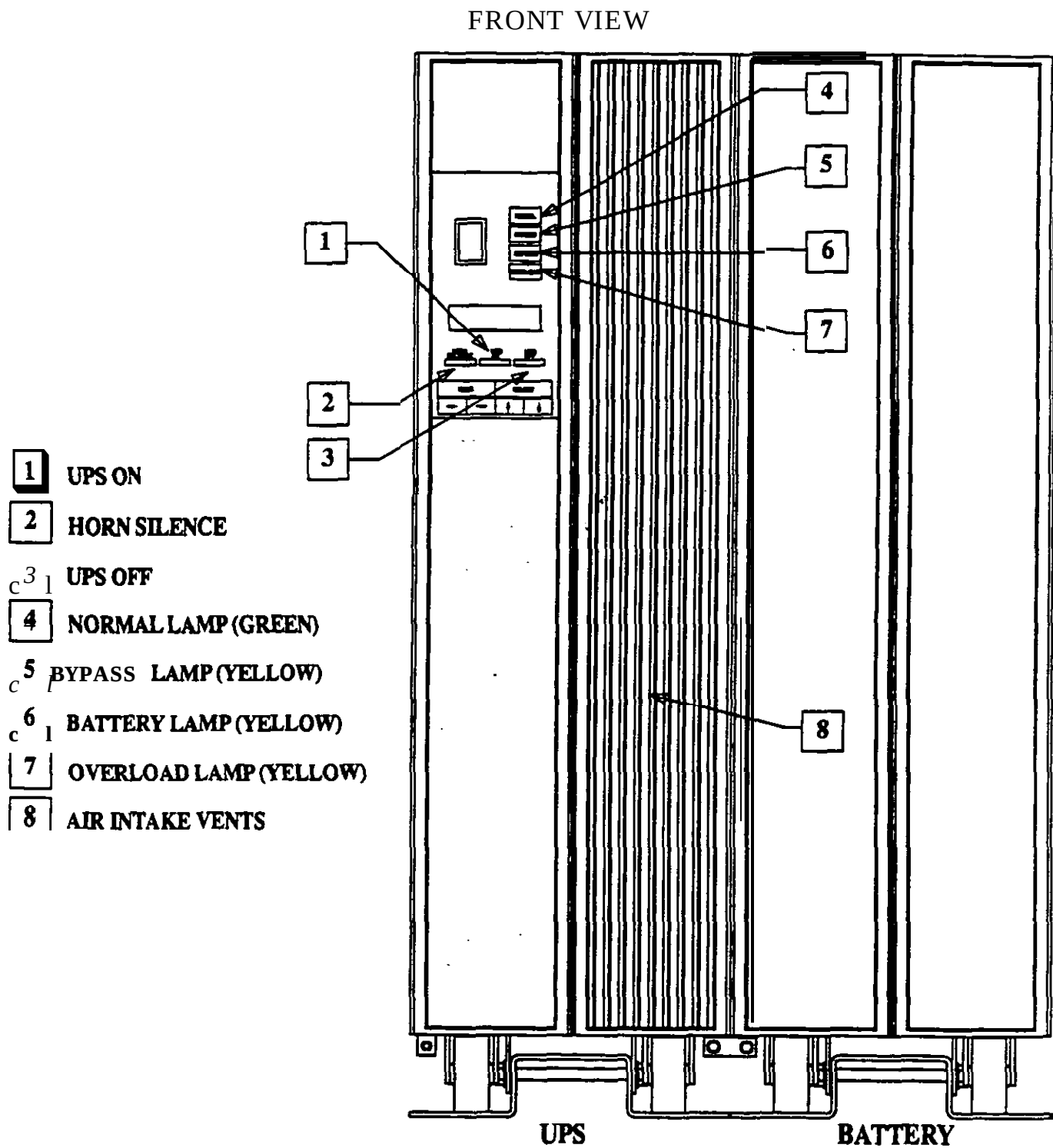
The OVERLOAD (**yellow**) light will **be illuminated** when the **system** goes into an overload condition and the HORN will **sound**. Push the HORN button to **silence** the HORN. **The** unit will go to Bypass **after** the specified time-out, if bypass is available. If the first attempt to transfer to bypass is unsuccessful, **the UPS** will make a second attempt to transfer. **After** the **second** attempt the UPS **will** shut off.

Bypass Mode

To switch to **Bypass, hold** the OFF button for 3 seconds. **The NORMAL** light will go off and the **BYPASS (yellow)** light will be illuminated.

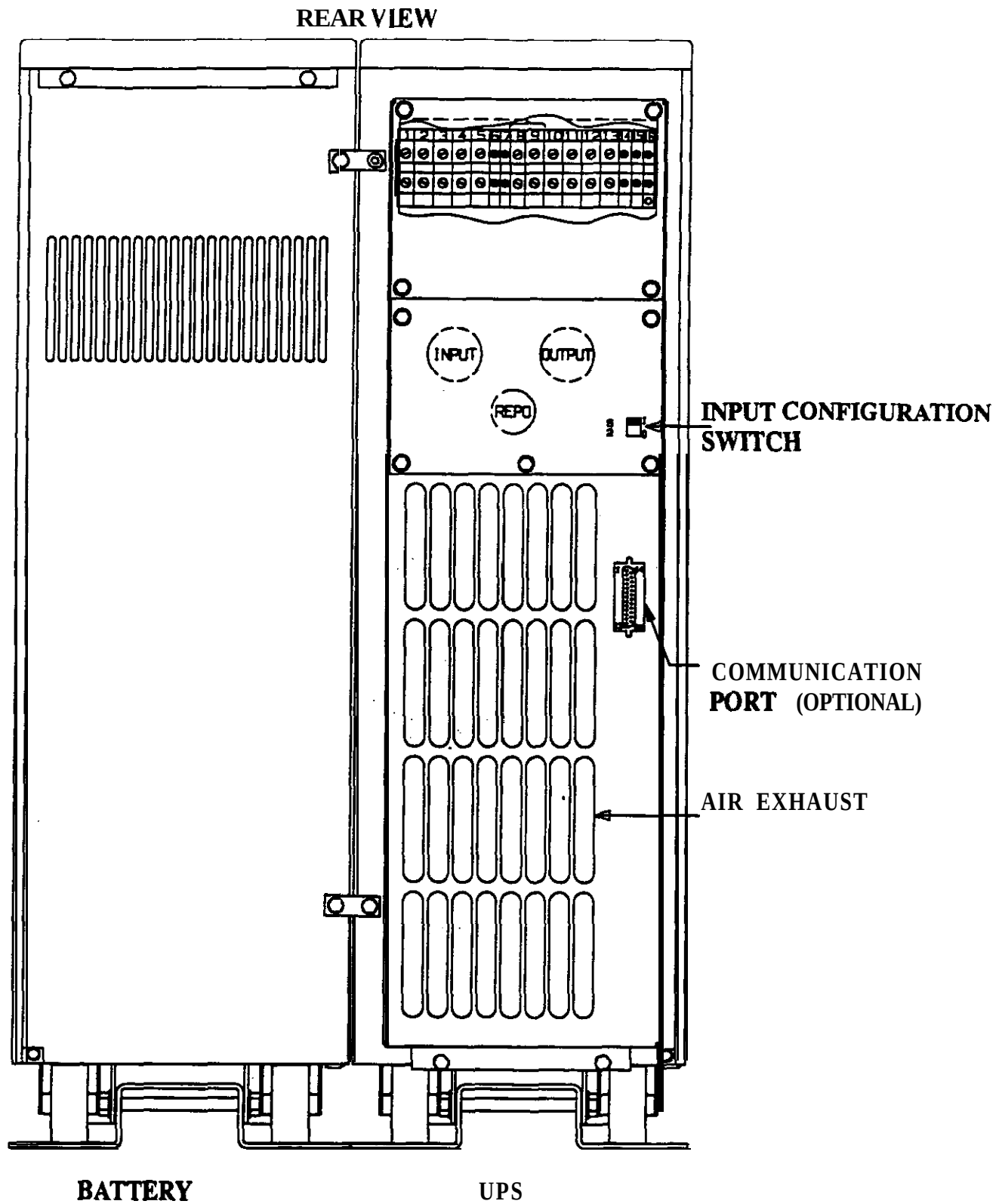
Emergency Power Off (EPO)

The **EPO disconnects the UPS** and protected equipment **from** all AC power sources. To operate. **press** the **EMERG OFF** button located on the front panel of the UPS or a remote **EPO station connected to the rear of the unit.**



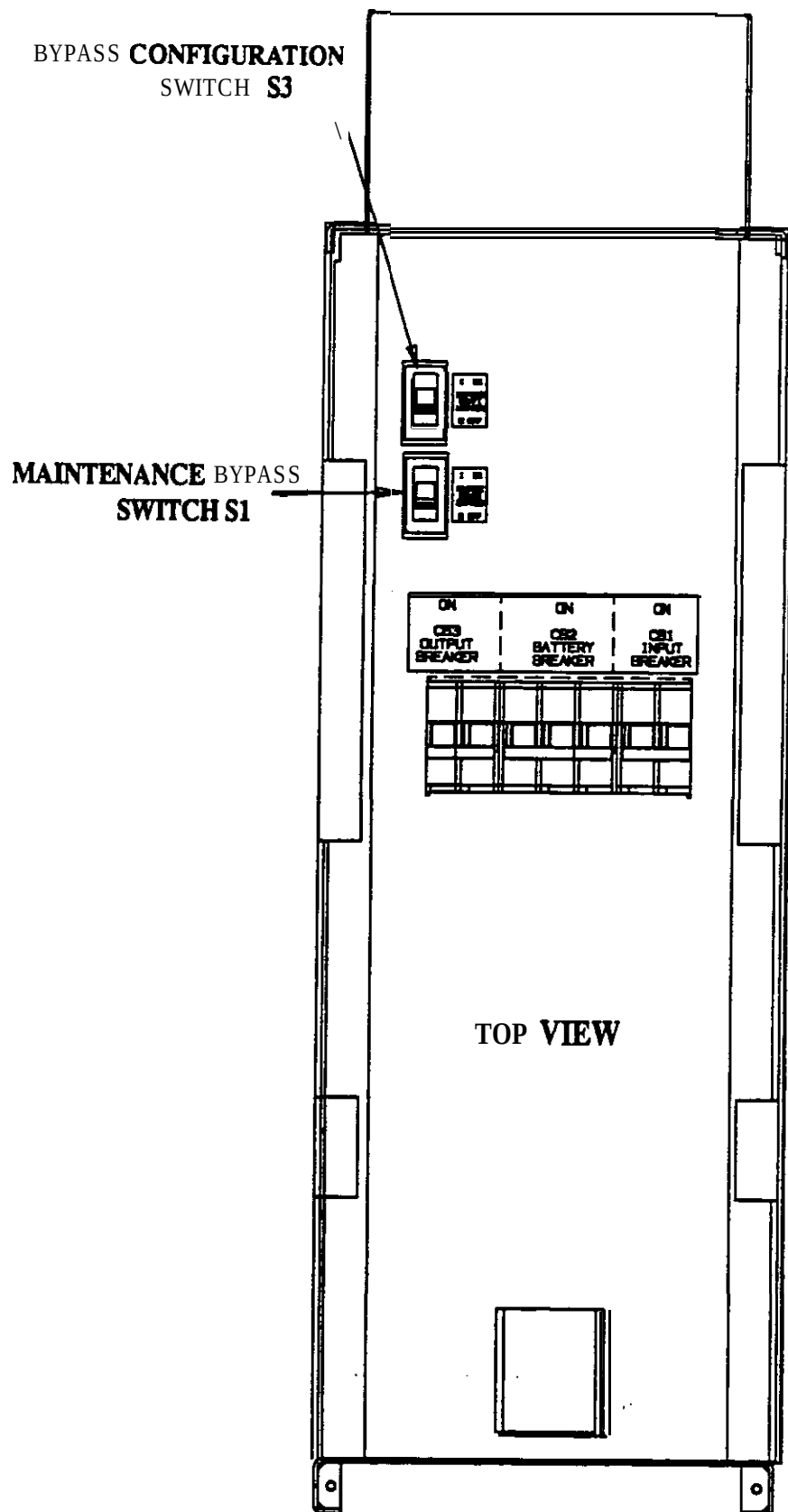
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Figure I -1 Front View



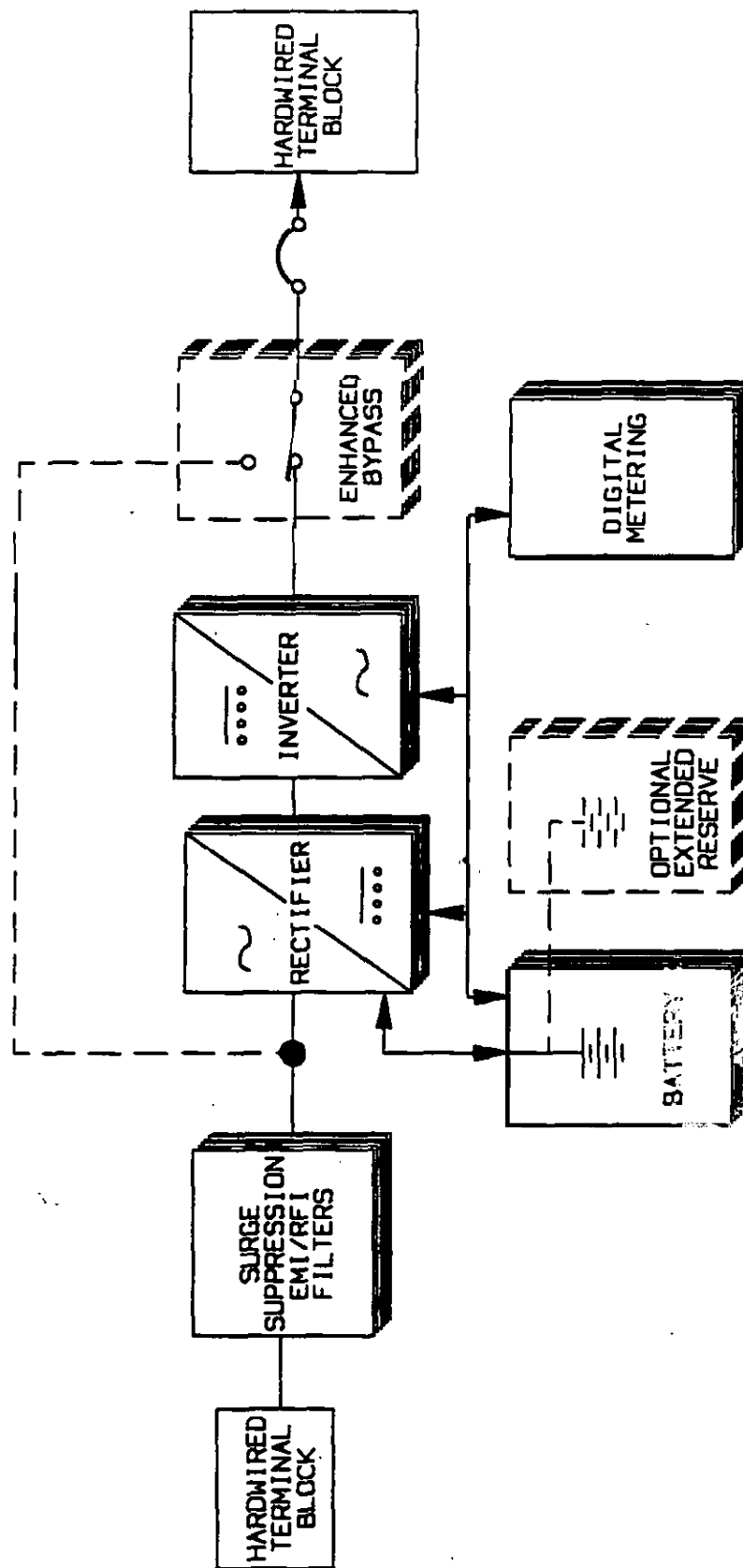
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Figure I-2 Rear View



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Figure I-3 Top View

*Figure 1-4 Power Flow*

1.4 SPECIFICATIONS

All **specifications** apply to nominal operating conditions unless otherwise stated

1.4.1 Ratings

The **system** is available in three output **power** ratings. The Model 12 may be upgraded **in the field to a Model 15**.

Model 12:	12 kVA (output voltage configuration dependent), 8 kW maximum.
Model 15:	15 kVA (output voltage configuration dependent), 10 kW maximum.
Model 18:	18 kVA (output voltage configuration dependent), 12 kW maximum.

1.4.2 Input

Nominal Input Voltage:	115/200 VAC three phase 120/208 VAC three phase 127/220 VAC three phase 4-wire andground 3-wire and ground 3-wire
Operating input voltage range:	176-276 VAC.
Operating input frequency range:	45-65 Hz.
Input power factor:	9s lag minimum.
Input current THD:	34% typical at Full Load.
Input surge withstandability:	ANSI C62.41 Category B-1980 standards.
Input current Inrush:	Three times the RMS full load output current for one cycle.
Rectifier Overload Capacity:	105% of rated power indefinitely 125% for 10 minutes 150% for 30 seconds
Input Protection:	Circuit breaker, current limiting circuitry, and transient suppression circuitry,

1.4.3 system output

Nominal Output Voltage and Frequency:	
50/60 Hz:	115/200 VAC 120/208 VAC 127/220 VAC
output current:	50A per phase

Load Power Factor:	6 lag – .6 lead
Steady state voltage regulation:	within 2.5% average of the nominal output voltage for balanced loads.
Manual output voltage adjustment:	114-127 VAC
Load Unbalance:	Maximum 100% of rated phase current.
Transient voltage response:	5% from nominal peak Voltage for a 100% load step .
Line sync range:	1 Hz standard. Line sync range is selectable from 0.5 Hz to 3 Hz in 0.5 Hz increments via the digital from panel display.
Frequency slew rate:	1 Hz/second
Frequency regulation:	0.1 Hz free running.
Output voltage total harmonic distortion:	3% maximum, linear : 5% non-linear load.
Load crest ratio:	3:1
Current overload capability:	105% indefinite 106% to 125% for 10 minutes 126% to 150% for 30 seconds.
Fault clearing capability:	300 A peak current for .2 sec.
Noise attenuation:	
Common Mode:	–100 dB up to 100 kHz.
Transverse Mode:	–60 dB up to 100 kHz.

1.4.4 Environmental

Operating temperature:	+10°C to +40°C without derating.
Storage temperature:	–20°C to +60°C. (Prolonged storage above WC will cause rapid battery self-discharge.)
Relative humidity (operating and storage):	95% maximum non-condensing.
Elevation:	5000 ft. (1500 m) maximum without derating.
Acoustical noise: surface. Measured at 25°C and full load.	55 dBA at one meter distance from any operator
EMI suppression: devices.	Meets FCC Part 15. Subpart J , for class A
Electrostatic discharge (ESD):	Withstands up to 25 kilovolts without damage and with no disturbance or adverse effect to the critical load.

1.4.5 Battery

Battery type:	Sealed, maintenance-free, high-rate discharge, lead-acid cells.
Expected life:	5 years or 200 complete full load discharge cycles when operated and maintained within specifications .
Nominal battery string voltage:	240 VDC (120 cells)
Nominal Float Voltage:	2.25 VDC/cell
Minimum final discharge voltage:	1.58 VDC/cell at full load.
Maximum final discharge voltage:	1.80 VDC/cell at no load.
Battery Recharge Time :	2 hours to 80% capacity (standard battery).
Battery circuit protection:	Battery fuses are provided for battery short-circuit protection.
Battery lime:	1 BBC18 35 minutes 1 EBC1 , 1 EBC2 7.0 minutes 2 EBC2 12.0 minutes 2 EBC18 19.0 minutes 3 EBC2 22.0 minutes 3 EBC18 34.0 minutes

1.4.6 Dimensions

STANDARD UNIT:

Size:	8.5" x 24.6" x 28.1" (216mm X 625mm X 714 mm)
Weight:	180 lbs. (82 kg)
Heat Dissipation:	
Full Load (at .8 pf)	
Model 12	5200 BTU/hour (1000 kg-cal/hour)
Model 15	6500 BTU/hour (1146 kg-cal/hour)
Model 18	7800 BTU/hour (1310 kg-cal/hour)

BATTERY CABINET:

Dimensions:	85" X 24.6" X 28.1" (216mm X 625mm X 714mm)
Weight:	
EBC1	180 lb (82 kg)
EBC2	220 lb (134 kg)
EBC18	350 lb (159 kg)

Electrical Specifications

Powerware Plus		12 kVA/8 kW		15 kVA/10 kW		18 kVA/12 kW	
Nominal Voltage **	Input Voltage	Input Current	Output Current	Input Current	Output Current	Input Current	Output Current
115/200	3-Phase Typical	29 A	34 A	36 A	42 A	43 A	50 A
120/208		28 A	34 A	35 A	42 A	42 A	50 A
127/220		26 A	31 A	33 A	39 A	39 A	47 A

2

Safety

2.1 GENERAL SAFETY CONSIDERATIONS

2.1.1 Tools, Equipment and Expendable Field Service Supplies

When performing service **calls** or procedure³ on **Exide Electronics'** equipment, observe the following rules when working with **tools**, testers, solvents, adhesives and lubricants:

Ensure that electrical hand tools, **such as power** drills, are inspected regularly. Replace **worn** and broken **tools** and test **equipment** with **new tools** and equipment.

2.1.2 General Safety Rules

Incorporate the following safety rules for working with **electrical and mechanical equipment**.

2.2 ENVIRONMENTAL SAFETY

Observe the following rules:

Do not work alone in potentially hazardous conditions or near equipment which has potentially dangerous voltages. Always inform appropriate **supervisor/manager** of conditions or voltages which poses **a threat to the safety** of **all** individuals and take all steps necessary to **maximize** safety on the site..

Always look for possible hazards. **such as** moist floors, non-grounded extension cables, power supplies. and missing safety **grounds**.

Do not make changes which **makes the** equipment unsafe or **creates** a hazard.

Before starting **the equipment, ensure** all service **personnel and** customers are not exposed to any unsafe conditions.

Do not **wear** loose clothing which can be trapped **in** the moving parts of a machine. **Ensure** the **shirt** sleeves are fastened **or** rolled above the **elbow**. Also **ensure** long hair is fasten.

Do not lift any **equipment** or parts too heavy **to** lift (that may cause strain on the back muscles). **Lift** with the leg muscles by **swatting down, then lifting** the equipment up.

Place removed UPS covers in a safe place while servicing the UPS. Reinstall the covers before returning the UPS to the customer.

Always keep tool kit(s) away from walk areas so other persons Cannot trip over it. For example, keep the tool kit on or under a table.

Observe good housekeeping practices in the area of the UPS while performing maintenance and after completing the job.

Reinstall all safety devices, such as guards, **shields**, and ground **wires**. Replace safety devices which are worn or defective with new ones. Remember the safety **devices** protect personnel from a hazard. Ensure all safety devices are reinstalled when the **maintenance/service** has been completed.

23 ELECTRICAL SAFETY

Observe the following rules when **working** on electrical machinery:

Follow the manual shut down and maintenance bypass procedurea to prevent **loss** of power to the customers load. Switch input and logic power off, if **recommended in the service manual**:

- Before removing or assembling the main **units** of the equipment.
- Before working near power supplies.
- Before **inspecting** power supplies.
- Before installing changes in machine circuits.

Unless the maintenance **documents specifically instructs otherwise**, do not service input, output, or **bypass** circuit breakers, transformers, **CTs**, or **PTs** with power on.

Working on equipment exposed to live electric circuits, observe the **following** precautions:

- Ensure **another** individual who is properly trained in the power-off **controls**, is within a **close distance** and **close** to the controls at all times to **switch** off power, **if necessary**.
- Do not wear **jewelry**, chains, metal frame eyeglasses, or other **personal** metal objects.
- use only **insulated** probe tips or **extenders**.
- Use one hand **while** you are working on or **near** equipment with power **switched on**. **Keep one hand in your pocket or behind your back** to prevent electric **current** flow **across** the heart.
- Do not **touch objects** which are **grounded**, **such as** metal floor strips, **machine frames**, or **other conductors**. Use **suitable** rubber mats, **obtained** locally, if **necessary**.
- When **using** test **equipment**, **set the** controls referenced **in** the operators or service manual and **use** only properly **insulated** probes

When working with units having voltages more than 30 VAC or 42.4 VDC, observe the **special** safety instructions given in Field Service Manuals and Technical Bulletins.

⚠ WARNING

Never assume power has been removed from a circuit. Check and ensure power has been removed by using a voltmeter.

Do not touch live electric circuits with **the surface** of a dental mirror. **The handle of the** mirror is conductive and can cause equipment damage and/or personal injury.

If an electrical accident occurs:

- Use caution; do not be a **victim**. Switch all power **off**.
- Instruct an individual to get medical aid.

2.4 MECHANICAL SAFETY

CAUTION

Do not touch moving mechanical parts at any time (including fans).

2.5 EYE SAFETY

Safety glasses **shall** be worn at **all** times. Use additional caution when using the following **equipment or** when performing the following procedure.

Using a hammer.

Using a power drill.

Using a spring hook.

Soldering parts.

Cutting wire or removing steel bands.

Using solvents, chemicals, or cleaners to clean parts.

Do not wear soft contact lenses when working on or around electrical equipment.

2.6 UPS SAFETY

WARNING

The oscilloscope must be isolated by using an adapter isolating the UPS and the scope. Use extreme caution, the scope will have potential between LJPS ground and scope frame. Do not touch the UPS and the scope at the same time.

2.6.1 Operating Environment

Keep surroundings clean and free from excess moisture..

Do not operate close to gas or electric heat **sources**.

The system is not **intended** for outdoor use.

Operating environment should be within the parameters listed in chapter 1.

2.6.2 Normal Operation

Keep equipment **doors** closed to **ensure** proper cooling air flow, and to protect from **dangerous** voltages within the unit. Ensure all conduit **knockouts** and/or unnecessary openings **are sealed**.

Do not make any assumptions about the **electrical** state of the UPS. **IF IN DOUBT, CHECK THE ELECTRICAL STATUS WITH A VOLTMETER!**

The UPS contains its own power source.

WARNING

Lethal voltages are **present** even **when** disconnected from the utility **source**.

2.6.3 Maintenance/Service

Always wear **appropriate** eye protection.

Remove restrictive clothing and remove all jewelry.

Use correct documentation **and** appropriate tools as outlined in this manual.

Use static secured work area and procedures when **performing** component replacement or **modifications**.

Ensure power is **disconnected before** performing **installation** or **service** when possible.

Observe **all** CAUTIONS, **WARNINGS**, AND **DANGER** notices **fixed to the inside and/or** outside of the **equipment**.

Always comply to more **detailed** safety precautions **described** at the appropriate section later in this manual.

2.6.4 Batteries

- 2.6.4.1 The lead-acid batteries are sealed maintenance-free. No electrolyte/water can **be** added.
- 2.6.4.2 Dangerous voltage is always present at battery terminals.
- 2.6.4.3 The battery contains sulfuric acid. If any spillage occurs, take the following **precautions**:

Contact with skin Wash immediately with **soap** and water. Contact a physician if any burn **results**.

If acid splashes in eyes, wash for 20 minutes under running water and contact a physician.

2.7 SITE SAFETY

Personnel associated with the UPS should be aware of the presence of potentially lethal voltages within. Observe the **following** precautions to ensure **personnel** safety and continued equipment operation.

Keep **surroundings** clean and free from excess **moisture**. Do not operate **close** to gas or electric heat sources. The system is not intended for outdoor use. Operating **environment should be within parameters described in specifications at front Of this** document.

DANGER

Voltages across charged capacitors can be in excess of 300 VDC. Be certain the filter capacitors are fully discharged and input power is off before performing my maintenance or troubleshooting.

Ensure the site is safe.

Inspect power cables and plugs; check for loose, damaged, or worn parts.

Review all **procedures** in the maintenance documents before removing a part which can hold an **electric** charge. **Carefully** discharge the **parts** exactly as instructed by the procedures

Do not **use a** household light (for example, a table lamp) for illumination when performing maintenance on the UPS. Use a flashlight with a nonconductive case.

NOTE:

Never assume a UPS or a circuit is safe. Follow all procedures and safety precautions selected in the maintenance documents and all other applicable manufacturers publications.

Always be aware of the following potentially hazardous **conditions** and **take** the **necessary** safety steps to protect **against** the existence of any of these potential **hazards**, including **all inspection** helpful to ensure the absence of these conditions.

- 2.7.1 The power receptacles might be wired **incorrectly**.
- 2.7.2 Safety devices or features might be missing or **defective**.
- 2.7.3 The **maintenance** or **change** history might **be wrong** or incomplete.
- 2.7.4 The UPS might have a design problem.
- 2.7.5 The **UPS** might have been damaged when it was shipped.
- 2.7.6 The **UPS** might have an unsafe change or attachment installed.
- 2.7.7 **An engineering change or a sales change might be installed incorrectly.**
- 2.7.8 A part might be defective.
- 2.7.9 The **UPS** might have become potentially unsafe because the **unit** is old or because the unit has operated in an **extreme** environment.

2.8 SUMMARY

Prevention is the key and **main aid** to **electrical** safety. Always think about electrical safety and use good preventive **practices** before performing **any** work on equipment.

Before starting **maintenance or repair procedures**, use good preventive judgment and caution; **Remember; Safety Comes First!**

Quality Control Procedure

QCP - 211

2.9 ELECTROSTATIC DISCHARGE (ESD) PROCEDURE AND EQUIPMENT REQUIREMENTS

2.9.1 Purpose

To provide **guidelines** on handling electrostatic sensitive **materials**.

2.9.2 Scope

To provide a procedure which **specifies** ESD criteria when handling electrostatic sensitive materials.

2.9.3 Responsibility

It **is** the responsibility of Quality Assurance Department to **assure** this procedure **is** adhered to. Purchasing shall be the responsible for assuring our vendors **conform** to these requirements with **Manufacturing, Product** and Customer **Service** Departments assuring their personnel are **following** it

23.4 Applicable Documents and Materials

- 2.9.4.1 **3M** Product Catalog **1986/1987**
- 2.9.4.2 3M Series 2100 Bags or **better**
- 2.9.4.3 Wrist Strap 3M 2221-2223 or **better**
- 2.9.4.4 Table Mats (Grounded) 3M **8200 series** or better
- 2.9.4.5 Anti static (Pink Poly)
- 2.9.4.6 **3M** Dissipative Mats (Field Kits) or better
- 2.9.4.7 Tables (grounded) with equivalent or better than **surface** of mat,

2.9.5 Definitions

- 2.9.5.1 **Static sensitive material:** Any static sensitive component/device (semiconductors, film resistors and capacitors, etc.) or **boards with** such components/devices mounted on them.
- 2.9.5.2 Static safeguard stations: Any **area** with **provisions** for controlling **electrostatic discharge**.
- 2.9.5.3 A static **shield:** Must be capable of providing a Faraday cage (protective from static discharge as well **as electrostatic** fields).

Static Protective equipment/tools: As a minimum must include but not **be** limited to a **wrist** strap with 1 meg ohm **resistor**, conductive table mat, or grounded work surface and **dissipative** mats for **field** engineers.

- 2.9.5.5 Antistatic material: Material that neither generates static electricity nor **does** it provide protection against static field, and typically has a surface **resistivity** of 10^9 to 10^{14} ohm/cm.
- 2.9.5.6 Dissipative **material**: Material that provides some protection **against** static field and typically **has** a surface **resistivity** of 10^5 to $10^9 \Omega$ per cm.
- 2.9.5.7** Conductive material: Material that provides a Faraday cage effect and protects **against** static generation **and** static field **with** a surface resistivity of $<10^5 \Omega$ per cm.
- 2.9.5.8** **Ground**: **Building/earth ground**.
- 2.9.5.9 Frame ground: Any unpainted surface of a unit or subassembly to **which** a wrist strap may be firmly **connected**.
- 2.9.5.10 Faraday Cage or **Faraday Shield**: A conductive enclosure capable of protecting its contents from any outside **static charge** or electrostatic field. **An** example would be an ESD bag **which** is closed.

⚠ WARNING

100% **ESD** prevention requires **removal** of **all** power from the UPS, i.e., Input, Bypass, and load power will completely de-energized causing a load interruption. **The** following recommendations are **being** made to ensure the boards and other static sensitive components will not be damaged.

29.6 Procedure

- 2.9.6.1 All static sensitive **material** shall be packaged **in** approved antistatic protective **packaging**.
- 2.9.6.2 Wrist straps and **grounded** mats, or table (grounded) **with** equivalent or better than surface of mat shall be used **when handling** static sensitive material.

NOTE

Boards with batteries mounted on the board (example: CCU board), the board shall first be wrapped in antistatic (Pink Poly) and then inserted in a static shielded bag (black 3M series 2100 or better).

- 2.9.6.3 **When removing** or installing boards in a unit or subassembly, a wrist strap **shall be used and it shall be connected** to the frame of the unit or subassembly.
- 2.9.6.4 Rejected boards (returned to **factory/rework** center) are just **as** sensitive to **electrostatic discharge and shall be handled with the same protection as** good/accepted boards (i.e., in a static protected **environment**).
- 2.9.6.5 **All static sensitive devices and boards with such devices shall be stored/handled** in their static protected tubes and bags that provide a complete Faraday **cage**. **The** protection for both is required at **all times**.

- 2.9.6.6 All sales and field engineering personnel **are** required to use a portable static **controlled** field service kit when **handling** static sensitive material.

23.7 Removal of Boards

CAUTION

When removing a board without pull out tabs, handle the board on the edges. 120 V may be present on the traces of the board.

Use correct removal procedure to **remove all** boards from the unit. **If** the board has **pull out** tabs, remove the board **with** the use of these tabs. For boards without **pull out** tabs, pull the board by grabbing the edge of the board. Do not touch any static sensitive component/device (**semiconductors**, film resistors, and capacitors, etc.). The following procedure provides **guidelines on handling electrostatic sensitive materials**.

All static sensitive material shall be packaged in approved anti-static protective **packaging**.

Wrist straps **and** grounded mats, or **table(grounded)** with surface equivalent **or better than** a mat, shall be used when handling static sensitive material.

N O T E :

Batteries mounted on boards shall first be wrapped in anti-static bubble wrap and then inserted in a static shielded bag.

When removing or **installing** boards in a unit or subassembly, a **wrist** strap shall be used **and it shall be connected** to the **frame** ground of the unit or subassembly.

Rejected boards (re-turned to **factory/rework** center) are **just** as sensitive to electrostatic discharge and shall be **handled** with the same protection **as** good/accepted **boards** (i.e., in a static protected environment).

All static sensitive devices and **boards with** such devices shall be **stored/handled** in their static **protected** tubes and bags. The protection for both is required at all times.

All **CSE personnel** are required to use a portable static **controlled** field service kit when handling static sensitive material.

23.8 Packaging of Boards

NOTE:

Packaging of boards, unless otherwise specified, will be packaged in egg-crate type cartons, separating each board with partitions.

ESD PROTECTION

All printed circuit boards without static sensitive components must, as a minimum, have a pink poly wrap for static protection. Boards with semiconductor devices must be in **ESD shielded** bags. Boards **with** on-board batteries must be wrapped with pink poly (for protection against battery discharge) prior to insertion into standard **shielded** bags.

2.10 GENERAL GUIDELINES FOR ESD PROTECTION

2.10.1 **Material** used is designed to protect static sensitive components and assemblies from both internal and external static charge during **transfer** between static safe work areas.

Protective bag **construction** must provide protection **inside** against static **buildup** from movement of devices, outside against electrostatic **fields** and **must insulate** against a direct static discharge.

2.10.2 **Resistivity** requirements are **as** follows:

2.10.2.1 Interior (anti-static) 14 to $10^{14} \Omega$ per square.

NOTE:

*The **resistivity** will be the same for any size square 1" x 1" x 1" will have the same resistivity as a 2" x 2" x 2" square.*

2.10.2.2 Inter-layer (**insulating and direct** discharge **protection**) greater than $10^{14} \Omega$ per square.

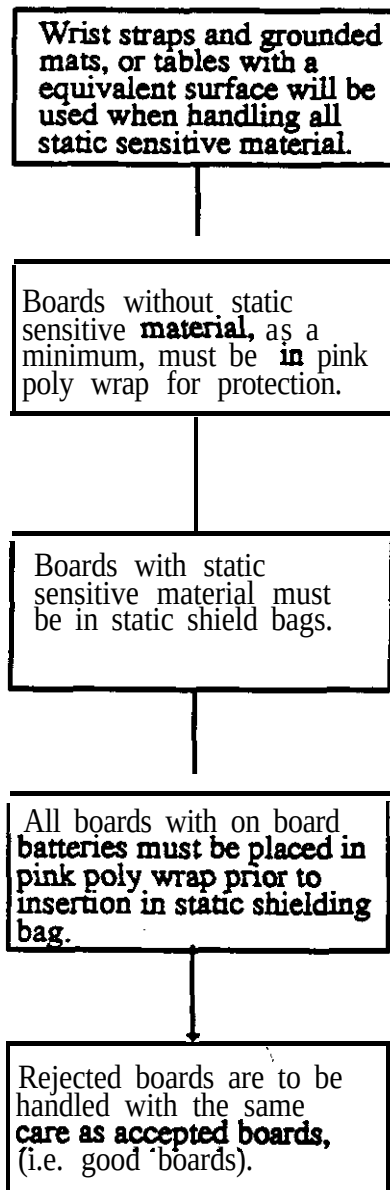
2.10.2.3 Exterior (**conductive**) **less than** or equal to $10^5 \Omega$ per square.

2.10.2.4 Total **thickness** of static bags (**including** all layers) must be 3 **MILS minimum**.

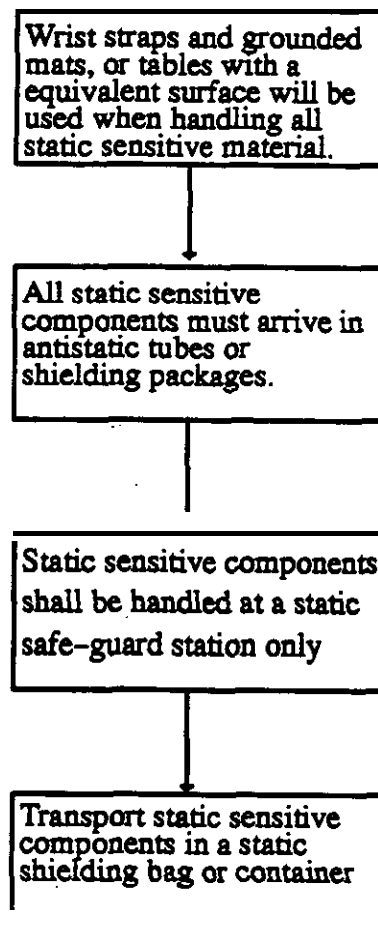
2.10.2.5 Static bags must be sealed in some manner.

FLOWCHART

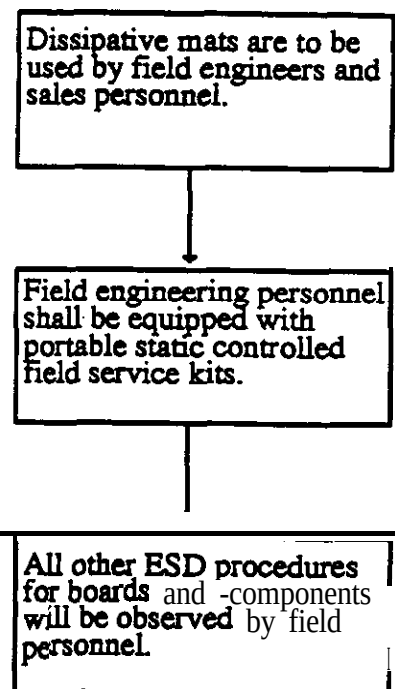
Handling of Boards



Handling of components



Handling for field engineers and sales personnel



Installation and Initial Startup

For optimum efficiency, operate the UPS within the environmental parameters given in the **SPECIFICATIONS** Section of this manual. Be sure **the** site conforms to the requirements **indicated** on Customer Drawing 6110719045.

3.1 UNPACKING INSTRUCTIONS

- 3.1.1 Check exterior packaging for damage. External **damage** may indicate possible internal damage.

NOTE

You will find an operators manual and warranty card on top of the UPS.

- 3.1.2 Allow a minimum clearance of 4 **feet** in front of the UPS.
3.1.3 Remove one bolt and use it to **secure** the ramp to the pallet.
3.1.4 Remove the second **bolt and** allow unit to roll down ramp.

CAUTION

When all bolts are removed, the UPS is free to roll.

3.2 INSTALLATION (CABINET JOINING)

- 3.2.1 **Place** the cabinet near **the operating** site.
3.2.2 Remove the **mounting** plate. from the **pallet**.
3.2.3 Position the mounting plate at the final installation location.
3.2.4 Using the 4 bolts **(5/16)** you took out when unloading the **cabinet**, bolt the cabinet to the mounting plate.
3.2.5 Join the cabinets together as shown in the Cabinet Joining section on customer drawing **#110719046**.
3.2.6 **Make electrical connections** as required. Refer to customer drawing **#110712208** for **configuration** information to connect the equipment Refer to customer drawing **#110719045** for appropriate wire information.

3.3 *INSTALLATION OF OPTIONS (IF APPLICABLE)*

- 3.3.1 **Refer** to customer drawings for PDM and extended **battery** installation instructions. Refer to customer drawing **#110719033**.

3.4 *CONNECTION OF UPS*

- 3.4.1 **Close CB** 1. Note: The following sequence of events;
- **Lamp Test**
 - **Fan will turn on**
 - UPS **status** will be **displayed** on the **Full Feature Front Panel screen**.

3.5 SYSTEM START-UP AND SITE ACCEPTANCE PROCEDURE

- 3.5.1 Inspect unit for shipping damage.
- 3.5.2 Inspect unit **to be sure all FRUs** are **installed** properly and **all** connectors are seated.
- 3.5.3 Before closing the input breakers verify the proper input voltage and phase rotation are present at **A3TB 1**.
- 3.5.4 Close the input, **output**, and battery **breakers**.
- 3.5.5 Verify all **lights** on front panel go out. **Verify** the BYPASS light is on **solid**. **If** the light **is** flashing **there** is a phase rotation **error**.
- 3.5.6 Perform lamp and horn tests. Refer to section 4.1.2.
- 3.5.7 Verify proper unit type is selected. Refer to section 4.3.7.
- 3.5.8 Turn the unit on and allow **to** go to system normal.
- 3.5.9 Verify the proper output voltage **and** phase angle. Refer to section 7.11.
- 3.5.10 If supplied connect the PDM and verify the proper **voltages** at each receptacle. Refer to installation diagram.
- 3.5.11 Perform **battery** test at no load.
- 3.5.12 Have the customer **connect** the critical load to the unit.
- 3.5.13 With **customer** approval, perform a one minute **battery** test while supplying the critical load.
- 3.5.14 Perform a transfer to and from bypass by turning the unit off and then **back** on.
- 3.5.15 Verify operation of all other options.
- 3.5.16 Give customer training on unit and option **operation**.

3.5 SYSTEM START-UP AND SITE ACCEPTANCE CHECK SHEET

CUSTOMER INFORMATION:

company name: _____

contact _____ Phone number: _____

UNIT INFORMATION:

Order number: _____ cl-0 number: _____ kVA: _____

serial number: _____

options installed: _____

UPS environment: _____

Warranty: Parts ___ 90 day ___ 1 yr ___ 2 yr - - yr
 Labor ___ 90 day ___ 1 yr ___ 2 yr - - F
 Expense ___ 90 day ___ 1 yr ___ 2 yr - - yr

START-UP INFORMATION:

3.5.1 No shipping damage.. _____ OK

3.5.2 FRUs installed and connected properly. _____ OK

3.5.3 Input voltage _____ A

_____ B

_____ C

3.5.4 Proper phase rotation. _____ OK

3.5.5 Input, Output, Battery breakers closed _____ OK

Bypass LED operation. _____ OK

3.5.6 Lamp and horn test function. _____ OK

3.5.7 unit type selected. _____ Type

3.5.8 System normal operation _____ OK

3.5.9 output voltage _____ A - N

_____ B - N

_____ C - N

3.5.10 Proper voltages at A5TB1. _____ OK

3.5.11 Battery operation at no load. _____ OK

3.5.12 critical load connected _____ OK

Customer approval for battery and transfer testing with critical load.

Name: _____ Date: _____

3.513 One **minute** battery test with critical load.

___ OK

3.5.14 Transfer test with critical load.

___ OK

3.5.15 operation of options.

___ O K

3.5.16 Customer trained.

___ O K

customer **acceptance:**

Name: _____ Date: _____

4

System Operation

4.1 CONTROLS AND INDICATORS

During normal operation the UPS functions automatically. Various operator accessible controls and indicators enable monitoring of the system status, manual transfer between modes, system shutdown and system start-up. Location of each control and indicator is given on the following page. Their individual functions are described as follows:

4.1.1 Operating Controls

Refer to figure 4-1.

UPS ON

Used to start-up the UPS.

UPS OFF

Use to shutdown the UPS.

HORN SILENCE

Use to silence the audible alarm; The Horn Silence push-button when pressed lights all indicators as a Lamp Test function; The Horn Silence push-button is also used to test audible alarm.

EMERG POWER OFF

The "EMERG POWER OFF" button will trip, CB2 and CB3 breakers; shutdown the Rectifier; and load interruption will occur. To react the "EMERG POWER OFF" button, open CB1, wait 5 seconds, and then close CB1.

NOTE:

Do not close CB3 until EPO failure has been identified.

4.1.2 Indicator Lights

These are normally invisible indicators. located on the front control panel, which illuminate when the appropriate condition is active.

NORMAL

The NORMAL light (green) is on when UPS is in NORMAL operating mode. The NORMAL light is flashing when utility fails (but still within specified parameters) and Bypass is unavailable. The NORMAL light is illuminated simultaneously with OVERLOAD to indicate Maintenance Mode during Set Type.

BYPASS

The **BYPASS** light (yellow) is on when **UPS** is in **BYPASS** mode. The **NORMAL** light will go off and the **BYPASS** light will be come on. To switch to the Bypass Mode, hold the **UPS OFF** button for 3 seconds. If the **first try** to go to Bypass is unsuccessful, a second attempt will have to be made. The **BYPASS** light flashes in the event of a phase rotation error.

BATTERY

The **BATTERY** light (yellow) is on when **UPS** is running on Battery. The **BATTERY** light is flashing in Set Type mode. When the utility is not available and the unit switches to the Battery Mode, the **NORMAL** light will go off, and the **BATTERY** light will come on and the **HORN** will sound. Press the **HORN SILENCE** button to silence the horn. When battery tune has run out, the **BATTERY** light will go **OFF** and the unit will shut down, removing power to the load-

OVERLOAD

The **OVERLOAD** light (yellow) is on when the **UPS** is in an overload condition. The unit will go to Bypass if it is available. The **OVERLOAD** light is illuminated simultaneously with the **NORMAL** light to indicate the **UPS** is in the **Maintenance Mode** during Set Type. The **OVERLOAD** light will be on when the system goes to an overload condition, and the **HORN** will sound. Press the **HORN SILENCE** button to silence the horn.

HORN AND LIGHTS TEST

In the Normal, Bypass, or Battery mode; press the **HORN SILENCE** button for 4 seconds to test the lights. Continue holding the **HORN SILENCE** button for 10 seconds to test the horn.

ICEYPADO OPERATION

Menu key **■** returns to previous menu level.

UP or DOWN arrow keys **■** changes position within the menus, status screen, or event queue.

RIGHT or **LEFT** arrow keys **■** shows possible device settings in menus or scrolls screen messages.

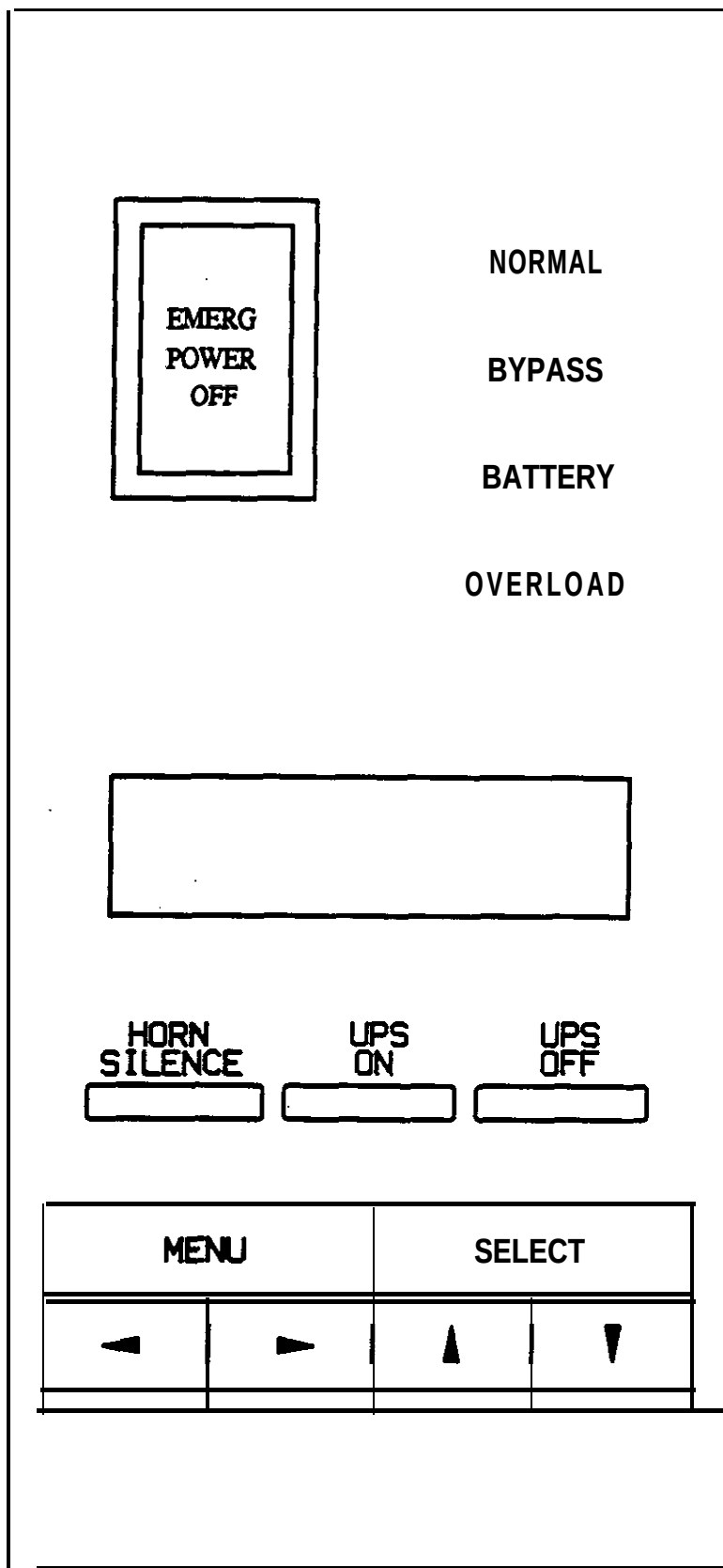


Figure 4-1 **Front** Panel

Main Menu 1. UPS Status		UPS Status System Normal
Main Menu 2. Meters		UPS Status UPS On Battery
Main Menu 3. Alarm Queue		UPS Status Inverter Overload
Main Menu 4. Active Alarms		UPS Status Inverter Ramping Up
Main Menu 5. Battery Data		UPS Status Syncing to Bypass
Maia Menu 6. S.W. Versions		UPS Status UPS On
Main Menu 7. System Setup		UPS Status UPS Off
		UPS Status Output Breaker Open
		UPS Status Rectifier Overload
		UPS Status Load On Inverter
		UPS Status UPS On Bypass
		UPS Status Rectifier Ramping
		UPS Status 0 Active Alarms

Figure 4-2 Menu Screen - UPS Status

Main Menu 1. UPS Status	Input Volts L-N 122 123 124
Main Menu 2. Meters	Input Volts L-L 211 212 213
Main Menu 3. Alarm Queue	Output Volts L-N 120 120 120
Main Menu 4. Active Alarms	Output Volts L-L 208 208 208
Main Menu 5. Battery Data	Avg. Battery Volts 266
Main Menu 6. S.W. Versions	DC Link Volts 420
Main Menu 7. System Setup	Inverter Freq 60.0 Hz
	Input Freq 60.0 Hz
	1. Heatsink Temp 23.9°C
	2. Power Supply Temp 34.5°C
	■■■■■ Output KVA ■ = 10%
	■■■■■ φA Load ■ = 10%
	■■■■■ φB Load ■ = 10%
	■■■■■ φC Load ■ = 10%
	05/01/93 09:46:17

Figure 4-3 Menu Screen - Meters

Main Menu 1. UPS Status	The alarm queue will store up to 200 alarms and/or events, logged with the date and time they occurred.
Main Menu 2. Meters	For example:
Main Menu 3. Alarm Queue	001 03/30/93 10:04:19.4 Bypass not available 002 03/30/93 10:04:19.4 Input under voltage φ A 003 03/30/93 10:04:19.4 Input under voltage φ B 004 03/30/93 10:04:19.4 On Battery 005 03/30/93 08:28:38.2 UPS Supplying load
Main Menu 4. Active Alarms	
Main Menu 5. Battay Data	
Main Menu 6. S.W. Versions	
Main Menu 7. system setup	

Figure 4-4 Menu Screen -Alarm Queue

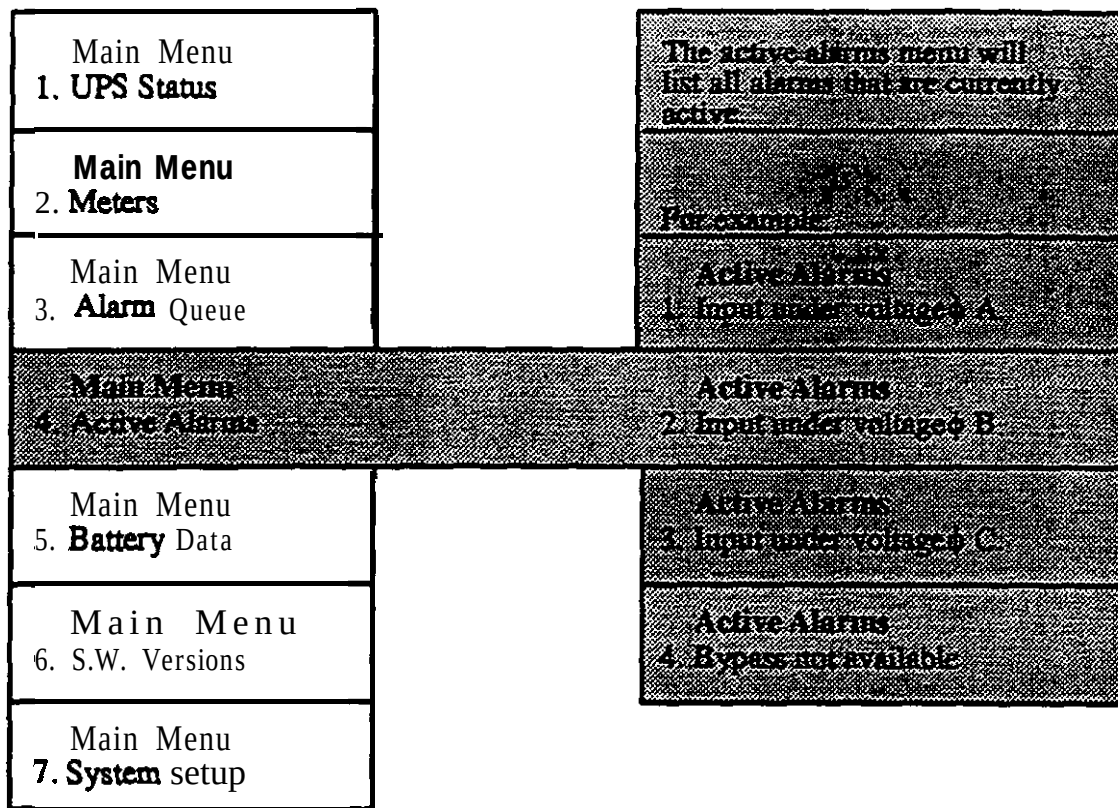


Figure 4-5 Menu Screen - Active Alarm

Main Menu 1. UPS status		Batt. % charge
Main Menu 2. Meters		Note: When unit drops on battery, display shown
Main Menu 3. Alarm Queue		Batt. Time in minutes or % of Batt. Capacity
Main Menu 4. Active Alarms		
Main Menu 5. Battery Data		
Main Menu 6 . S.W. Versions		
Main Menu 7. System Setup		

Figure 4-6 Menu Screen - Battery Data

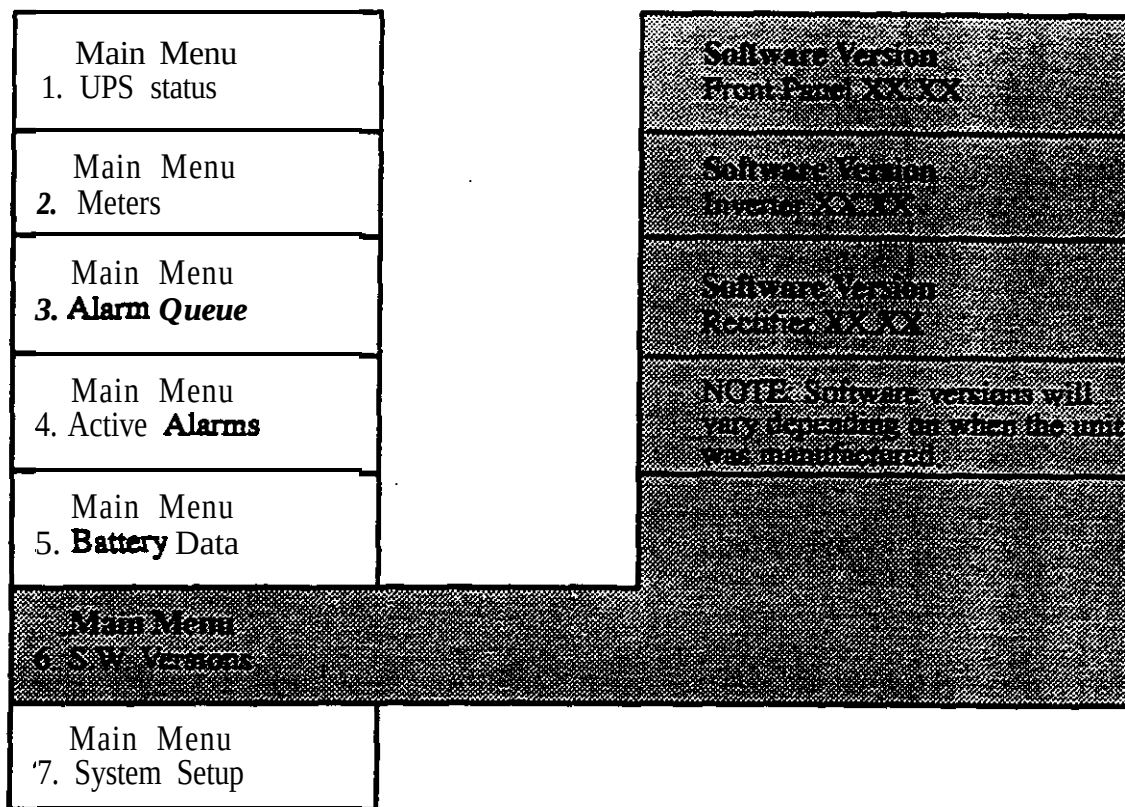
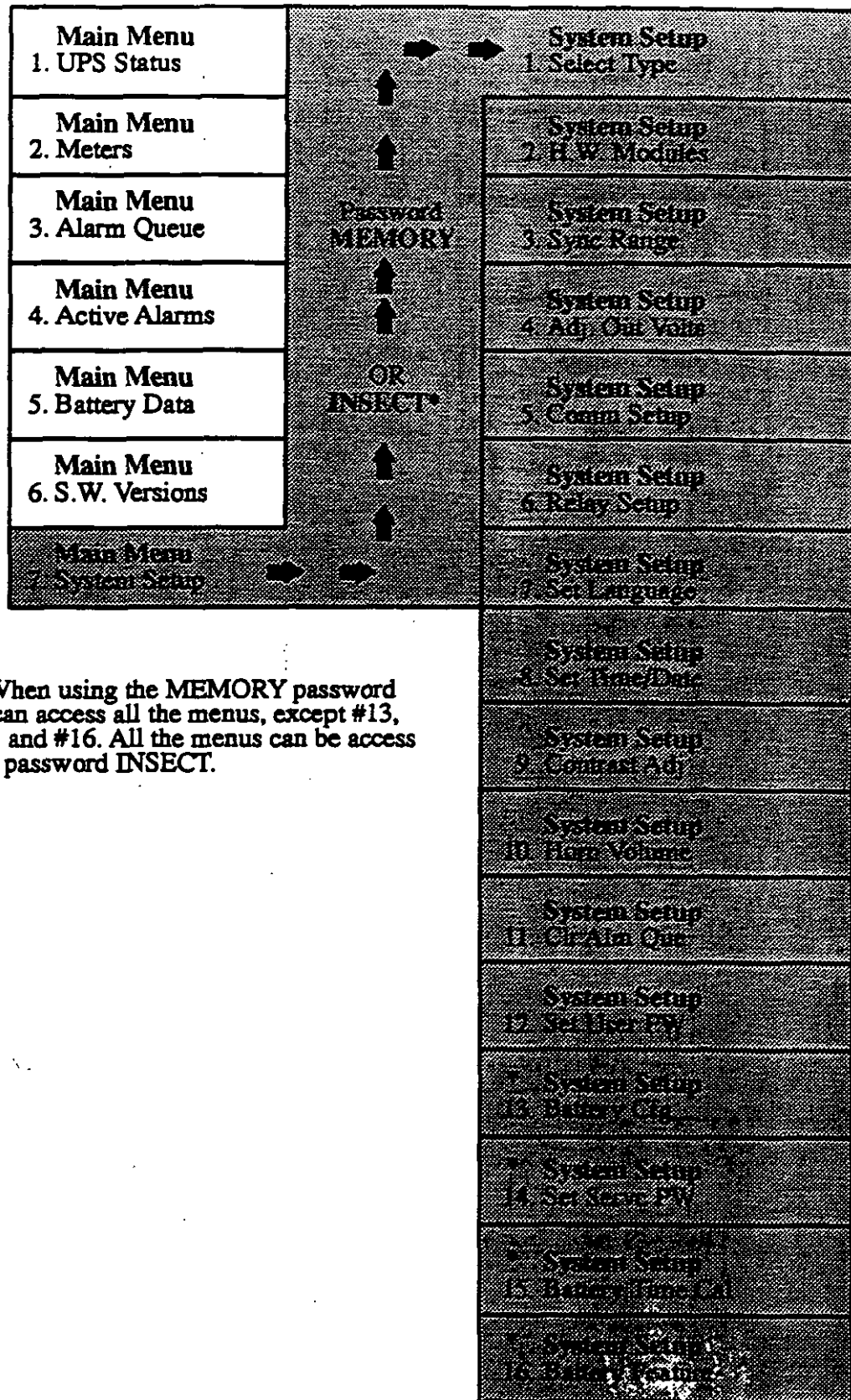


Figure 4-7 Menu Screen - S.W. Versions



NOTE: When using the MEMORY password the user can access all the menus, except #13, #14, #15, and #16. All the menus can be access using the password INSECT.

Figure 4-8 Menu Screen - System Setup

System Setup		Output Voltage ?
1. Select Type		115/200, 120/205, 117/120 VAC
system setup 2. H.W. Modules		Output Frequency ? 50, 60 Hz
System Setup 3. Sync Range		Power-wake Plus Model XXX
System Setup 4. Adj. out Volts		* shows which voltage is selected
System Setup 5. CommSetup		
System Setup 6. Relay Setup		
System Setup 7. Set Language		
system setup 8. Set Time/Date		
System Setup 9. Contrast Adj.		
system Setup 10. Horn Volume		
System Setup 11. Clr Alm Oue		
system setup 12. Set User PW		
* System Setup 13. Battery Cfg		
* systemsetup 14. Set Servc P.W.		
* System Setup 15. Battery Time Cal		
* System Setup 16. Battery Feature		

Use arrow keys to view and change setup choices.

Press SELECT button to save changes.

NOTE: When using the **MEMORY** password the **user can** access all the **menus, except #13, #14, #15, and #16.** All the **menus can** be access using the password **INSECT.**

Figure 4-9 Menu Screen - Select Type

System Setup 1. Select Type	Bypass Inst ? Yes No
System Setup 2. H.W. Modules	# Output Phases Three Phase
System Setup 3. Sync Range	Inverter Inst ? Yes No
System Setup 4. Adj. Out Volts	Rectifier Inst ? Yes No
System Setup 5. Comm Setup	Shunt Breaker ? Yes No
System Setup 6. Relay Setup	Comm Board Inst ? Yes No
System Setup 7. Set Language	Front Interface ? Yes No
System Setup 8. Set Time/Date	Modem Installed ? Yes No
System Setup 9. Contrast Adj.	
System Setup 10. Horn Volume	
System Setup 11. Clr Alma Que	
system setup 12. Set User PW	
* System Setup 13. Battery Cfg	
* System Setup 14. set Servc PW	
* System setup 15. Battery Time Cal	
* systemsetup 16. Battery Feature	



Use arrow keys to view and change setup choices.

Press SELECT button to save changes.

NOTE: When using the MEMORY password the user **can** access all the **menus**, except #13, #14, #15, and #16. All the **menus** can be access using the password **INSECT**.

Figure 4-10 Menu Screen - H.W. Modules

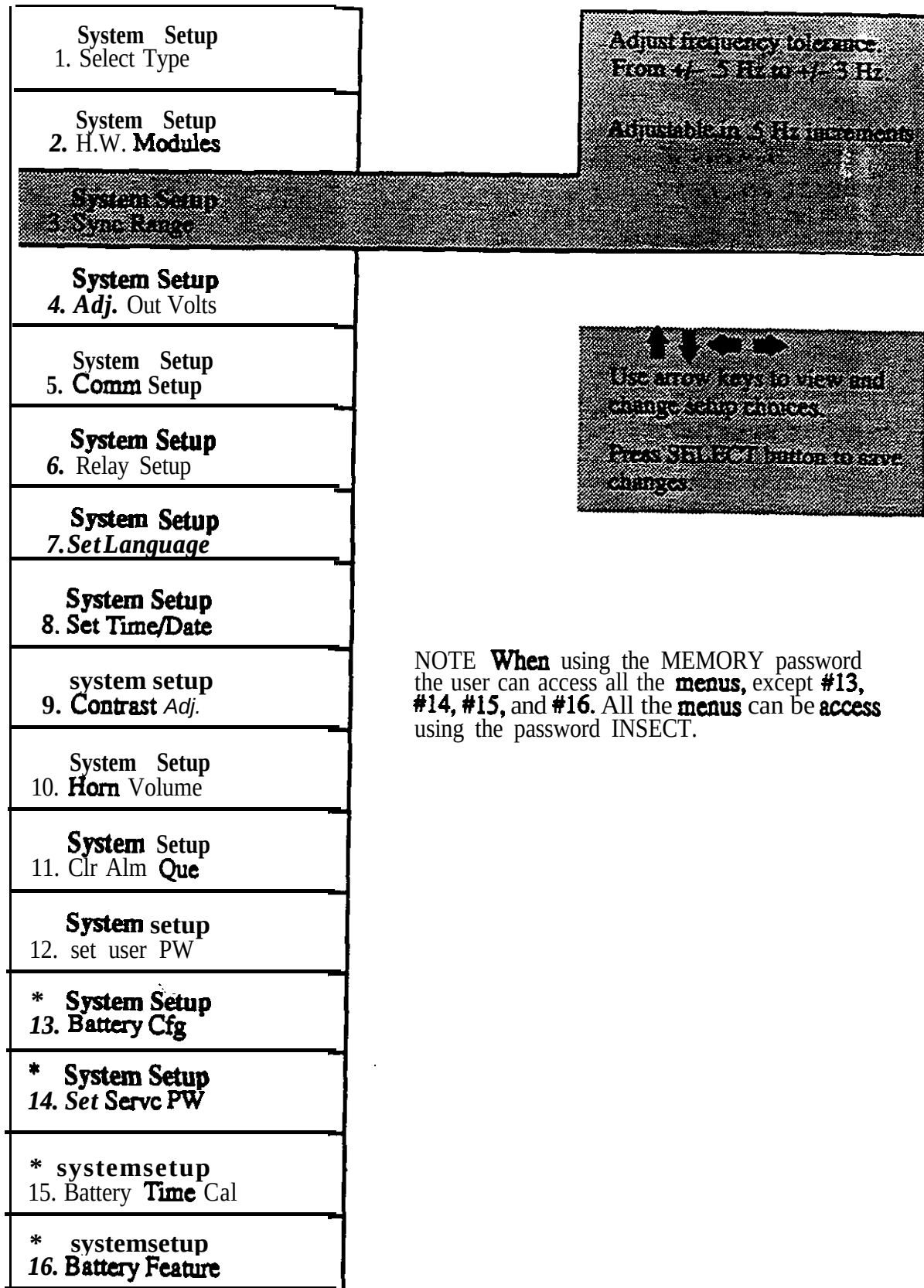


Figure 4-11 Menu Screen- Sync Range

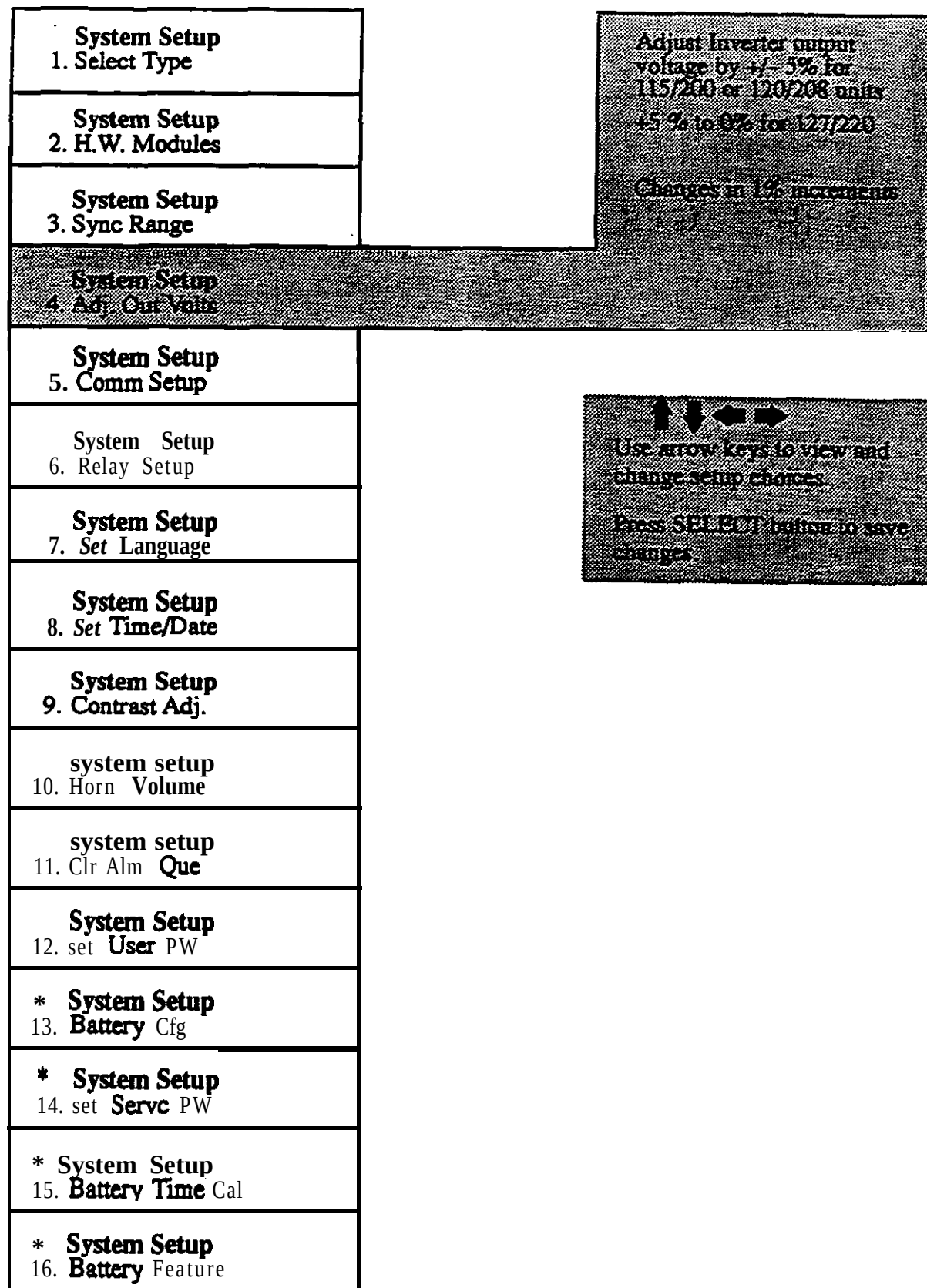


Figure 4-12 Menu Screen - Adj. Out Volts

System Setup 1. Select Type	Comm Setup 1. Output Mode
system Setup 2. H.W. Modules	Comm Setup 2. I/O Port Setup
system Setup 3. Sync Range	Comm Setup 3. Customize I/O
system Setup 4. Adj. Out Volts	
System Setup 5. Comm Setup	
system Setup 6. Relay Setup	
System Setup 7. Set Language	
system Setup 8. Set Time/Date	
system Setup 9. Contrast Adj.	
System Setup 10. Horn Volume	
System Setup 11. Clr Alm Que	
system Setup 12. Set User PW	
* system Setup 13. Battery Cfg	
* System Setup 14. Set Servc PW	
* system Setup 15. Battery Time Cal	
* System Setup 16. Battery Feature	

NOTE When using the MEMORY password the **user** can access all the **menus**, except #13, #14, #15, and #16. All the menus can be **access** using the password **INSECT**.

Figure 4-13 Menu Screen - Comm Setup

System setup 1. Select Type		Output Mode Printer
system setup 2. H.W. Modules		Output Mode Terminal
System Setup 3. sync Range		Output Mode Binary Computer
System Setup 4. Adj. Out Volts		Output Mode ASCII Computer
System Setup 5. Comm Setup	Comm Setup 1. Output Mode	Output Mode RTM
System Setup 6. Relay Setup	Comm Setup 2. IO Port Setup	Output Mode None
System Setup 7. Set Language	Comm Setup 3. Customize I/O	
System Setup 8. set Time/Date		
system setup 9. Contrast Adj.		
System Setup 10. Horn Volume		
System Setup 11. clr Alm Qlle		
system setup 12. Set User PW		
* System Setup 13. Battery Cfg		
* systemsetup 14. Set Servc PW		
* System Setup 15. Battery Time Cal		
* systemsetup 16. Battery Feature		




 To change selection
 * Indicates current selection
 Press SELECT button to save changes

NOTE: When using the MEMORY password the user can access all the menus, except #13, #14, #15, and #16. All the menus can be access using the password INSECT.

Figure 4-14 Menu Screen - Comm Setup - Output Mode

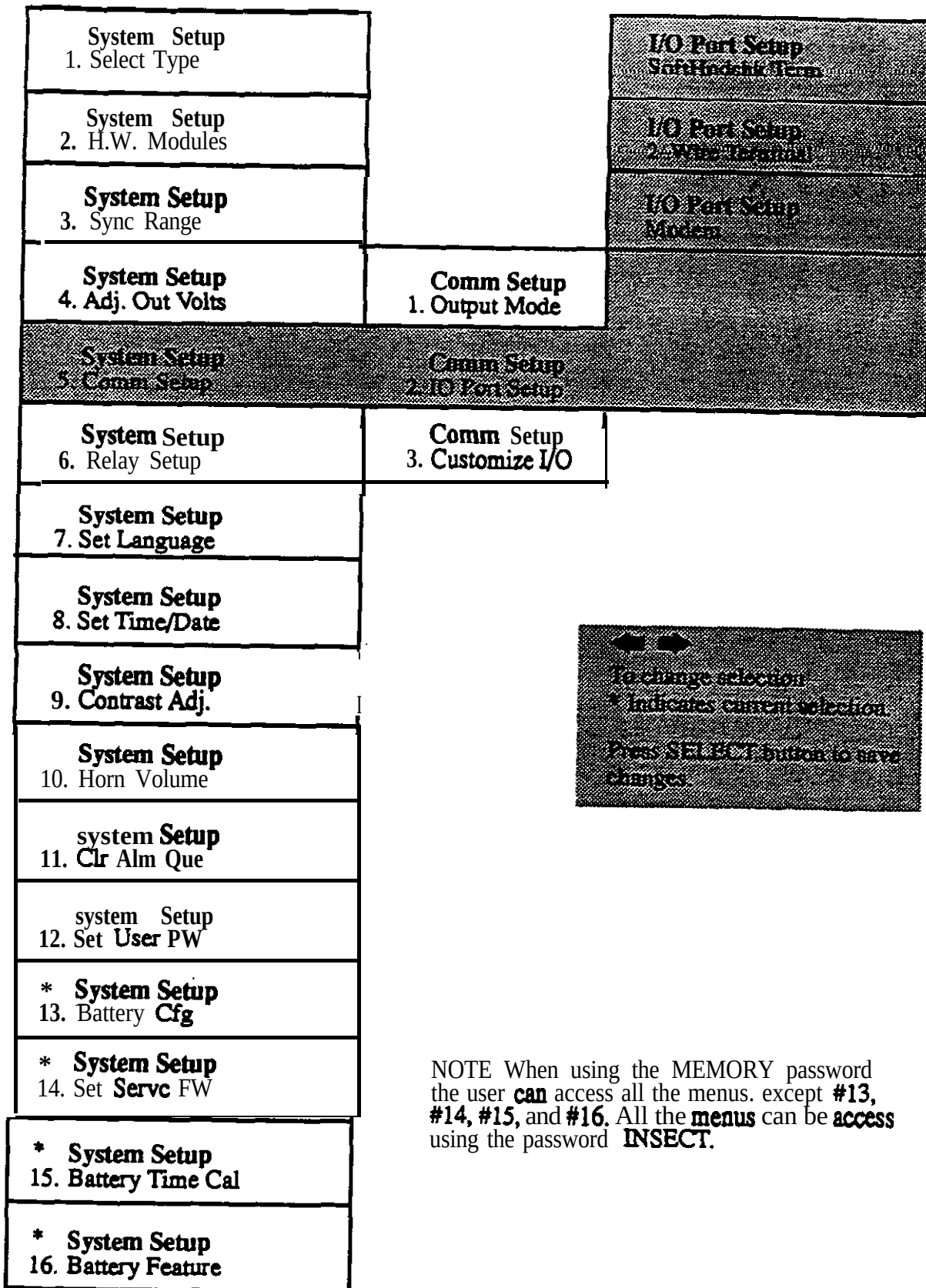


Figure 4-15 Menu Screen - Comm Setup - I/O Pon Setup

System Setup 1. Select Type		Baud Rate 2400, 4800, 9600, 19200 baud
System Setup 2. H.W. Modules		Data Size 7 or 8 bits
System Setup 3. sync Range	Comm Setup 1. Output Mode	Hardware Handshk Enable/Disable
System Setup 4. Adj. Out Volts	Comm Setup 2. IO Port Setup	Software Handshk Enable/Disable
System Setup 5. Comm Setup	Comm Setup 3. Customize I/O	Parity None, odd or even
System Setup 6. Relay Setup		
System Setup 7. Set language		
system setup 8. Set Time/Date		
System Setup 9. Contrast Adj		
System Setup 10. Horn Volume		
System Setup 11. Clr Alm Que		
system setup 12. set User PW		
* System Setup 13. Battery Cfg		
* System Setup 14. Set Servc PW		
* System Setup 15. Battery Time Cal		
* System Setup 15. Battery Feature		

↑ ↓
To scroll through selections
and indicate what is selected

← →
Used to change selections

Press SELECT button to save changes

NOTE When using the MEMORY password the user can access all the menus, except #13, #14, #15, and #16. All the menus can be access using the password INSECT.

Figure 4-16 Menu Screen - Comm Setup - Customize I/O

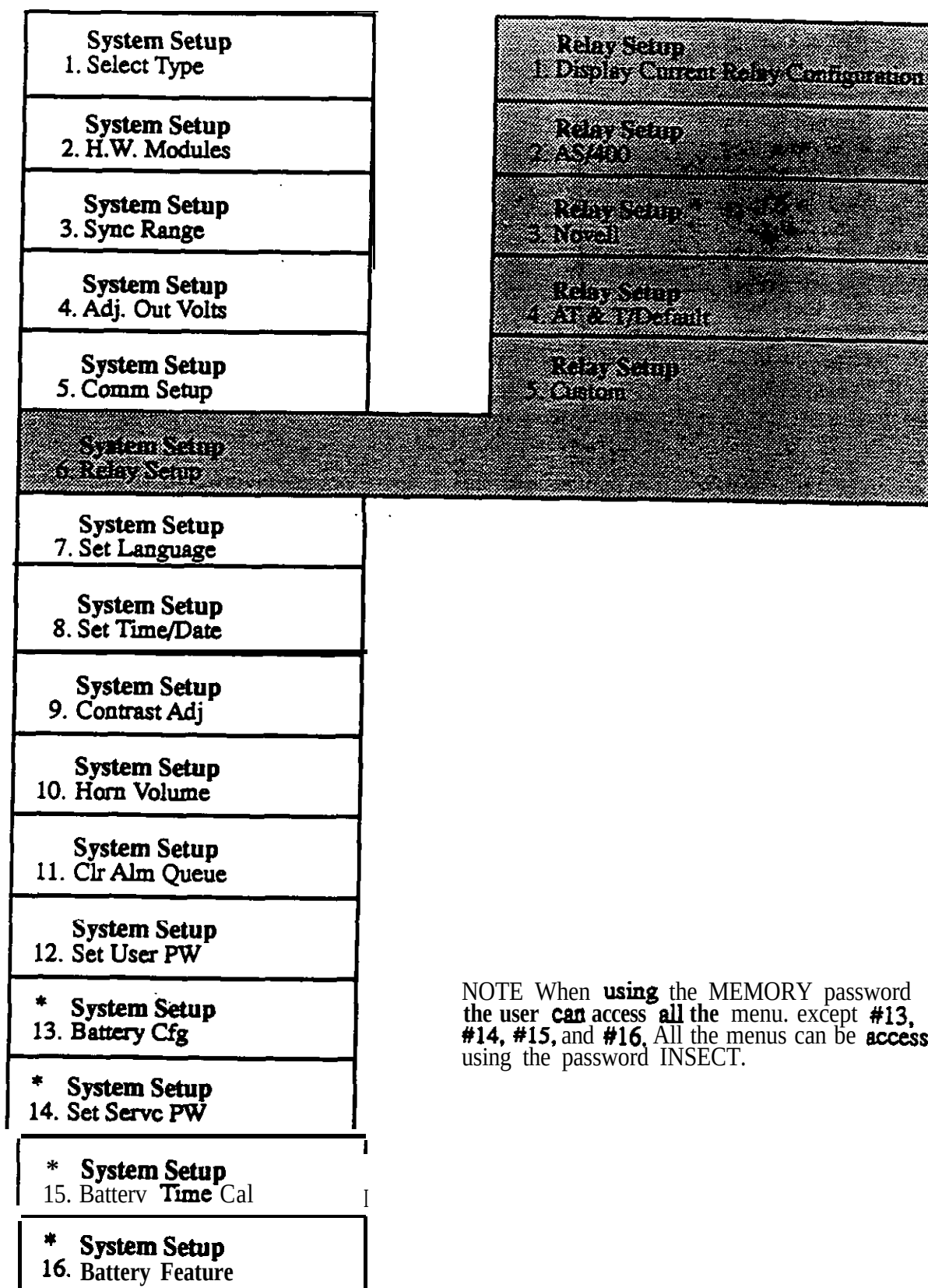
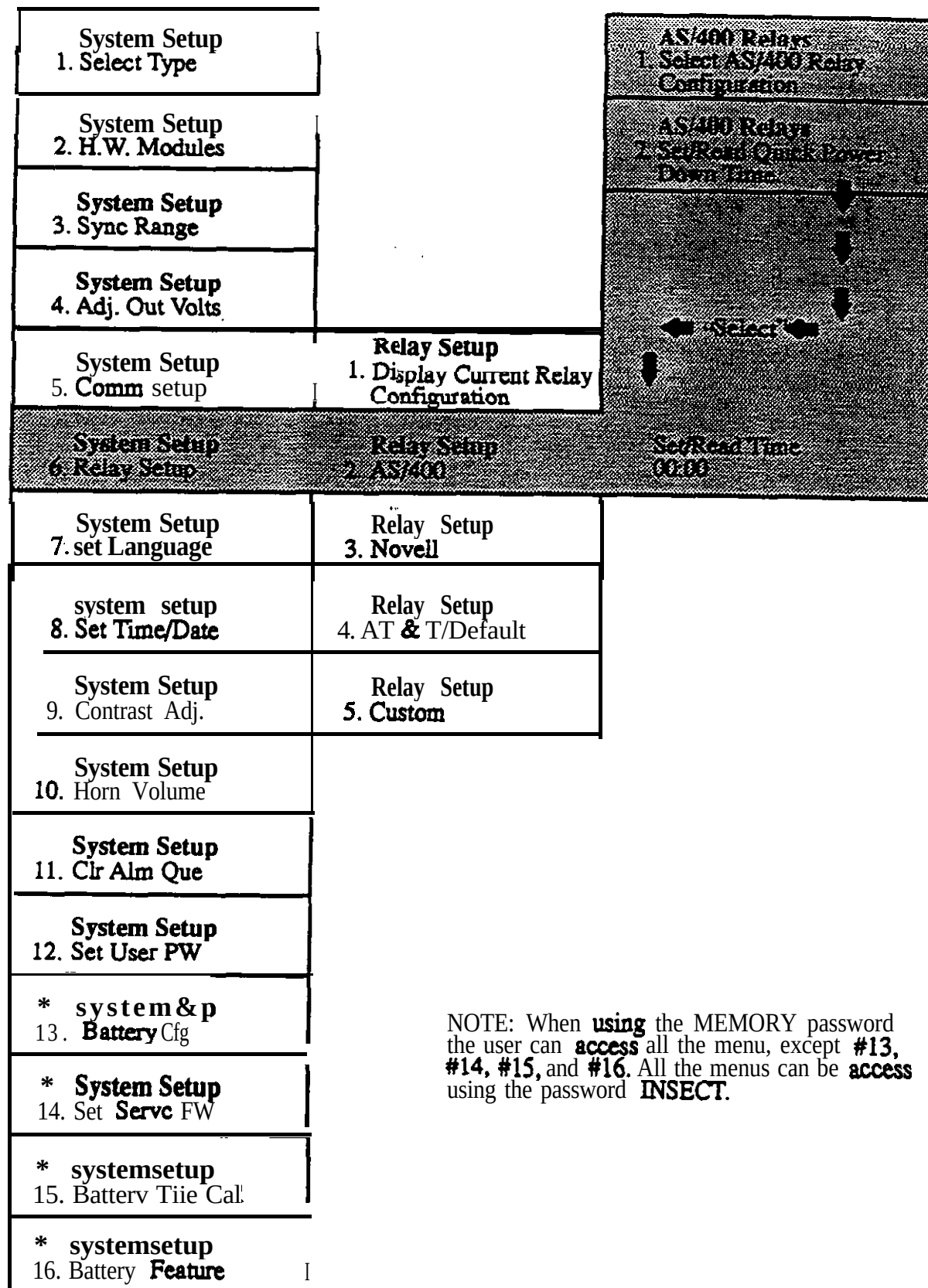


Figure 4-17 Menu Screen - Relay Setup

System Setup 1. Select Type	1.	XXXXX Relays Selected
System Setup 2. H.W. Modules		
System Setup 3. sync Range		
System Setup 4. Adj. Out Volts		
System Setup 5. Comm setup		
System Setup 6. Relay Setup	Relay Setup 1. Display Current Relay Configuration	
System Setup 7. set Language	Relay Setup 2. AS/400	
System Setup 8. Set Time/Date	Relay Setup 3. Novell	
System Setup 9. Contrast Adj	Relay Setup 4. AT & T/Default	
System Setup 10. Horn Volume	Relay Setup 5. Custom	
system setup 11. Clr Alm Que		
System Setup 12. Set User PW		
* System Setup 13. Battery Cfg		
* System Setup 14. set Servc PW		
* System Setup 15. Battery Time Cal		
* System Setup 16. Battery Feature		

NOTE: When using the MEMORY password the user can access all the menus, except #13, #14, #15, and #16. All the menus can be access using the password INSECT.

Figure 4-18 Menu Screen - Relay Setup - Display current setup



NOTE: When **using** the MEMORY password the user can **access** all the menu, except #13, #14, #15, and #16. All the menus can be **access** using the password **INSECT**.

Figure 4-19 Menu Screen - Relay Setup - AS/400

System Setup 1. Select Type		Novell Relays 1. Select Novell Relay Configuration
System Setup 2. H.W. Modules		
System Setup 3. sync Range		
System Setup 4. Adj. Out Volts	Relay Setup 1. Display Current Relay Configuration	
System Setup 5. Comm Setup	Relay Setup 2. AS/400.	
System Setup 6. Relay Setup	Relay Setup 3. Novell	
System Setup 7. Set Language	Relay Setup 4. AT & T/Default	
System Setup 8. Set Time/Date	Relay Setup 5. custom	
System Setup 9. Contrast Adj.		
System Setup 10. Horn Volume		
system setup 11. Clr Ah Que		
system setup 12. Set User PW		
* System Setup 13. Battery Cfg		
* System Setup 14. Set Servc PW		
* System Setup 15. Battery Time Cal		
* system setup 16. Battery Feature		

NOTE: When using the MEMORY password the user can access all the menus, except #13, #14, #15, and #16. All the menus can be access using the password INSECT.

Figure 4-20 Menu Screen - Relay Setup -Novell

System Setup 1. Select Type		Relay Setup AT & T/Default Relays Select AT & T/Default I Relay Configuration
system Setup 2. H.W. Modules		
System Setup 3. Sync Range	Relay Setup 1. Display Current Relay Configuration	
System Setup 4. Adj. Out Volts	Relay Setup 2. AS/400	
System Setup 5. Comm Setup	Relay Setup 3. Novell	
System Setup 6. Relay Setup	Relay Setup 4. AT & T/Default	
System Setup 7. Set Language	Relay Setup 5. Custom	
System setup 8. Set Time/Date		
System setup 9. Contrast Adj.		
system setup 10. Horn Volume		
system setup 11. Clr Alm Que		
system setup 12. Set User PW		
* System Setup 13. Battery Cfg		
* System Setup 14. Set Servc PW		
* System Setup 15. Battery Time Cal		
* System Setup 16. Battery Feature		

NOTE: When using the MEMORY password the user can access all the menus, except #13, #14, #15, and #16. All the menus can be access using the password INSECT.

Figure 4-21 Menu Screen - Relay Setup - Default #1

System Setup 1. Select Type		Custom Relays 1. Relay 1 Setup
System Setup 2. H.W. Modules	Relay Setup 1. Display Current Relay Configuration	Custom Relays 2. Relay 2 Setup
System Setup 3. sync Range	Relay Setup 2. AS/400	Custom Relays 3. Relay 3 Setup
System Setup 4. Adj. Out Volts	Relay Setup 3. Novell	Custom Relays 4. Relay 4 Setup
System Setup 5. Comm Setup	Relay Setup 4. AT & T/Default	Set/Read Battery Time Remaining Alarm Level
System Setup 6. Relay Setup	Relay Setup 5. Custom	
System Setup 7. set Language		
System Setup 8. Set Time/Date		
System Setup 9. Contrast Adj.		
System Setup 10. Horn Volume		
System Setup 11. Ctr Alm Que		
System Setup 12. Set User PW		
* System Setup 13. Battery Cfg		
* System Setup 14. set Servc PW		
* System Setup 15. Battery Time Cal		
* System Setup 16. Battery Feature		

NOTE: When using the MEMORY password the user can access all the menus, except #13, #14, #15, and #16. All the menus can be access using the password INSECT.

Figure 4-22 Menu Screen -Relay Setup - Custom

Relay Setup 1. Display Current Relay Configuration		'X' = Any of relays 1, 2, 3, 0r 4.
Relay Setup 2. AS/400		33 Alarms displayed. + indicator which relay alarm(s) selected
Relay Setup 3. Novell		Relay's Alarm Condition Clear
Relay Setup 4. AT & T/Default		Relay 1 Setup Selected Alarms for Relay 'X'
Relay Setup 5. Custom	Custom Relays 1. Relay 1 Setup	Relay Polarity Inverted/Restored
	Custom Relays 2. Relay 2 setup	1. Set/Clear Relay Alarm Conditions
	Custom Relays 3. Relay 3 Setup	2. Clear All Relay Alarm Conditions
	Custom Relays 4. Relay 4 Setup	3. Display Relay Alarm Conditions
	Set/Read Battery Time Remaining Alarm Level	4. Invert Relay Output Polarity
		Set/Read Alarms with Time

Figure 4-23 Menu Screen - Relay Setup - Custom - Relay 1

System Setup 1. Select Type	English
System Setup 2. H.W. Modules	French
System Setup 3. Sync Range	German
System Setup 4. Adj. Out Volts	Portuguese
System Setup 5. Comm Setup	Spanish
System Setup 6. Relay Setup	
System Setup 7. Set Language	
System Setup 8. set Time/Date	
System Setup 9. Contrast Adj.	
System Setup 10. Horn Volume	
System Setup 11. Clr Alm Que	
system setup 12. set user PW	
* System Setup 13. Battay Cfg	
* System Setup 14. Set Servc PW	
* System Setup 15. Battery Time Cal	
* System Setup 16. Battery Feature	

NOTE When using the MEMORY password the user can access all the menus, except #13, #14, #15, and #16. All the menus can be access using the password INSECT.

Figure 4-24 Menu Screen - Set Language

System Setup 1. select Type	Date Format MM/DD/YY DD/MM/YY 04/12/88 12/11/88
System Setup 2. H.W. Modules	
System Setup 3. sync Range	
System Setup 4. Adj. Out Volts	
System Setup 5. Comm Setup	
System Setup 6. Relay Setup	
System Setup 7. Set Language	
System Setup 8. Set Time/Durc	
System Setup 9. Contrast Adj.	
System Setup 10. Horn Volume	
System Setup 11. Clr Alm Que	
System Setup 12. set user PW	
* System Setup 13. Battery Cfg	NOTE: When using the MEMORY password the user can access all the menu. except #13, #14, #15, and #16. All the menus can be access using the password INSECT .
* System Setup 14. Set Servc PW	
* System Setup 15. Battery Time Cal	
* System Setup 16. Battery Feature	

Figure 4-25 Menu Screen - Set Time/Date

System Setup 1. Select Type	1	Adjust Contrast Select to Save
System Setup 2. H.W. Modules		
System Setup 3. sync Range		
System Setup 4. Adj. Out Volts		
System Setup 5. Comm setup		
System Setup 6. Relay Setup		
System Setup 7. Set Language		
System Setup 8. Set Time/Date		
System Setup 9. Contrast Adj.		
System Setup 10. Horn Volume		NOTE When using the MEMORY password the user can access all the menus, except #13, #14, #15, and 016. All the menus can be access using the password INSECT.
System Setup 11. Clr Ah Que		
System Setup 12. set user PW		
* System Setup 13. Battery Cfg		
* System Setup 14. Set Sercv PW		
* System Setup 15. Battery Time Cal		
* System Setup 16. Battery Feature		

Figure 4-26 Menu Screen - Contrast Adj.

System Setup 1. Select Type		Horn Volume Load/Soft
System Setup 2. H.W. Modules		Select to save:
system setup 3. Sync Range		
System Setup 4. Adj. Out Volts		
System Setup 5. Comm Setup		
system setup 6. Relay Setup		
system setup 7. Set Language		
System Setup 8. Set Time/Date		
System Setup 9. Contrast Adj.		
System Setup 10. Horn Volume		
System Setup 11. Clr Alm Que		
System Setup 12. Set User PW		
* systems & p 13. Battery Cfg		
* System Setup 14. Set Servc PW		
* System Setup 15. Battery Time Cal		
• systemsetup 16. Battery Feature		

NOTE: When using the MEMORY password the user can access all the menus, except #13, #14, #15, and #16. All the menus can be access using the password INSECT.

Figure 4-27 Menu Screen - Horn Volume

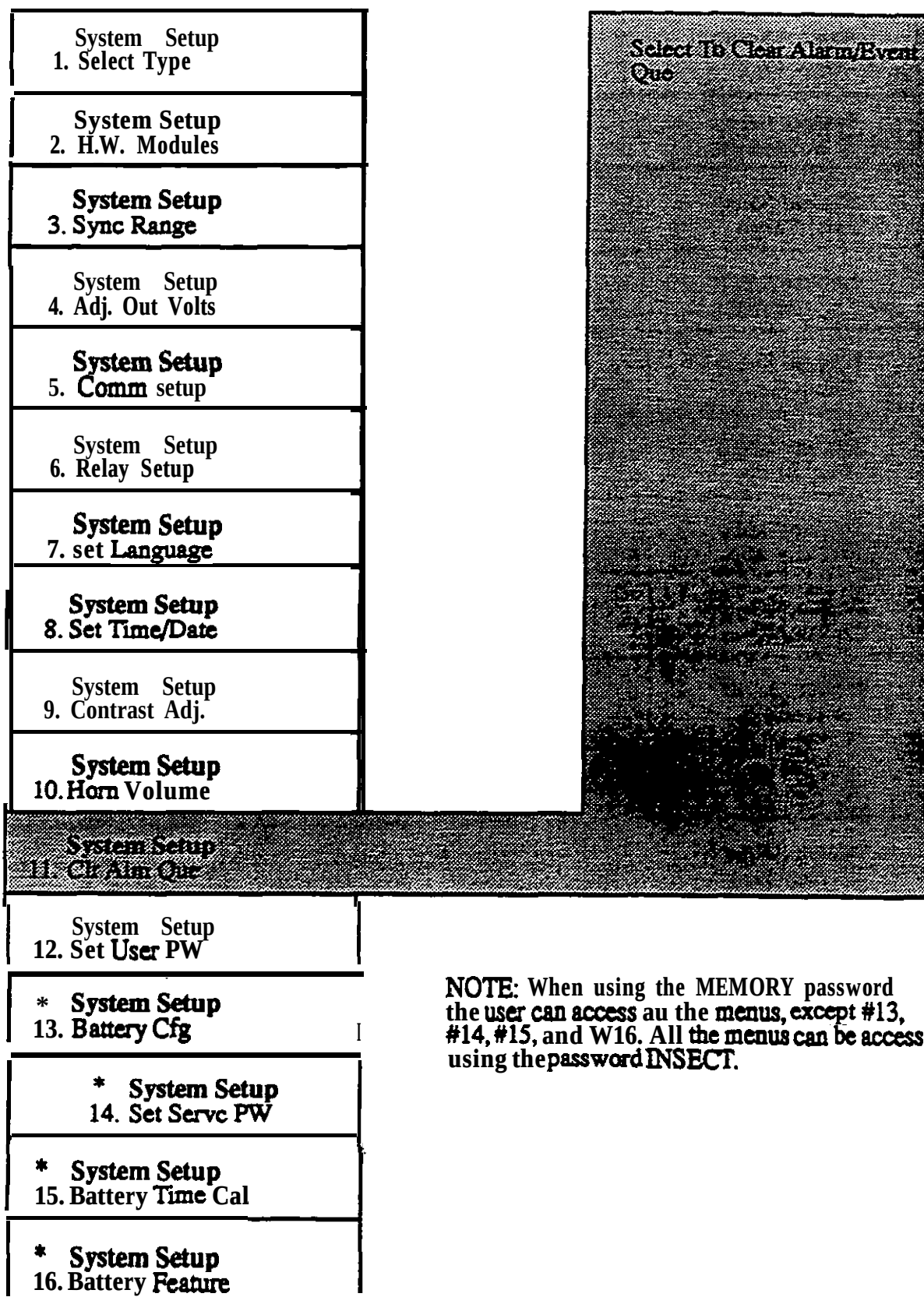


Figure 4-28 Menu Screen - Clear Alarm Queue

System Setup 1. Select Type	Password XXXXXX ← → To move cursor ↑ ↓ To change letter Select to save
system setup 2. H.W. Modules	
System Setup 3. sync Range	
System Setup 4. Adj. Out Volts	
System Setup 5. Comm setup	
system Setup 6. Relay Setup	
system Setup 7. Set Language	
System Setup 8. Set Time/Date	
System Setup 9. Contrast Adj.	
System Setup 10. Horn Volume	
System Setup 11. Clr Alm Que	
System Setup 12. Set User PW	
* System Setup 13. Battery Cfg	NOTE: When using the MEMORY password the user can access all the menus, except #13, #14, #15, and #16. All the menus can be access using the password INSECT.
* System Setup 14. Set Servc PW	
* systemsetup 15. Battery Time Cal	
* System Setup 16. Battery Feature	

Figure 4-29 Menu Screen-Set User P. W.

System Setup 1. Select Type	Battery Config Custom Batt
System Setup 2. H.W. Modules	Battery Config 1 EBC2
System Setup 3. Sync Range	Battery Config 2 EBC2s
System Setup 4. Adj. out Volts	Battery Config 3 EBC2s
System Setup 5. Comm setup	Battery Config 1 EBC1 & 1 EBC2
System Setup 6. Relay Setup	Battery Config 2 EBC1s & 1 EBC2
System Setup 7. Set Language	Battery Config 1 EBC1 & 2 EBCs
System Setup 8. Set Time/Date	Battery Config 1 EBC1 and 1 EBC2
System Setup 9. Contrast Adj.	Battery Config 1 EBC1
System Setup 10. Horn Volume	Battery Config 3 EBC1s and 1 EBC2
System Setup 11. Clr Alm Que	Battery Config 1 EBC18
System Setup 12. Set User PW	Battery Config 1 EBC18 and 1 EBC2
* System Setup 13. Battery Cfg	Battery Config 3 EBC18s
* System Setup 14. Set Servc PW	Battery Config No Battery
* System Setup 15. Battay Time Cal	
* System Setup 16. Battery Feature	

NOTE: When using the MEMORY password the user cm access all the menus, except #13, #14, #15, and #16. All the menus CM be access using the password INSECT.

Figure 4-30 Menu Screen - Battery Configuration

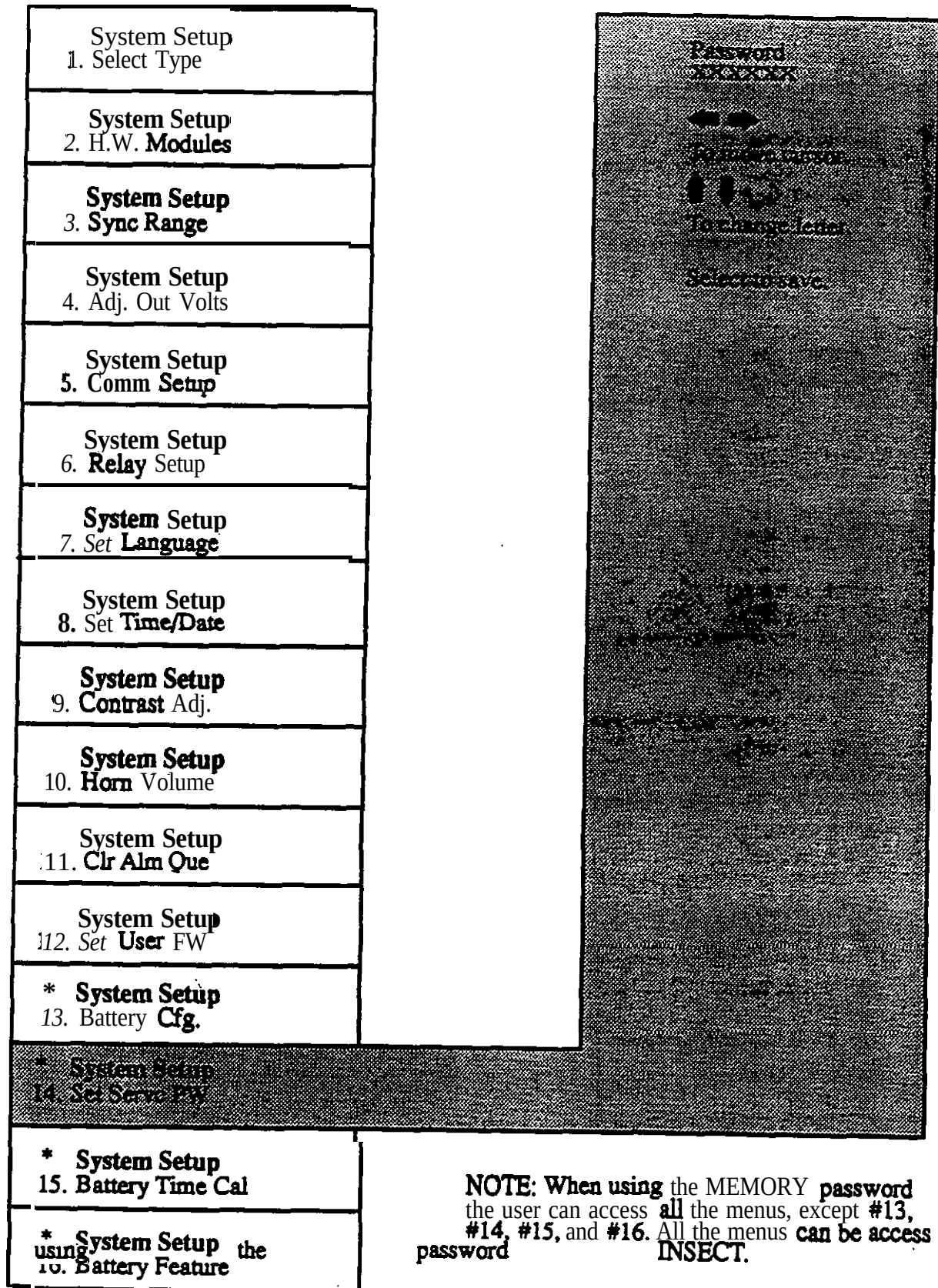


Figure 4-31 Menu Screen - Set Service PW.

System Setup 1. Select Type	This menu will walk the user through the procedure to calibrate the battery time remaining.
System Setup 2. H.W. Modules	
System Setup 3. sync Range	
System Setup 4. Adj. Out Volta	
System Setup 5. Comm Setup	
System Setup 6. Relay Setup	
System Setup 7. Set Language	
System Setup 8. Set Time/Date	
System Setup 9. Contrast Adj.	
System Setup 10. Horn Volume	
System Setup 11. Clr Alm Que	
System Setup 12. Set User PW	
* System Setup 13. Battery Cfg	
* System Setup 14. Set Servc PW	
* System Setup 15. Battery Time Cal	
* System Setup 16. Battery Feature	

Figure 4-32 Menu Screen - Battery Time Calibration

System Setup 1. Select Type	On Batt Display * Shows Batt Time or Shows % Battery
System Setup 2. H.W. Modules	BTR Shut On UPS ? Yes/No
System Setup 3. Sync Range	
System Setup 4. Adj. Out Volts	
System Setup 5. Comm Setup	
System Setup 6. Relay Setup	
System Setup 7. Set Language	
System Setup 8. Set Time/Date	
System Setup 9. Contrast Adj.	
System Setup 110. Horn Volume	
System Setup 111. Clr Alm Que	
System Setup 12. Set User PW	
* System Setup 13. Battery Cfg	
* System Setup 114. Set Servc PW	
* System Setup 15. Battery Tie Cd	
* System Setup 16. Battery Feature	

Figure 4-33 Menu Screen - Battery lime Feature

4.2 FRONT PANEL DISPLAY

The UPS Digital Front Panel **Display** allows unit set up and monitoring the UPS status. The following pages contain breakdowns for each alarm menu.

4.3 EXPLANATION OF MENUS

43.1 UPS status

The number of **currently** active slams and the following UPS Status conditions are **displayed**:

On Battery	UPS is On Battery
Inverter Overload	overload condition indicated from Inverter
Rectifier Overload	Overload condition indicated from Rectifier
Inverter Ramping Up	Inverter ramping
System Normal	Inverter supplying load (bypass available)
Load On Inverter	Inverter supplying load (no bypass)
On Bypass	Unit On Bypass
UPS ON	Rectifier or Inverter ON but not supplying load
UPS OFF	Rectifier and Inverter OFF

43.2 Meters Menu

Displays system meter **values** obtained through **the** Serial Communications network or **calculated from** the values **obtained** through the network. Use the UP or DOWN arrow **keys to view metered values, use the MENU key to return to the MENU.**

Values displayed are: Input Voltage (each phase and line to line), Output voltage (each phase and line to line). DC Input Voltage, Average **Battery** Voltage, DC Link Voltage, **Inverter** Frequency, Input **Frequency**, Heat Sink **Temperature**, and **Power** Supply Temperature. The **Load Currents** (each phase) and **Output** KVA are shown as **bar** graphs each block **representing** 10% of capacity. The present lime and date are displayed in **the mm/dd/yy; hh:mm:ss.s format.**

433 Alarm Queue

The 200 most recent **alarms** and events are displayed in chronological order (most recent first). Use the RIGHT or **LEFT** arrows to **scroll** the screen and view **entire** description.

CAUTION

*The **alarms** listed in the troubleshooting section are to be used only as a troubleshooting guide.*

43.4 Active Alarms

Displays **all** active **alarms**.

43.5 Password

Factory setpassword must be **entered** to access System Set-Up options. After entering a valid password, the System Set-Up menu will be displayed. **The** factory set user password is MEMORY. The factory **set** service password is INSECT.

43.6 System Set-up

Used to set up the UPS. From the SYSTEM **SETUP** menu, use **the MENU** key to return to the MAIN MENU. In **general**, when altering the settings under the **SYSTEM SETUP** menu, the **SELECT** key will save a change and the **MENU** key will abort, leaving the setting **as** it was. **An** asterisk (*) displayed on the left side indicates the presently **selected** item.

43.7 Select Type

Used to select the output voltage, output phase, and output frequency type for the UPS. Use the **RIGHT** and **LEFT** arrow keys to display all options for each category. Press the SBLBCT button to save **an option**. **The kVA** rating can be viewed but not changed.

43.8 H. W. Modules

Used **to** view and change the current system configuration. The entries are:

- **Bypass Installed ***

- **Rectifier** 
- **Battery Installed**

- **Communication Board Installed**


* Item may be viewed, but **not changed**.

To view the **entries presently selected**, press the **UP** or **DOWN** arrow key. To view options available for each **selection**, the **LEFT** or **RIGHT** arrow key is pressed. To choose an option other than the one presently selected press the **select** key while the option is being displayed. To return to the System Setup Menu, press the Menu key.

43.9 Sync Range

The range, **in Hz**, in which the input frequency may vary **from** the selected output **frequency** and still have bypass available. The value is from **+/- 0.5 to +/- 3.0 Hz**. The **UP** and **DOWN** arrow keys **selects** between **the options**, the **SELECT** key sets the new value.

43.10 Adj Out Volts

Used **to** adjust the unit's output voltage by **+/- 5%** of the nominal output voltage. When **selected**, the present output **voltage** and the deviation **from** the nominal voltage is displayed. **The UP and DOWN** keys will provide a **1% increment or decrement** of the output voltage.

4.3.11 Comm Setup

Allows the serial port to be used with a **terminal, printer** or in one of the computer **modes**. The following menus **are** used to setup **communications**:

- . Output Mode
- **I/O Port Setup**
- **Customize I/O**

For each of these menus a list of set up parameters can be viewed by using the UP or DOWN arrow key. To change a parameter the **LEFT** and **RIGHT** arrow keys should be used to view **other** options and the **SELECT** key pressed to change to the currently **displayed**.

Output Mode

The modes are: ASCII Computer; Binary Computer; Printer; Terminal.

setup **I/O Port**

The I/O port may by **default** be set to: **2-Wire Terminal**; Software Handshaking. Note It is possible not to have any of these selected.

Customize I/O

Used to allow the communications port parameters to be set individually. **These** items are: Baud **Rate**; Hardware **Handshaking**; Software Handshaking Parity; and Data **S k** '.

4.3.12 Relay Setup

Used to change the **current** rear panel relays **configuration**. The available options **are**: Display Current **Relay Setup**, A/S 400. **Novell, AT** &T/Default 1. **and** Custom.

4.3.13 Set Language

Used to select the language used for the display. The selections are English, French, German, Spanish, and Portuguese. Use the UP or DOWN arrow keys to view the options **and the SELECT key to change**.

4.3.14 Set Time/Date

Used to set the time and date. Use the **RIGHT** and **LEFT** arrow keys to change the group (minutes to hours, etc.) Use the UP and DOWN arrow keys to change **numbers** and the **SELECT key to set it**.

4.3.15 Contrast Adjust

Used to adjust the LCD contrast for **better** visibility. Use the UP and DOWN arrow keys to vary the contrast.

4.3.16 Horn Volume

The horn volume is controlled by this **setup** entry. To select **a volume (LOUD OR SOFT)** use the **LEFT** and **RIGHT** keys. **Once the volume has been selected, use the select key to save it**. Upon this **selection**, the horn will beep with the new volume.

43.17 Clear Alarm Queue

Used to completely empty the alarm queue of all listed **alarms**. Press the **SELECT** key to empty the queue.

4.3.18 Set User PW

The user password is entered **here**. The **screen** will always default to "AAAAAA". The **UP** and **DOWN** arrows increment or decrement a letter value and the **LEFT** and **RIGHT** arrows move to each of the **six** letters. Once the new user password **has** been **entered**, the **SELECT** key **saves** it.

43.19 Battery Type

This menu **allows** the selection of the type of **battery installed**. The choices are 7.0 and 18.0 ampere hour batteries. This menu **entry is** not displayed when **the user or field service password** is used to enter the System Setup menus.

4.4 SET TYPE (FULL FEATURE)

1. Apply AC input power. Front panel lights will come ON and then go off. **Ensure the UPS is OFF by checking the Output breaker (must be OFF) and all front panel lights must be OFF. The UPS Status will be displayed.**
2. **Press the MENU key to get to the MAIN MENU 1. UPS Status.**
3. **Depress the DOWN arrow key to get to MAIN MENU 7. System SETUP. Press the SELECT key. Password AAAAAA will be displayed**
4. **Enter** the factory set password (MEMORY) unless the customer/user has changed it.
5. To **enter** the **password**, use **the** UP and DOWN **arrow** keys to **scrolls** through the letters and use the RIGHT and **LEFT** arrow keys to move to another **character** positions.
6. After entering **the** password, press the **SELECT** key. The Front Panel **will** display the System Setup 1. **Select** Type.
7. Press **SELECT** to get to the Output Voltage option.

NOTE

Using the DOWN arrow key to scroll through all the menu options. The present settings are indicated with an asterisk.

8. To view the possible **settings** for **the-Output** Voltage option, use the RIGHT and LEFT **arrow** keys. Once the desired setting is reached, **press** the **SELECT** key.
9. **Press the** DOWN arrow key to get to the Output Frequency option. Use the RIGHT and **LEFT** arrow keys to view the **settings**. **Press** the **SELECT** key at the **desired** setting.
10. Press **the** DOWN arrow key to display the **kVA** rating.
This display is view only, the **kVA** rating can not change from this selection.
11. To return to normal **operation**, press the MENU key four times then press **SELECT** **once** to get back to the UPS **Status Screen**.

4.5 SYSTEM START-UP

1. **Apply AC power to the UPS.**
2. Close the Input, Output, and the Battery **breakers**.
3. Wait for the power-on **tests** to **run** (approximately one minute)
4. Press **the on** button, hold for **2 seconds** and **then** release. **After** approximately 30 **seconds, the NORMAL** light **will** illuminate.

4.6 SYSTEM SHUT-DOWN (**WITHOUT** BYPASS)

1. Hold the UPS OFF **button**; HORN sounds for 3 seconds. **The** NORMAL **light** will go off and power **will** be removed **from** the **load**.

4.7 SYSTEM SHUT-DOWN (**WITH** **BYPASS**)

1. Hold the UPS OFF button **until** the unit transfers to Bypass, the BYPASS light **illuminates and the HORN will sound**. **The BYPASS light will remain on unless the user** manually opens the output breaker.

4.8 MAINTENANCE BYPASS

While in **Maintenance Bypass** the **critical** load is powered **from** the utility AC power. The make-before-break switch **prevents** any load interruptions while in **Maintenance Bypass**. This allows for **servicing of the UPS**. The Manual Bypass switch is located in **the I/O FRU at the top of the unit**. **If the unit has a PDM, ensure the load breaker is in the ON (closed) position.**

1. Transfer to Bypass (hold the **OFF** button for 3 **seconds**).

2. Turn the Maintenance Bypass switch from UPS to BYPASS.
3. Perform maintenance tasks.

⚠ DANGER

HIGH VOLTAGES: *This equipment may contain lethal voltages. Utility and Bypass power must be removed, by using either Maintenance Bypass or by an another external means.*

CAUTION

Failure to follow the following instructions will result in load power interruption.

CAUTION

When operating in Manual Bypass Mode, the equipment on the UPS will not be protected from power outages.

4. Turn **Maintenance Bypass switch from** Bypass to UPS and wait 3 seconds.
5. Turn the UPS ON (press the UPS ON button and hold for 2 seconds).

5

Functional Description

5.1 RECTIFIER FRU

The Rectifier FRU houses the power supply for the system. The nominal outputs of the supply are **+7 VDC**, **+15 VDC**, and **-15 VDC**. These voltages **connect** to the Rectifier Control Card and exit the FRU via inter-FRU harness. The Rectifier Control Card performs many functions **which** include battery charging, system regulation, **over** temperature, and **SCR/IGBT (insulated gate base transistor) gating**.

Battery Charge - Voltage from the **secondary** winding on **T1** is routed into **A1A1** at **E1 & E2**. This voltage is rectified on the card and connected through **a solid state switch to the battery sensing inputs**. **The charger is turned on and off at preset levels to keep the battery within normal float ranges**. With 100% load the system will **provide approximately 4.5 amps of battery charge current**.

System Regulation - The system output is regulated by varying the input **frequency** of the resonant converter. By varying the frequency the available output current of the **rectifier** can be limited to **regulate** the output voltage.

Over Temperature - A **thermistor located** in the Rectifier FRU is used to determine fan speed and **over temperature**. The **fan** speed will vary with **temperature**. **This is done to reduce noise levels during light load or low temperature conditions**.

Battery SCR Gating - The battery SCR is **gated** by the **Rectifier** Control card when the voltage on the **unregulated** DC buss drops below a preset level. When the battery SCR is **gated** on the **batteries** supply power to the DC bus.

IGBT gating - The **gating signals** to the **IGBTs** exit the **Rectifier** Control card at **J4**. They are then routed through the **A1 A2 Gate Drive** card to provide isolation and **amplification of the** signals.

5.2 INVERTER FRU

The **Inverter** FRU contains the Inverter Control Card. The major **functions** of this card are **inverter gating**, output **sensing**, and Bypass control.

IGBT gating - The gate signals are controlled to regulate the output frequency and phase **angle**. These signals pass through the **A2A2/A2A3** Gate Drive cards to provide isolation and **amplification** of the signals.

Output sensing - The output voltage and current signals are **connected** to the card at **J1**. **These signals are processed on the A2A1 card and then exit at J3 in the form of serial data to the Rectifier Control card and the Full Featured Front Panel for metering**.

Bypass controls - The inverter card controls the Bypass Relay. The relay drives and output breaker auxiliaries are connected to the card at J3.

5.3 POWER CONVERSION

Refer to print #110-712-227 and figure 5-1

The input to the system connects to the I/O FRU via A3TB 1 at the back of the FRU. The input passes through the FCC filter to A3CB 1. This is then routed to the Rectifier FRU to A1TB1. The input is rectified and filtered to produce an unregulated DC link. The batteries are connected to the DC bus by an SCR gated by the Rectifier Control card. The rectifier control card gates the IGBTs to produce the high frequency input to the series resonant converter. The resonant converter is tuned to 30 kHz. The output of the converter is rectified and filtered to produce the nominal output voltage of 410 VDC. The output is routed through the frame to the DC input (E1 & E2) of the inverter FRU. The gating can be varied to produce 50 or 60 Hz and from 200 to 227 VAC line to line, and 110,120, or 127 VAC line to neutral. The filtered output is then routed to A2TB 1 and then to the bypass contactor (K1). The output of K1 is then routed to A3CB3 and to the customers load through A3TB 1.

Refer to simplified rectifier drawing (Figure 5-2)

The AC input is rectified by D1 to produce an unregulated DC link. This voltage is filtered by L5 and C1. The batteries are connected to the input DC link by Q5. U1 and U2 are switched at a rate of 27-30 kHz to provide an input to the resonant converter. The resonant converter is tuned by C2,C4, and L3 to resonate at 30 kHz. The high frequency output of the resonant converter is rectified by D2 and D3 to produce a DC output filtered by C5-C8. The DC output is regulated by varying the input frequency to the resonant converter.

Refer to simplified inverter drawing (Figure 5-3)

The positive and negative DC inputs to the inverter connect to U3, U4, and U5. U3, U4, and U5 are switched in a PWM pattern to produce the AC output voltage filtered by L6, L7, and L8; and C6, C7, and C8.

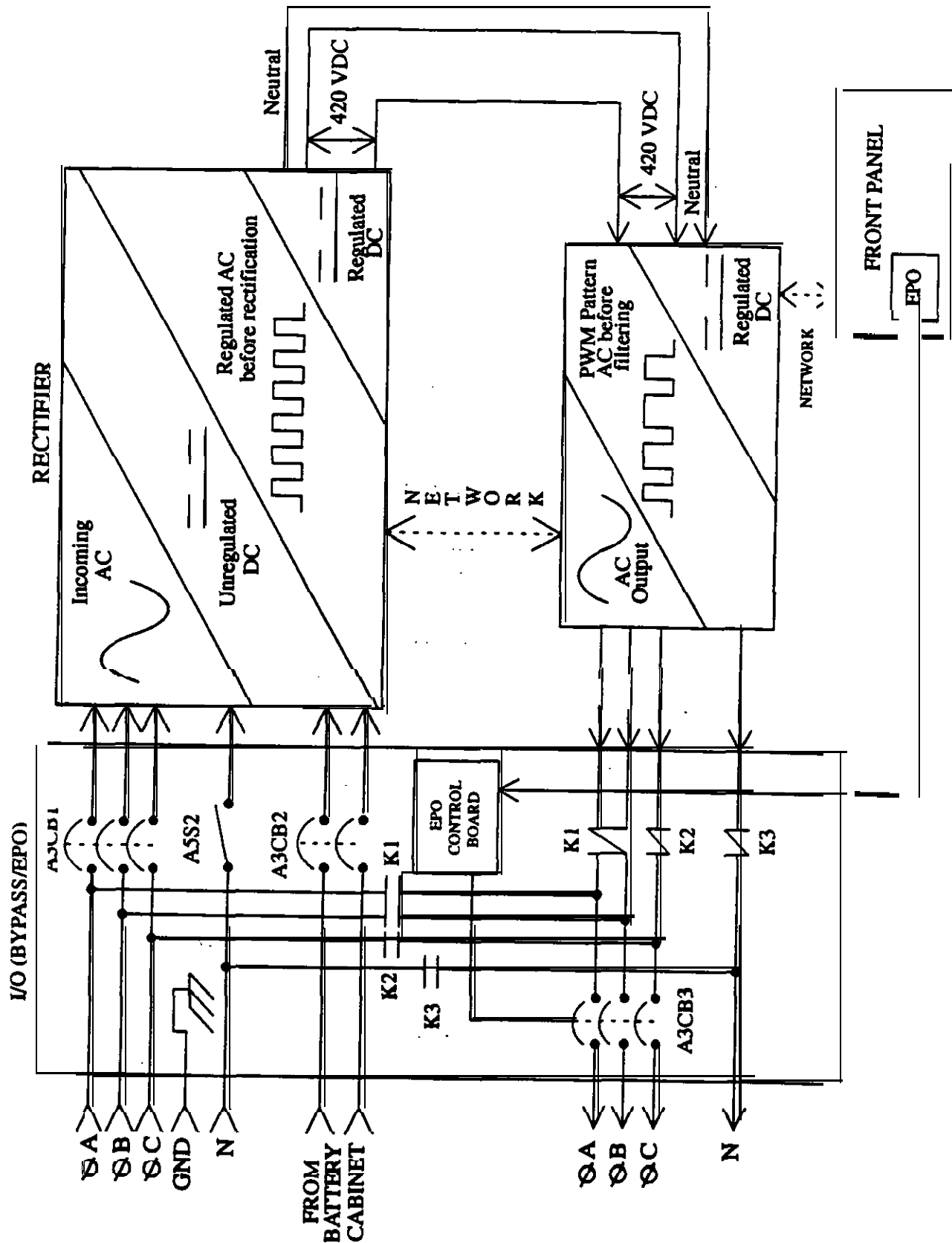


Figure 5-I One-line Diagram

Circuit Board Descriptions

5.4 A1A2 AND A2A2 GATE DRIVE BOARD

There are four identical gate drive channels contained on each Gate Drive board. Only one gate drive channel will be discussed in this description.

A 2-megahertz clock signal is necessary for circuit operation on the gate drive board. An enable signal provides a means of disabling the gate drive during power-up, power-down, or other abnormal modes. The regulator circuit provides control power to the Gate Drive board,

The gate drive channel consists of a DC-to-DC converter, signal interface, and output driver. The DC-to-DC converter provides isolated positive and negative voltages for the output driver.

The output driver directly turns the MOS-input device on or off and is controlled by the signal interface. Protection from undervoltage, overvoltage, short-circuit, and over-temperature conditions are performed in this circuitry.

The signal interface receives and filters the control signals from the logic and transmits the control signals (on or off) across an isolation boundary. The circuitry then conditions the isolated control signal for the output driver.

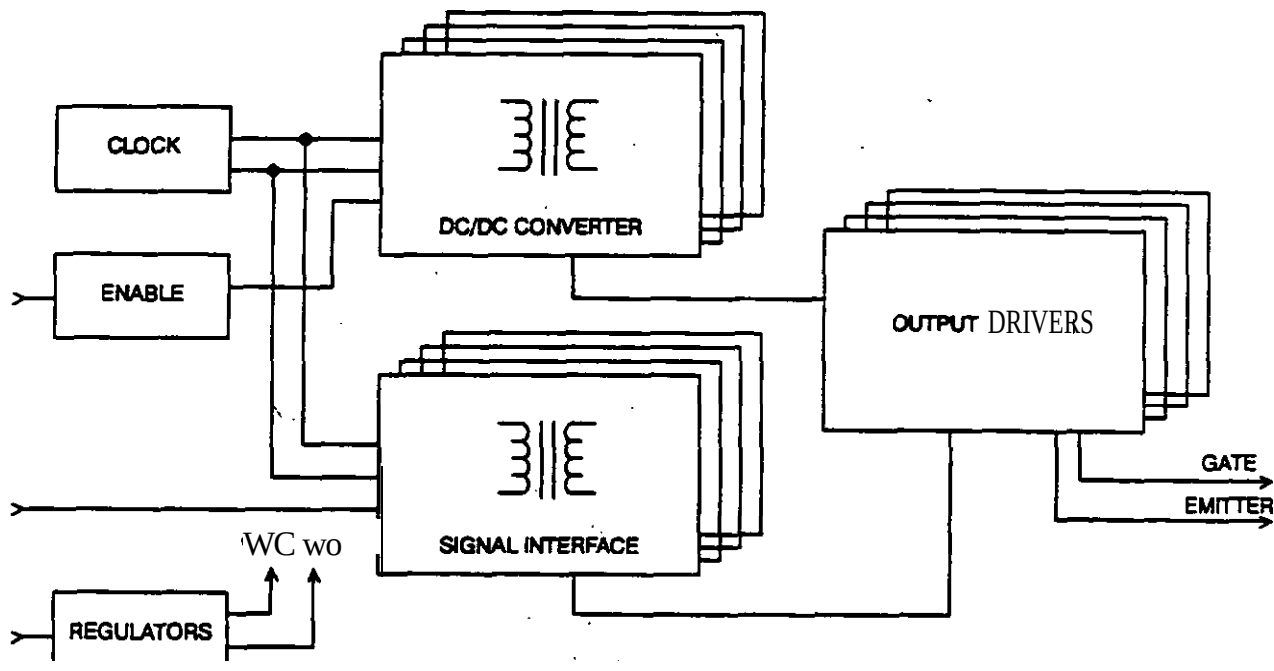


Figure S-2 Gate Drive Board Block Diagram

5.5 A1A3 POWER SUPPLY BOARD

The power supply provides power to the control, monitoring, and internal diagnostic circuitry for the Powerware Plus products. The power is provided in the form of three loosely regulated outputs of +7, +15, and -15 VDC. This power supply is designed to derive power from the rectified AC inputs and provide outputs referenced to the output neutral.

The boot strap/start-up circuit provides the necessary current to start the power supply from the input source. PWM control provides the closed loop regulation and drive for the DC to AC Inverter.

The DC to AC inverter stores and releases energy in the isolation transformer at a high frequency. Voltage feedback and control power provides the scaled output voltage feedback necessary for regulation and PWM IC power.

The isolation transformer passes energy from the input circuit common source to the output circuit common load. Output of the isolation transformer is rectified and filtered to provide outputs of +7, +15, and -15 VDC.

An input voltage monitor continuously averages and compares the input voltage and will shut the power supply off during undervoltage conditions. Air temperature/ventilation sensing provides a voltage proportional to the air temperature on the Power Supply board.

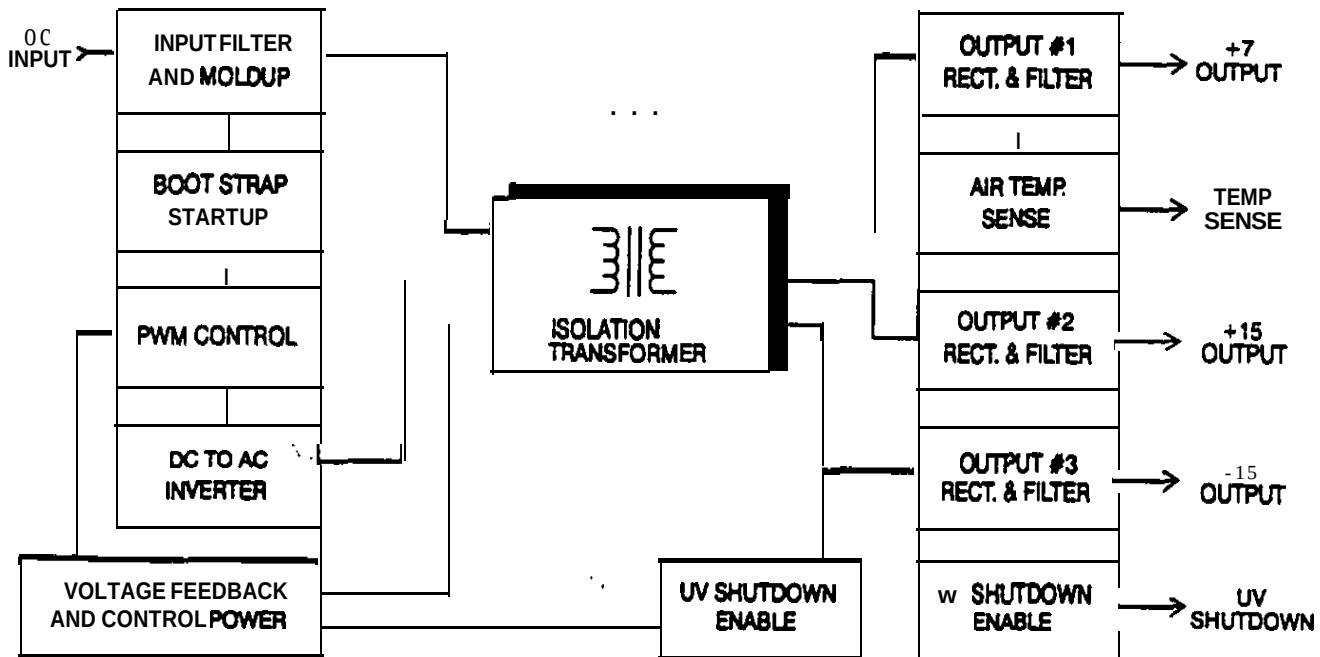


Figure 5-3 Power Supply Board Block Diagram

5.6 A8A1 BYPASS CONTROL BOARD

The Auto Bypass **Control** Board derives power from phases A and B of the AC input to the **unit**. This board is required to drive the coil of the Auto Bypass Contactor.

Phases A and B are connected to the line side **filtering** and power control circuit which provides closed loop regulation and start up for the power supply **on** the Auto Bypass Control Board. The output of **the** Power Control circuit is sent to an isolation transformer and **then** coupled to a High Voltage Output **Circuit** which **rectifies** and **filters** the voltage for **charging** the coil overdrive capacitor.

The High Voltage Recharge circuit charges the coil overdrive capacitor while the load **is** being powered by the **Inverter**. Coil voltage **sensing** monitors the voltage on the coil overdrive capacitor and inhibits an **"inverter to bypass transfer"** until the capacitor is of **sufficient** magnitude to complete the transfer.

Voltage for powering the control circuits on the Auto Bypass Control Board and holding the **contactor coil** is rectified and **filtered** by the **Low** Voltage Output circuit.

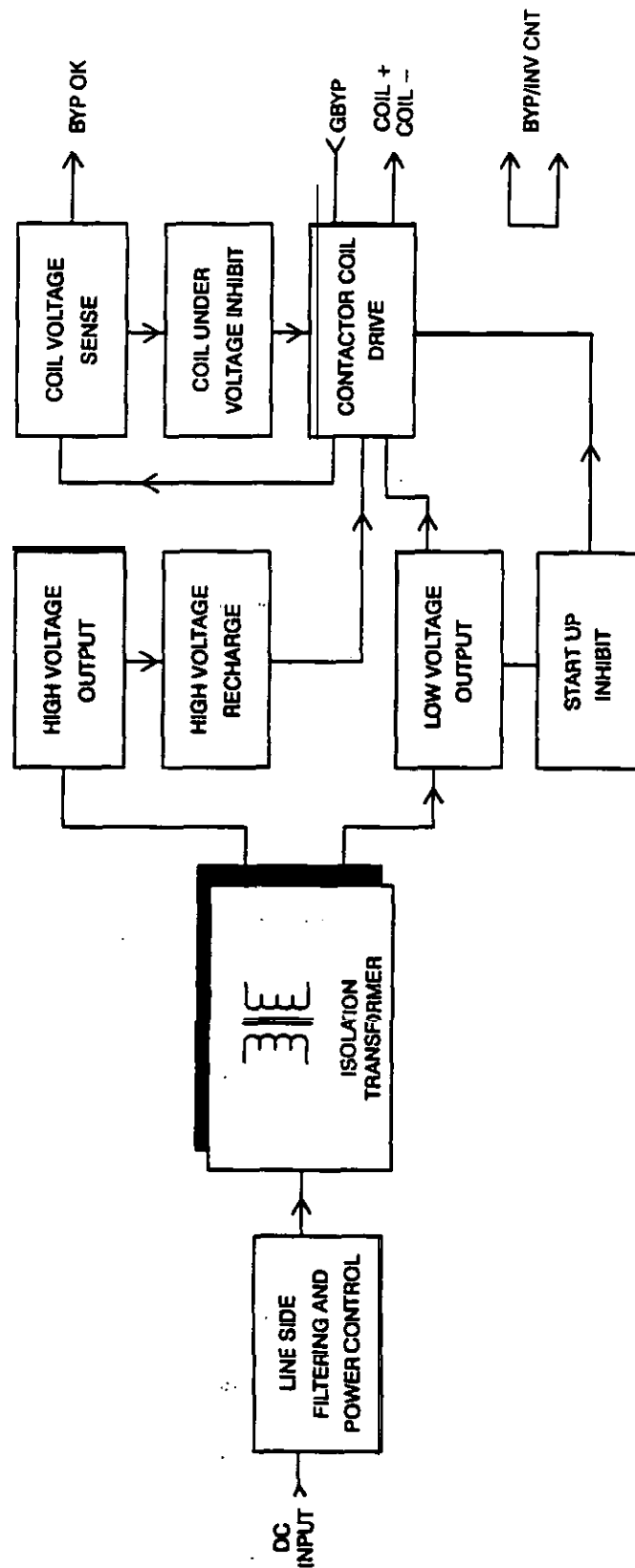


Figure 5-4 Auto Bypass Control Board Block Diagram

5.7 A3A2 FULL FEATURE FRONT PANEL BOARD

Operation of the Full Feature Front Panel is basically the same as the Basic Front Panel with the exception of an LCD display interface. The LCD display provides the user with a visual readout using an arrow keypad which generate input signals to the microcontroller.

The daughterboard provides the appropriate interface and isolation (I.E. RS-232D). then passes the signal on to the Front Panel Board microcontroller via standard asynchronous serial protocol. The following functional descriptions provides more detail information of this boards.

5.7.1 Front Panel Interface Board

The Front Panel Interface board serves as the customer interface to the UPS. The board provides an interface. to the alarm/event relays, the serial communications port and network interface between the UPS and a local area network (LAN). Signals are sent directly to this board from the Front Panel Board to control the relays. Signals are sent from the Front Panel Board to this board via a daughterboard attached to the Front Panel Board to provide serial communications. The daughterboard provides electrical isolation as do the relays. All customer accessible signals are referenced to earth ground or are isolated from logic common (as is the case with the relay contacts).

5.7.1.1 Relay Drivers

RS-422 differential signals are sent from the front panel board to this board via J1, pins 5-12. These differential signals are received by U1, an RS-422 differential receiver. They are each AC terminated by a 100 ohm resistor in series with a 0.1 microfarad capacitor (R1-4 and C7-10). If the differential signal is logic TRUE (+input is greater than -input) then the output of the receiver is a logic "1". This output is passed to the input of a 7407 (U2) in order to provide an open-collector drive for the relays. The 7407 is non-inverting, "1" on U2 input causes a "1" on U2 output. A "1" on the output of the 7407 (U2) leaves the relay de-energized (N.O. contact is connected to COMMON). When a FALSE is applied to the receiver's inputs, the relay is energized. Diodes D1-4 are clamps for the relay coils to prevent an overvoltage from occurring on the outputs of the 7407 when the relays are de-energized. The relays each have "Form C" contacts (SPDT) connected to the DB-25 connector. The only exception to this is relay #3. There were not enough pins left on the DB-25 connector to dedicate to all of the relays. Therefore, relay #3 only has two pins available to it on the DB-25 connector and the pins can be programmed to be each NO or NC via programming plug W6. The relays provide isolation and meet UL, CSA, VDE and IEC requirements.

5.7.1.2 DB-25 Connector

The DB-25 connector provides the primary interface to the UPS alarms and serial data for the customer. It is pinned out as a standard RS-232 connector with full modem handshake including Ring Indicator and Carrier Detect (RLSD). The pins not used by RS-232, RS-422, RS-423 or RS-485 are used by the relays. Pin 1 is chassis ground via faston connector E1. The schematic contains detailed pin-out information in table form.

5.7.1.3 RJ-11 Interface

The two RJ-11 phone jacks will be used in the future for the **Exide-Net®** option, the modem option and for the **auto-dialer** option. Two jacks are provided for a telephone pass-through **connection**. Two jacks are also needed for the pass-through Connection of **Exide-Net®**. The function of these jacks is **controlled** by the future **daughterboards**. **W2** is installed when an internal modem is used and provides a pass-through path. **W1** and **W5** are installed when Bxide-Net@ is used to provide **terminators** in the event the unit has an end node. **W4** is installed for **Exide-Net®** to provide the required logic ground to the network interface and it is removed when a telephone line interface is used.

5.7.1.4 Power Consumption

+5 volts:	80 mA.
+12 volts:	150 mA.
-12 volts:	(not used)

5.7.2 Daughterboard

The daughterboard serves as the customer **interface** to the UPS. The daughterboard provides an interface to the alarm/event **relays**, and/or the RS-232 serial **communications** port. The **daughterboard** also provides either the Relay interface, the RS-232 **interface**, or both, **depending** on **which** components are assembled onto the board. **TTL** level RS-232 signals from the front panel are converted to **electrically** isolated RS-232 levels at the 26 Pin Header connector. Also, **TTL** level **signals** are sent directly from the front panel board to control the **relays**.

The board has two connectors; a **64-pin** connector which mates with the front panel and a **26 Pin** Header which **connects** via ribbon cable to a standard DB-25 for **customer** access. All **customer accessible** signals are referenced to earth ground or are isolated from logic common (as is the case with the relay contacts). Isolated logic common can be connected to logic common (earth ground) by **installing** a programming plug at jumper 'W1'.

5.7.2.1 Isolated Power Supply

Power for the isolated **circuitry** is derived from the **+12** Volt regulator, **U12**. The diode, **D11**, provides reverse bias protection for **U12**. A 4 **MHz** oscillator, **Y1**, powered by **+5** Volts supplied by the front panel, drives a square wave into **U1** where it is divided down to two 1 **MHz** signals phased 180° apart.

These 1 **MHz** signals are fed into peripheral driver **U2**. **U2**, along with resistors **R12** and **R13**, provide the gate drive to FETs **Q1** and **Q2**. **Q1** and **Q2** drive the two legs of the center-tapped primary of **transformer T1**. Transformer primary coil current limiting is provided by resistors **R2** and **R3**. Capacitors **C2**, **C3**, and **C1** serve as bypass caps and help suppress radiated noise.

The **secondary** of **transformer T1** supplies isolated power to the isolated circuitry. The **secondary winding** is center-tapped with the **center-tap** connected to isolated logic common; a **programming** plug must be installed at **W1** to connect chassis (earth) ground to isolated logic common. Diodes **D1** and **D2** along with filter capacitors **C9** and **C11**

provide a positive DC source (+12 Volts). This positive DC source is also filtered by capacitors C4 and C5 and is then regulated down to +5 Volts by IC regulator, U3. Capacitors C6 and C7 provide a bypass function and help to improve the stability and transient response of U3. Diodes D3 and D4 along with filter capacitors C12-15 provide a negative DC source (-12 Volts). The +5 Volts is used by TTL IC U7, 7407, interface IC U10, 1489A, and the PC112 opto-couplers, U5, U6, U9, U11. The plus and minus 12 Volt sources are used by the RS-232 driver U8, 1488. The isolated chassis connection is the common reference for all of the isolated circuitry on this board.

5.7.2.2 Relay Drivers

TTL-level signals are sent from the front panel board to this board via J1. These signals are fed to the input of a 7407 (U4) in order to provide an open-collector drive for the relays. The 7407 is non-inverting, "1" on U4 input causes a "1" on U4 output. A "1" on the output of the 7407 leaves the relay ~&-energized (N.O. contact is connected to COMMON). When a "ZERO" is applied to the receiver's inputs, the relay is energized. Diodes D5-8 are clamps for the relay coils to prevent an overvoltage from occurring on the outputs of the 7407 when the relays are de-energized. The relays each have "Form C" contacts (SPDT) connected to the DB-25, via the 26 Pin Header connector. In order to maintain backward compatibility, pin 8 of the 26-pin connector (pin 17 of the DB-25) can be programmed to be either N.O. or N.C. via programming plug W2. The relays provide electrical isolation and meet UL, CSA, VDE and IEC requirements.

5.7.2.3 26-Pin Header Connector

The 26-Pin Header connector, J2, provides the primary interface to the UPS alarms and serial data for the customer. J2 is pinned out to provide a standard RS-232 pinout with hardware handshaking capability (RTS, DTR, CTS, DSR) when connected via ribbon cable to a DB-25. The pins not used by RS-232 are used by the relays. Pin 1 is chassis ground via faston connector E1. All signals on this connector are electrically isolated and are referenced to isolated ground. Table 1 contains detailed pin-out information for the translation from 26-pin header to DB-25.

Table 5-1 Cable Pinout

26-PIN HEADER	DB-25	SIGNAL
1	1	CHASIS GROUND
2	14	RELAY 2 NO
3	2	TXD
4	15	RELAY 2 COM
5	3	RXD
6	16	RELAY 2 NC
7	4	RTS
8	17	RELAY 3 NO/NC
9	5	CTS
10	18	RELAY 3 COM
11	6	DSR
12	19	RELAY 3 NO
13	7	RS-232 GND
14	20	DTR
15	8	(NOT USED)
16	21	RELAY 3 NC
17	9	(NOT USED)
18	22	(NOT USED)
19	10	(NOT USED)
20	23	RELAY 4 NC
21	11	RELAY 1 NO
22	24	RELAY 4 NO
23	12	RELAY 1 COM
24	25	RELAY 4 COM
25	13	RELAY 1 NC

57.3 Front Control Panel Interface

The 64-pin rectangular DIN connector provides the interface between this board and the front panel. There are 3 categories of signals in this interface: Voltage lines, RS-232 signals and Relay signals. There are 4 logic common lines, two regulated +5 Voltage lines, and two of each of the three unregulated power supply Voltage lines (+7, +15 and -15). All signals on this connector are referenced to logic common. The RS-232 signals on this connector (RTS and CTS) provide hardware handshaking capability. The RXD and TXD signals are connected to serial port 1 of the 80C537 microprocessor on the front panel. The handshake line, CTS, is sourced from and controlled by the microprocessor.

The handshake line, RTS, is an input to the microprocessor. The unused handshake lines microprocessor inputs (DTR, RLSD, and RI) are brought onto the board and tied to a voltage level which asserts the ready state of operation. DSR is an unused microprocessor output. The presence of the handshake lines (DSR, DTR, RLSD, and RI) is necessary for implementation of future communications options.

The Relay signals, RLY 1 - 4, are used to energize or de-energize the coil of the relays. These signals are driven by the microprocessor and allow customization of the Relay interface to comply with various Relay interface specifications: NOVELL, 3-COM, etc., as well as custom configurations.

5.8 EXPANDER INTERFACE BOARD

The Expander Interface Board serves as the customer interface to the UPS. It provides an interface to: 1) the alarm/event relays, 2) the RS-232 serial communication port, and 3) the Relay Interface Board. A three-way splitter cable will allow simultaneous operation of these three types of interfaces. All customer accessible signals are referenced to earth ground or are isolated from logic common (as is the case with the relay contacts). Isolated logic common can be connected to logic common (chassis ground) by installing a programming plug at jumper 'W 1'. In the standard configuration the jumper plug is installed on position 1-2 which connects the isolated common to chassis ground.

The Expander Interface Board has two connectors. A 64-pin female connector, J1, which mates with the front panel and a 26-pin header, J2, which connects to a standard DB-25 for customer access. This connector is described with more detail in Section 7. TTL level RS-232 signals from the front panel are converted to electrically isolated RS-232 levels at the 26 Pin Header connector. Also, TTL level signals are sent directly from the front panel board to control the relays.

5.8.1 Isolated Power Supply

Power for the isolated circuitry is derived from the +12 volt regulator, U12. The diode, D1 1, provides reverse bias protection for U12. A 4 MHz oscillator, Y 1, powered by +5 volts supplied by the front panel, drives a square wave into U1 where it is divided down to two 1 MHz signals phased 180 degrees apart. These 1 MHz signals are fed into peripheral driver U2. U2, along with resistors R12 and R13, provide the gate drive to FETs Q1 and Q2. Q1 and Q2 drive the two legs of the center-tapped primary of transformer T1. The transformer primary coil current limiting is provided by resistors R2 and R3. Capacitors C1, C2, and C3 serve as bypass caps and help suppress radiated noise.

The secondary of transformer T1 supplies isolated power to the isolated circuitry. The secondary winding is center-tapped with the center-tap connected to isolated logic common; a programming plug must be installed at W1 to connect chassis (earth) ground to isolated logic common. Diodes D1 and D2 along with filter capacitors C9 and C11 provide a positive DC source (+12 Volts). This positive DC source is also filtered by capacitors C4 and C5 and is then regulated down to +5 Volts by regulator, U3. Capacitors C6 and C7 provide a bypass function and help to improve the stability and transient response of U3. Diodes D3 and D4 along with filter capacitors C12-15 provide

a negative DC source (-12 Volts). The +5 Volts' is used by TTL IC U7, 7407, interface IC U10, 1489A, and the PC112 optocouplers, U5, U6, U9, U11. The plus and minus 12 Volt sources are used by the RS-232 driver, U8, and the Relay Interface PCB. The isolated chassis connection is the common reference for all of the isolated circuitry on this board. The +12 volts and ground are also used to power the Relay Interface PCB.

5.8.2 Relay Drivers

TTL-level signals are sent from the front panel board to this board via J1. These signals are fed to the input of a 7407 (U4) in order to provide an open-collector drive for the relays. The 7407 is non-inverting, "1" on U4 input causes a "1" on U4 output. A "1" on the output of the 7407 (U4) leaves the relay de-energized (N.O. contact is connected to COMMON). When a "ZERO" is applied to the receiver's inputs, the relay is energized. Diodes DS-8 are clamps for the relay coils to prevent an overvoltage from occurring on the outputs of the 7407 when the relays are de-energized. The relays each have "Form C" contacts (SPDT) connected to the DB-25, via the 26 Pin Header connector. In order to maintain backward compatibility, pin 8 of the 26-pin connector (pin 17 of the DB-25) can be programmed to be either N.O. or N.C. via programming plug W2. The relays provide electrical isolation and meet UL, CSA, VDE and IEC requirements.

The Relay signals, RELAY1 - RELAY4, are used to energize or de-energize the coil of the relays. These signals are driven by the microprocessor and allow customization of the Relay interface to comply with various Relay interface specifications: NOVELL, 3-COM, AS/400, etc., as well as custom configurations.

5.8.3 RS-232 Signals

The RS-232 signals (RTS and CTS) on connector J2 provide hardware handshaking capability. The RXD and TXD signals are connected to serial port 1 of the 80C537 microprocessor on the front panel. The handshake line CTS, is sourced from and controlled by the microprocessor. The handshake line RTS, is an input to the microprocessor. The unused handshake lines microprocessor inputs (DTR, RLSD, and RI) are brought onto the board and tied to a voltage level which asserts the ready state of operation. DSR is an unused microprocessor output. The presence of the handshake lines (DSR, DTR, RLSD, and RI) is necessary for implementation of future communications options.

5.8.4 AS400 Expansion

The 87C751 microprocessor is a CMOS 8-Bit microcontroller which is based on the 80C51 architecture. The 87C751 is a one-time programmable part and the 83C751 is a mask programmable version. The status of Relay 1 through Relay 4 is read from the TTL-level inputs of the relay driver and sent to Port 1 on the microcontroller, P1.0-P1.3. The relay driver is a 7407 and referenced by U4. The 83C751 has 2K x 8 of ROM available to store the status of Relay 1 through Relay 4 as well as send out this status of the alarm to the RS-422 driver. The CMOS RS-422 driver sends out a 300 baud bit stream which matches the required data input of the Relay Interface PCB. This data is received by the Relay Interface PCB and the relay alarms will indicate the same state as those on the Expander Interface Board.

5.8.5 26-Pin Header Connector

The **26-Pin Header connector, J2**, provides the primary interface w the **UPS alarms** and serial data for the customer. It is pinned out to provide a standard RS-232 **pinout** with hardware **handshaking** capability (**RTS, DTR, CTS, DSR**) when connected via ribbon cable to a DB-25. The pins not used by RS-232 are used by the relays. Pin 1 is **chassis** ground via **faston** connector El. AU signals on this **connector are** electrically isolated and are **referenced** to isolated ground. Table 1 contains detailed pin-out information for the **translation** from the 26-pin header to the DB-25.

5.8.6 Front Control Panel Interface (Expander Interface)

The 64-pin **rectangular DIN connector** provides the interface between this **board** and the front panel. There are 3 categories of signals in **this** interface: Voltage lines, RS-232 signals and **Relay** signals. **There** are 4 logic common lines, two regulated **+5** Voltage lines, and two of each of the three unregulated **power** supply Voltage **lines** (**+7, +15** and **-1.5**). All signals on this connector are **referenced** to logic common.

5.8.6.1 Power Consumption

+5 Volts regulated	150 mA.
+15 Volts unregulated:	570 mA.
+7 Volts unregulated:	(not used)
-15 Volts unregulated:	(not used)

Table 5-2 26-Pin w DB-25 Pinout

26-PIN HEADER	DB-25	SIGNAL
1 -----	1	CHASSIS GND
2 -----	14	RELAY 2 NO
3 -----	2	TXD
4 -----	15	RELAY 2 COM
5 -----	3	RXD
6 -----	16	RELAY 2 NC
7 -----	4	RTS
8 -----	17	RELAY 3 NO/NC
9 -----	5	CTS
10 -----	18	RELAY 3 COM
11 -----	6	DSR
12 -----	19	RELAY 3 NO
13 -----	7	RS-232 GND
14 -----	20	DTR
15 -----	8	+12V ISOLATED
16 -----	21	RELAY 3 NC

17 -----9	RS-422 +
18 -----22	-12V ISOLATED
19 -----10	RS-422 -
20 -----23	RELAY 4 NC
21 -----11	RELAY 1 NO
22 -----24	RELAY 4 NO
23 -----12	RELAY 1 COM
24 -----25	RELAY 4 COM
25 -----13	RELAY 1 NC
26 ---- - ----	NOT CONNECTED

Table 5-3 Communication Pinout

RS-422 COMMUNICATION

<i>DB-25 Connector</i>	<i>26-Pin Header</i>	<i>Signal</i>
7	13	Signal Ground
8	15	+12 V o l t
9	17	Rs-422 +Output
10	19	Rs-422 -Output

RS-232 COMMUNICATION

<i>DB-25 Connector</i>	<i>26-Pin Header</i>	<i>Signal</i>
1	1	Frame/Chassis Ground
2	3	TXD
3	5	RXD
4	7	RTS
5	9	CTS
6	11	D S R
7	13	Signal Ground
20	14	D T R

RELAY CONNECTIONS

<i>DB-25 Connector</i>	<i>26-Pin Header</i>	<i>Signal</i>
13	25	Relay 1 N.C.
11	21	Relay 1 N.O.
12	23	Relay 1 Com
16	6	Relay 2 N.C.
14	2	Relay 2 N.O.

15	4	Relay 2 Com
21	16	Relay 3 N.C.
17	8	Relay 3 N.O./N.C.
19	12	Relay 3 N.O.
18	10	Relay 3 Com
23	20	Relay 4 N.C.
24	22	Relay 4 N.O.
25	24	Relay 4 Com

5.9 A1A1 RECTIFIER CONTROL BOARD

The microprocessor **dictates the state** of the **rectifier** control board. Signals are provided to start and stop the operation of the power circuit and **battery charger**. The microprocessor also fires the battery SCR in the event of a **utility** failure. **Voltages**, currents, and **temperatures** are monitored with an **eight channel** A/D port. PWM channels are used for adjusting the **output** voltage of the **power** circuit and for varying the fan speed. Communications with other FRUs are **established** via the **intra-FRU network**, **AST-NET**. Various faults are latched, acted upon, and **cleared** by the **microprocessor**. An **EEPROM** stores set-up and **calibration information**. Two **LEDs** display status for diagnostic purposes.

NOTE:

On the Rectifier Control Board phase "C" is monitored by the microprocessor.

5.10 A2A1 SINGLE AND THREE PHASE INVERTER CONTROL BOARD

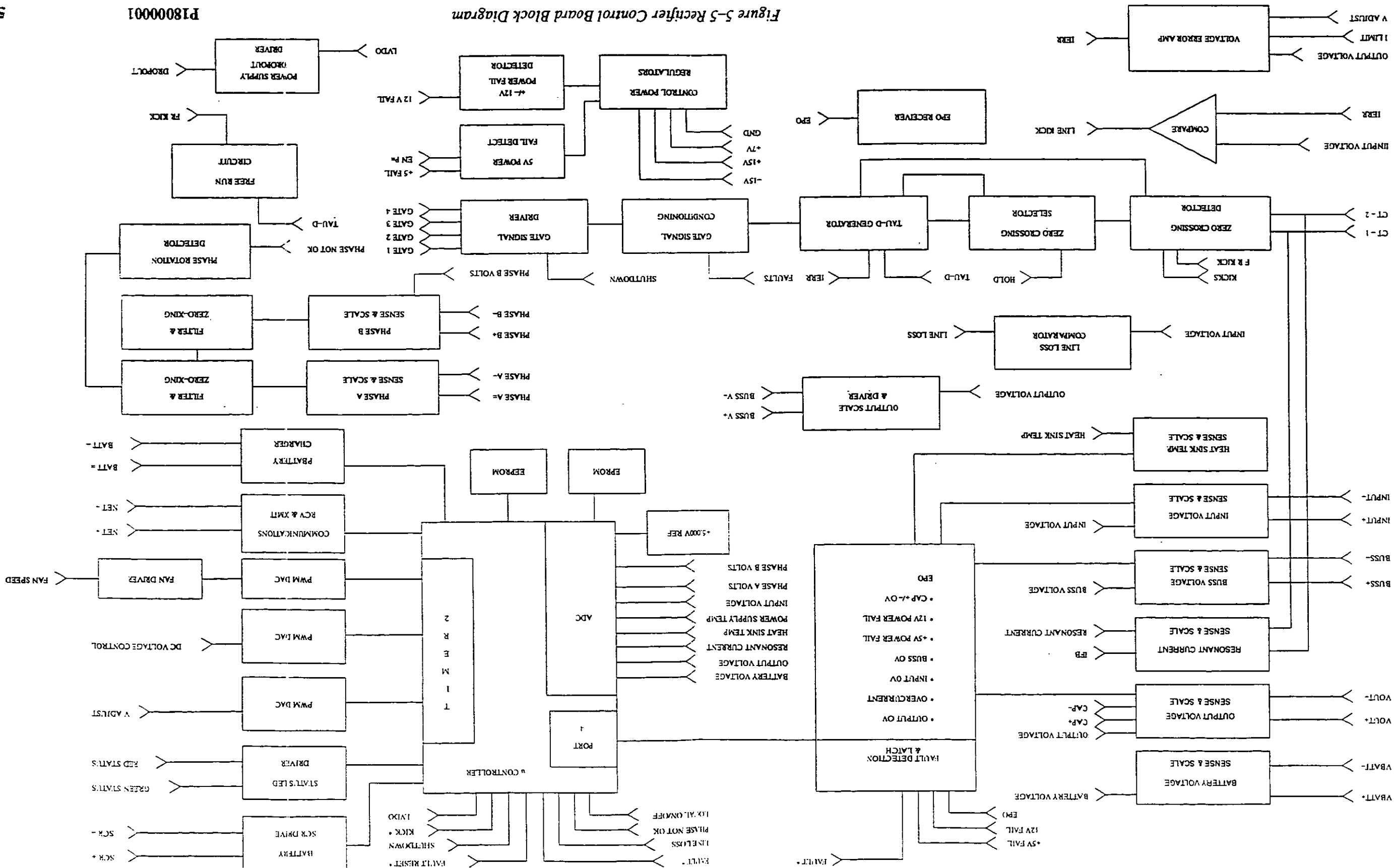
The **Inverter** Control Board is responsible for **creating** signals to drive the output power stage to produce **three** sinusoidal output voltages. Pulse-width-modulation control provides the **means** of controlling the power Switches and **affords** the least-cost design for **meeting** the **regulation** and **control specifications**.

Critical power-stage **parameters** are **monitored** by the **microprocessor**, so in the event of a fault or failure an **orderly shutdown/transfer to bypass** is provided. The input DC - bus and the **filter inductor** currents are **monitored** for absolute limits. **Load** protection involves monitoring the **output** voltage insuring the voltage stays between the AC **undervoltage and overvoltage limits**.

The **intra-FRU network**, **AST-NET**, is the **main link between the Inverter FRU** and the rest of the system. For the UPS to operate, the messages on the ASTNET must consist of the following:

- a) alarm conditions **detected** by the **FRU**,
- b) **FRU status**
- c) **commands** from the front panel or other **FRUs**,
- d) information about each of the **critical internal** parameters inside the **FRU**; **metering** information.

Figure 5-5 Rectifier Control Board Diagram



6

Options

6.1 OPTIONS

This section gives information for the following options:

- **Extended Battery** Option
- Output Power **Distribution**
- **High Voltage Transformer** Cabinet
- 
- **Local Emergency Power Off**
- Remote Emergency Power **Off**
- **LAN Relay** Interface

6.1.1 Extended Battery Cabinets

For increased back-up time, add extended **optional** battery **cabinet(s)**. These must be installed by qualified personnel only.

Listed below are the **selections** for the Battery and the Extended Battery Cabinets. An EBC 1 is a battery cabinet with 2 trays (1 string) of batteries. An EBC 2 is a cabinet **with** 4 trays (2 strings) of batteries. Also shown below is the Standard Battery Cabinet and the selection **indicating** the **standard** battery.

NO BATTERY INSTALLED	
7 AH INTERNAL BATTERY TRAY	STANDARD PLUS 6
1 EBC 2	1 CABINET 4 TRAYS (STANDARD PLUS 12)
2 EBC 2s	2 CABINETS 4 TRAYS EACH
3 EBC 2s	3 CABINETS 4 TRAYS EACH
1 EBC 1 & 1 EBC 2	1 CABINET 2 TRAYS & 1 CABINET 4 TRAYS
2 EBC 1 & 1 EBC 2	2 CABINETS 2 TRAYS EACH & 1 CABINET 4 TRAYS
1 EBC 1 & 2 EBC 2	1 CABINET 2 TRAYS & 2 CABINETS 4 TRAYS EACH

1 EBC 1	1 CABINET 2 TRAYS
2 EBC 1s	2 CABINETS 2 TRAYS EACH
3 EBC 1s	3 CABINETS 2 TRAYS EACH
1 BBC 18AH	1 STRING OF 18AH BATTERIES
2 EBC 18AH	2 STRINGS OF 18AH BATTERIES
3 EBC 18AH	3 STRINGS OF 18AH BATTERIES

ALL OF THESE SELECTIONS ARE AVAILABLE ON BOTH THE 6 & 12 MODELS AND SHOULD BE **SET CORRECTLY TO INDICATE ACCURATE BATTERY TIME REMAINING.**

6.12 Output Power Distribution

The PDM offers combinations of **output** circuit breakers and receptacles to **accommodate** world class needs. The following domestic types are available:

5-15R2, 1 pole 15 A breaker

L14-30R, 2 pole 30 A breaker

L5-20R, 1 pole 20 A breaker

L6-30R, 2 pole 30 A breaker

L6-15R, 2 pole 15 A breaker

L5-15R2, 1 pole 15 A breaker

L6-20R, 2 pole 20 A breaker

5-20R2, 1 pole 20 A breaker

L5-30R, 1 pole 30 A breaker

6-15R, 2 pole 15 A breaker

L14 - 20R, 2 pole 20 A breaker

L6-15R2, 2 pole 15A breaker

Refer to **Figures 6-1 and 6-2** and **the PDM Installation diagram #110619141** for additional **information.**

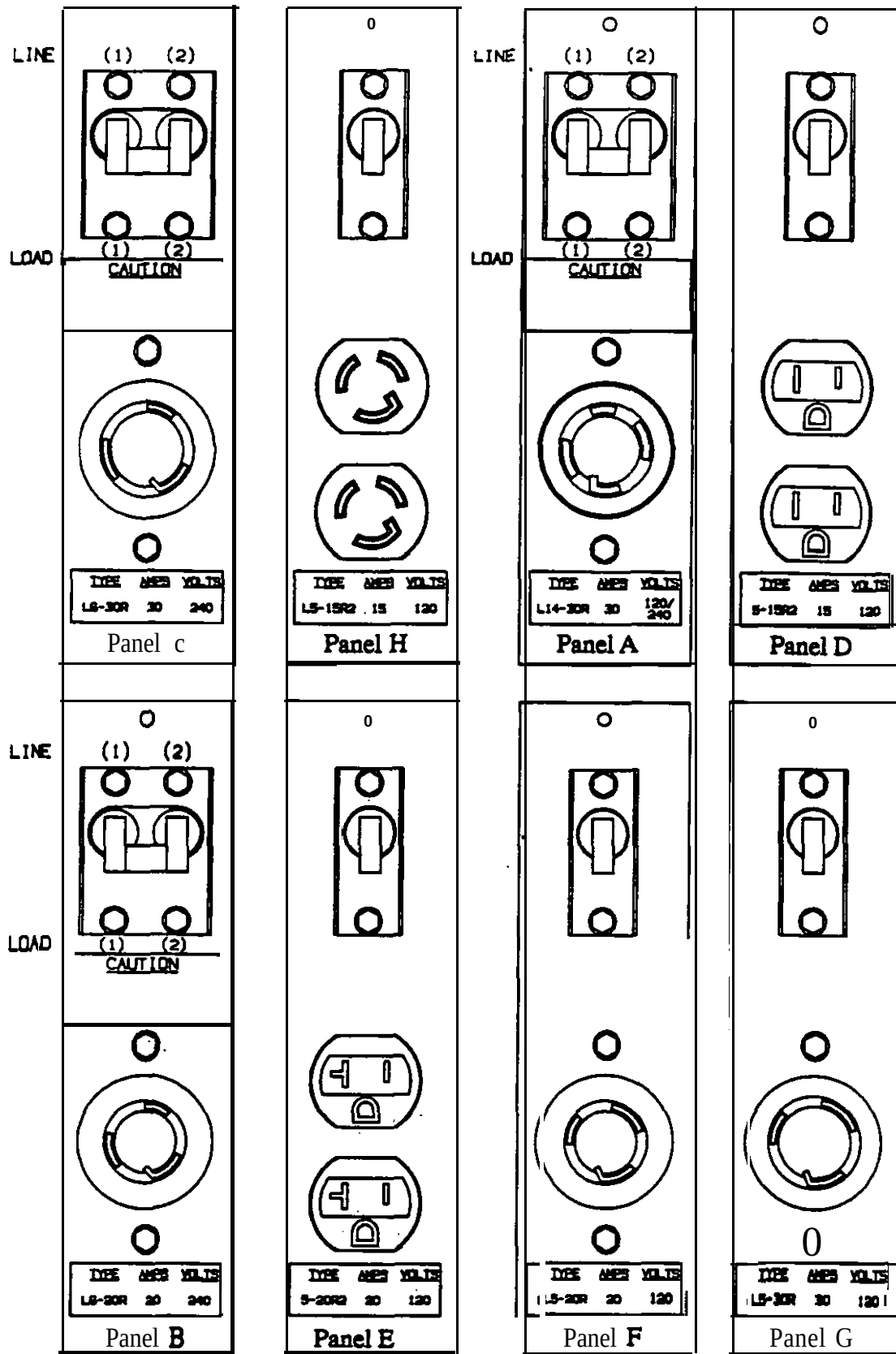


Figure 6-1 Output Panels

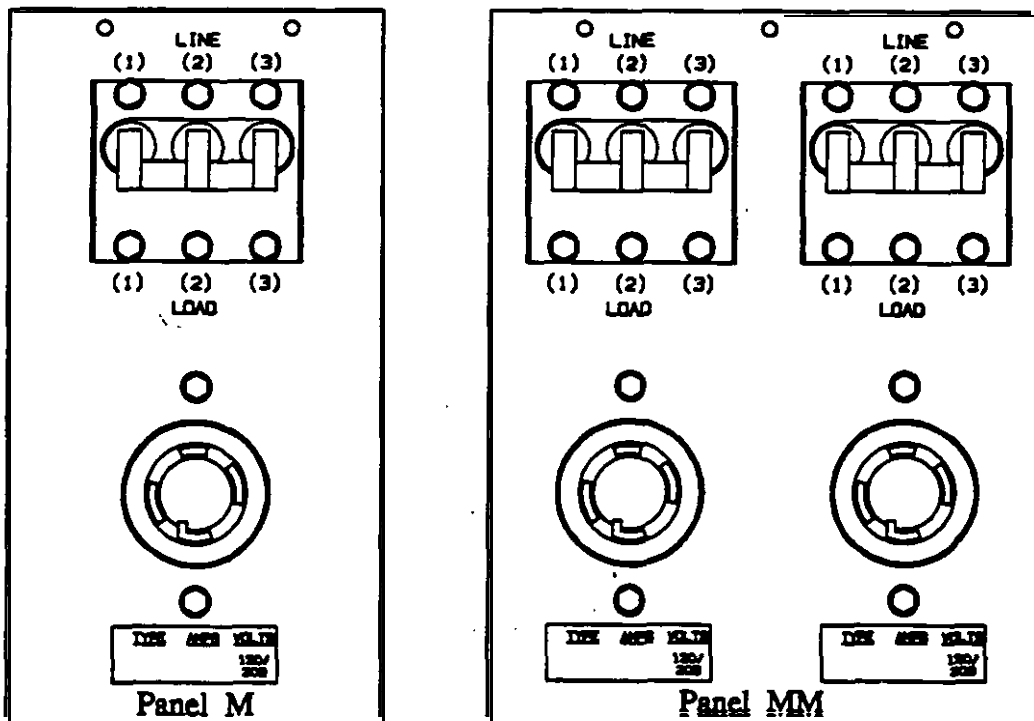
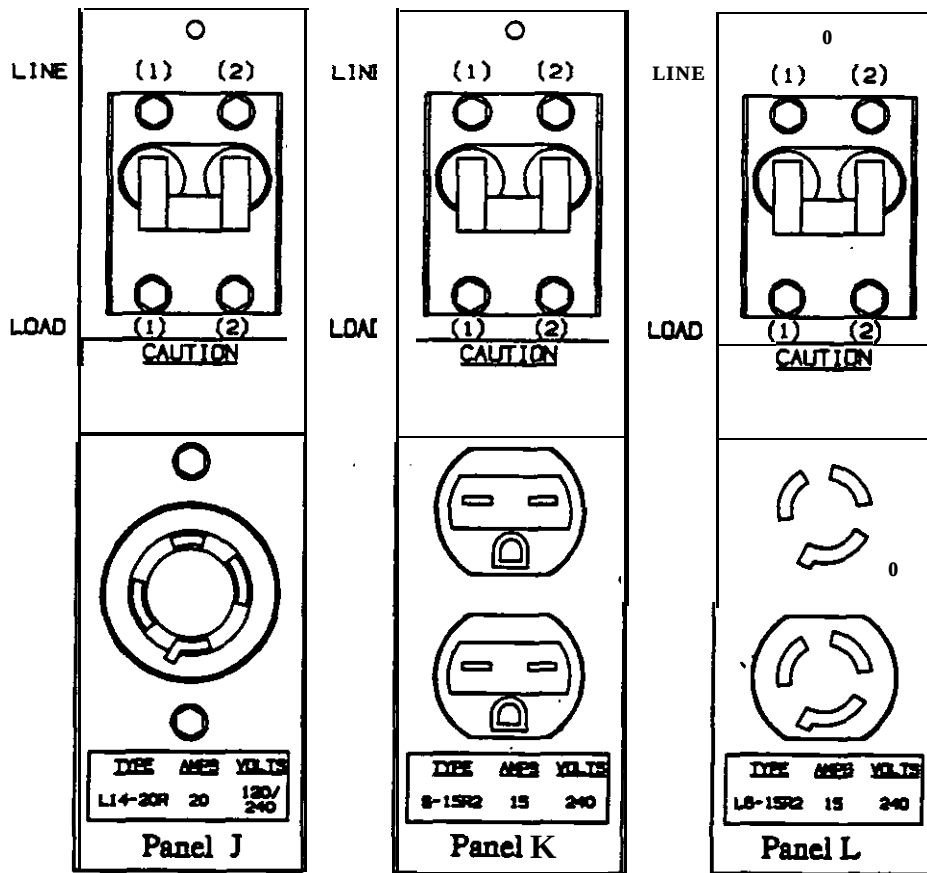


Figure 6-2 Output Panels (continued)

6.1.3 High Voltage Transformer Cabinet

The high voltage **cabinet** consists of six **transformers** (T1-T6).

6.1.4 Communications Interface

RS232 Interface

Interfaces provides full RS232 wmmunication.

The wmmunication have selective baud rates of **2400, 4800, 9600**, or 19.2 **K** and **can** operate in the following **mode**:

Computer Mode: Using the factory **available** protocol, the user can write software to **interface with** the information provided by the Digital Front **Panel** Display. A diagnostics mode is also available.

6.1.5 Local Emergency Power Off

This option disconnects the UPS and protected equipment from **all** AC power sources. To operate, press the Emergency Power Off button located on the front **panel** of **the** UPS.

6.1.6 Remote Emergency Power Off

A wall-mounted, push-button **switch disconnecting** the UPS and protected equipment from all AC **power** sources when activated. Customer provided switch and wiring can be **connected to A3TB1-14 and** 15 for use of **this** option.

6.1.7 LAN Relay Interface

The **LAN** Relay **Interface** is set up through the Digital Front Panel Display. It **has** programmable relays for Novell, **3COM**, and Banyan networks and for the **IBM AS/400**. These **relays** are also customer programmable.

Communications

6.2 RS-232 OPTION FOR USE WITH THE DIGITAL FRONT PANEL DISPLAY

62.1 Introduction

The RS-232 is available with the UPS Digital Front **Panel** Display. This option supports four operational modes:

- ASCII Computer Mode
- Binary Computer Mode
- **Terminal Mode**
- **Printer Mode**

62.2 Communications Setup

To set up the communications on the UPS, go to the SYSTEM SET UP **menu** of the UPS and select COMM Setup. The flow chart below **shows** the **possible configurations** (Figure 6-3). Follow the **menus** to select the desired settings.

NOTE:

The *I/O Port Setup* will automatically customize the *I/O*

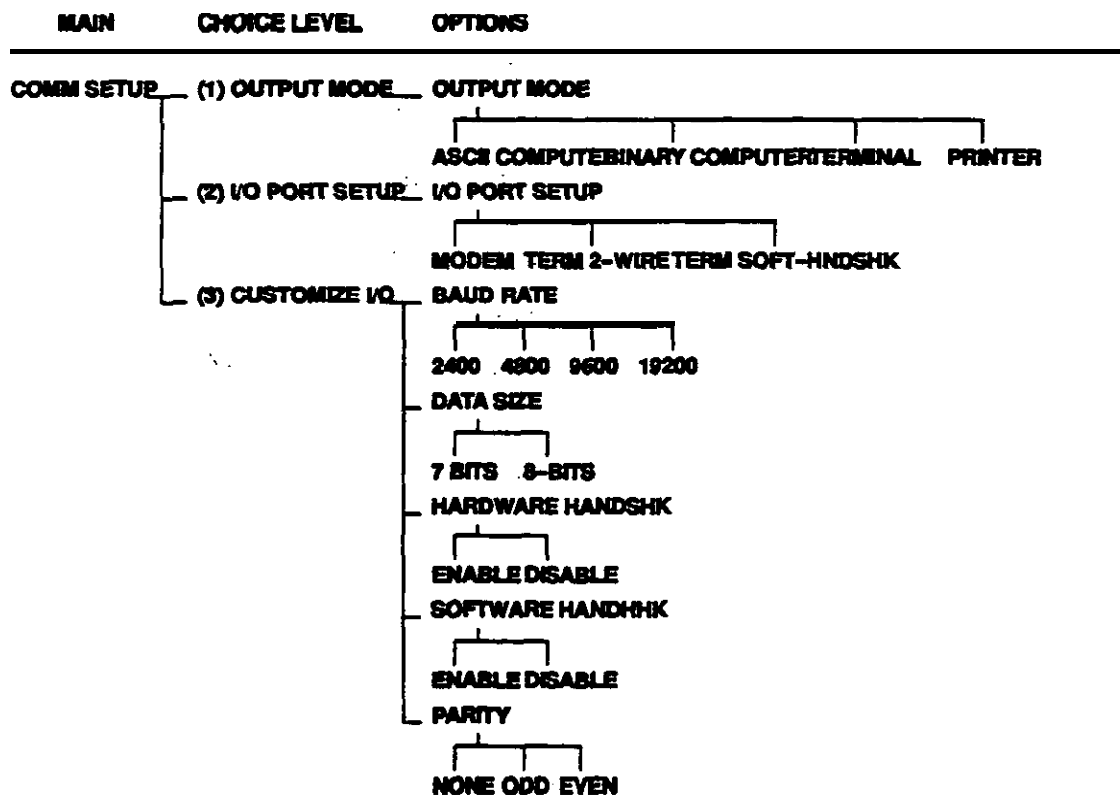


Figure 6-3 *Communications* Menu Configurations

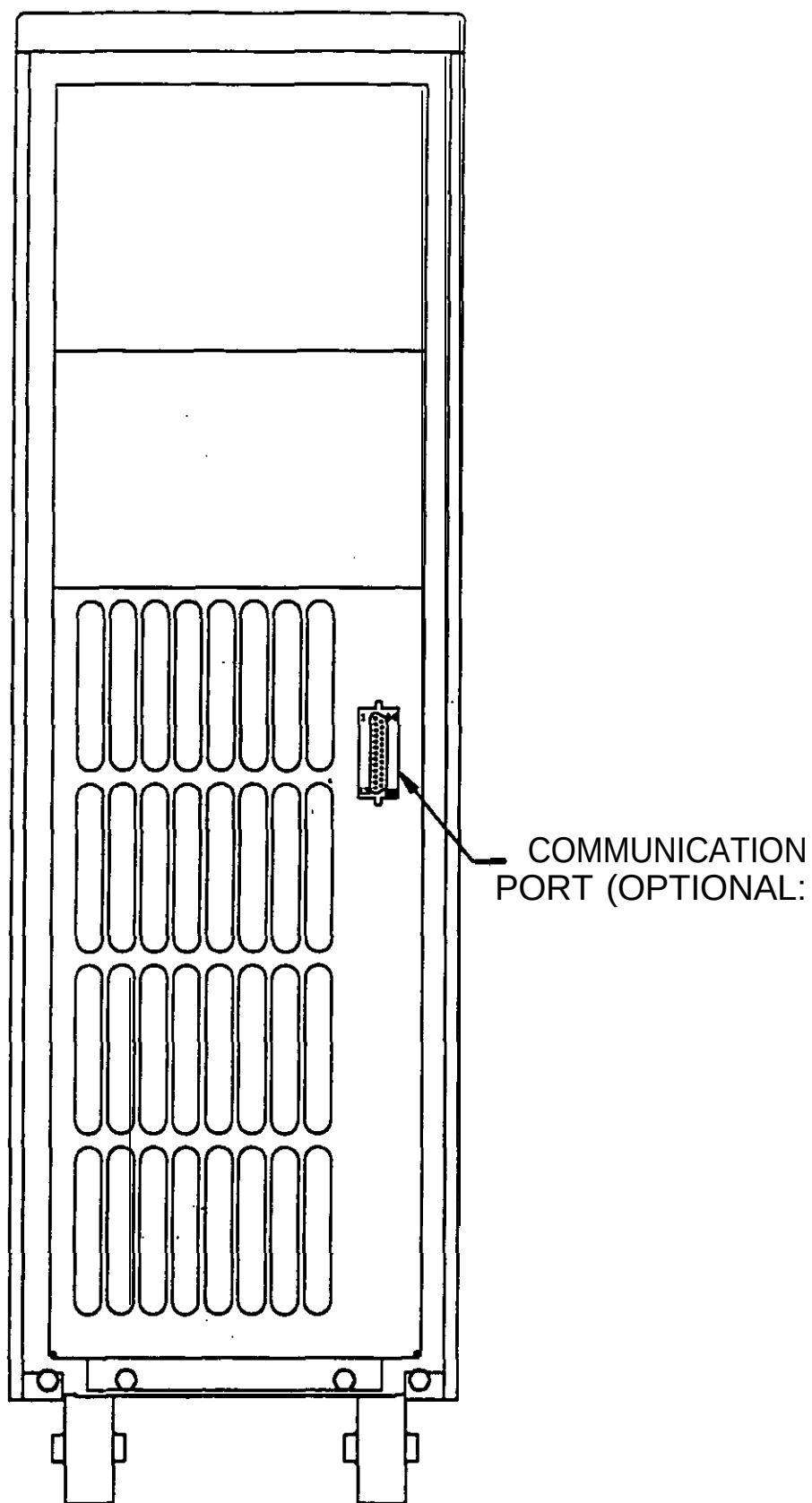


Figure 6-4 Location of Communication Connector

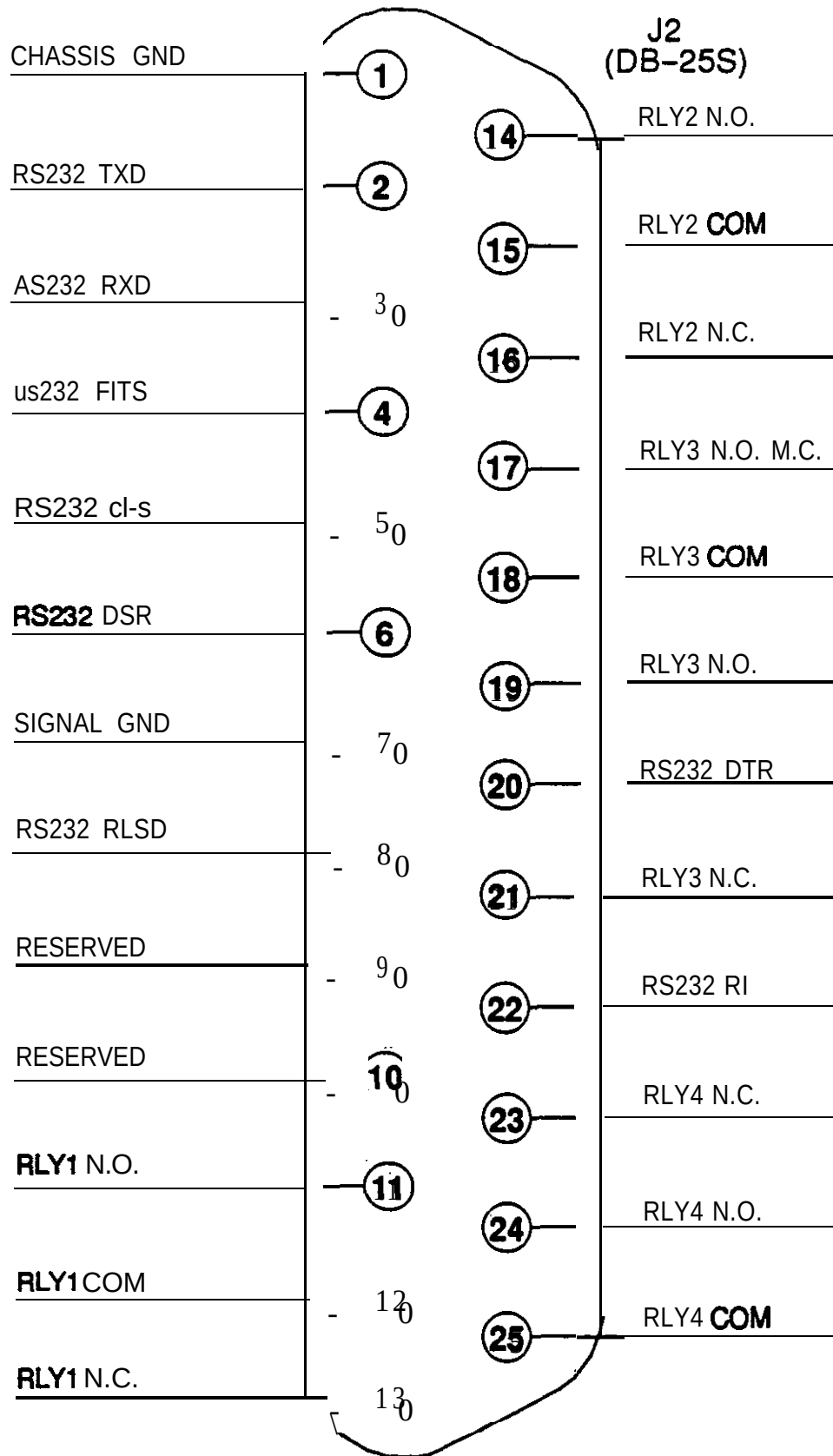
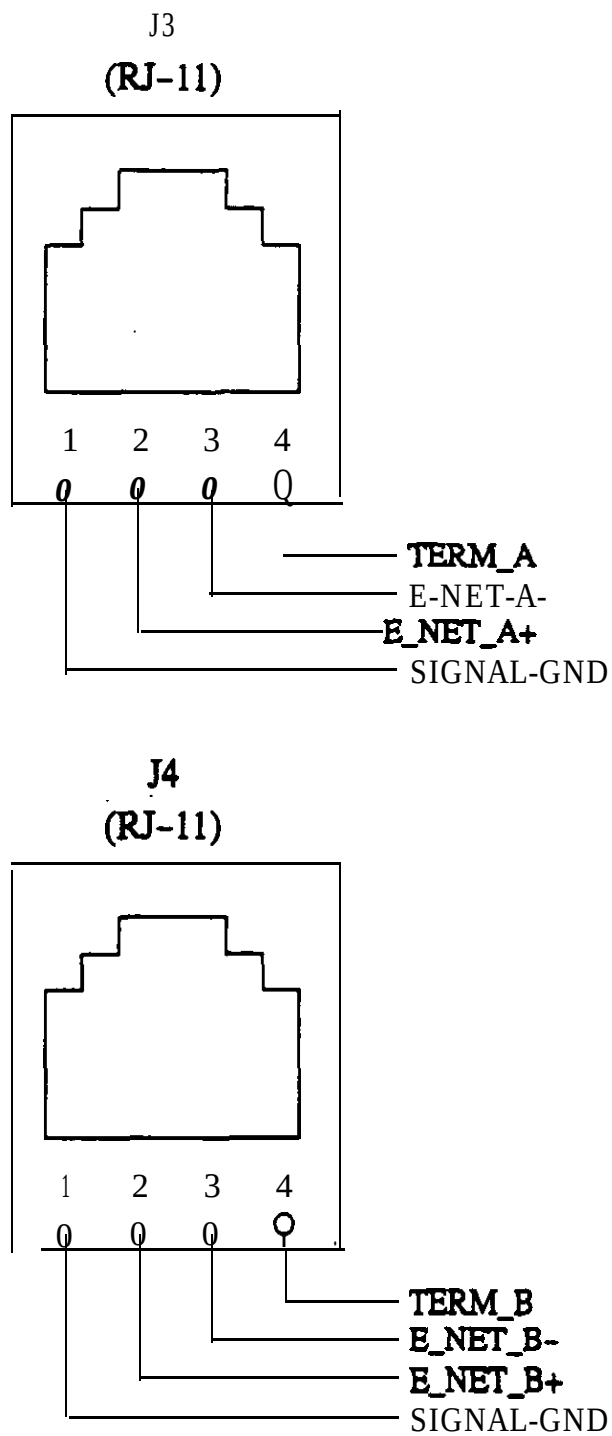


Figure 6-5 Communications **Pin** Assignments

Figure 6-6 *Communications Pin Assignments*

6.2.3 Terminal Mode

This mode provides a user interface to the UPS running data through an ANSI X3.64 compatible terminal, such as a VT100. The displayed data is user selectable via a menu screen. When the data screen is selected, the data is continually updated to reflect the UPS state. The following options are available from the Menu Screen:

- Meters Screen
- Active Alarms
- Alarm/Event →◆◆◆
- Battery Data
- Mimic Screen
- ◆◆◆ Time ◆◆◆◆◆

◆◆◆ the UP and DOWN arrow keys to move within the menu. Use the RETURN key to select an option. The following sections describe each entry of the Menu Screen.

633.1 Meters Screen

The Meters Screen provides the operating data of the UPS. It displays the input and output voltages, input and output frequency, battery voltage and the DC link voltage. Bar graphs of the percent of rated current for each output phase and the total kVA are also displayed. Press the PF1 key to return to the Menu Screen.

6.2.3.2 Active Alarms

The Active Alarm Screen provides a list of currently active alarms. Tent descriptions are displayed in order of alarm priority. Press the PF1 key to return to the Menu Screen.

6.233 Alarm/Event Queue

This screen provides a live display of the Alarm/Event Queue. The entries show the most recent alarm first. Each entry contains an entry number, time and date stamp and description. When entries are made to the queue, the screen will automatically be updated. Use the UP and DOWN arrow keys on the ANSI keyboard to scroll through the entries; wrap-around is implemented. Press the PF1 key to return to the Menu Saeen.

6.23.4 Battery Data

The Battery Data Screen provides battery information. The screen displays an estimate of battery time remaining (when On Battery) or a percentage of charge (when not On Battery) and, a bar graph of battery volts. Press the PF1 key to return to the Menu Screen.

6.2.3.5 Mimic Screen

The Mimic Screen provides a block diagram of the system configuration. This screen also displays the current operational state of the UPS (i.e., On Bypass). Press the PF1 key to return to the Menu Screen.

6.23.6 Set Time and Date

The Set Time and Date screen is used to set the UPS time and date via a remote terminal. Use the LEFT and RIGHT arrow keys to move from field to field. The field will flash if an invalid entry is entered. Use the RETURN key to update the system time; this field will flash to show acceptance. Press the PF1 key to return to the Menu Screen.

62.4 Printer Mode

6.2.4.1 Options Mode

Printer mode operates in two main modes: logging mode and options mode. The logging **mode** prints all alarms in the alarm history queue (oldest to most recent) **and then** continues to print any new alarm in the queue. The options mode prints out a given screen of data upon request.

Bach option starts with a header string and a blank line. The header string consists of the name of the screen (all caps) and **a** time/date stamp of the **exact** time the command was issued. The **time/date** stamp follows the screen name but **does** not start at any particular column. Bach screen en& **with** a **<EOF>** character (**<ctrl>Z**) followed by the message **“***Return to Logging ***.”** Use the following commands for **specific** print options:

- “0” prints out all of the below
- “1” prints out **Configuration** Screen
- “2” prints out Meters Screen
- “3” prints out Active Alarms Screen
- “4” prints out entire Alarm History screen

625 Configuration Screen

This displays all **the set-up** and type **information** about the UPS. The screen is divided up into 2 **columns**, category **labels and** data, starting at column 1 and column 22 respectively. Categories are as follows: Machine **Type &** Model Number, Input Frequency **&** Deviation **Limit**, Output Volts, Output Frequency, Output **Phase** Angle, Number Output Phases, Hardware Modules. Battery Information, Option Modules (communication/relay boards) Communications Set-up and Version Numbers.

6.2.5.1 Meters Screen

The top of this screen provides phase voltages, line voltages and frequency. This displays all the voltages and currents valid at the displayed **time/date** stamp divided into 5 **columns**, **starting** at **column 1, 30, 40, 50 and 60**. The bottom of **the** screen provides percent rated current and percent **kVA** in bar graph form 0% starts at column 20 and each 25% increment takes up 8 **columns up to** 125%.

6.25.2 Active **Alarms** Screen

*This displays all currently active **alarms** in one **column** beginning at **column 1**.*

6.25.3 **Alarm/Event History** Screen

This displays the entire **alarm** history queue in the UPS at the time this data is requested. It begins with **the** oldest **alarm** entry in the queue **and** ends **with** the most recent. Any alarms **occurring** during printing of the **history** will be included in chronological order. **The output** format is identical to the format for **the** logging printer mode.

62.6 **Logging Mode**

This mode is used to generate a hard **copy** of the Alarm/Event Queue. Any **alarm entered** into the alarm queue will also be directed **to** the printer. The printed alarm queue messages contain a **time** and date stamp and the alarm text message. **Entry numbers** are not **used** for the printed alarms. Printer Mode uses the following output format for **printing** alarm entries:

MM/DD/YY HH:MM:SS.T ALARM MESSAGE ... <CF> <LF>

12345678901234567890123456789012 ...

1 2 3 . . .

CHARACTER POSITION NUMBERS

Symbol	Description
MM	Month (2 digit)
DD	Day (2 digit)
YY	Year (last 2 Digits. eg. 1990 = 90)
HH	Hours (2 digit)
MM	Minutes (2 digits)
s s	Seconds (2 digits)
T	Tenth of Seconds (1 digit)
< a >	Carriage Return Character (ASCII code 13)
< lf >	Line Feed (ASCII code 10)

The **character position numbers** indicate each field's starting position and length. The **Alarm Message** will be prefixed by the word **"CLEAR:"** whenever an alarm is entered into the alarm **history** queue **with a cleared status**. Following is a list of all the alarms and event messages:

Auto On Enabled
 Battery DC Ova Voltage
Battery DC Under Voltage
 Battery Charges Failure
 Bypass Failure
 Bypass Not Available
Bypass Under Freq/Over Freq
Complete Battery Discharge
 control Power off
 control Power **On**
 DC Link Over Voltage
DC Link Under Voltage
 Emergency Power off **Trip**
 Front Panel **BIT** Failure
 Greater **Than** 106% Overload Phase A
Greater Than 106% Overload Phase B
Greater Than 106% Overload Phase C
Greater Than 125% Overload **Phase A**
Greater Than 125% Overload **Phase B**
Greater Than 125% Overload Phase C

Greater **Than** 150% Overload Phase A
 Greater Than 150% Overload **Phase B**
Greater Than 150% Overload Phase C
Heatsink Tempaature Sensor **Failed**
Heatsink Ova Temperature
 Input Line Voltage Loss
 Input Ova Voltage **Phase A**
 Input Ova Voltage **Phase B**
 Input **Phase** Rotation **Error**
 Input Under Voltage **Phase A**,
 Input **Under** Voltage Phase B
Inverter A/D Converter **BIT** Fsil
Inverter Control Board Failed BIT
Inverter CPU **BIT** Fsil
Inverter EEPROM Checksum Fail
Inverter EPROM Checksum Failed
Inverter Program **Stack Error**
Inverter RAM **BIT** Failure
Inverter Ramp Up Fsil
Inverter Ramp Up **Test** Failed
Inverter Shut-down **Imminent**
Inverter Shut-down **Rectifier**
Load Dumped
Load on **Inverter**
 Low Battay Shut-down
 Network Not Responding
 Node **EEPROM Verification** Error
 Output AC Ova Volt Test Fail
 Output **Breaker** Open
 Output DC Ova Voltage
 Output Ova Current Trip **Phase A**
Output Ova **Current** Trip **Phase B**
 Output Ova Current **Trip Phase C**
 Output Over **Voltage Phase A**
Output Over Voltage Phase **B**
 Output Ova Voltage Phsse C
 Output **Under** Voltage Phase A
 Output **Under** Voltage Phsse B
 Output **Under Voltage** Phase C
Power Supply **5** volt Fault
Power Supply **+/-** 12 volt **Fault**
Power Supply Failure
Power Supply Ova Tempaature
Power Supply Shut-down
Rectifier Current Ova 100%
 Rectifia **Current** Ova 125%

Rectifier EEPROM Failure
 Rectifier EPROM Failure
Rectifier Failed
Rectifier Failed BIT
Rectifier Fault Interrupt Fail
 Rectifier Power Capacitor Fault
Rectifier Shut-down Imminent
Software Change Occurred
UPS On Battery
UPS On Bypass
UPS Off Command
UPS On Command

63 ASCII COMPUTER MODE

The ASCII computer mode has two basic **modes** of operation. In the **first** mode, also the default **mode**, the UPS will only send out data blocks when a request is received. The second mode is **the** unrequested mode in which periodic ID blocks and unrequested alarm **blocks are sent out the RS232 port. When the unrequested mode is selected from the** Digital Front Panel Display, **an** ID block will be sent out of the **RS232** port every 2 minutes to the host. This indicate the UPS is **running**. To request blocks of data, send **control** codes to the **UPS** Front Panel over the serial **port**. These **control codes** consist of two **ASCII characters**. Any **ASCII** control characters. **spaces** or **tabs preceding** or following the two **control codes** will be ignored. The following **control** codes represent the commands **used** for **data requests**.

ASCII CONTROL CODES	CONTROL FUNCTIONS
A+	Send Unrequested Alarm & ID Blocks
A-	Send Only Requested Alarm & ID Blocks
S1	Send ID Block
S2	Send Alarm History Block
S4	Send Meter Block
S5	Send Alarm Block

Any unrecognized control code will receive the following message:

***FF 0000 UNIDENTIFIED CONTROL CODE RECEIVED xx**
 12345678901234567890123456789012345678901234~678~~~~~
 1 2 3 4 5

CHARACTER POSITION NUMBERS

NOTE:

The position numbers are shown to determine the number and position of the characters.

The message consists of 51 characters as indicated by the position numbers above. The line is terminated by a carriage return (OD Hex) and a line feed (OA Hex), represented above by 'xx'. The following sections describe the data blocks of the ASCII Computer Mode. The 'A + ' and 'A-' control codes are described in the ID Block and Alarm Block sections.

63.1 Data Block Format

This section provides the format for the data blocks sent back to the requesting computer. All ASCII computer mode data returned from the UFS is in the following generic format:

```
:BB 0000 DD DD DD DD DD DD DD DD DD DD DD DD DD DD DD DD CCxx
1234567890123456789012345678901234567890123456789012345678901
      1             2             3             4             5             6
```

CHARACTER POSITION NUMBERS**NOTE:**

The position numbers are shown to determine the number and position of the characters

This represents a single line of data in a given block. The data blocks can be a single line or many lines, depending on the amount of data that needs to be sent. A given line starts with a fixed delimiter, the colon character ':'. The delimiter is changed to an asterisk character '*' to indicate the line is the last one of a data block. The 'BB' which follows refers to the data block number. This number is the same as the requested block number. If an ID block is requested by an 'S 1' command then the block number returned will be an '01'. The ID block will be a '01', the Alarm History block will be an '02' and so on.

A block number of 'FF' corresponds to an unidentified control code which was received. The '0000' represents the offset of the current line from the start of the data block. The offset starts at '0000' for the first line and increments by 10 Hex (16 decimal) for each consecutive line of the data block. The increment of 10 Hex (16 decimal) is for the 10 Hex bytes sent on the previous line of data. This means the second line of a given block will have a value of '0010', the third '0020' and so on.

The pairs of 'DD' represent the actual hexadecimal data byte. Since ASCII computer mode only transmits ASCII characters, a binary 8 bit value is converted to two ASCII characters represented here by 'DD'. The value of a single character is 0 to 9 or A to F which gives the 16 possible values. Using two characters yields the 256 possible values which the binary data byte can have. Each line of data contains, at most, 16 bytes of the data block. The last line of a data block contains only the number of bytes needed to complete the block.

The final piece of data on a line is the line checksum denoted here by 'CC'. This is a two's complement byte checksum. The checksum is calculated by summing the block number byte, the two block offset bytes, and the 16 data bytes together and taking the two's complement of this value which becomes the line checksum. Like the data bytes, this value is converted into two ASCII characters for transmission.

Each line of data is terminated by a carriage return (OD Hex) and a line feed (OA Hex), represented by 'xx'.

NOTE:

The 18 space characters shown between the data fields are also transmitted.

6.3J.1 ID Block (S1)

The ID block contains general information about the UPS and the data blocks which can be requested. The ID block is sent periodically every two minutes until the UPS receives an 'A-' command. After the 'A-' command is received, no ID block will be sent periodically until the 'A+' command is received. To request the data block, send an 'S1' command to the UPS in ASCII computer mode. The only difference between the periodic and requested ID data blocks is the periodic ID data block preempts any requested data block currently transmitted. This interruption of the requested block occurs after a complete line has been transmitted. The ID block is then transmitted in its entirety, then the interrupted requested data block is allowed to continue. The periodic ID block can be interrupted by the unrequested Alarm block which is the highest priority.

The block number for the ID block is '01'. The ID block consists of roughly eight lines. The size of the block is dependent on the size of a string of text embedded in the ID block describing the unit's type. The number of microprocessors in the unit, the unit's kVA rating and the information describing the data in the other data blocks are also in the ID block. Remember; Each data byte is converted into two ASCII character bytes which are transmitted.

6.3.1.2 Alarm History Block (S2)

The Alarm History block contains the data from the UPS's Alarm History Queue. This is a log of the alarms previously occurred or cleared. This data block is sent when it is requested by an 'S2' command to the UPS in ASCII computer mode. The block number for the Alarm History block is '02'. If the alarm queue is empty, this data block consists of a single line of data. This line contains the last line delimiter '*', a block number, a block offset and a checksum. In all other cases, the block length is determined by the number of entries in the alarm history queue. Each alarm history queue entry is converted into nine data bytes. The maximum number of entries is controlled by the Alarm History Queue. Currently the maximum number of entries could be up to 400 which translates to 225 lines of data in ASCII computer mode. Remember Each data byte is converted into two ASCII character bytes which are transmitted.

6.3.1.3 Status Block (S3)

The Status block contains data describing the UPS status. The block number for the status block is '03'. To request this block send an 'S3' command in ASCII computer mode.

6.3.1.4 Meter Block (S4)

The **Meter** block contains the **UPS's** measured information. This data block contains the input and output voltages, currents **and** frequencies, the battery voltage and **the** temperature as well as other measured **values**. This data block is sent when it **is** requested by an **'S4'** command to the UPS in ASCII computer mode. The block **number** for the Meter block is '04'. The data is converted to binary floating point **representation**. This block is 7 lines long consisting of **104** data bytes. **Remember;** Each data byte **is** converted into two ASCII character bytes which are transmitted.

6.3.1.5 A h Block (S5)

The Alarm block contains the state of **all** current system alarms. The **Alarm** block **can** be sent for two different conditions. The first case is when the block is **requested** by an **'S4'** command to the UPS in ASCII computer **mode**. The second case is when the Alarm block is sent unrequested. The unrequested **Alarm** block is sent **if** a flag has been set previously by an **'A+'** command. The flag is cleared by **an** **'A-'** command. These two **commands** are the only two received without sending a response back.

When the unrequested **flag** is **set** and a **change** occurs in the system alarms, **the** Alarm block is sent. The change in system alarms can be the setting or clearing of an alarm condition. The unrequested Alarm block has **the** highest priority in ASCII computer mode. Like the periodic **ID** block, it preempts all **other** data **blocks** including the periodic ID block. This could bring about the following **scenario**: A data block is requested **and** the first few lines are received back. Then the periodic ID block **suspends** the current **data block and sends a few lines of the ID block**. **Now a system alarm occurs**. The ID block is suspended and the entire Alarm block is sent. The ID block continues if there **are** no **other** changes **in** the system **alarms**. **Finally the requested** data block finishes **transmission**.

These **interruptions** can **be detected** at **the** receiving end by looking at the block and offset numbers of a given data line. Remember. The interruption **never occurs** in the **middle of a line of data and each line is terminated with a carriage return and a line feed**. This is used so the receiver can sort out the received data.

The Alarm block is 4 lines **long consisting** of 52 data bytes. The block number for the **Alarm** block is '05'. **Remember;** Each data byte is converted into two ASCII **character** bytes which are transmitted.

63.2 Binary Mode

Selecting Binary **Computer Mode** from the Digital **Front** Panel Display, sends control **commands** to the UPS. To generate a control command, the unit must send **an** authorization **block** followed by a valid **command** block. The authorization **will** expire after a valid **command** is received or one minute, which ever comes first. Both the authorization block and command block will include a **checksum** to prevent inadvertent **generation** of control **commands**. All control commands and the authorization **block** will be in the following **format**:

SFD | Size | DATA | CSUM

Start Frame Delimiter. (SFD) : 10101011

Frame Size (Size): number of data bytes

DATA: control code or authorization code

CSUM: **Two's** complement **checksum** of preceding bytes

The code for each **control** command is **defined** as follows:

Control	Commands	Control Code
	UPS Off	88h
	UPS On	89h
	Delay Load Dump	8Ah
	Load Dump	8Bh
	Decrement Output Voltage	8Ch
	Increment Output voltage	8Dh
	Set Time/Date	90h
	Send ID Block	31h
	Alarm History Block	32h
	Send Status Block	3 3 h
	Send Meter Block	34h
	Send Alarm Block	35h
	Send Only Requested Alarm & ID Blocks	A0h
	Send Unrequested Alarm & ID Blocks	Alh

The **authorization code** is **as** follows:

SFD	Size	DATA	CSUM
ABh	04h	CF69E8D5h	5Ch

The time and date block should **be** as follows:

SFD	Size	Code	DATE (4 byte-s)	TIME (4 bytes)	CSUM
ABh	09h	90h	DATE	TIME	XX

6 . 3 3 **Date Format**

This is a 32'bit **representation** of the data. The **representation** may be either **YEAR:MONTH:DAY** format far **YEAR:JULIAN__ DATE** format. The **MONTH:DAY** format uses values 1-12 for month and 1-31 for. The **JULIAN__ DATE** format uses the same two bytes for the number of days from the beginning of the year (January 1st is Julian Day 1).

The form is as **follows**:

FYYY YYYY	YYYY YYYY	MMMM MMMM	DDDD DDDD

This is a one bit field containing one flag. Bit cleared = use Julian Date format. Bit set = use **Month:Day** format. This is a BCD value.

YYY YYYYYYYYYYYY

This is the value of the **year**. Values range from 1990-2089. This is a BCD value.

MMMM MMMM

If **in MONTH:DAY** format, this is the month. Values range from 1- 12. If in **JULIAN DATE** format, this is the upper (most significant) byte of the days. **This** is a BCD value.

DDDDDDDD

If **in MONTH:DAY** format, this is the number of days. **Values** range from 1-31 **in** BCD. If in **JULIAN DATE** format, this is the lower (**least** significant) byte of the days. Here the values for the entire number of days since the most recent December 31st **are** stored as a BCD number in two bytes. The range is 1-366.

6.3.4 Time *Format*

This is a 32 bit representation of time. The format is as follows:

3	2	1	0
HHHHHHHH	MMMM MMMM	SSSS SSSS	TTTT 0000

HHHHHHHHH

Hours, values range from 0-23. This is a BCD value.

MMMMMMMMM

Minutes, values range- from 0-59. This is a BCD value.

SSSS SSSS

Seconds, **values** range from 0-59. This is a BCD value.

TTTT

Tenths of **seconds**, values range from 0-9. **This is** a BCD value.

0000

Constant **zero, reserved** for hundredths of **seconds** (0-9).

6.3.5 UPS to CPU Communications

The packet sent to the host from the **UPS** is formatted as follows:

SFD	BLOCK#	LEN	SEQ	DATA	CSUM

SFD Start Frame **Delimiter: 0AB hex**

BLOCK # Byte value which **indicates** type of network block.
Defined blocks are:

1. ID Block
2. **Alarm** History Block
3. Status Block
4. Meter Block
5. **Alarm Block**

LEN **Byte** value **indicating number** of **UPS** status bytes in the block. This value **does not include the 5 overhead bytes used from SFD to SEQ and CSUM** which are included in every transmission.

Sequence Byte **value** giving the sequence number of this packet in relation to transmission of an entire block. **These** packets are numbered in ascending order with the **first one** being one. If a packet is the last one **in** a sequence, **then the high order bit of this field will be set in addition to the final sequence number.**

DATA **Up to a maximum of 121 bytes** are allowed **per** sequence. Data field structure **for each block type will be outlined later.**

CSUM **Two's** complement checksum of preceding **fields (includes** SFD through DATA bytes).

Upon power up, the UPS Digital Front Panel Display first sends the ID block. **Thereafter**, the **ID** block is sent periodically every two minutes. If the Send Unrequested Alarm Blocks flag is set (Alh), the ID block is sent periodically every two minutes and the alarm block will be transmitted each **time** a change **occurs** with any of the UPS **system alarms**. This feature is Set by default The other blocks of data are sent once, upon request

6.3.6 *Data Block Descriptions*

This section **describes** the data blocks in detail. They are the ID Block, the Alarm **History** Block, the Meter Block and the Alarm Block The data in each block is the same for both ASCII and Binary computer modes.

6.3.6.1 *ID Block*

The **ID** block is **used** to **describe** the UPS and the Meter and Alarm data blocks. Table 6-4 **provides** an overview of the ID block **data**. The first piece of data is the number of **microprocessors** in the UPS and the number of software versions to follow. There is one software version number for each of the Central Processing Units (**CPUs**) present in the data block The order **in** which they appear **in** the table is fixed as shown. If **a** particular processor **is** not installed then the software version number corresponding to the **microprocessor** is **000**. The **version numbers** are transmitted as the least significant **version** number first, followed by the **most significant** byte.

The **kVA** rating **is** the next **item** in the ID block followed by the number of output **phases**, the output **phase** angle and the byte count for the descriptive message. The **message is an ASCII string of characters giving** the name of the current UPS. Following the message are the data block maps describing the information **present** in the Meter and **Alarm data blocks**. **The first byte is the number of bytes contained in the Meter map**. The Meter map, shown in the table as bytes 41 through 109, describe what type. of data is **contained in the Meter data block**.

The next byte, number 110, is the number of bytes in the Alarm map. The Alarm map, shown in the table as bytes 111 **through 129**, is the last piece of data in the ID block. **This map data describes the data in the Alarm data block**.

NOTE:

The byte numbers in Table 6-4 are not fixed. The actual byte numbers depend on the type of UPS and the configuration.

Table 6-4 ID Block Table

Byte Number	Description
	Number of CPUs - This byte is the number of microprocessors which are installed in the UPS unit.
2-3	Prom Panel Version - These two bytes are the Full Featured Front Panel Software Version Number. A value of 01:02 is Version 1.02
4-5	Inverter Version - These 2 bytes are the Inverter Software Version Number. A value of 01:02 is Version 1.02.
6-7	Rectifier Version - These 2 bytes are the Rectifier Software Version Number. A value of 01:02 is Version 1.02.
8-9	Exide Net Version - These 2 bytes are the Exide Net Interface Card Software Version Number. A value of 01:02 is Version 1.02. This is an optional card which may not be present.
10	kVA Rating - This byte is the kVA rating of the UPS unit.
11	Output Phases - This byte is the number of output phases for the UPS unit.
12	Output Phase Angle - This byte provides the output phase angle.
13	Message Length - This byte is the number of bytes which follows in the descriptive message below.
14-39	Descriptive Message - The descriptive message is a string of ASCII character bytes describes the UPS unit type.
40	Meter Map Size - This byte is the number of bytes contained in the following byte numbers 41 through 109.
41-109	Meters Map - This table of bytes describes the type of metered data received See the Meters Map Table for a description of these bytes. Actual length is given in meter map size
110	Alarm Map Size - This byte is the number of bytes contained in the following bytes numbers 111 through 129. Actual length is given in alarm map size.
111-129	Alarm Map - This table of bytes describes alarm types present in the system. See the Alarm Map Table for a description of these bytes.

NOTE:

The **byte numbers** will change depending on the size of the data fields, such as the number of CPU software version numbers, the message length, the meter map size, and the alarm map size.

6.3.6.2 Meter Map

The Meter map describes the type of data contained in the Meter data block. This data can be one of four types; a 32 bit floating point representation, a 32 bit integer value, a date stamp or a time stamp. Each byte in the Meter map corresponds to a single meter

value. If the byte in the Meter map is 00, then the meter value is not present in the Meter data block which only contains valid meter values. The Meter map is shown in Table 6-5.

The first 15 bytes in the Meter map are 00 since the UPS does not measure these values. If the meter value does exist and is a floating point number then the byte in the Meter map describes the size of the data field needed to display the meter value.

The byte is a packed Binary Coded Decimal (BCD) value. The upper nibble of the BCD value gives the number of digits it takes to display the meter data at its maximum value. This includes the decimal point. For example, if the maximum value is '100.0' then the upper nibble is 5. The lower nibble informs how many digits are to the right of the decimal point. In the example the lower right nibble is 1, giving a BCD value of '51 Hex' for the Meter map entry. If the meter value is a 32 bit integer then the byte value is 'F0 Hex' which is an invalid BCD number. Date and time formats have the values 'EO Hex' and 'E1 Hex', respectively. All meter block values are four bytes long with the least significant byte being transmitted first.

Table 6-5 Meter Map Table

Byte Number	Description
1	OUTPUT VOLTS AB - Output Voltages from the inverter
2	OUTPUT VOLTS BC - measured phase to phase. 'AB' is
3	OUTPUT VOLTS CA - phase A to B.
4	INPUT VOLTS AB * Input voltages to the rectifier
5	INPUT VOLTS BC * measured phase to phase. 'AB' is
6	INPUT VOLTS CA * phase A to B.
7	INVERTER VOLTS AB -
8	INVERTER VOLTS BC -
9	INVERTER VOLTS CA -
10	BYPASS VOLTS AB - Input voltages at the Bypass
11	BYPASS VOLTS BC - measured phase to phase. AB; is
12	BYPASS VOLTS CA - phase A to B
13	+ 8 VDC LOGIC POWER - Logic power supply voltages.
14	+16 VDC LOGIC POWER -
15	-16 VDC LOGIC POWER -
16	OUTPUT CURRENT PHASE A - Output phase currents
17	OUTPUT CURRENT PHASE B - from the Inverter.
18	OUTPUT CURRENT PHASE C -
19	INPUT CURRENT PHASE A - Input phase currents to the
20	INPUT CURRENT PHASE B - Rectifier.

21	INPUT CURRENT PHASE C -
22	OUTPUT KW - Output and input power measurements.
23	INPUT KW -
24	OUTPUT KVA *
25	INPUT KVA -
26	OUTPUT POWER FACTOR -
27	INPUT POWER FACTOR -
28	OUTPUT FREQUENCY - Frequency measurements
29	INPUT FREQUENCY -
30	INVERTER FREQUENCY *
31	BYPASS FREQUENCY *
32	DC LINK VOLTS * DC voltage Rectifier to Inverter
33	BATTERY CURRENT- Battery measurements
34	BATTERY VOLTAGE *
35	% BATTERY LEFT *
36	BATTERY TIME REMAINING *
37	BATTERY CHARGE TIME -
38	RAW OUTPUT CURRENT PHASE A - Raw inverter
39	RAW OUTPUT CURRENT PHASE B - output peak
40	RAW OUTPUT CURRENT PHASE C - phase current values.
41	AVG INPUT I 3 PHASE SUM - Average sum of the 3 phase input currents.
42	OUTPUT I SUM BAR CHART - Bar chart current values.
43	INPUT CURRENT BAR CHART
44	RAW DC LINK VOLTS - Raw DC & bar chart voltages
45	DC VOLTS BAR CHART - measured between rectifier and inverter.
46	RAW BATTERY CURRENT - Raw battery & bar chart
47	BATTERY BAR CHART - battery current values.
48	AVG BYPASS VOLTS 3 PHASE SUM - Average sum of
49	AVG OUTPUT VOLTS 3 PHASE SUM - the 3 phase
50	AVG DC VOLTS 3 PHASE SUM - voltages.
51	AVG INV VOLTS 3 PHASE SUM -
52	AVG INPUT VOLTS 3 PHASE SUM -
53	BYPASS VOLTS NOMINAL SUM - Nominal voltage
54	OUTPUT VOLTS NOMINAL SUM - sums.
55	INV VOLTS NOMINAL SUM -

56	INPUT VOLTS NOMINAL SUM -	1
57	INPUT VOLTS PHASE A * Rectifier input phase voltages	
58	INPUT VOLTS PHASE B * measured phase to neutral.	
59	INPUT VOLTS PHASE C *	
60	OUTPUT VOLTS PHASE A * Inverter output phase	
61	OUTPUT VOLTS PHASE B * voltages measured phase	
62	OUTPUT VOLTS PHASE C * to neutral.	
63	AMBIENT TEMPERATURE * Temperature	
64	HEATSINK TEMPERATURE * measurements	
65	POWER SUPPLY TEMPERATURE *	
66	LOAD CURRENT PHASE A * Inverter RMS output	
67	LOAD CURRENT PHASE B * phase currents.	
68	LOAD CURRENT PHASE C *	
69	LOAD CURRENT PHASE A BAR CHART * 100%	
70	LOAD CURRENT PHASE B BAR CHART * values for	
71	LOAD CURRENT PHASE C BAR CHART * the bar	
72	OUTPUT kVA BAR CHART * charts.	
73	DATE *	
74	TIME *	

NOTE:

The '-' denotes the UPS will never have this value. The '*' denotes the possible values the UPS will have.

6.3.63 Alarm Map

The Alarm map describes the alarms present in the Alarm data block. If the byte in the Alarm map is 00, then the alarm value is not present in the Alarm data block which contains only the state of valid system alarms. The Alarm map is shown in Table 6-6.

Each bit of an Alarm map byte represents a possible Alarm in the Alarm data block. If all 8 bits of the first Alarm map byte are set (FF Hex), then the first 8 bytes in the Alarm data block correspond to these 8 alarms. In the case of the UPS, the first Alarm map byte is 'E0 Hex' because the first 5 alarms do not exist in the UPS. The next map byte is '06 Hex' and so on.

Table 6-6 Alarm Map

Byte Number	Bit Number	Description
1	0	- Inverter AC over voltage
	1	- Inverter AC under voltage
	2	- Inverter under or over frequency
	3	- Bypass AC over voltage
	4	- Bypass AC under voltage
	5	* Bypass under or over frequency
	6	* Input AC over voltage
	7	* Input AC under voltage
2	0	- Input under or over frequency
	1	* Output AC over voltage
	2	* Output AC under voltage
	3	- Output under or over frequency
	4	- Remote emergency power off
	5	- Remote go to Bypass
	6	- Building alarm 6
	7	- Building alarm 5
3	0	- Building alarm 4
	1	- Building alarm 3
	2	- Building alarm 2
	3	- Building alarm 1
	4	- Static switch over temperature
	5	- Charger over temperature
	6	- Charger logic power fail
	7	- Charger over voltage or current
4	0	- Inverter over temperature
	1	* Output over load
	2	* Rectifier input over current
	3	* Inverter output over current
	4	* DC link over voltage
	5	* DC link under voltage
	6	* Rectifier failed
	7	* Inverter fault

5	0	- Battery contactor fail
	1	- Bypass breaker fail
	2	* Charger failure
	3	* Ramp up failed
	4	- Static switch failure
	5	- Analog board A/D reference fail
	6	- Bypass uncalibrated
	7	- Rectifier uncalibrated
6	0	* Output uncalibrated
	1	* Inverter uncalibrated
	2	- DC voltage uncalibrated
	3	- Output current uncalibrated
	4	- Rectifier current uncalibrated
	5	- Battery current uncalibrated
	6	- Inverter On/Off stat failure
	7	- Battery current limit
7	0	- Inverter failure (3 attempts)
	1	- Analog board A/D stat failure
	2	- Output current over 100%
	3	- Battery ground fault
	4	- Waiting for charger sync
	5	- Non-volatile RAM failure
	6	- Analog board A/D time out
	7	* Shut-down imminent
8	0	* Battery low
	1	- Utility fail
	2	- Output short circuit
	3	- Utility not present
	4	- Full time charging
	5	- Fast Bypass command
	6	- A/D error
	7	- SPI communications error
9	0	* Rectifier failed self-test
	1	* Rectifier EEPROM failure
	2	* Rectifier EPROM failure

	3	* Input line voltage loss
	4	* Battery DC over voltage
	5	* Power supply over temperature
	6	* Power supply failure
	7	* Power supply 5 volt fault
10	0	* Power supply +/-12 volt fault
	1	* Heatsink over temperature
	2	* Heatsink temperature sensor failed
	3	* Rectifier current over 125%
	4	* Rectifier fault interrupt failed
	5	* Rectifier power capacitor fault
	6	* Inverter program stack error
	7	* Inverter control board failed self-test
11	0	* Inverter A/D converter self-test failed
	1	* Inverter ram self-test failure
	2	* Inverter EEPROM checksum fail
	3	* Inverter EPROM checksum fail
	4	* Inverter CPU self-test failed
	5	* Network not responding
	6	* Front panel self-test failure
	7	* Node EEPROM verification error
12	0	* Output AC over voltage test failed
	1	* Output DC over voltage
	2	* Input phase rotation error
	3	* Inverter ramp up test failed
	4	- Inverter off command
	5	- Inverter on command
	6	- To bypass command
	7	- From bypass command
13	0	- Auto mode command
	1	* Emergency shutdown command
	2	- Setup switch open
	3	- Inverter AC over voltage (interrupt)
	4	- Inverter AC under voltage (interrupt)
	5	- Absolute DCOV/ACOV (interrupt)

	6	- Phase A current limit
	17	- Phase B current limit
14	0	- Phase C current limit
	1	* Bypass not available
	2	- Rectifier breaker open
	3	- Battery contactor open
	4	- Inverter contactor open
	5	-Bypass breaker open
	6	- Inverter board ACOV interrupt test failed
	7	- Inverter over temperature trip
15	0	- Inverter board ACUV interrupt test fail
	1	- Inverter voltage feedback error
	2	- DC under voltage timeout
	3	- AC under voltage timeout
	4	- DC under voltage while charger is full on
	5	- Inverter voltage bias error
	6	- Rectifier phase rotation
	7	-Bypass phase rotation
16	0	- System interface board failure
	1	- Parallel board failure
	2	- Loss of load sharing phase A
	3	- Loss of load sharing phase B
	4	- Loss of load sharing phase C
	5	- DC over voltage timeout
	6	* Battery totally discharged
	7	- Inverter phase bias error
17	0	- Inverter voltage bias error
	1	- DC link bleed complete
	2	- Large charger input current
	3	* Inverter voltage too low for ramp level
	4	- Loss of redundancy
	5	- Loss of sync bus
	6	- Rectifier breaker shunt tripped
	7	- Loss of charger sync
18	0	- Inverter low level test timeout

	1	- Output breaker open
	2	- Control power on
	3	- Inverter on
	4	- Charger on
	5	- Bypass on
	6	- Bypass power loss.
	7	- Bypass manual turn on
19	0	- Bypass manual turn off
	1	- Inverter bleeding DC link voltage
	2	- CPU ISR error
	3	- System ISR restart
	4	- Parallel DC
	5	- Check battery flag
	6	- Battery charging
	7	- Battery not charged
20	0	- Disable battery time
	1	- Series 7000 enable
	2	- Other UPS on
	3	- Parallel Inverter
	4	- UPS in parallel
	5	- Machine mode
	6	- Control power off
	7	* Greater than 106% overload on phase A
21	0	* Greater than 106% overload on phase B
	1	* Greater than 106% overload on phase C
	2	* Greater than 125% overload on phase A
	3	* Greater than 125% overload on phase B
	4	* Greater than 125% overload on phase C
	5	* Greater than 150% overload on phase A
	6	* Greater than 150% overload on phase B
	7	* Greater than 150% overload on phase C
22	0	+ UPS On Battery
	1	+ UPS On Bypass
	2	+ Load Dumped
	3	+ Load On Inverter

	4	+ UPS On Command
	5	+ UPS Off Command
	6	+ Low Battery Shut-down
	7	+ Auto On Enabled
23	0	* Software Incompatibility Detected
	1	* Inverter Temperature Sensor Failed
	2	- DC Start Occurred
	3	- In Parallel Operation
	4	- Syncing to Bypass
	5	- Ramping UPS Up
	6	- Inverter On Delay
	7	- Charger On Delay
24	0	- Waiting for Utility Input
	1	- Close Bypass Breaker
	2	- Temporary Bypass Opa
	3	- Syncing to Output
	4	* Bypass Failure
	5	- Auto OFF Command Executed
	6	- Auto ON Command Executed

NOTE:

The '-' denotes the UPS will never have this value. The '*' denotes the possible values the UPS will have.

6.3.6.4 Alarm History Block

The Alarm History block is a list of all the system alarms occurred in the past. This gives a record of the alarms occurred, when the alarms occurred, and when the alarms cleared.

This data block can contain from 0 to 400 Alarm History entries. Each alarm consists of a 9 byte format shown in Table 6-7. The size of the data block can be as much as 3600 bytes long. Each Alarm History entry has a 15-bit field giving the type of alarm or event occurred. This 15-bit value corresponds to the bit number of the alarm or event in the Alarm map.

The first byte of an entry also contains a flag indicating whether this alarm or event has occurred or cleared. This flag is located in the least significant bit (Bit 0) of the first byte. The rest of the bytes of data in an entry give the date and time when the alarm occurred or cleared. The date and time are sent as 7 packed Binary Coded Decimal (BCD) numbers which give the month, day, year, hour, minute, second and tenths of

seconds. The Alarm History is stored in non-volatile memory in the UPS. This means even after the unit is powered down, the Alarm History queue will contain a valid Alarm History table when powered back up.

Table 6-7 Alarm History Block

Byte Number	Bit Number	Description
		Inactive/Active Flag - indicates whether this alarm or event has occurred or has cleared. If set to 0 the alarm has cleared. A1 indicates the active condition.
1	1-7	Alarm/Event Number - gives type of alarm occurred.
2	all	This value comes from the bit number of the alarm in the Alarm Map. The alarm number is calculated by multiplying the byte number by 8 and adding the bit number to it. This gives a 15 bit value where the lower 7 bits are packed into the upper 7 bits of the first byte and the remaining 8 bits are packed into the second byte.
3	all	Month - indicates the month the alarm or event became active or cleared. This is a BCD value.
4	all	Day - indicates the day the alarm or event became active or cleared. This is a BCD value.
5	all	Year - indicates the year the alarm or event became active or cleared. This is a BCD value. 90 = 1990, 00 = 2000
6	all	Hour - indicates the hour the alarm or event became active or cleared. This is a BCD value which has a value from 0 to 23.
7	all	Minutes - indicate the minute the alarm or event became active or cleared. This is a BCD value.
8	all	Seconds - indicates the second the alarm or event became active or cleared. This is a BCD value.
9	all	Tenths of Seconds - indicates the tenths of second value when the alarm or event became active or cleared. This is a BCD value.

6.3.6.5 Status Block

The Status block contains the status of the UPS. This is a two byte value. The possible status values are listed below.

NOTE:

For byte 1 more than one status may be active; however, only the highest priority (highest value) status will be sent. For byte 2 all bits are always valid.

BYTE1

ON BATTERY STATUS

INVERTER OVERLOAD

RECTIFIER OVERLOAD

F0

E0

'Do

INVERTER RAMPING UP	90
SYNCING TO BYPASS	80
RECTIFIER RAMPING	70
ON BYPASS	60
SYSTEM NORMAL	50
LOAD ON INVERTER	40
UPS ON	30
OUTPUT BREAKER OPEN	20
UPS OFF	10

BYTE 2 (0 = False, 1 = True)

Bit

7	utility Present
6	Rectifier On
5	Low Battery Warning
4	Inverter on
3	On Battery
2	On Bypass
1	Output Breaker Closed
0	Bypass Installed

63.7 Meter Block

The Meter **block** contains the **measured values** of the UPS. This consists of the input and output voltages, **currents** and **frequencies**, the battery voltage and the temperature, as well as other measured **values**. The measured values are **in** 32-bit floating point format, 32-bit **integers** or a time and date stamp. These 4 byte **values** are **all** transmitted **least significant** byte, **first significant** byte, most **significant** byte. The data type, used for a given meter value **is** transmitted as part of the ID block in the **Meter** map section. Each meter value **consists** of four bytes of data, **independent** of the data type. Table 6-8 gives the current description to the Meter Data **Block** on a value by value basis.

Table 6-8 Meter Block

Byte Numbers	Description
1-4	INPUT VOLTS AB - This value is the floating point Rectifier input voltage measured between phases A and B. This value is also adjusted to reflect the input phase difference between the two phases. The units on this value are volts . When displayed as volts, there are three digits all to the left of the decimal point
5-8	INPUT VOLTS BC - This value is the same as the phases AB value above but measured between phases B and C.
9-12	INPUT VOLTS CA - This value is the same as the phases AB value above but measured between phases C and A.
13-16	OUTPUT CURRENT PHASE A - This is the floating point average output phase current from the Inverter . The units on this value are in amps. When displayed as amps, there are three digits, one of which, is to the right of the decimal point.
17-20	OUTPUT CURRENT PHASE B - This value is the same as the phase A value above but measured on phase B .

21-24	OUTPUT CURRENT PHASE C - This value is the same as the phase A value above but measured on phase C.
25-28	OUTPUT kVA - This is the floating point output power being sent out of the inverter. This value is calculated by multiplying the output voltage by the output RMS current for each phase and adding the phases together. The units on this value are volt*amps. When displayed as volt*amps there are 5 digits all to the left of the decimal point.
29-32	INVERTER FREQUENCY - This is the floating point inverter output frequency value. The units on this value are in hertz. When displayed as hertz, there are four digits, two of which, are to the right of the decimal point.
33- 36	BYPASS FREQUENCY - This is the floating point Bypass frequency value. The units on this value are in hertz. When displayed as hertz, there are four digits, two of which, are to the right of the decimal point.
37-40	DC LINK VOLTS - This is the floating point DC voltage measured between the rectifier and inverter. The units on this value are volts. When displayed as volts there are three digits all to the left of the decimal point.
41-44.	BATTERY VOLTAGE - This is the floating point DC battery voltage. The units on this value are volts. When displayed as volts there are three digits all to the left of the decimal point.
45-48	PERCENT BATTERY LEFT - This is the floating point value of the percentage of battery charge left in the battery. When displayed as percentage there are three digits all to the left of the decimal point.
49-52	BATTERY TIME REMAINING - This is the 32-bit integer value of the time left running on battery. The units on this value are seconds. When displayed as seconds there are five digits all to the left of the decimal point.
53-56	RAW OUTPUT CURRENT PHASE A - This is the floating point inverter raw peak output current for phase A. When displayed as an integer, there are three digits all to the left of the decimal point.
57-60	RAW OUTPUT CURRENT PHASE B - This value is the same as the phase A value above but measured on phase B.
61-64	RAW OUTPUT CURRENT PHASE C - This value is the same as the phase A value above but measured on phase C.
65-68	INPUT VOLTS PHASE A - This is the floating point average input phase voltage to the rectifier. This Value is measured from phase A to the neutral input leg. The units on this value are volts. When displayed as volts, there are three digits all to the left of the decimal point.
69-72	INPUT VOLTS PHASE B - This value is the same as the phase A value above but measured on phase B.
73-76	INPUT VOLTS PHASE C - This value is the same as the phase A value above but measured on phase C.

77-80	OUTPUT VOLTS PHASE A - This is the floating point average output phase voltage from the inverter . The units on this value are volts. When displayed as volts, there are three digits all to the left of the decimal point.
81-84	OUTPUT VOLTS PHASE B - This value is the same as the phase A value above but measured on phase B .
85-88	OUTPUT VOLTS PHASE C - This value is the same as the phase A value above but measured on phase C.
89-92	AMBIENT TEMPERATURE - This is the floating point ambient temperature measured by the front panel. The units on this value are in degrees Celsius. When displayed as degrees Celsius, there are three digits, one of which, is to the right of the decimal point.
93-96	HEATSINK TEMPERATURE - This is the floating point heatsink temperature measured by the rectifier . The units on this value are in degrees Celsius. When displayed as degrees Celsius, there are three digits , one of which , is to the right of the decimal point.
97-100	POWER SUPPLY TEMPERATURE - This is the floating point power supply temperature measured by the rectifier. The units on this value are in degrees Celsius. When displayed as degrees Celsius. there are three digits, one of which, is to the right of the decimal point.
101-104	LOAD CURRENT PHASE A - This is the floating point output phase RMS current from the inverter . The units on this value are amps. When displayed a9 amps, there are two digits all to the left of the decimal point.
105-108	LOAD CURRENT PHASE B - This value is the same as the phase A value above but measured on phase B.
109-112	LOAD CURRENT PHASE C - This value is the same as the phase A value above but measured on phase C.
113-116	LOAD CURRENT PHASE A BAR CHART - This is the 32 bit integer value for the load current when it is at 100% of its rated value. The units on this value are amps. This value has only two digits. It is used to display bar charts of the output load currents.
117-120	LOAD CURRENT PHASE B BAR CHART - This value is the same as the phase A value above but for phase B.
121-124	LOAD CURRENT PHASE C BAR CHART - This value is the same as the phase A value above but for phase C.
125-128	OUTPUT KVA BAR CHART - This is the 32-bit integer value for the output KVA when it is at 100% of its rated value. The units on this value are volt*amps . This value has 5 digits. It is used to display bar charts of the output kVA .

129-132	DATE - This is a 32-bit representation of the date. The representation may be in either YEAR:MONTH:DAY format or YEAR:JULIAN DATE format. The MONTH: DAY format uses values 1-12 for month and 1-31 for day. The JULIAN DATE format uses the same two bytes for the number of days from the beginning of the year. The form is as follows: <pre> MSB LSB FYY YYYY YYYY MMMM MMMM DDDD DDDD 100 99 98 97 MSB LSB HHHH MMMM MMMM SSSS SSSS TTTT TTTT 104 103 102 101 </pre>
133-136	TIME - This is a 32-bit representation of the time.

6.3.7.1 Alarm Block

The Alarm block contains the state of all the UPS Alarms and Events. This consists of a byte of data for each Alarm or Event. If the value of the byte is zero, then the Alarm or Event is in the inactive state. A non-zero value indicates the active state. The ID block contains a list of all the possible alarms in the Alarm map section. Table 6-9 gives a list of alarms currently in the UPS.

Table 6-9 Alarm Block

Byte Number	Description
1	Bypass under or over frequency
2	Input AC over voltage
3	Input AC under voltage
4	Output AC over voltage
5	Output AC under voltage
6	Output over load
7	Rectifier input over current
8	Inverter output over current
9	DC link over voltage
10	DC link under voltage
11	Rectifier failed
12	Inverter fault
13	Shut-down imminent
14	Battery low
15	Rectifier failai self-test
16	Rectifier EEPROM failure
17	Rectifier EPROM failure
18	Input line voltage loss

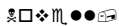
19	Battery DC over voltage
20	Power supply over temperature
21	Power supply failure
22	Power supply 5 volt fault
23	Power supply +/-12 volt fault
24	Heatsink over temperature
25	Heatsink temperature sensor failed
26	Rectifier current over 125%
27	Rectifier fault interrupt failed
28	Rectifier power capacitor fault
29	Inverter program stack error
30	Inverter control board failed self-test
31	Inverter A/D converter self-test failed
32	Inverter ram self-test failure
33	Inverter EEPROM checksum fail
34	Inverter EPROM checksum fail
35	Inverter CPU self-test failed
36	Network not responding
37	Front panel self-test failure
38	Node EEPROM verification error
39	Output AC over voltage test failed
40	Output DC over voltage
41	Input phase rotation error
42	Inverter ramp up test failed
43	Emergency shut-down command
44	Bypass not available
45	Battery totally discharged
46	Inverter voltage too low for ramp level
47	Output Breaker Open
48	Control Power On
49	Control Power Off
50	Greater than 106% overload on phase A
51	Greater than 106% overload on phase B
52	Greater than 125% overload on phase A
53	Greater than 125% overload on phase B

54	Greater than 150% overload on phase A
55	Greater than 150% overload on phase B
56	UPS On Battery
	UPS On Bypass
58	Load Dump
59	Load On Inverter
60	On Command
61	off command
62	Low Battery Shut-down
63	Auto On Enabled
64	Software Change Occurred
65	Charger Fail
66	Bypass Fail

6.4 RELAY SETUP

6 . 4 . 1 Introduction

The relay setup is **available with the UPS Front Panel** Digital Display, informs the hardware of the UPS of **conditions during utility** outages and **battery discharges**. The relay setup requires **a relay circuit card**. The relay supports four **types** of relay interface **configurations**:

- IBM AS/400,
- 
- 3Com,
-  configuration.

The relays open or close based on system alarms. The relay setup determines which system alarm causes which relay to open or close. The configuration is in EEPROM, so the selected configuration will be saved even when power is not applied.

6.4.2 Main Relay Menu Screen

WARNING

The maximum voltage applied across the relays is 50 volts DC. The maximum current the relay can carry is 150 milliampere.

From the System Setup menu. **select** the Main Relay **Menu** Screen.

Relay Setup

1. Display Current Relay Configuration
2. **AS/400**

3. Novell
4. Default 1
5. Custom

6.4.2.1 Display Current Relay Configuration

Use the UP and DOWN arrow keys to move within the menu. Press SELECT for the desired selection. The MENU key returns back to the menu **screen**. If a Banyan system, is installed, select Novell.

6.4.2.2 AS/400 Configuration

The **AS/400** relay configuration provides four signals to inform the **AS/400** computer of the **UPS** status.

Table 6-10 A.51400 Relay Configuration

CONDITION	RELAY	ACTIVATED PIN WHEN CONDITION IS TRUE*
UPS Available	1	Pin 11 (Normally Open)
Utility Failure	2	Pin 14 (Normally Open)
UPS Off Line	3	Pin 17 (Normally Closed)
Battery Weak Signal	4	Pin 24 (Normally Open)

* Pin numbers are provided here for **reference only** and are subject to change. Refer to the Figure 6-5 for pin numbers.

The “Activated” pin makes contact with the Common pin when the condition is true. For **AS/400** the **common** pins of all four **relays** must be tied **together**.

Relay 1 remains energized to inform the computer a UPS is available. Relay 2 energizes to indicate the utility has failed and signals the **AS/400** to start its **QUPSDLYTIM** timer. When this timer has expired, the **AS/400** will automatically shut down. Relay 3 de-energizes to inform the computer the UPS is on bypass. This is the opposite state of Relay 1. Relay 4 energizes to indicate there is insufficient battery power **left** and signals the computer to shut down immediately. The amount of battery time remaining in order to **energize** the **relay** is user **selectable**. This setting is the “Quick Power Down” time of the unit. The default Quick Power Down **time** is 2 minutes.

AS/400 9-Pin interface Cable

Models C30 - 70

Models D30 - 70

UPS		COMPUTER
UPS Pin 1		P24-SHELL
UPS Pin 12		
UPS Pin 15		
UPS Pin 18		
UPS Pin 25	System Common	P24 Pin 5
UPS Pin 17	UPS Off Line (Relay 3)	P24 Pin 6
UPS Pin 24	Battery Weak (Relay 4)	P24 Pin 7
UPS Pin 11	UPS Available (Relay 1)	P24 Pin 8
UPS Pin 14	Utility Failure (Relay 2)	P24 Pin 9

P1 connector is a
two row 25 pin
D-subminiature with
male pins

Connector is a
standard two row 9 pin
D-subminiature with
male pins

- available in 15', 30', 50', 75' and 100' lengths

- part number: 124902074-XXX (XXX = length in feet)

AS/400 15-Pin Interface Cable

Models C10 - 20

.. Models D10 - 20

UPS		COMPUTER
UPS Pin 1		P4 - SHELL
UPS Pin 11	UPS Available (Relay 1)	P4 Pin 2
UPS Pin 17	UPS Off Line (Relay 3)	P4 Pin 3
UPS Pin 14	Utility Failure (Relay 2)	P4 Pin 9
UPS Pin 24	Battery Weak (Relay 4)	P4 Pin 10
UPS Pin 12	System Common	P4 Pin 11
UPS Pin 15		
UPS Pin 18		
UPS Pin 25		

P1 connector is a
two row 25 pin
D-subminiature with
male pins

Connector is a
standard two row 15 pin
D-subminiature with
male pins

- available in 15', 30', 50', 75' and 100' lengths

- part number: 124902075-XXX (XXX = length in feet)

AS/400 MENU SCREEN

AS/400 Relays

1. Select **AS/400** Relay Configuration
2. Set/Read Quick **Power** Down **Time**

Use the UP and DOWN **arrow** keys to move **in** the menu. Use the select key to select the relay **configuration** or power down **time**.

SET/READ QUICK POWER DOWN **TIME**

Set/Read **Tie**

00:00

Use the UP and DOWN arrow keys to increment or decrement the digits to set the time. Press the **SELECT** key to save the time. Be sure the time is less than (**<**) or equal to (**=**) the amount of battery time remaining which is selected. Use the MENU key to return to the menu.

6.4.2.3 Novell **Configuration**

The Novell and Banyan relay configurations are identical. The relay **configurations** provide two signals to inform the **Novell** computer network of the UPS status.

CONDITION	RELAY	ACTIVATED PIN WHEN CONDITION IS TRUE*
on Utility Power	1 Pin 11	(Normally Open)
Low Battery Warning	4 Pin 23	(Normally Closed)

Relay 1 energizes to indicate the UPS is running normally. Relay 1 de-energizes to indicates the utility has failed. **Relay 4 de-energizes** to indicate there is **insufficient** battery power left and signals the computer to shut down immediately. The amount of battery time remaining in order to de-energize the relay is user selectable. **This** setting is the **"Battery Time Remaining Alarm Level"** of the unit. The default **time** is 2 minutes. See the **Custom Configuration** section for more information on setting the Battery **Time Remaining Alarm Level**.

Novell Relays

1. Select Novell Relay Configuration

Press the **SELECT** key to select this **configuration**. Use the **MENU** key to return to the menu.

6.424 AT & T/Default 1

The “AT & T/Default 1” relay configuration provides four relay signals. **Latched Battery Time Remaining Low** is set using the BTM communications mode timer.

Table 5-11 AT&T/Default 1 Relay Configuration

CONDITION CONDITION IS TRUE*	RELAY	ACTIVATED PIN WHEN
Latched Battery Time Remaining Low	1	Pin 11 (Normally Open)
System On Battery	2	Pin 14 (Normally open)
UPS On Bypass -OR- 125% overload	3	Pin 19 (Normally Open)
Output DC Overvoltage -OR- Output AC Overvoltage -OR- FRU Failed Self Test	4	Pin 24 (Normally Open)

* Pin numbers are provided here for reference only and are subject to change. Refer to the Figure 6-5 for pin numbers.

Relay 1 energizes to inform the computer the battery **time remaining** has fallen below a preset level **determined** in the **BTM** communications setup menu. The signal is **only active when the UPS has lost the utility power and can only be deactivated by restoring the utility power**. Relay 2 energizes to indicate the UPS is on Bypass or in Overload. The UPS will automatically transfer to Bypass after 30 seconds of a 125% Overload. Relay 3 energizes to indicate the UPS is on Bypass or in Overload. Relay 4 energizes to indicate the UPS is not **functioning properly**. Default 1 Menu Screen.

Select AT & T/Default 1 Relay Configuration

Since **there** is only one **menu** item, use the UP and DOWN arrow keys to select the desired selection. Use the RIGHT and **LEFT** arrow keys to display the entire message. Press the **SELECT** key to display the message Default 1 is selected. Press the MENU key to return to the **Main** Relay Menu.

6.4.2.5 Custom Configuration

The Custom configuration is used to define a unique relay definition for each of the four relays. Following is the menu:

Custom Relays

1. Relay 1 Setup
2. Relay 2 Setup
3. Relay 3 Setup
4. Relay 4 Setup
5. **Set/Read** Battery **Time** Remaining Trip Level

Use the UP and DOWN arrow keys to move **within** the menu. Press the **SELECT** key on items 1- 4 for the Relay Setup menu. Press the **SELECT** key on item **5** for the Set/Read Battery **Time Remaining** Trip Level. Use the MENU key to return to the menu.

6.42.6 Relay Number Setup

This is used to **configure** a single relay or look at the current configuration of a relay.

Relay # Setup

1. Set/Clear Relay Alarm Conditions
2. Clear All Relay Alarm Conditions
3. Display Relay Alarm Conditions
4. **Invert** Relay **output Polarity**

Use the UP and DOWN arrow keys to move within the menu. Press the SELECT key while the cursor is on the first relay setup to display the Set/Clear Relay Alarm Conditions menu. Once in this menu, use the SELECT key to select a **specific** alarm. An asterisk indicates the item is selected.

The second menu allows the relay setup to be cleared. The **third** menu only allows viewing of the **selected** alarms. The fourth menu simply inverts the state of the relay. Usually, relays energize when the selected conditions are **true**. Inverting the relay causes it to energize when **the** selected conditions are false.

If more than one status **conditions** or alarm for a single relay is **selected**, then the relay will be energized when **any** of those conditions or alarms are **true**. All condition does not have to be true to energize the relay, **just** one.

Following is the list of status **conditions** and **alarms**:

Table 6-12 Alarms Status Conditions

SET/READ ALARMS	SET/READ ALARMS
1. BATTERY TIME REMAINING LOW	17. INPUT UNDER VOLTAGE
2. SYSTEM NORMAL	18. INPUT OVER VOLTAGE
3. SYSTEM ON BYPASS	19. RECTIFIER SHUT-DOWN IMMINENT
4. SYSTEM NOT ON BYPASS	20. INPUT PHASE ROTATION ERROR
5. LOAD ON INVERTER	21. DC LINK UNDER VOLTAGE
6. SYSTEM ON BATTERY	22. DC LINK OVER VOLTAGE
7. INVERTER SENSES DC LINK OVER VOLTAGE	23. INPUT LINE VOLTAGE LOSS
8. OUTPUT DC OVER VOLTAGE	24. COMPLETE BATTERY DISCHARGE
9. OUTPUT OVER CURRENT TRIP	25. BATTERY DC UNDER VOLTAGE
10. OUTPUT UNDER VOLTAGE	26. BATTERY DC OVER VOLTAGE
11. OUTPUT OVER VOLTAGE	27. POWER SUPPLY OVER TEMPERATURE
12. GREATER THAN 150% OVERLOAD	28. HEATSINK OVER TEMPERATURE
13. GREATER THAN 125% OVERLOAD	29. RECTIFIER CURRENT OVER 100%
14. GREATER THAN 106% OVERLOAD	30. RECTIFIER CURRENT OVER 125%
15. BYPASS UNDER FREQ/OVER FREQ	31. BYPASS NOT AVAILABLE
16. INVERTER SHUTDOWN IMMINENT	32. FRU FAILED SELF TEST
	33. LATCHED BATTERY TIME REMAINING LOW

Table 6-13 All Relays Configuration

	RELAY1	RELAY 2	RELAY3	RELAY4
AS/400	UPS Available 4.5	Utility Failure 6,17, 23	UPS Off Line 4, 5	Battery Weak (2 min or less) 1,16, 21, 24,25
NOVELL	On Utility 6, 17,23 (polarity in- verted)	Not Used	Not Used	Low Battery 1, 16, 21, 24, 25 (polarity in- verted)
AT&T DEFAULT 1	Latched Battery Tie Remaining Low (2 min or less) 33	system On Battery 6	On Bypass or overload 3, 13	UPS Malfunction 8, 11,32

The numbers in the chart correspond with the SET/READ ALARMS.

To Clear All Relay Alarm Conditions, position the cursor on this item and press the SELECT button. A message indicating all alarms have been cleared will be displayed.

Select Display Relay Alarm Conditions to display the following screen:

RELAY ALARMS

1. BATTERY **TIME REMAINING**

21 INPUT **LINE** VOLTAGE LOSS

OR

RELAY ALARMS

NO ALARMS SELECTED

Use the SELECT key to **Select Invert** Relay Output Polarity. An asterisk indicates selection. Use the MENU key to return to the menu.

6.5 REMOTE MONITOR PANEL

The remote monitor connects to the system via an **DB-25S** serial **interface** cable. Listed below are the status and **alarms** conditions of the UPS monitored by the Remote Monitor. Refer to figure 6-7.

NOTE:

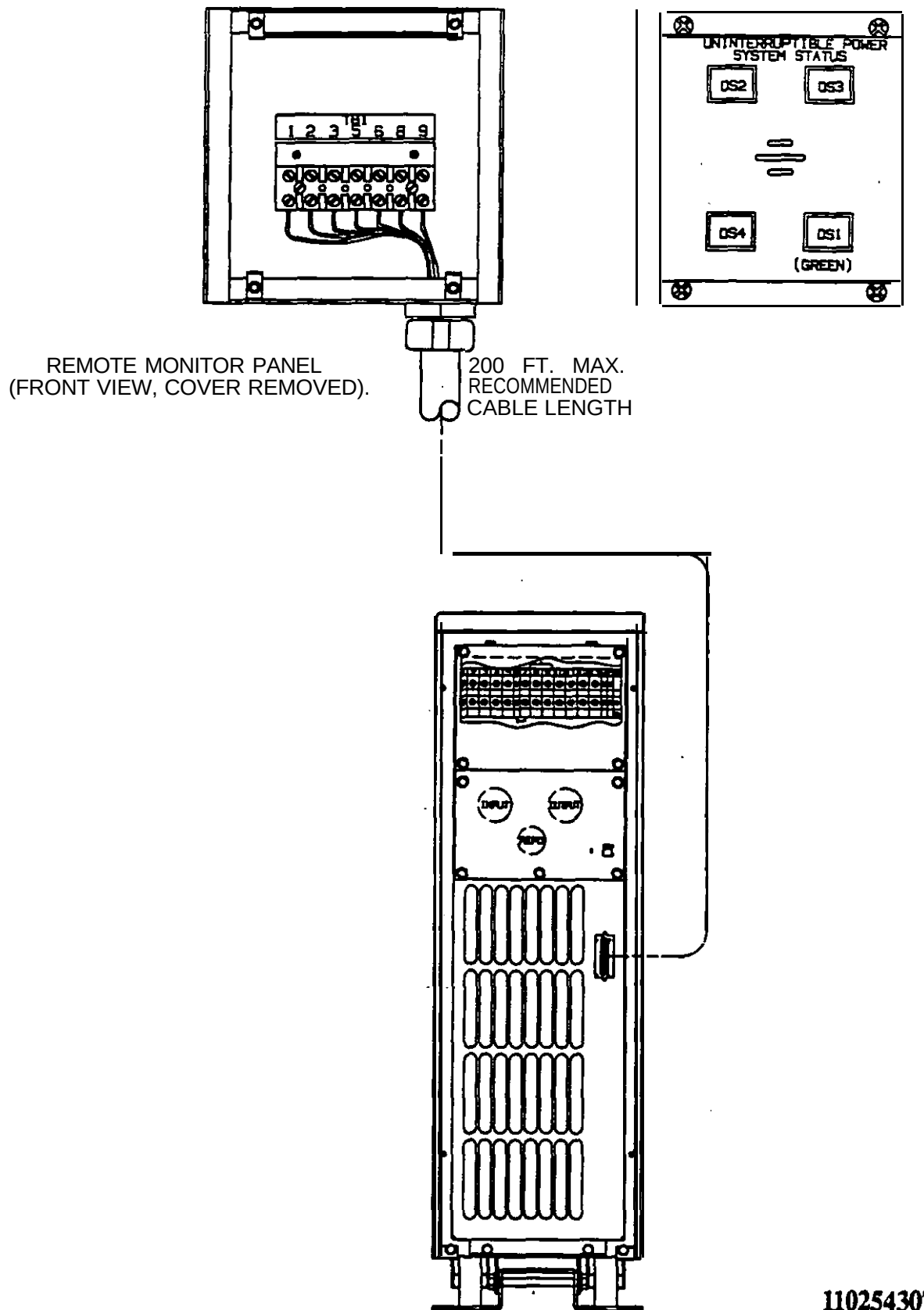
*The **maximum** recommended cable length for the remote monitor is 200 ft.*

SYSTEM NORMAL (DS1)	Lit green when the UPS is energized and supplying conditioned power to the load.
ON BATTERY (DS2)	Lit yellow when the UPS is supplying the load on battery . Input parameters may not be within specifications . Horn sounds after 30 seconds.
ON BYPASS (DS3)	Lit yellow when the UPS is supplying the load from a Bypass source. Horn sounds after 30 seconds.
UPS FAIL (DS4)	Lit red and UPS has shutdown and transferred to bypass.
HORN	Press the HORN pushbutton to silence the HORN. TO perform lamp test, Press and hold the HORN pushbutton for 5 seconds, all lamps should be lit.

Perform lamps test. If any **incorrect** lamps are lit, or if any lamps are not **lit**, verify **proper installation** of the RMP, reference to drawing 110254307. Also refer to Figure 6-5 **Communications** Pin Assignments. Table **6-14** provides additional information.

Table 6-14 RMP Interface Wiring

REMOTE MONITOR PANEL (RMP)	COMMUNICATIONS INTERFACE DB-25	DESCRIPTION	DRIVES
1	24	RELAY 4 N.O.	DS4
2	7	SIGNAL COMMON	
3	13	RELAY 1 N.C.	DS2
5	17	RELAY 3 N.O./N.C.	DS3
6	14	RELAY 2 N.O.	DS1
8	22	-12 v	
9	8	+12 V	



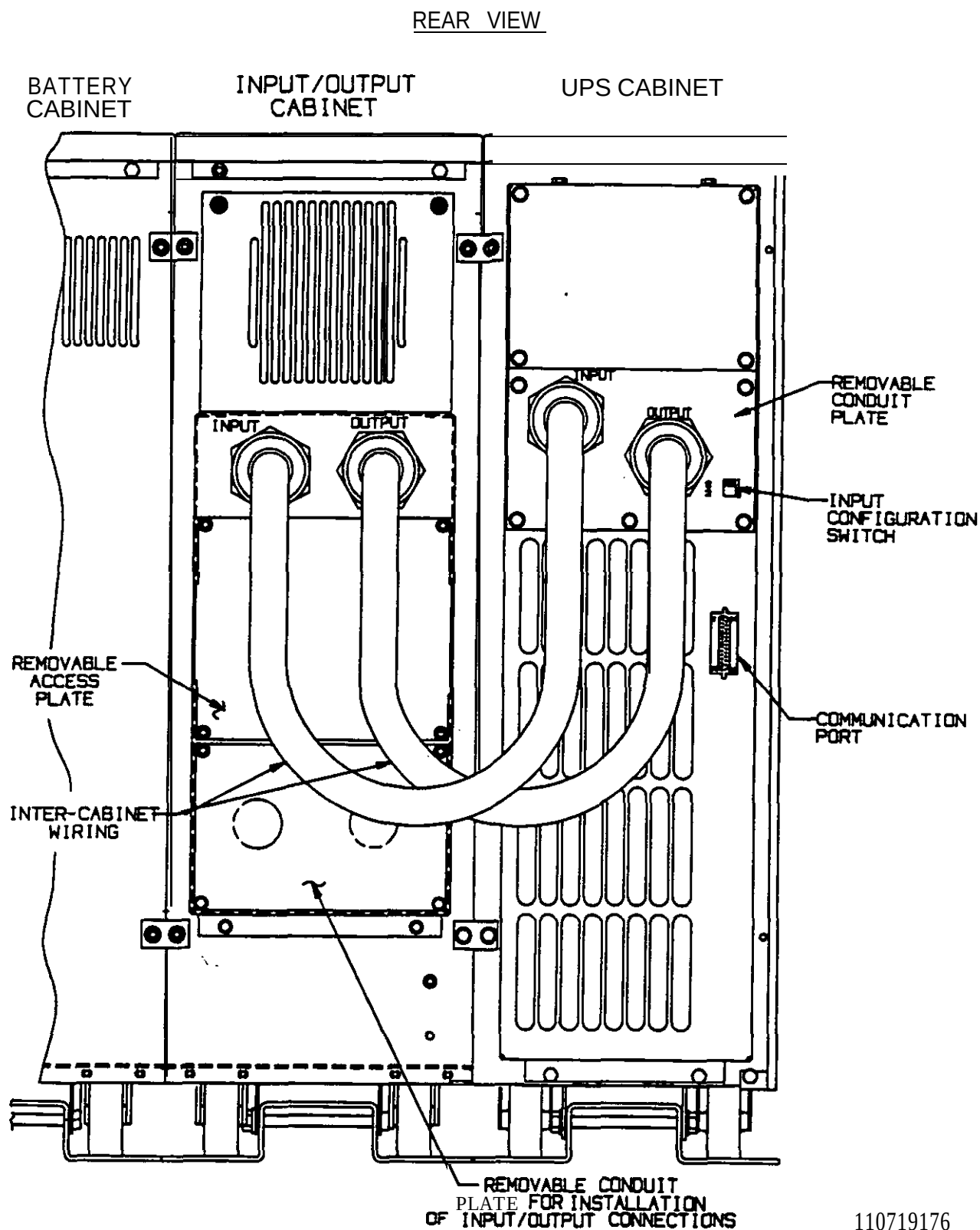
110254307

Figure 6-7 RMP Installation

4.6 HIGH VOLTAGE TRANSFORMER CABINET

The high voltage **transformer** cabinet is a stand-alone cabinet which provides HV interface for the UPS. The cabinet houses six **toroidal shaped** auto-transformers, which **lowers** the high voltage for **the input to the UPS**, and **raises the UPS output voltage for connection** to the load. The **transformer** input and output **connections** are located on **terminal** blocks (TB 1-TB5). The **transformer** taps provide the following voltages:

- . 380 VAC
- . 400VAC
- . 415VAC



110719176

Figure 6-8 High Voltage Transformer Cabinet Installation

Troubleshooting and Maintenance

NOTE

The following I/O diagrams are provided for reference use to determine failure in the UPS. The NO diagrams are to be used in conjunction with the Alarm Informations Table located after the I/O diagrams.

7.1 RECTIFIER TROUBLESHOOTING

CAUTION

When removing and replacing any logic board, ensure all jumpers are in the correct position. Ensure W1 is in correct position for the type of Eeprom installed.

7.1.1 Power Supply Test

The power supply provides power for control, monitoring, and internal diagnostics for the unit. This power supply derives its power from rectified AC inputs (measured at the input to the rectifier bridge) and provides three regulated voltages; +7 VDC, +15 VDC, and -15 VDC. F1 - F3 provides overcurrent protection to the Power Supply board (A1A3). F1 provides overcurrent protection for +7 VDC, F2 provides overcurrent protection for +15 VDC, and F3 provides overcurrent protection for -15 VDC. The following voltages are derived on the Power Supply Board (A1A3). Refer to figure 7-1.

Measure the following power supply voltages on J2.

- +5 VDC on J2 pins 3 (Control LVDO) and pin 5 (Control Power Supply Temp Return)
- +7 VDC on J2 pin 11
- -15 VDC on J2 pin 7
- +15 VDC on J2 pin 9

If any of the voltages are not present, replace the Rectifier Power Supply (A1A3).

7.1.2 Battery Voltage

Verify Battery Open Cell voltage is 240 VDC on TB1-5 (BATT +) and TB1-6 (BATT -). Verify Battery Floating voltage is 270 VDC. Measure 420 VDC voltage on E1 (+) and E2 (-). If there is no voltage, or the voltage is incorrect, replace the Rectifier FRU.

7.13 Battery SCR

The Battery SCR is turned "ON" in the event of a utility failure so power may be drawn from the Batteries. The Battery SCR is **gated** by the Battery SCR **circuitry** located on the **Rectifier** Control board. If the Battery SCR is **gated**, verify the batteries are not in **overcharge**. The **battery** voltage should be less **than (<)** 290 VDC. If the Battery voltage is **> (greater than)** 290 VDC, then the Battery SCR is shorted and needs to be replaced. Refer to figure 7N0 TAG.

7.1.4 IGBTs

To verify the operation of **the** IGBTs, measure the output frequency of the IGBTs. The output should **be** 27 - 30 **kHz depending on the amount of** load applied to the unit. If there is no output, **power** down the unit. **Ensure** all power is removed from the UPS and remove the IGBTs. Refer to the removal and replacement **procedures**.

CAUTION

Do not check the IGBTs gate signals with the unit running with a metering device. The devices impedance is too high and could damage the IGBTs, Gate Drive board, or the Rectifier Control board. Remove all power before measuring the IGBTs.

CAUTION

The IGBTs are static sensitive devices, follow the outline instructions in Chapter 2 regarding handling of static sensitive material.

CAUTION

Do not remove the IGBTs gate leads until the IGBTs has been installed.

Table 7-1

Test Points	Measurement Approx. value (in ohms)
C1 to E2	160 meg
C1 to C2E1	130 meg
E2 to C2E1	200K

7.1.5 Fan Power

The Rectifier Control board controls the fan speed to reduce the audible noise at low loads and increase the speed at high loads for cooling. The voltage across the fan terminals (J3 pins 3 and 4) controls the fan speed. The voltage supplied to the fan is derived from the +/- 15 VDC of the Rectifier Power Supply board. Measure J3 Pins 4 and 5 for 30 VDC on the Rectifier Control board. If the voltage is not present, verify the +/- 15 VDC. If the voltage is present, replace the fan.

7.1.6 Thermistor

The temperature is sensed in two places in the unit. The main sensing is located on the heat sink assembly in the Rectifier FRU. The second sensing is located on the power supply directly in front of the fan. A thermistor is used for fast warning of conditions such as fan failure. The detection for a power supply failure needs a quicker response than for an heat sink temperature failure. The thermistor can also detect fan failure if the unit is under no load. The following voltages should be measured for the temperatures of the thermistor:

Surface temperature
of thermistor

25° C

35° C

45° C

65° C

Power Supply Temperature
Voltage Level

+3.48 VDC +/- 9.5%

+2.94 VDC +/- 10.4%

+2.32 VDC +/- 11.4%

1.55 VDC +/- 12.7%

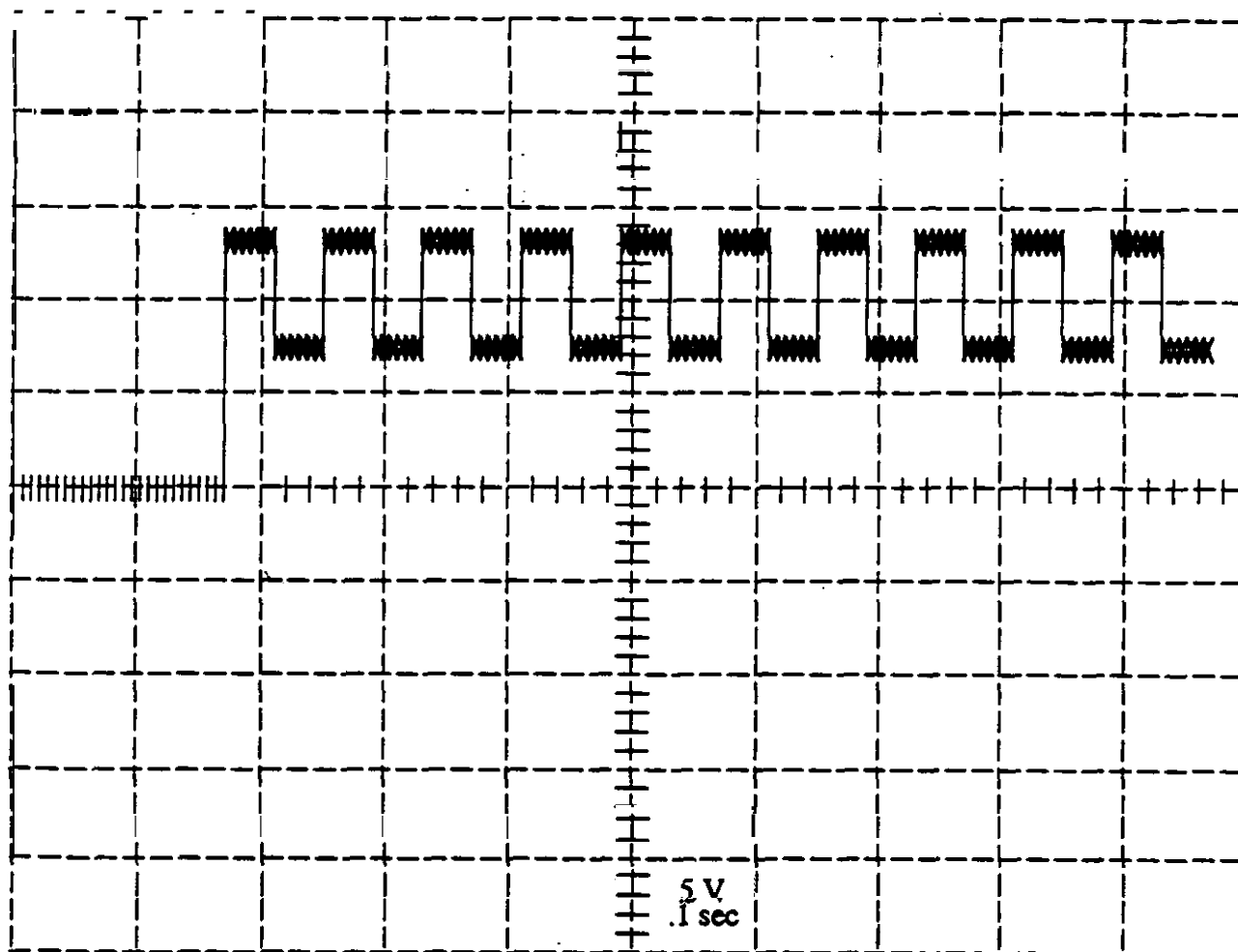


Figure 7-1 Q5 (Battery SCR) Gate Signal

		INPUTS	POWER SUPPLY BOARD	OUTPUTS	
18	>>	J1-1	DC IN	+7 V D C	J2-1 >> 208
13	>>	J1-5	Return	Common (Gnd)	J2-2 >> 300
305	>>	J4-1	Ground	+15 VDC	J2-3 >> 200
				Common	J2-4 >> 300
				-15 VDC	J2-5 >> 201
				Common	J2-6 >> 300
				PS Temp	J2-7 >> 121
				Common	J2-8 >> 300
				LVDO	J2-9 >> 122
				Common	J2-10 >> 300
				+7 V D C	J3-1 >> 208
				Common	J3-2 >> 300
				+15 VDC	J3-3 >> 200
				Common	J3-4 >> 300
				-15 VDC	J3-5 >> 201
				Common	J3-6 >> 300

Figure 7-2 *I/O Power Supply Board*

7.2 INVERTER TROUBLESHOOTING

Measure the following power supply voltages on J3.

- +7 VDC on J3 pin 1.
- -15 VDC on J3 pin 3.
- +15 VDC on J3 pin 5.

If voltages are **correct**, measure the following regulated power voltages;

- +5 +/- .25 VDC at U62 Pin 3 (pin 2 ground)
- +12 +/- .75 VDC at U63 Pin 3 @in 2 ground)
- -12 VDC +/- .75 VDC at U64 Pin 3 (pin 1 ground)

If the **voltages** are not **correct**, replace the Inverter **Control** board.

7.2.1 IGBTs

To **verify the operation** of the IGBTs, measure the output of the IGBTs. The output should be a PWM signal (100 pulses); If there is no output, **power** down the unit. Ensure all power is removed from the UPS **and** remove the IGBTs. Refer to the Removal and Replacement of IGBTs.

CAUTION

Do not check the **IGBTs** gate signals with the unit running **with** a metering device. The **devices impedance** is too high **and could damage** the **IGBTs, Gate Drive board, or the Rectifier Control board**. Remove **all** power before measuring the IGBTs

CAUTION

The IGBTs are **static sensitives** devices, **follow** the instructions in Chapter 2 **regarding handling** of static sensitive **material**.

CAUTION

Do not remove the IGBT gate leads **until** the IGBT has been **installed**.

CAUTION

It is recommended when replacing an **IGBT**, the **Inverter Control board** and **Gate Drive board** **should also** be **replaced**.

Teat Points	Measurement Approx. value (in ohms)
C1 to E2	160 meg
C1 to C2E1	130 meg
E2 to C2E1	200K

72.2 Fan Power

Inverter Fan power comes from the **Rectifier** Power Supply board. Measure 22 VDC on A2J2 Pins 1 and 2. If the voltage is not present, check Rectifier Power Supply board.

72.3 Inverter Sensing

Measure 150–190 VAC on J1-1 (Phase A), J1-7 (Phase B), and J1-13 (phase C). If voltage is not present, replace Inverter IGBTs, Inverter Control board, or the Gate Drive board.

72.4 sync

NOTE:

If a generator is running, ensure generator voltage and frequency are within specifications before replacing any board.

If the **unit** will not sync to bypass, check phase rotation. Then measure 0-5 VDC, 5-60 cycles on J3 Pin 17 and 19. If signals are **present**, check the Bypass Control board. Then **replace** the Bypass Control board **or the** Inverter Control board. **If** the signals are not present, replace the **Rectifier Control** board.

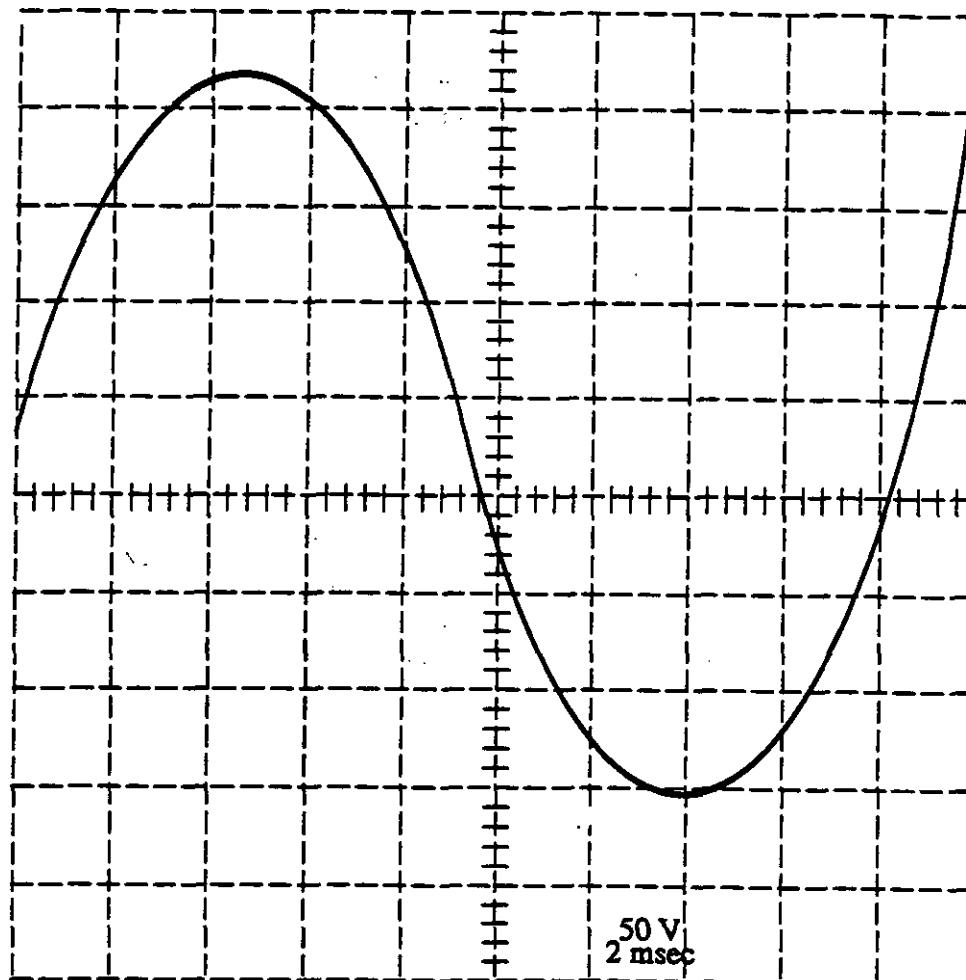


Figure 7-4 Inverter Output

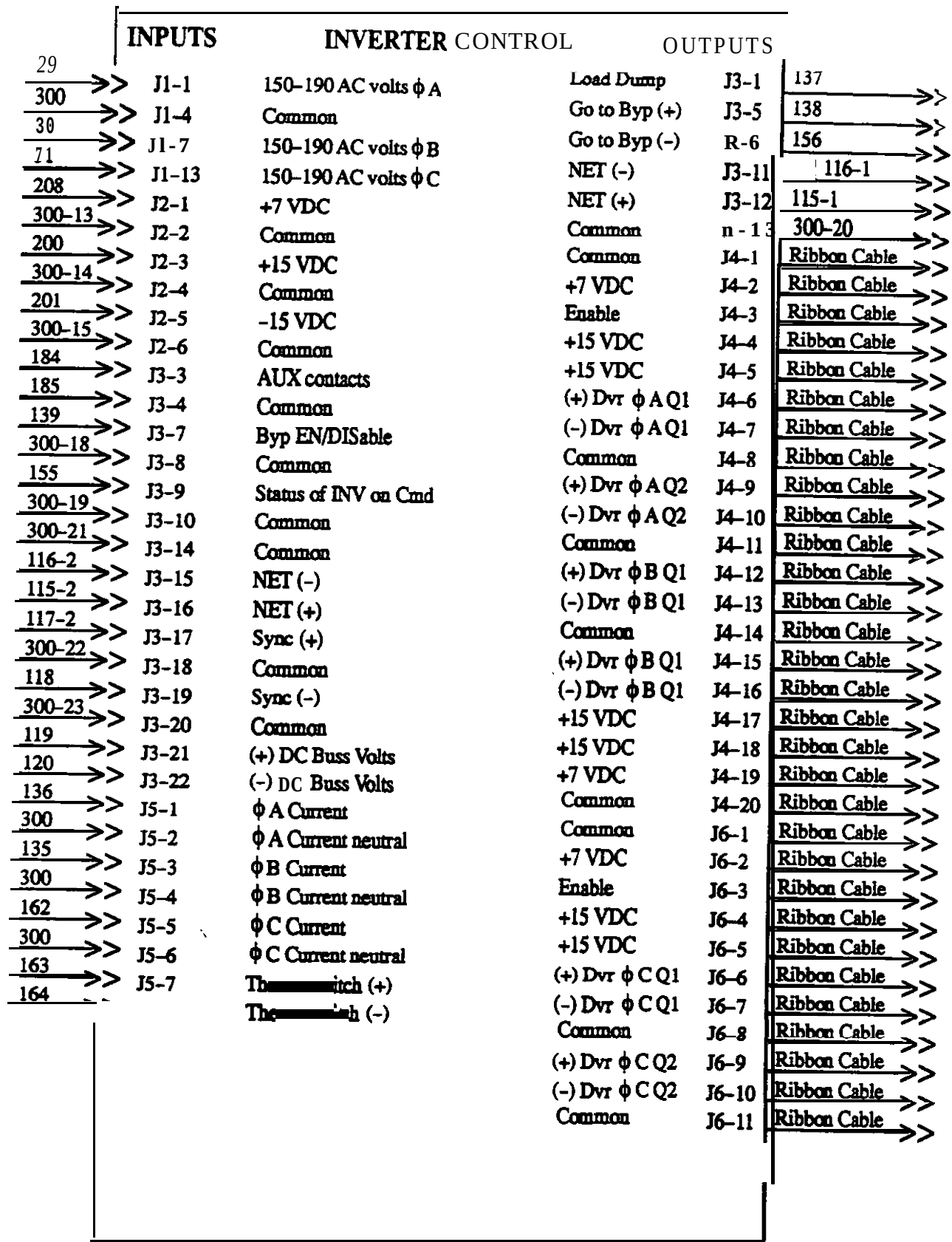


Figure 7-5 I/O Inverter Control Board

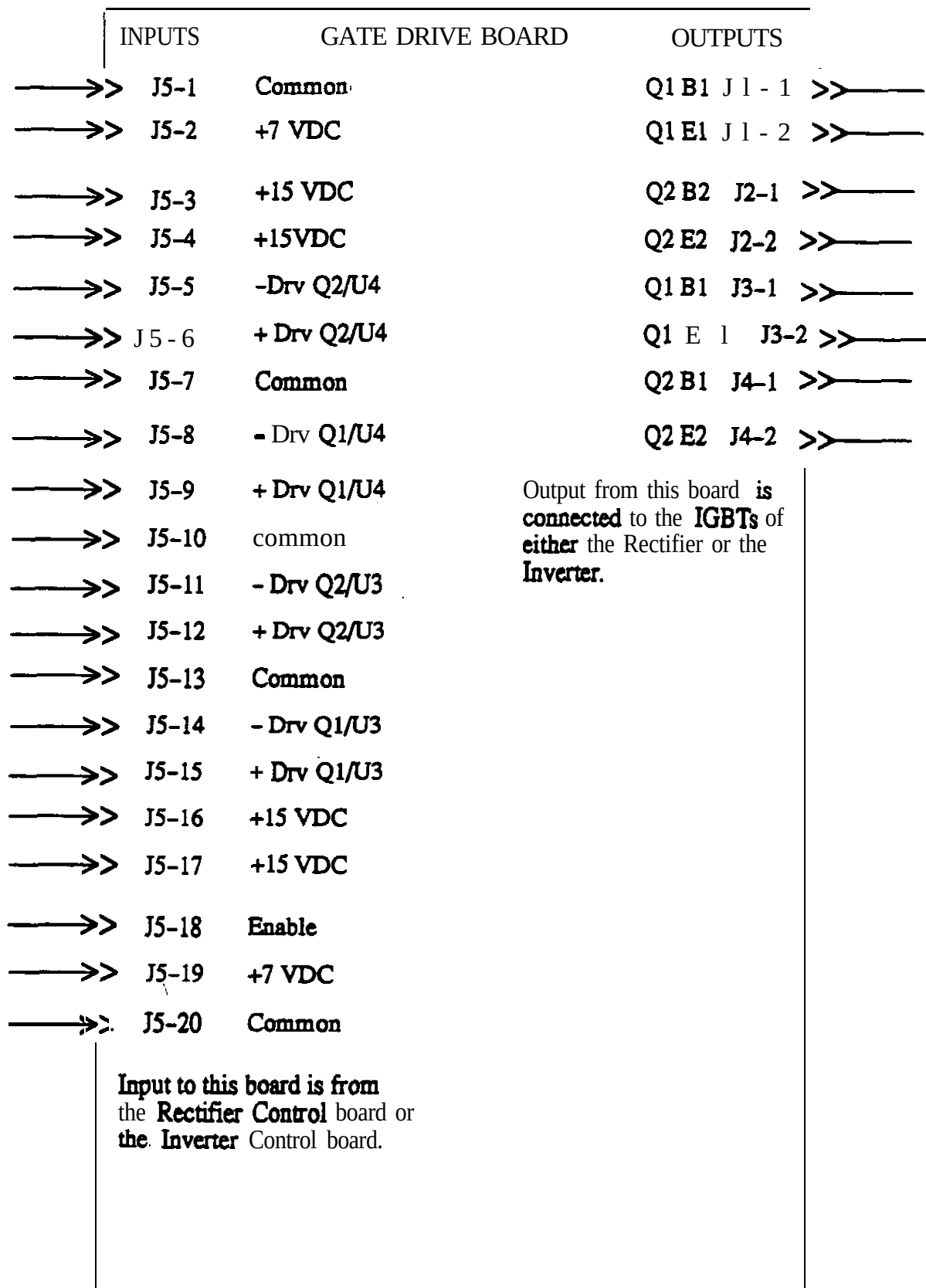


Figure 7-6 I/O Gate Drive Board

7.3 COMMUNICATION TROUBLESHOOTING

The Inter-FRU serial network, known as “AST-NET”, is the main link between the FRU and the entire system. For the unit to operate, the alarm messages on the network must consist of the following:

- alarm conditions detected by the FRU
- FRU status
- commands from the front panel or other FRUs
- information on each of the parameters inside the FRU and metering information.

The Rectifier and Inverter LEDs will be flashing during NORMAL operation. If the LEDs are not flashing, the FRU is not responding to the network, Replace the suspect FRU.

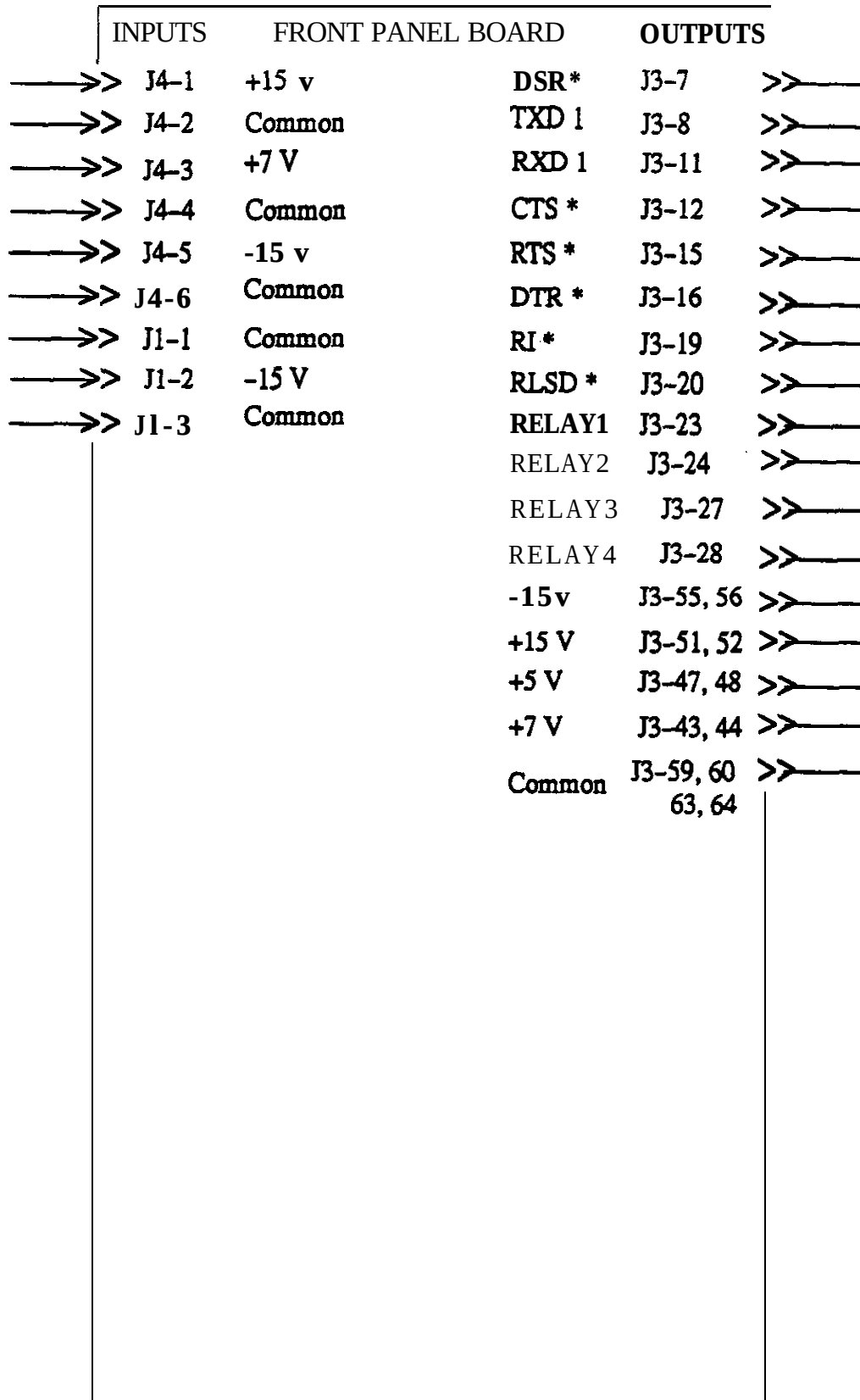


Figure 7-7 I/O Front Panel Board

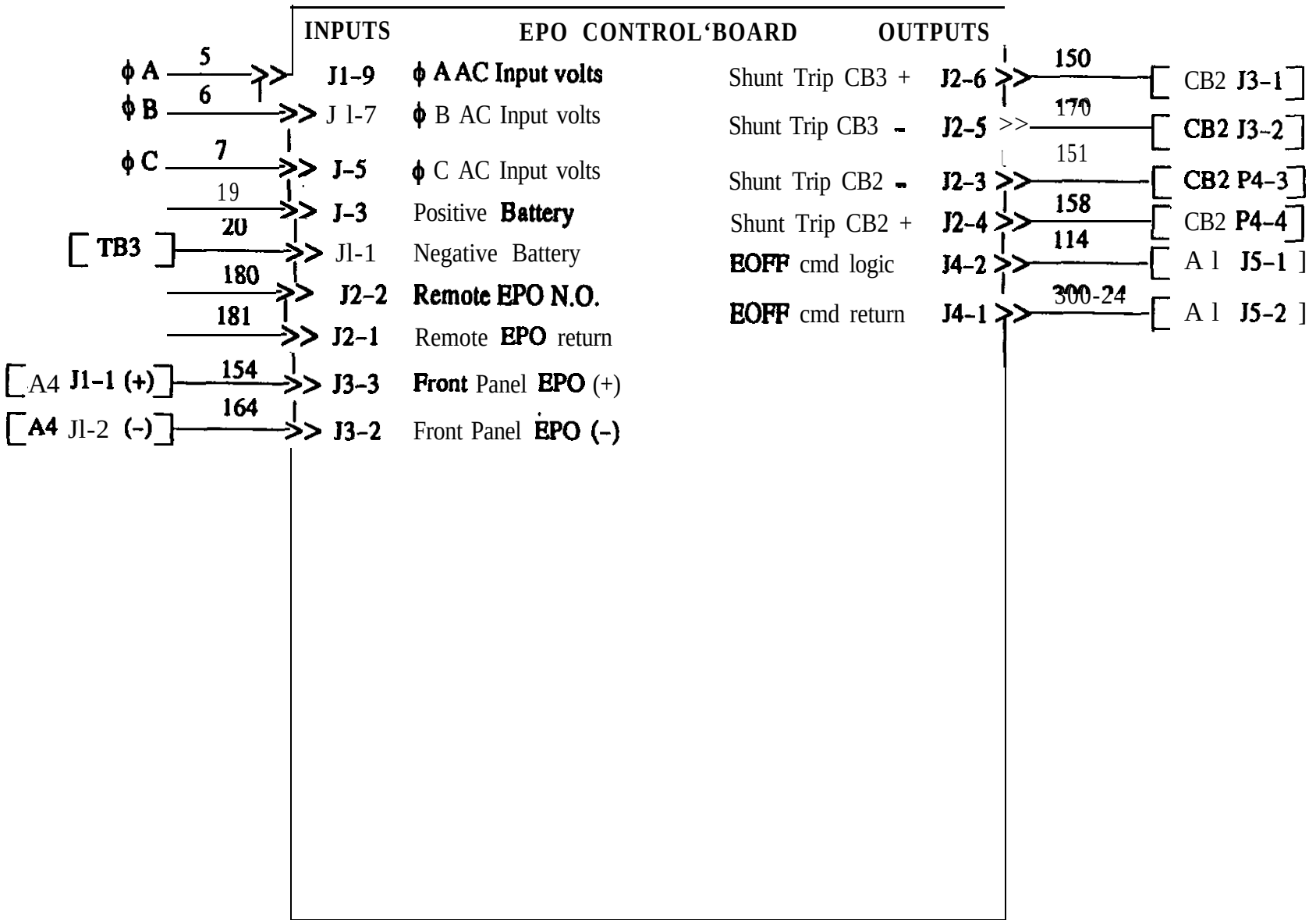
7.4 EPO OPTION

CAUTION

When the unit **is** not in use, the batteries **should** be disconnected. The EPO Control board **can discharge** the batteries over a long period of time.

The EPO command shunts trips **CB2** and CB3 only. Measure **+36** VDC across J2 pins 6 and 5. If voltage is not present, replace the EPO Control board. If the voltage is present, check the shunt trip wires (**#150** and **#170**) for CB3 and (**#151** and **#158**) for CB2.

Figure 7-8 I/O EPO Control Board



7.5 BYPASS CONTROL TROUBLESHOOTING

CAUTION

All power must be removed before removal and replacement of the Bypass Control board.

7.5.1 Relays

The relay **coils** are driven by the Bypass Control **board**. The Bypass Control board receives power **from Phase A and Phase B** of the AC input to the **unit**. During normal operation the coil holding voltage is **+12 VDC**. But also for an **instantaneous energization** (high voltage recharge), 220 **+/- 15 VDC** is **applied across the** contactor to energize the **coil** faster. Measure the coil resistance across **all** three wils (**K1-K3**) at J2 **Pins 1 (#190) and 2 (#191)**. The resistance shall be 16.3 **ohms**.

7.5.2 "GO TO BYPASS" and "GO TO INVERTER" Command

When a "GO **TO** BYPASS" command is given, the voltage at J3 **Pin 2 (+)** should be **+5 VDC**. When a "GO **TO** INVERTER" command is given, the voltage at J3 **Pin 3 (-)** should be **+5 VDC**. If the **voltages are** not present, replace the Bypass Control board or the **Inverter** Control board.

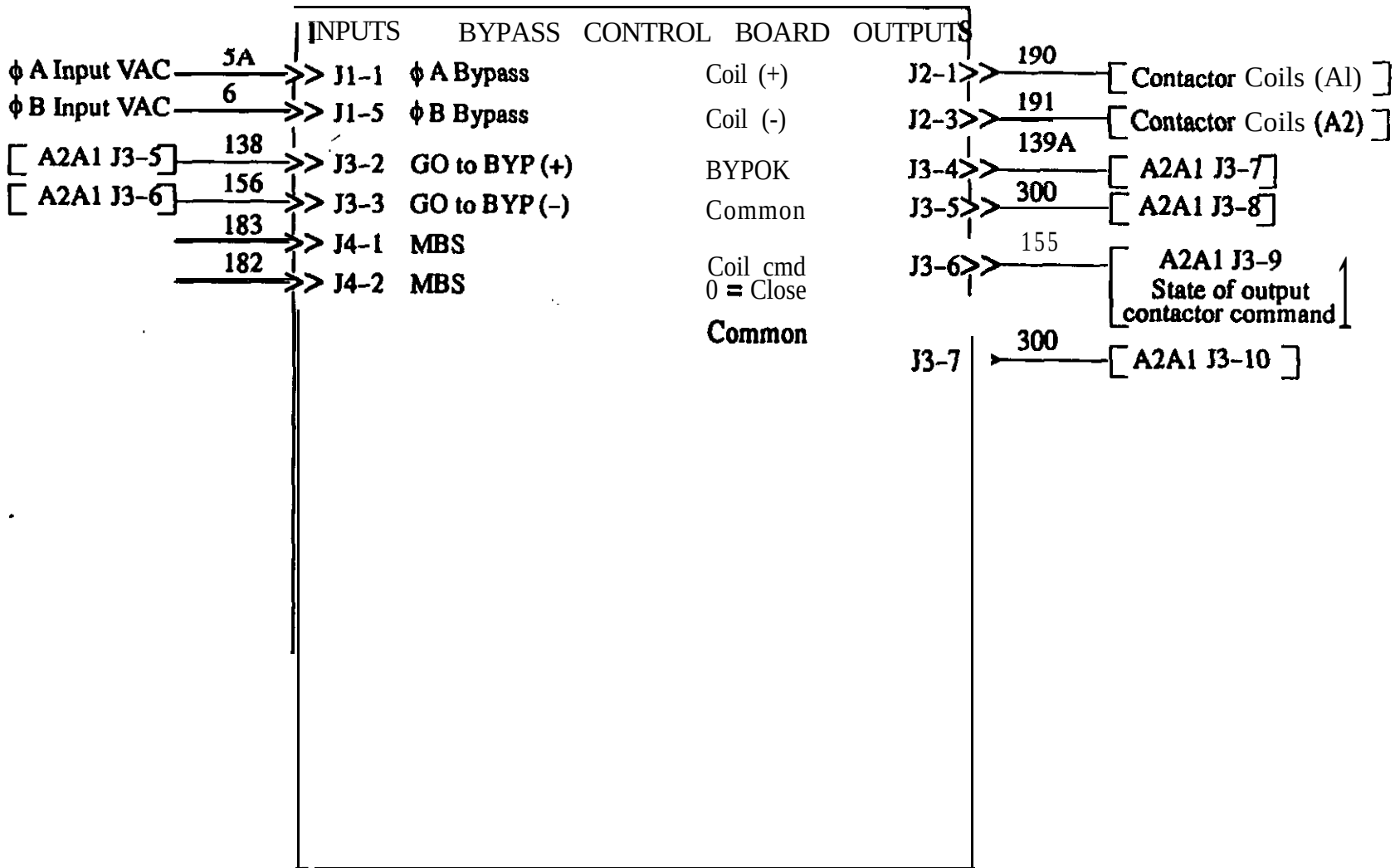


Figure 7-9 I/O Bypass Control Board

7.6 FRU FAILURE DISPLAY

Note:

The FRU failure display can be checked in any mode of operation.

The Front Panel gives important diagnostic information in the form of FRU failure displays. The **display** mode can be **entered** into after a lamp **test function** and **identifies** the FRU most likely caused the **failure**. Please note these indications **are not 100% correct and** should serve only to assist in **troubleshooting the** suspected FRU. Then examine the FRU status **LEDs**.

To view the FRU failure display, hold **the** HORN button, and wait through the lamp test functions (approx. 8 seconds). At **this** time all but one of the Front Panel lamps **will** go out. Compare the remaining LED's by monitoring the FRU status LED's and the ALARM QUEUE to determine the **most likely** FRU failure.

FRU FAILURE MODE	
FRONT PANEL LED	FRU INDICATED
NORMAL	INVERTER
BYPASS	I/O
BATTERY	RECTIFIER
OVERLOAD	FRONT PANEL

To clear an alarm press the OFF **button** while still holding **the** HORN. The alarm **will** automatically clear when the ON button is pressed to restart the **unit**.

7.7 RECTIFIER STATUS **LEDs**

Red and green status **LEDs** are on the **Rectifier** Control card. **The** side panel of the **Rectifier** would have to be lowered to view the **LED's**.

If an error exists and the Inverter is off the red and green LED's will flash a binary code to indicate the type of error. The code structure is an eight bit binary pattern with two pause bits inserted at the end to determine when the code starts. To read the code first wait for the **pause** (approx. four seconds). then each time the green **LED** is lit, write down the status of the red LED using 1 for on, and 0 for off condition. The eight bit binary number can now be referenced to the list of alarms.

EXAMPLE:

G	p	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	p
R	d	0		0		0		0		1		1		1		1	d

binary number **00000111** = PHASES **ROTATED**

ERROR CODE	DECIMAL	BINARY CODE
RECTIFIER FAILED	2.55	1111111
+5V POWER SUPPLY FAULT	24	00011000

12V POWER SUPPLY FAULT	23	00010111
OVER CURRENT FAULT	22	00010110
BUSS OVER VOLTAGE FAULT	21	00010101
DCOV	20	00010100
BATTERY DCOV	19	00010011
POWER SUPPLY OVER TEMP.	18	00010010
POWER SUPPLY TEMP FAIL	17	00010001
HEAT SINK O.T.	16	00010000
HEAT SINK TEMP FAIL	15	00001111
INPUT OV FAULT	14	00001110
OUTPUT OV FAULT	13	00001101
BATTERY DCOV	12	00001100
FAULT INTERRUPT FAILED	11	00001011
PHASE A OR PHASE B ACOV	10	00001010
EPO FAULT	9	00001001
PHASE A OR PHASE B ACUV	8	00001000
PHASES ROTATED	7	00000111
EEPROM FAILED	6	00000110
EPROM FAILED	5	00000101
CAP FAULT	4	00000100

7.8 INVERTER STATUS *LEDS*

Red and green LED's are provided on the **Inverter Control card** to indicate the status of the **Inverter FRU**. The LEDs can be viewed from the left side of the unit after the side panel of the **Inverter** is lowered.

Normal operation is indicated by:

- **Alternate flashing of the red and green LED's.** = Normal operation at 60 Hz
- **A steady on red LED and a flashing green LED.** = Normal operation at 50 Hz
- **A steady off red LED and a flashing green LED.** = Inverter is off and no error has occurred

If an error exists and the Inverter is off the red and green LED's will flash a binary code to indicate the type of **error**. The code structure is an eight bit binary pattern with two pause bits inserted at the end to determine when the code starts. To read the code first wait for the pause (approx. four sec.) then each time the green LED is lit write down the status of the red LED using 1 for on and 0 for off condition. The eight bit binary number can now be referenced to the list of alarms.

EXAMPLE:

G	p	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	p
R	p	0		0		0		1		0		1		0		0	p

binary number 00010100 = Alarm condition ACOV

CODE	DESCRIPTION
00000000	NO ERROR
00000011	SOFTWARE 106% CURRENT LIMIT
00000100	SOFTWARE 125% CURRENT LIMIT
00000101	SOFTWARE 150% CURRENT LIMIT
00001010	HARDWARE CURRENT LIMIT
00001111	HARDWARE ACOV DETECTION
00010100	HARDWARE ACOV DETECTION
00011000	HARDWARE OLTF/UT DCOV DETECTION

7.9 MAINTENANCE MODE

CAUTION

Entering the maintenance mode of operation will remove power from the load.

NOTE:

CB3 must be open to enter into Maintenance Mode.

To enter the maintenance mode, start with the unit off and press both the "HORN" and "ON" buttons simultaneously until the "NORMAL" and "OVERLOAD" lights are illuminated. Now by pressing the "ON" button the unit can be stepped through the start up sequence. By pressing the off button will back up one function step.

FUNCTION	CONTROL	LEDS ON
MAINTENANCE MODE	HORN & ON	NORMAL & OVERLOAD
BYPASS ON	ON	BYPASS
BYPASS & RECTIFIER ON	ON	BYPASS & BATTERY
BYPASS, RECTIFIER, INVERTER ON	ON	BYPASS & BATTERY & NORMAL
BYPASS OFF RECTIFIER & INVERTER ON	N	BATTERY & NORMAL

To isolate FRU's in the maintenance mode requires inter-connecting wiring of the system.

CAUTION

Do not connect or reconnect any system wires with the system on. Disconnecting or connecting these wires while the system is on will cause personal harm and system damage. Press the "UPS OFF" button to assure the system is off.

7.10 FRU ISOLATION

To isolate the Rectifier from the Inverter open the Rectifier and remove the two wires from the Inverter only wire #22 (E1) and wire #23 (E2) from the capacitor assembly and insulate. Enter the maintenance mode and press the "UPS ON" button three times. This

will turn the Rectifier on. Measure the DC voltage from E1 - E2 for a reading of 410 VDC. **Measuring** the voltage from E1 - E3 should read 205 VDC and from E2 - E3 should read -205 MC. **If** these voltages are good then the **Rectifier** is operating. Press the UPS OFF button and wait **approximately** 5 minutes before reconnecting wires 22 and 23.

To isolate the **inverter** from the **I/O** open the **Inverter** and **disconnect** wires 29 and 30 from TB1-2, 3 and **insulate**. **Enter** the maintenance mode and press the UPS ON button three times. Measure the AC voltage from TB1-2 and TB 1-3. These voltages should **match** the output voltage **set** at the Front **Panel**. In the **international configuration the voltage** should only be **measured from** TB 1-3 to TB 1-4. If these voltages match the voltage set at the front panel the inverter is operating. Press the UPS OFF button three **times** and wait **approximately 5 minutes** before reconnecting **wires** 29 and 30.

To isolate the **Inverter** logic from the **Rectifier** logic open CB 1 of the system and open the **Inverter** and **disconnect** A2A1-P2 from the **Inverter** control card (A2A1). Reapply input power and measure A2A1-P2 pins 1-2 for **+7 VDC**, 3-4 for **+15 VDC**, and 5-6 for **-15 VDC**.

To isolate the Rectifier logic from the front panel open CB 1 of the system, remove Front Panel and **disconnect** A4A1-P5 from the panel. Close **CB1** and measure **A4A1-P5** pins 1-2 for **+15 VDC**, pins 3-4 for **+7 VDC**, and pins 5-6 for **-15 VDC**.

7.11 PHASE RELATIONSHIP WITH VOLTMETER

To determine the phase **relationship** of either the **UPS** input or the **inverter** output measure the phase to **neutral** voltages and then add them together. Then measure the **phase** to phase voltage and **compare** the two. If the phase to neutral voltages add up to equal the phase to phase voltage the **phase** angle is 180°. If the phase to neutral voltages add **up** to be approximately 115% **of** the phase to phase **voltage** the phase angle is 120°.

EXAMPLE: (1) L-N = 119 VAC L-L = 237 VAC
 L-N = 118 VAC
 237 VAC **L-L = L-N + L-N = 180°**

(2) L-N = 119 VAC L-L = 206 VAC
 L-N = 118 VAC
 237 VAC **L-L = (L-N + L-N).87 = 120°**

7.12 BATTERY TEST INFORMATION

Battery **Isolation** Procedure

The following **procedure** may be used to **determine** if a battery tray or batteries are **serviceable**.

Test **Procedure**

Connect a **100 ohm 300 watt** resistor in to the mate-n-lock **connector** of the individual battery tray for approximately **5 seconds**. **Measure** voltage under load at the **terminals** of the resistor. If the battery tray **is** determined to be bad **disconnect** the resistor and remove the tray from the system. **Reconnect** the **resistor** and measure the voltage of the individual batteries to identify the bad battery.

Battery tray voltage	Battery condition
118 VDC or more	Good
116 VDC to 110 VDC	Requires charge
108 VDC or less	Bad

Battery tray voltage	Battery condition
11.8 VDC or more	Good
11.6 VDC to 110 VDC	Requires charge
10.8 VDC or less	Bad

7.13 ALARM *INFORMATION/ACTION* ITEM LIST

CAUTION

These alarms are to be used as a troubleshooting aid only. It is possible for a failed FRU to indicate an alarm in another FRU.

The following chart indicates the most probable causes for the alarms however, poor FRU interconnections or the front panel card may also induce many of these conditions therefore, if the suggestions from the chart do not work then verify all interconnections are properly made, then if the failure continues replace the Front Panel assembly.

Alarms/status present in Front Panel software REV.B

ALARM	DESCRIPTION/CAUSE	ACTION
Battery DC over voltage	The Rectifier detected the battery voltage to be 290 VDC or above. - Improper batteries or battery connections Rectifier failure	Verify battery voltage and connections - If front panel metering doesn't match measured battery voltage, replace Rectifier.
Battery DC under voltage	The Rectifier detected the battery voltage to be 160 VDC or below. - Improper batteries, battery not connected or failed battery Rectifier failure	- Verify battery break connection - Verify battery voltage and connections - If front panel metering doesn't match measured battery voltage to within 10 volts, replace Rectifier FRU.

ALARM	DESCRIPTION/CAUSE	ACTION
ypass not available	The utility input doesn't match the selected output voltage, frequency or phase angle. - Utility disturbance • □□□% □♦♦♦♦ ♦♦♦♦♦♦ - Failed Rectifier	- Verify input breaker operation - Verify utility input matches the selected output voltage frequency and phase angle. - Verify UPS output selections - If utility and output selections are OK then replace Rectifier FRU.
ypass under /freq. ver/frequency	The utility input frequency doesn't match the selected output frequency. - Utility disturbance • □□□% □♦♦♦♦ selected - Failed Rectifier	- Verify utility input frequency within specification - Verify UPS output selections - If utility and output selections are OK then replace Rectifier FRU.
omplete battery ischarge	Battery DCUV alarm active for an ex- tended period of time. ● Dischargedbm ● Disconnected or mis-connected battery ● Failed Rectifier - Failed Battery	- Verify battery voltage - Verify battery connections - Allow battery to charge for 1-2 hours with load on the unit. if alarm doesn't clear replace the Rectifier. If UPS meter value and actual battery voltage. don't match, replace the Rectifier If the above values match and the batteries are verified by the procedure in section 3 then replace the Rectifier FRU.
ontrol power off	Status indication in the alarm history indicates the power supply is turned off. - normal indication if power is re- moved from unit when the unit is not on. ● Normallypr&edbyUPS Om: COMMAND in the alarm history ● Actions should be taken only if this alarm is logged when the unit is on line.	- Verify input wiring, power wir- ing - Check power supply outputs from Rectifier Verify battery connections, breaker and the voltage is above 140 VDC. - Replace Rectifier FRU - Replace Front Panel FRU

ALARM	DESCRIPTION/CAUSE	ACTION
Control power on	Status indication in the alarm history indicates the power supply is turned on. ' Should always be preceded by CONTROL POWER OFF in the alarm history unless queue has been cleared.	• If alarm appears to be randomly generated, replace the Rectifier FRU • Replace Front Panel FRU
DC link over voltage	Status indication in the alarm history indicates the DC link voltage exceeded 451 volts.) Most probable cause is a failed Rectifier) Could be a shorted bypass contactor	• To check for a shorted bypass contactor place system on bypass. Open Inverter FRU and verify no voltage at TB 12-3 • Replace the Rectifier FRU
DC link under voltage	Status indication in the alarm history indicates the DC link voltage went below 300 VDC. Most probable cause is a failed Rectifier If This alarm appears along with Inverter alarms the problem could be a failed Inverter FRU.	• Using maintenance mode isolate the Rectifier from the Inverter and then verify the DC link voltage is above 300VDC. If voltage is still low, replace the Rectifier FRU. If voltage is correct replace the Inverter FRU.
Emergency power off trip	Alarm indication indicating the local or remote EPO has been activated. To reset EPO remove and then reapply input power.	• If EPO will not reset, verify the local or remote switches are not activated • Remove the remote EPO connection from the rear of the unit to determine if the problem is in the external wiring. • If local or remote switches activated, remove J1 from the Rectifier control card (A1A1). If the EPO is no longer active replace the EPO control card (A3A3). If the EPO is still active replace the Rectifier FRU.

ALARM	DESCRIPTION/CAUSE	ACTION
Front panel BIT failure	The front panel failed the BUILT IN TEST (BIT). • Most probable cause is the front panel board.	• Verify power supply voltages at front panel • Replace the front panel board. • Replace Front Panel
Greater than 150% overload phase A, phase B, or phase C	The Inverter detected output current to be greater than 153% of nominal. • Normally load related alarm • Secondary cause would be an Inverter failure	• Alarm is normally generated by load steps caused by starting equipment. if this is the case it may be ignored. • Monitor the load current to determine if load current is causing the problem. • If alarm occurs without an increase in load replace the Inverter FRU. • Replace Front Panel FRU
Greater than 125% overload phase A, phase B, or phase C	The Inverter detected output current to be greater than 125% of nominal. • Normally load related alarm • Secondary cause would be an Inverter failure.	• Alarm is normally generated by load steps caused by starting equipment. if this is the case it may be ignored. • Monitor the load current to determine if load current is causing the problem. • If alarm occurs without an increase in load replace the Inverter FRU. • Replace Front Panel FRU
Greater than 106% overload phase A, phase B, or phase C	The Inverter detected output Current to be greater than 106% of nominal. • Normally load related alarm* Secondary cause would be an Inverter failure	• Alarm is normally generated by load steps caused by starting equipment. if this is the case it may be ignored • Monitor the load current to determine if load current is causing the problem. • If alarm occurs without an increase in load replace the Inverter FRU. • Replace Front Panel FRU

ALARM	DESCRIPTION/CAUSE	ACTION
Heat sink over temperature	The Rectifier heat sink is approaching dangerous levels (112–121°C) - Blocked airflow to UPS - Very high room temperature - Rectifier failure	- Verify airflow from rear grill from the Rectifier and the Inverter - Verify the front side rear vents are clear - Verify the room temperature is within limits - Replace the Rectifier FRU - Replace Front Panel FRU
Heat sink temperature sensor fail	The Rectifier control card has detected indicating the heat sink temperature was below 11–21°C. Rectifier failure	* Replace the Rectifier FRU
Input line voltage	Input voltage fell below 150 VAC - Utility outage or brown-out condition - Rectifier failure	- Verify protection - Verify utility input voltage and connections - If voltage is present but the UPS metering doesn't read properly or the alarm is still active replace the Rectifier FRU
Input over voltage phase A, phase B, or phase C	The phase A input phase to neutral voltage is greater than 135 VAC for 180° phase angle or 157 VAC for 120° phase angle. Input power is not connected properly	- Verify utility input voltage and connections - If input voltage is OK but the UPS metering doesn't read properly or the alarm is still active replace the Rectifier FRU
Input phase rotation error	The Rectifier detects the input phase relationship doesn't match the selected output. - Input phases are rotated - This alarm is enabled only if the bypass option is installed	- Verify input breaker Verify the selected output phase angle matches the utility input Reference section #2. - Replace the Rectifier FRU - Replace Front Panel FRU

ALARM	DESCRIPTION/CAUSE	ACTION
Input under voltage phase A, phase B, phase C	The phase A input phase to neutral voltage is less than 87 VAC for 180" phase angle, 100 VAC for 120" phase angle, or 174 VAC for international configurations . • utility input is too low - Input power is not connected properly	• Verify input breaker • Verify utility input voltage and line cord connections • If input voltage is OK but the UPS metering doesn't read properly or the alarm is still active replace the Rectifier FRU • Replace the Front Panel FRU
Inverter A/D converter bit failure	The Inverter failed it's self test • Inverter failure • Power supply failure	• Isolate. the Inverter logic power from the Rectifier logic power and then measure the power supply inputs to the Itlverter •  Inverter FRU
Inverter control board failed BIT	The Inverter failed it's self test • Inverter failure • Power supply failure	• Isolate. the Inverter logic power from the Rectifier logic power and then measure the power supply inputs to the Inverter 
Inverter CPU BIT failed	The Inverter failed it's self test • belter failure. • Power supply failure	• Isolate the Inverter logic power from the Rectifier logic power and then measure the power supply inputs to the Itlverter 
Inverter EEPROM checksum failed	The Inverter failed it's self test • Inverter failure • Power supply failure	• Isolate the Inverter logic power from the Rectifier logic power and then measure the power supply inputs to the Inverter • replace the Inverter FRU
Inverter fault/ In- verter shutdown Rectifier	The Inverter FRU commanded the Rectifier to shut-down • Should appear after an Inverter alarm in the alarm history	• Status  Inverter
Inverter over tem- perature	The Inverter heat sink is approaching dangerous levels (112-121°C) • Inverter failure	• Replace Inverter FRU
Inverter temp sense 'ail	Inverter control has detected the Heat-sink temperature was below 21°C	• Replace Inverter FRU

ALARM	DESCRIPTION/CAUSE	ACTION
Inverter program stack error	the control card. Inverter failure	- Isolate the Inverter logic power from the Rectifier logic power and then measure the power supply inputs to the Inverter - replace the Inverter FRU
Inverter ram bit failure	The Inverter failed it's self test - Inverter failure - Power supply failure	- Isolate the Inverter logic power from the Rectifier logic power and then measure the power supply input9 to the Inverter - verify power supply outputs
Inverter ramp up fail	The Inverter control card is not re-wiving the proper sensing values. Inverter failure	- Isolate the Inverter logic power from the Rectifier logic power and then measure the power supply inputs to the Inverter - Replace the Inverter FRU - Replace Front Panel FRU
Inverter ramp up test failed	The Inverter failed self test - Inverter failure - Power supply failure	- verify power supply outputs - Isolate the Inverter logic power from the Rectifier logic power and then measure the power supply inputs to the Inverter - Replace the Inverter FRU
Inverter senses DC link over voltage	The Inverter senses the DC link to be greater than 480 VDC - Rectifier failure - Inverter failure	- Isolate the Rectifier from the Inverter and verify the DC link voltage is below 450 VDC - If the link voltage is above 450 VDC replace the Rectifier. - If the link voltage is below 450 VDC replace the Inverter
Inverter shutdown imminent	The Inverter's 10 cycle initialized. load Inverter failure	- Verify load bus is not shorted - Monitor load for large current demand - Replace the Inverter FRU - Verify Front Panel FRU
Node eeprom verification error	One FRU eeprom was reprogrammed due to a mismatch from the other two. - This alarm is normal after FRU replacement - FRU failure	If this alarm occurs without a FRU replacement the FRUs must be isolated to determine which FRU is being reprogrammed

ALARM	DESCRIPTION/CAUSE	ACTION
Output AC overvoltage test fail	The Inverter failed self test • Inverter failure • Power supply failure	• Isolate the Inverter logic power from the Rectifier logic and then measure the power supply input to the Inverter • Replace the Inverter FRU
Output DC overvoltage	The inverter has sensed a DC voltage on its output is greater than .2 VDC • Inverter failure • Rectifier failure	• Isolate the Rectifier and Inverter and then measure the DC link voltage • If the DC link is below the nominal of the proper voltage replace the Inverter FRU • If the DC link is above the nominal then replace the Rectifier
Output overcurrent phase A, phase B, or phase C	The Inverter has detected the output current was greater than 300% of nominal • Fault load • Inverter failure	• Verify load bus is not shorted • Monitor load for large current demand • Replace the Inverter FRU
Output undervoltage phase A, phase B, or phase C	The output voltage to be 10% below the selected output voltage. • Fault load • Inverter failure • Rectifier failure	• Verify load bus is not shorted • Monitor load for large current demand • Replace the Inverter FRU
Output overvoltage phase A, phase B, or phase C	The Inverter sensed the output voltage to be 10% above the selected output voltage. • Inverter failure	• This could be caused by an inductive load feedback • Replace the Inverter FRU
Power supply +/- 2 volt fault	The Rectifier control card has sensed a drop in the 12V supply voltage. • Failed Rectifier • Other FRU overloading power supply	• Measure power supply voltages leaving the Rectifier, refer to section #1 • If the voltages are low isolate the other FRUs and measure again. • If voltage is correct, replace the FRU which allowed the voltage to return to normal. • If voltages are still low replace the Rectifier FRU

ALARM	DESCRIPTION/CAUSE	ACTION
Power supply 5 volt fault	The Control detects a drop in the 5V supply voltage. - Failed Rectifier - Other FRU overloading power supply	• Measure power supply voltage, leaving the Rectifier • If the voltages are low isolate the other FRUs and measure again. • If voltage is correct replace the FRU which allowed the voltage to return to normal. • If voltages are still low, replace the Rectifier FRU
Power supply failure	Power supply temperature reached dangerous levels and power supply shutdown - Blocked airflow to unit - Rectifier failure	• Verify airflow from rear grill • Verify the front and rear air vents are not blocked • Replace the Rectifier FRU
Power supply over temperature	Power supply temperature is approaching dangerous levels - Blocked airflow to unit - Rectifier failure	• Verify airflow from rear grill • Verify the front and rear air vents are not blocked • Replace the Rectifier FRU
Power supply shutdown	Power supply has detected a low voltage condition on the battery link and will shut down in one minute - Discharged battery - Rectifier failure	• If the alarm appears any time other than an extended battery discharge, replace the Rectifier FRU
Rectifier current over 100%	The Rectifier has sensed the resonant current to be over 100%. The Rectifier will shut down in 10 minutes. - Failed Rectifier - Failed Inverter	• Verify load does not exceed the rating for the model • If alarm clears, replace the Inverter • If alarm doesn't clear, replace the Rectifier
Rectifier current over 125%	The Rectifier has sensed the resonant current to be over 100%. The Rectifier will shut down in 10 minutes. - Failed Rectifier - Failed Inverter	• Verify load does not exceed 10 KW for the model 12 or 12.5 KW for the model 15 or 15 KW for the model 18 • Isolate the Rectifier and Inverter • If alarm clears, replace the Inverter • If alarm doesn't clear, replace the Rectifier

ALARM	DESCRIPTION/CAUSE	ACTION
Rectifier Eeprom failure	The Rectifier failed self test • Rectifier failure • Power supply failure	• Isolate the Inverter logic power from the Rectifier logic and then measure the power supply voltages • Replace the Rectifier FRU
Rectifier eeprom failure	The Rectifier failed self test • Rectifier failure • Power supply failure	• Isolate the Inverter logic power from the Rectifier and then measure the power supply voltages • Replace the Rectifier FRU
Rectifier failed	The Rectifier failed self test, is not reading resonant current or has an extended DCUV condition. • Battery is not connected or is fully discharged • Rectifier failure	• Verify battery connections, battery breaker position and battery voltage • If battery is in good condition replace the Rectifier, reference section #3
Rectifier failed BIT	The Rectifier failed BUILT IN TEST •                                  	

7.14 FRU REPLACEMENT

DANGER

The UPS contains lethal voltages.

CAUTION

The UPS contains its own energy source (Battery). The output receptacles may be live even when the UPS is not connected to an AC source.

All **FRUs** can be replaced with the exception of the **I/O** assembly, when the system is in **manual** bypass and **CB1** and **CB2** are open. **Ensure** **CB3** is closed. The maintenance switch (**S1**) on the **I/O** should be closed before **CB1** is opened or load interruption will occur. When attempting a restart, close **CB1** and **CB2**, wait 10 seconds, and verify the "ON BYPASS" lights, then open the **maintenance** switch (**S1**).

NOTE:

Each major FRU is equipped with its own microprocessor. If more than one FRU is to be replaced to fix a problem then only one FRU should be replaced at a time and the logic re-energized. This is to allow the other two FRUs to program the replacement. If this procedure is not followed, it may be necessary to reset unit type.

7.14.1 Rectifier FRU Removal

- Turn the unit off
- Raise the top and remove the left side
- Place **A3S1** in the bypass position
- Open the input and battery breakers and wait 5 minutes
- Remove the service panel on the rear housing
- Remove the Front P&I from the unit and set aside
- Remove the screws holding the side panel of the FRU
- Fold down the side panel using caution not to stress internal wiring
- Disconnect **A1A3P3**, **A1A1P12**, and plug **A1P5** and pull through front of the unit
- Disconnect wires 8, 9, 10, 13-1, 14-1, and 300 from **TB1** and plug **A1P1** pull out the rear of the unit
- Disconnect **E1** (wire 22-2), **E2** (wire 23-2), and **E3** (wire 300-2) from cap assembly and push through the frame into Inverter
- Fold the side panel up and tack the plate on the **FRU**
- Remove screws securing FRU to the frame

- Remove **FRU** from the left side of the frame

7.14.2 Rectifier FRU Replacement

- Slide **FRU** into the frame from the left side
- Remove the screws holding the side panel of the **FRU**
- Fold down the side panel using caution not to stress the internal wiring. slide panel into slots at bottom of **FRU**
- **Install screws to secure FRU to frame**
- **Reconnect DC wires to E1, E2, E3 on the cap assembly**
- Reconnect wires 8, 9, 10, 13-1, 14-1, and 300 to **TB1**
- Reconnect **A1A3P3, A1A1P12**, and plugs **A1P1** and **A1P5**
- Fold the side panel up and secure it to the **FRU**
- Install the front panel, service panel and the left side panel
- Close the input and battery breakers, place **A3S 1** in the UPS position and lower the top panel
- **Refer to the system start up procedure in the manual**

7.14.3 Inverter FRU Removal

- **Turn off the unit**
- **Raise the top and remove the left side**
- Place **A3S 1** in the bypass position
- **Open the input and battery breakers and wait 5 minutes**
- Remove the service panel on the rear housing
- Remove the front panel from the unit and set aside
- Remove the screws holding the side panel of the **FRU**
- Fold down the side panel using caution not to stress internal wiring
- **Disconnect connectors A2A1P1, P2, P3, and P4 from the Inverter Control board, unhook harness from clips and put the side panel aside**
- **Disconnect wires 29, 30, 31, and 300-2 and 300 from the right side of TB1**
- **Disconnect wires 22-2 from E1, 23-2 from E2 and wires 300-1, 300-2, and 300-3 from output filter capacitors and let them hang in front of the Rectifier**
- **Remove the FRU mounting screws at either end of the FRU**
- **Remove the FRU from the frame**

7.14.4 Inverter FRU Replacement

- Slide **FRU** into the left side of the frame
- Remove the side panel and **disconnect A2A1P1, P2, P3, and P4** from the **Inverter** control board **unhook harness from the clips** and put side panel aside
- Connect **wires 22-2** to **E1** and **23-2** to **E2** and **300-1, 300-2, and 300-3** to filter capacitors
- **Connect wires 29, 30, 31, and 300-2** to **TB1**
- **Reconnect** **PI-P4** to the **Inverter** control board and **fold up** side panel and **secure it to the FRU**
- Install the **front panel**, service panel and **left** side panel
- Close the **input and** battery breakers, place **A3S1** in the **UPS** position and lower top panel
- Refer to the system start-up procedure in the manual

7.14.5 Front Panel FRU Removal

- **Verify the unit is off**
- **Open input and battery breakers**
- Remove the mounting screw located in center bracket at top of panel
- **Slide the panel up and forward to remove**
- **Disconnect** the **plugs** and capacitor assembly from the front panel board
- Remove **the** four **screws** securing the front panel **board** to the panel

7.14.6 Front Panel FRU Replacement

- Install new board on **panel** using **original hardware**
- Connect the plugs to the original locations on the **front** panel card
- **Place the panel on the front of the unit, align the studs with the holes** then push down **to** lock panel into place
- **Install** the mounting screw in **the** bracket
- **Close input and battery breakers and close top**
- **Refer** to the system start-up

7.14.7 I/O FRU Removal

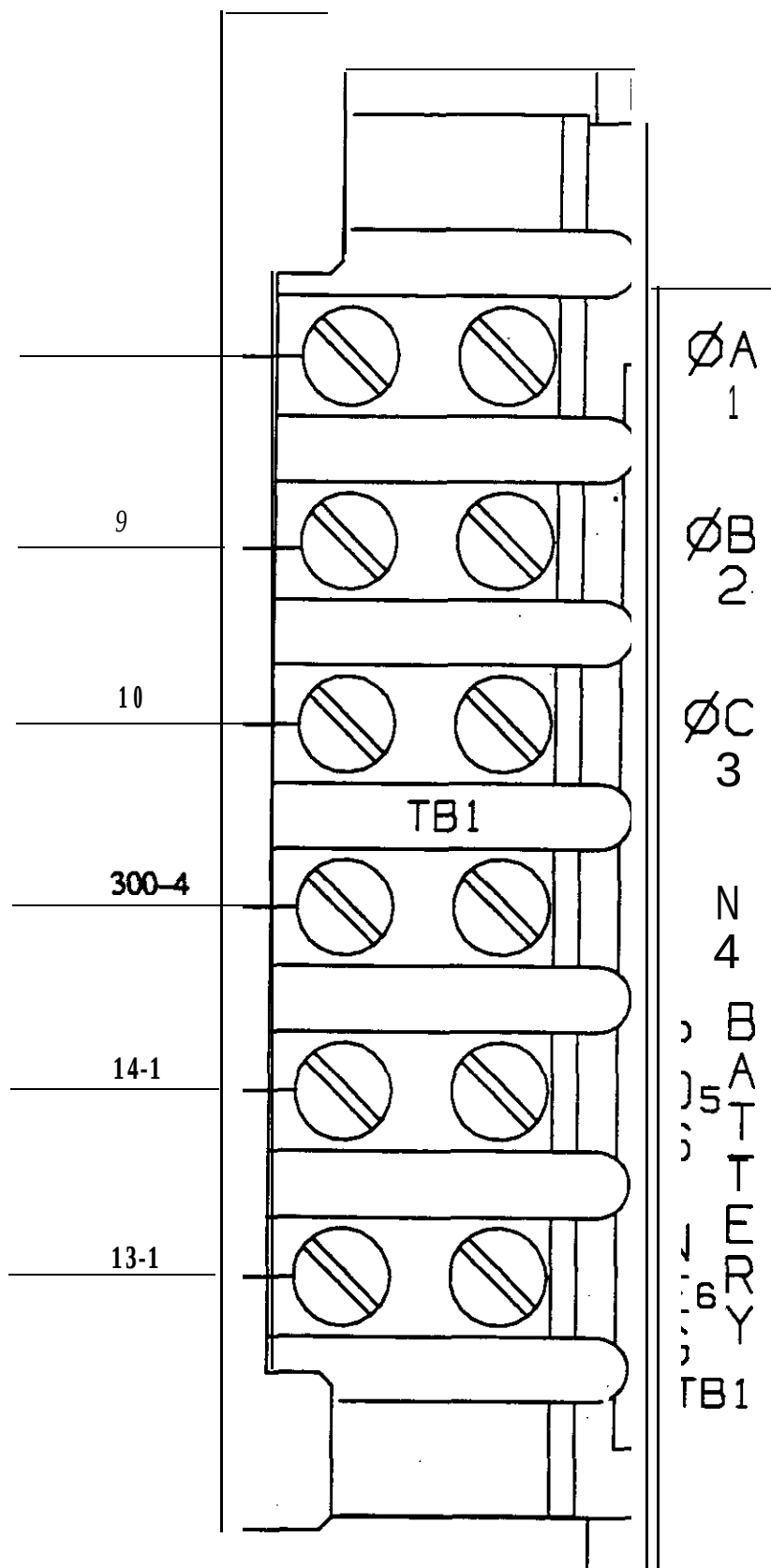
- **Verify the unit and all loads connected to the unit are off**
- **Disconnect**      

- Disconnect battery cabinet from the unit **AND** WAIT FIVE MINUTES
- Raise the top and remove four screws on the cover of the **I/O FRU** (two in front and two in back)
- Remove side panel of unit
- Remove front panel **FRU** (see front panel removal)
- **Disconnect the A4P6 connector to front panel FRU**
- Disconnect the **A4P3** auto bypass **connector**
- Remove the 3 X 18 inch service entrance plate, on left rear corner of **the unit**
- Disconnect wiring to the **S2** and **S3** switches (NOTE ALL CONNECTIONS)
- Disconnect the **A4P4 connector** near the front of the unit and **pull** wiring through hole
- **Remove 4 X 6 inch plate at top rear of unit**
- Disconnect all input, output **and** battery **connections** from **terminal** strip located behind the plate removed in the previous step (NOTE ALL **CONNECTIONS**)
- Open the **Inverter** PRU door by removing the four quarter inch screws **on the side of the assembly**
- Disconnect all power cables at the rear of the **Inverter FRU**, then push these **cables** back into the rear housing of the unit as much as possible (NOTE ALL CONNECTIONS)
- Close **Inverter FRU** door but do not screw it all the way down
- Open **the Rectifier** PRU door by removing the five quarter inch screws on the side of the assembly
- Disconnect the ground wire from the frame of the unit to the **Rectifier** door panel
- **Disconnect all power** cables at the rear of the **Rectifier FRU**, then push these cables back into the rear housing of the **unit** as much as possible (NOTE ALL CONNECTIONS)
- Close **Rectifier FRU** door but do not **screw** it all the way down
- Remove the two **five-sixteenth inch** screws on the left side of the **I/O FRU** (one in the front and one in back of the unit)
- **Gently** remove the **I/O FRU** by lifting up **slowly** on the front end (some **ty-wraps** may **need** to be removed)

7.14.8 I/O FRU Replacement

- **Insert the rear of the I/O FRU into the unit making sure the frame of the PRU is on the outside of the black mounting tabs on the unit's frame**

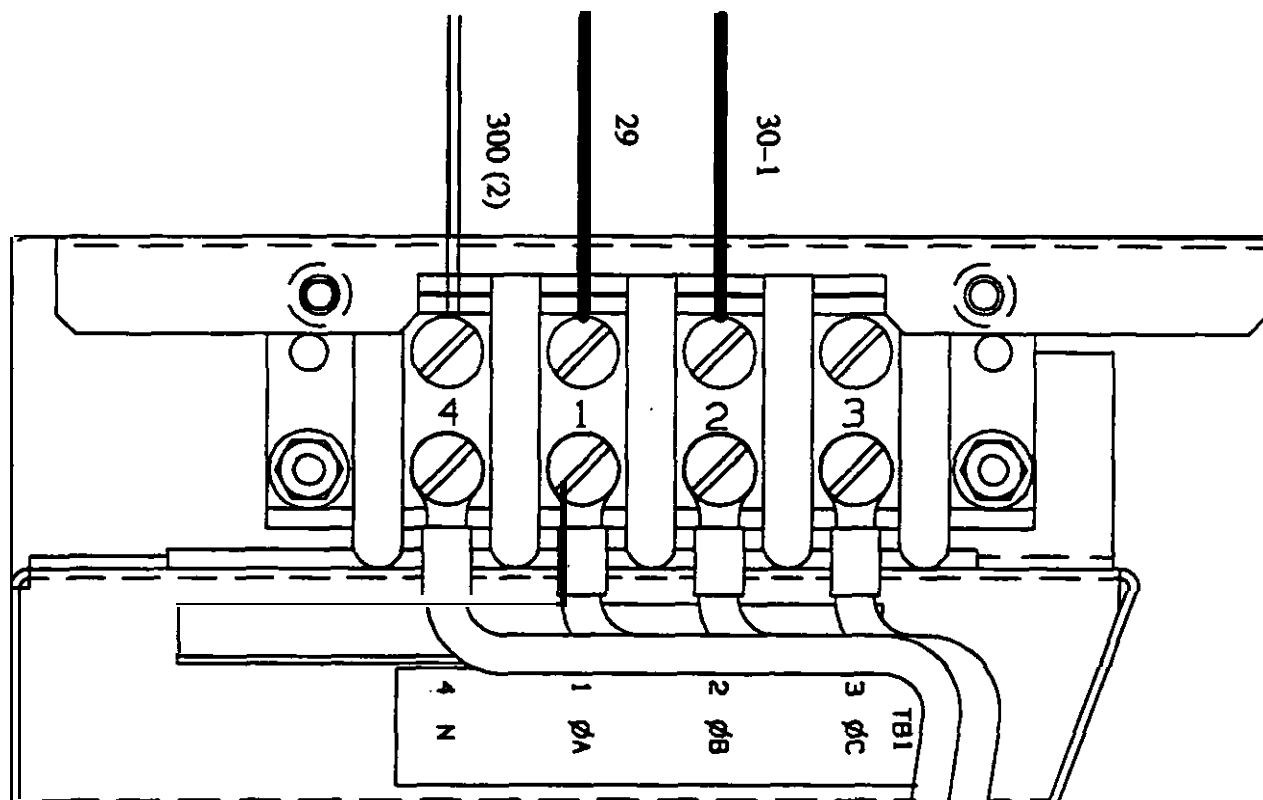
- Open the Rectifier **FRU** door and connect the power cables to the **terminal** strip on the left side of the FRU. Refer to **figure 7-10**.



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Figure 7-10 Rectifier FRU Connections

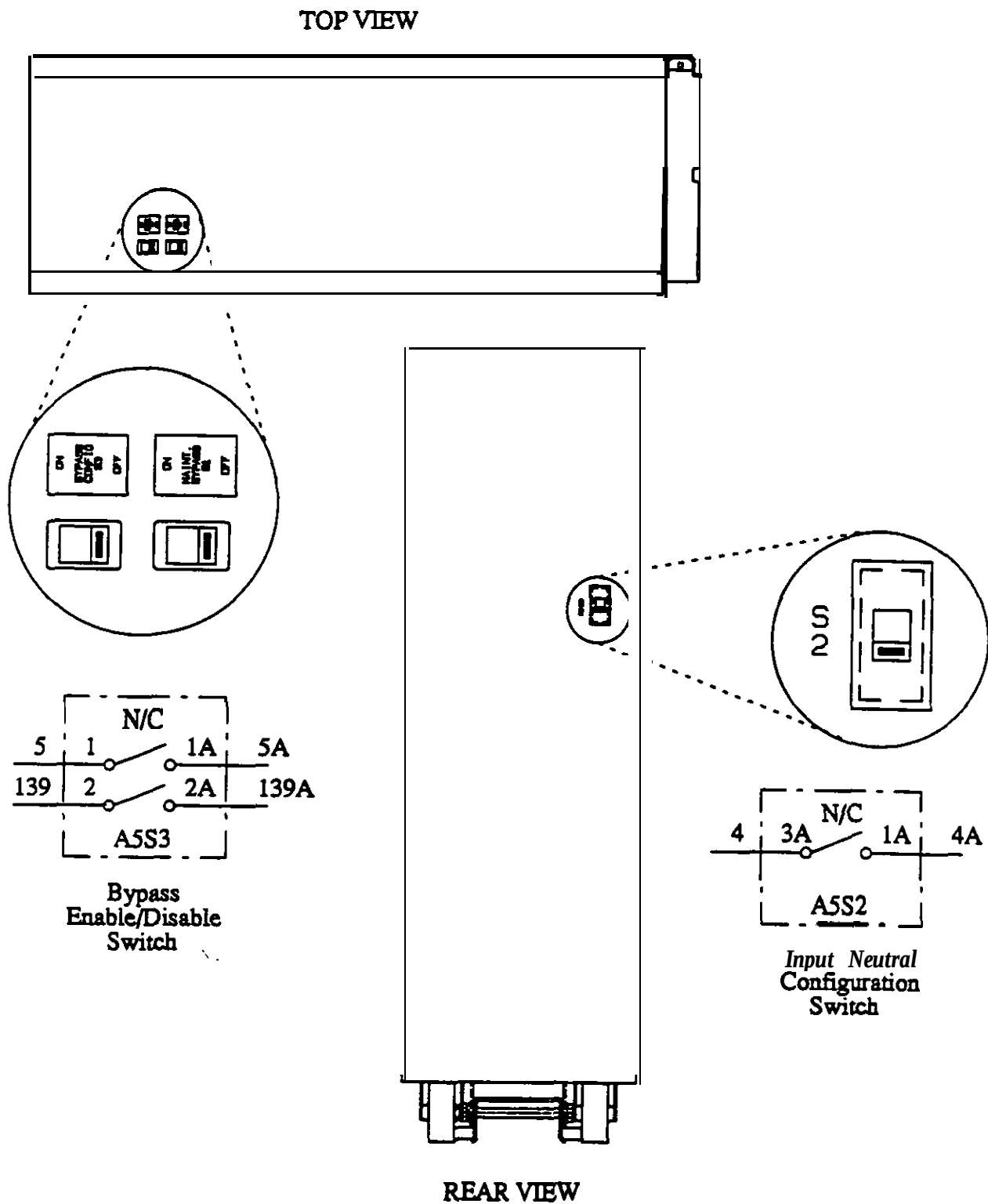
- Connect the ground wire from the Rectifier FRLJ door to the screw on the frame **from** which it was removed
- Secure the Rectifier FRU door **with** the **five** quarter inch screws which were removed
- **Open Inverter** FRU door and **connect** the power cables to the **terminal strip on the left side of the FRU**. Refer to figure 7-11.



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Figure 7-11 Inverter FRU Connections

- Secure the **Inverter** FRU door **with** the four quarter inch screws which were removed
- **Reconnect** the **A4P3** plug to **the** logic circuit board near **the** front of the I/O FRU
- **Insert** **small** wiring harness for the **S2** and **S3** switches through **the** hole at the rear of the I/O FRU
- **Reconnect** the wiring to **S2** and **S3**. Refer to figure 7-12.



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Figure 7-12 Switch Connections

- Reconnect the front panel FRU
- Secure the top cover of the **I/O** FRU with the four screws **which** were removed
- **Secure** the side panel of the unit and lower the top
- Reconnect all **input**, output and **battery cables** to **the terminal** strip at **the top rear of the unit**
- **Secure the 3 X 18 and 4 X 6 inch plates on the rear of the unit**

8

Parts List

OUTPUT PANEL "C" (FIGURE 8-1)

101258842

REF PARTNUMBER DESCRIPTION

QTY DESIGNATION

03	122130078-007	CRKT BREAKER 50/60 HZ 30A	1
12	154108099	TWIST-LOCK RECEPT L6-30R-1	1

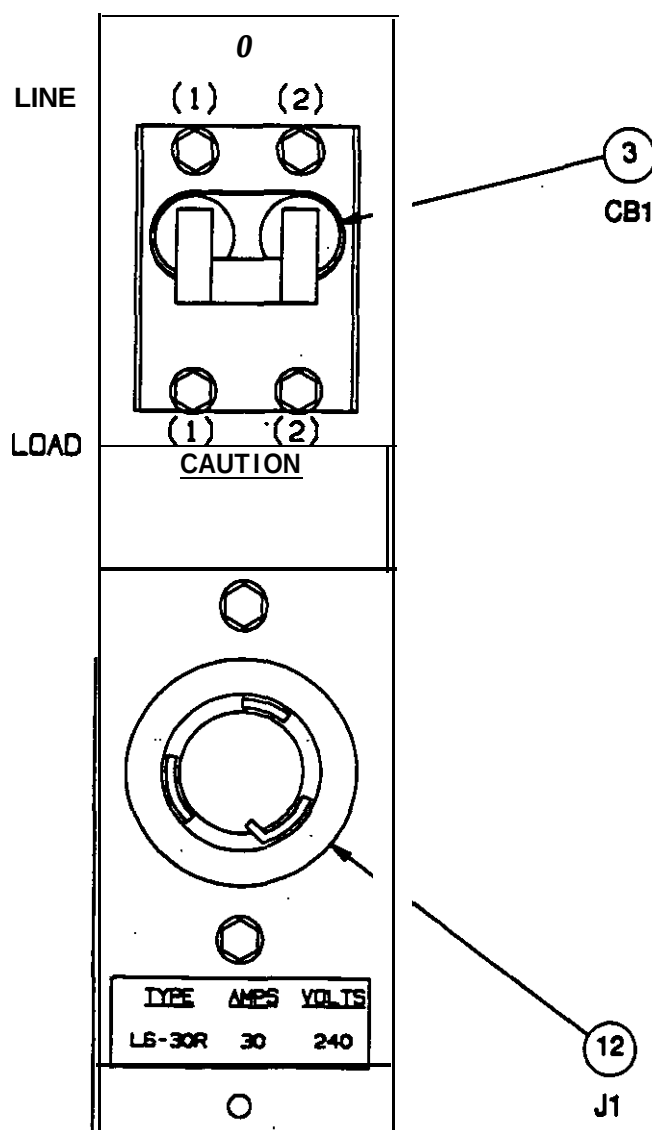


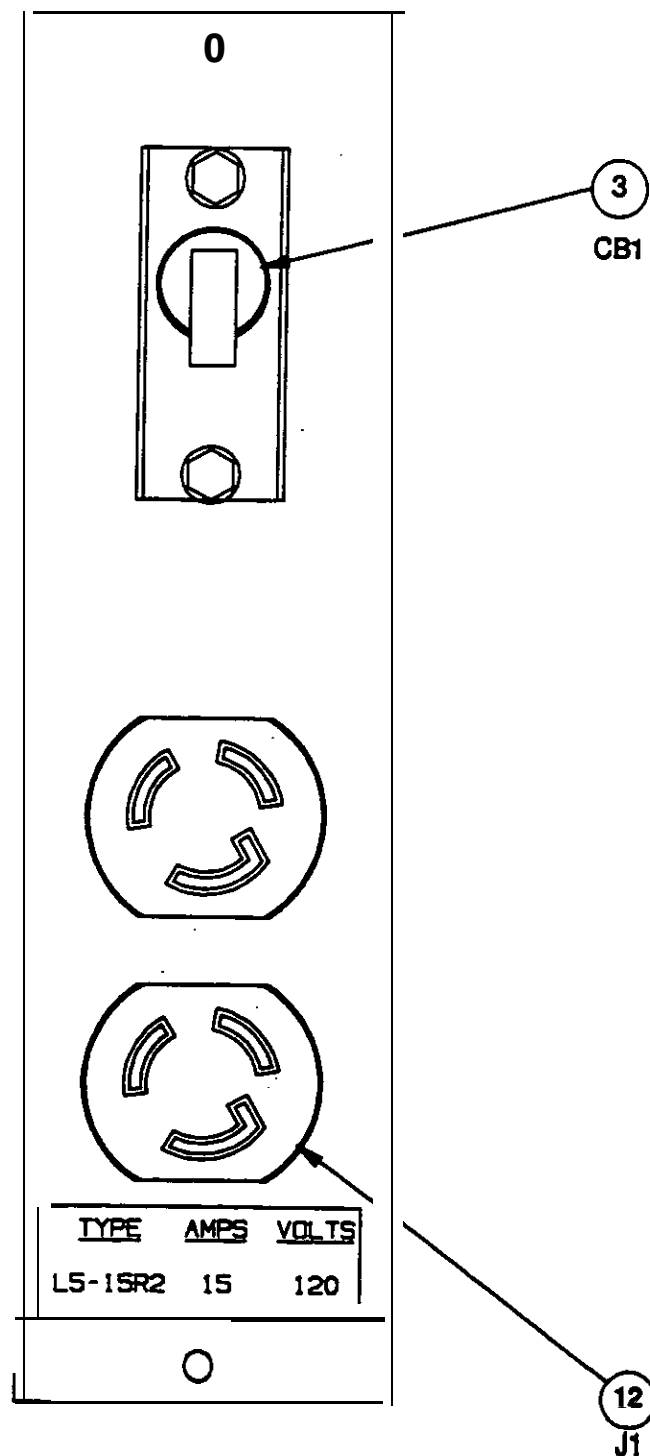
Figure 8-1 Output Panel "C"

110253889

OUTPUT PANEL "H" (FIGURE 8-2)

101258843

REF	PART NUMBER	DESCRIPTION	QTY	DESIGNATION
03	122130078-001	CRKT BREAKER 1P 15A	1	
12	154108093	TWIST-LOCK RECEPT L5-15R-2	1	



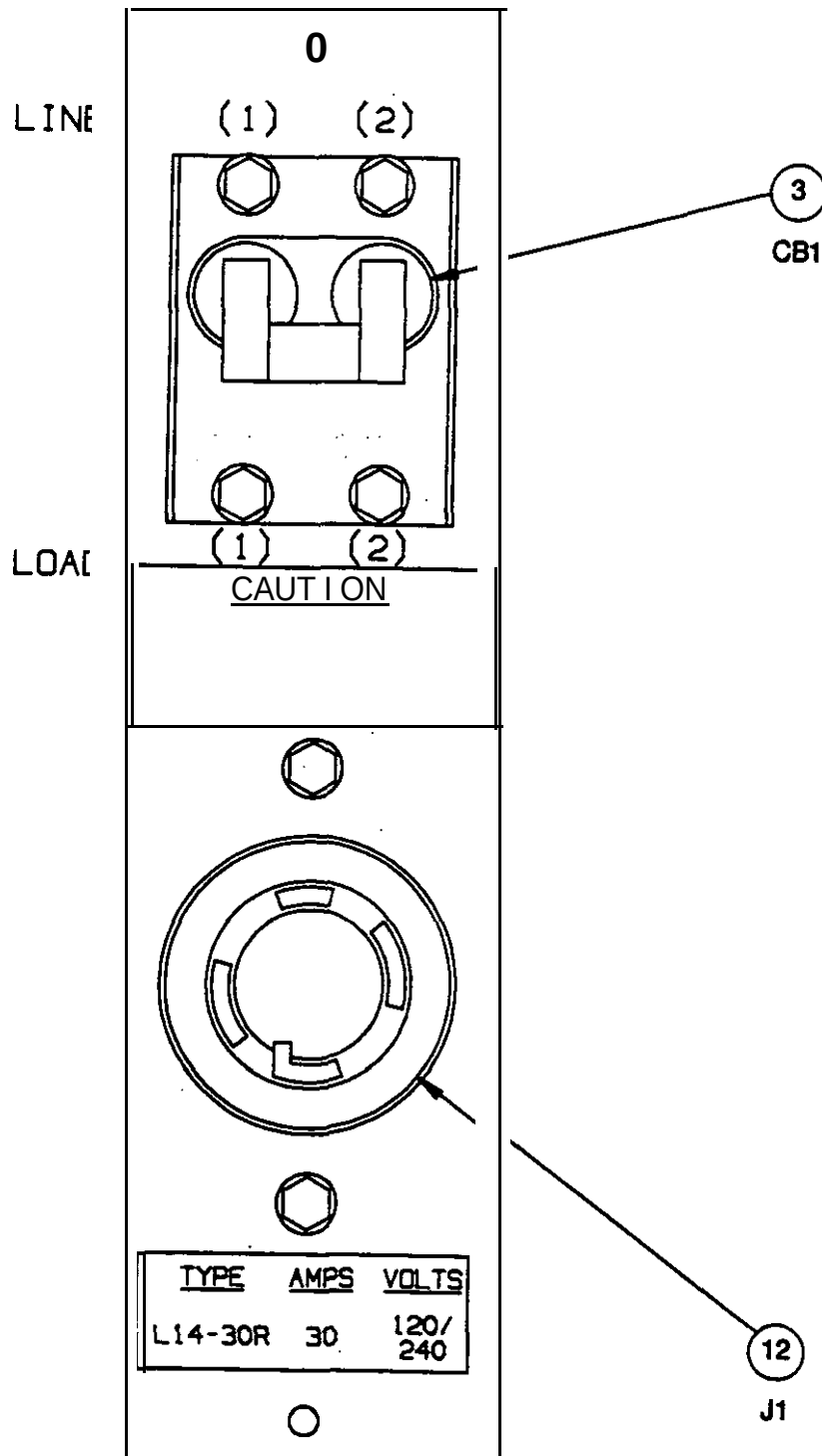
110253890

Figure 8-2 Output Panel "H"

OUTPUT PANEL "A" (FIGURE 8-3)

101258849

REF	PART NUMBER	DESCRIPTION	QTY	DESIGNATION
03	122130078-007	CRKT BREAKER 50/60HZ 30A	1	
12	154108102	TWIST-LOCK RECEPT L14-30R-1	1	



110253892

Figure 8-3 Output Panel "A"

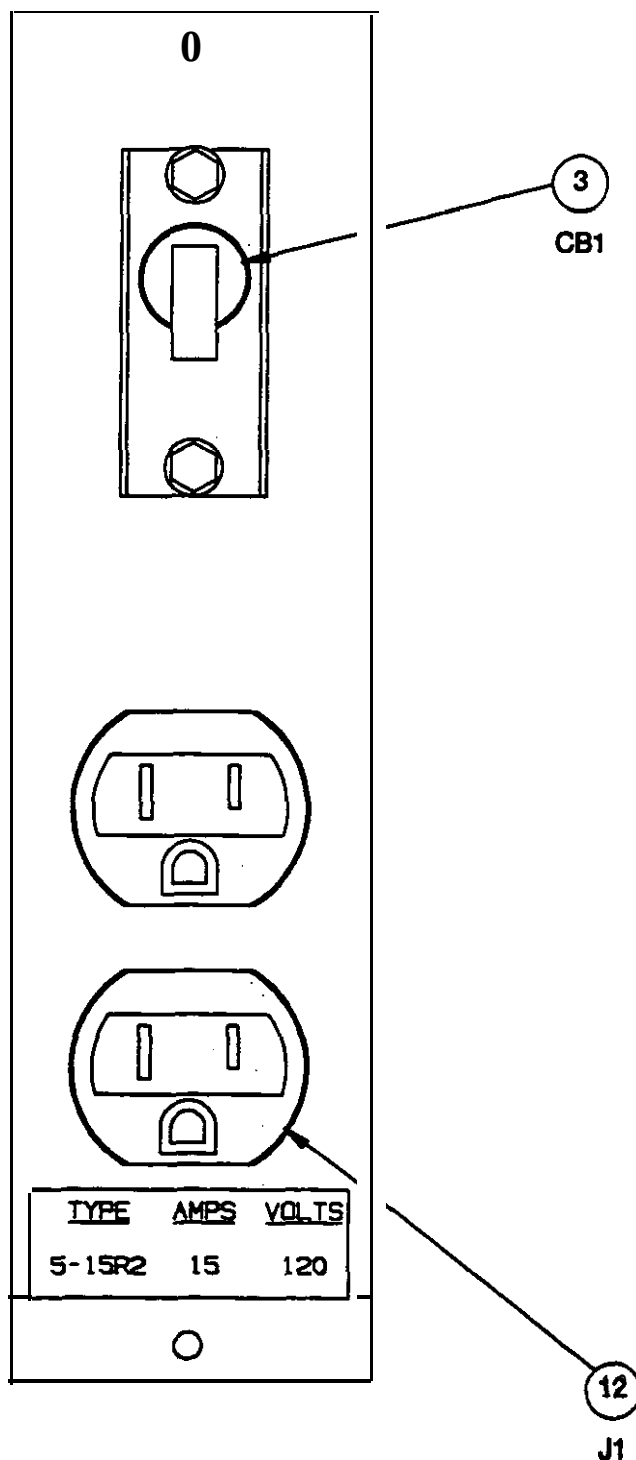
OUTPUT PANEL "D" (FIGURE 8-4)

101258850

REP PART NUMBER DESCRIPTION

QTY DESIGNATION

03	122130078-001	CRKT BREAKER 50/60HZ 1P 15A	1
12	154108073	STRAIGHT BLADE RECEPTACLE	1



110253893

Figure g-4 Output Panel "D"

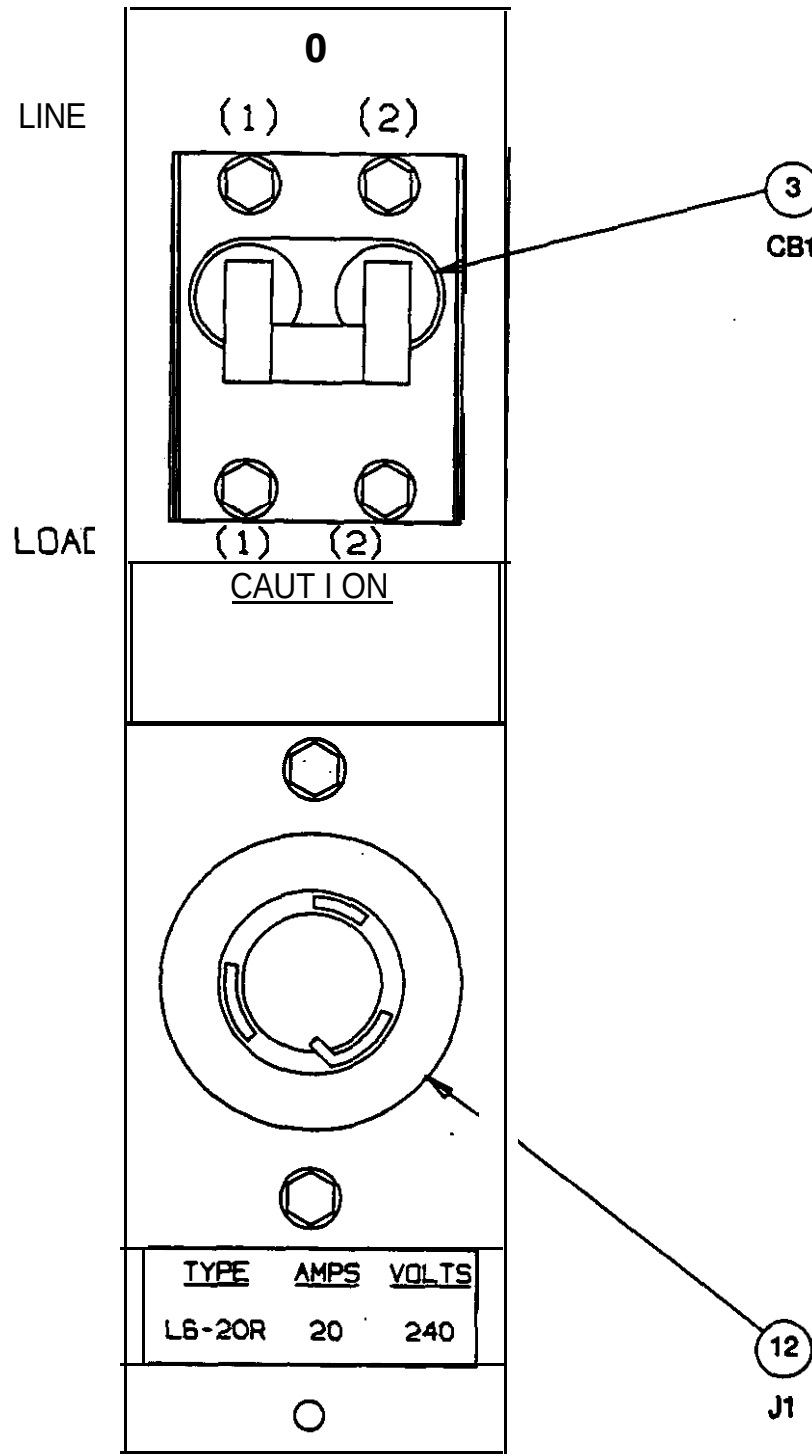
OUTPUT PANEL "B" (FIGURE 8-5)

101258859

REF PARTNUMBER DESCRIPTION

QTY DESIGNATION

03	122130078-004	CRKT BREAKER 50/60HZ 2P 20A	1
12	154108098	TWIST-LOCK RECEP L6-20R-1	1



110253898

Figure g-5 Output Panel "B"

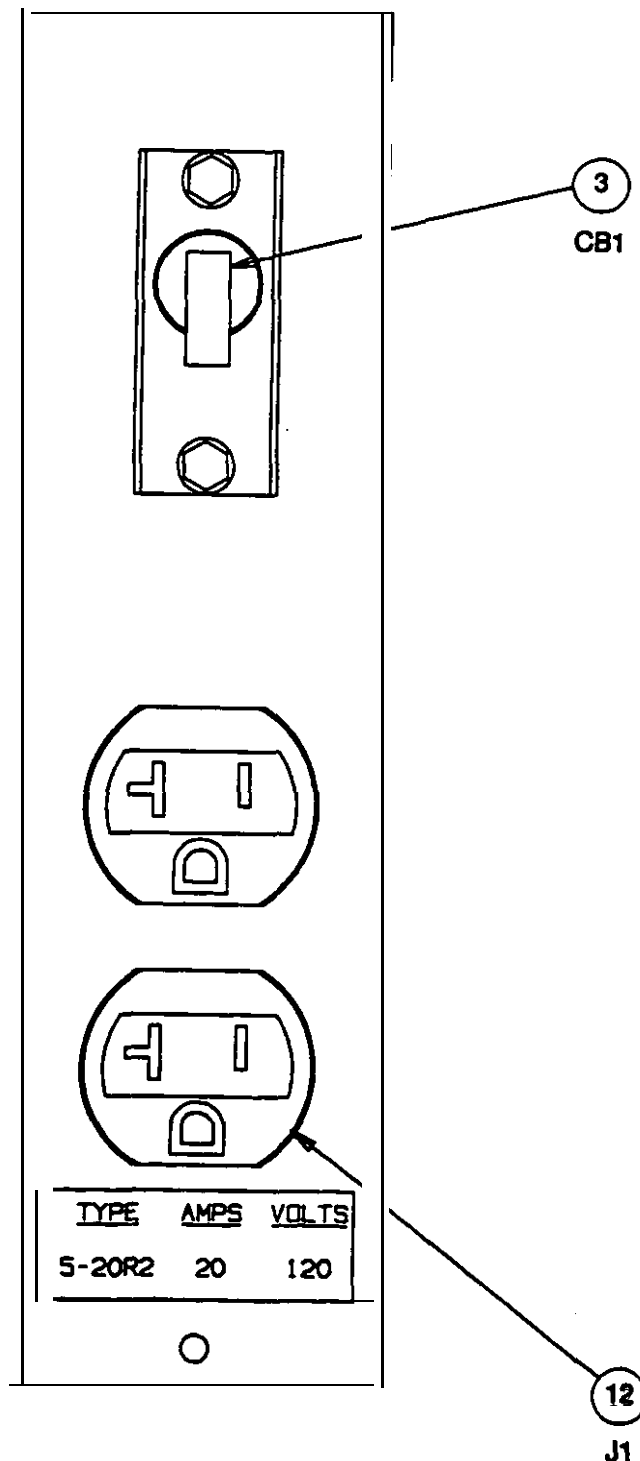
OUTPUT PANEL "E" (FIGURE 8-6)

REF PART NUMBER DESCRIPTION

101258860

QTY DESIGNATION

03	122130078-002	CRKT BREAKER 50/60HZ 1P 20A	1
12	154108075	STRAIGHT BLADE RECEPTACLE	1



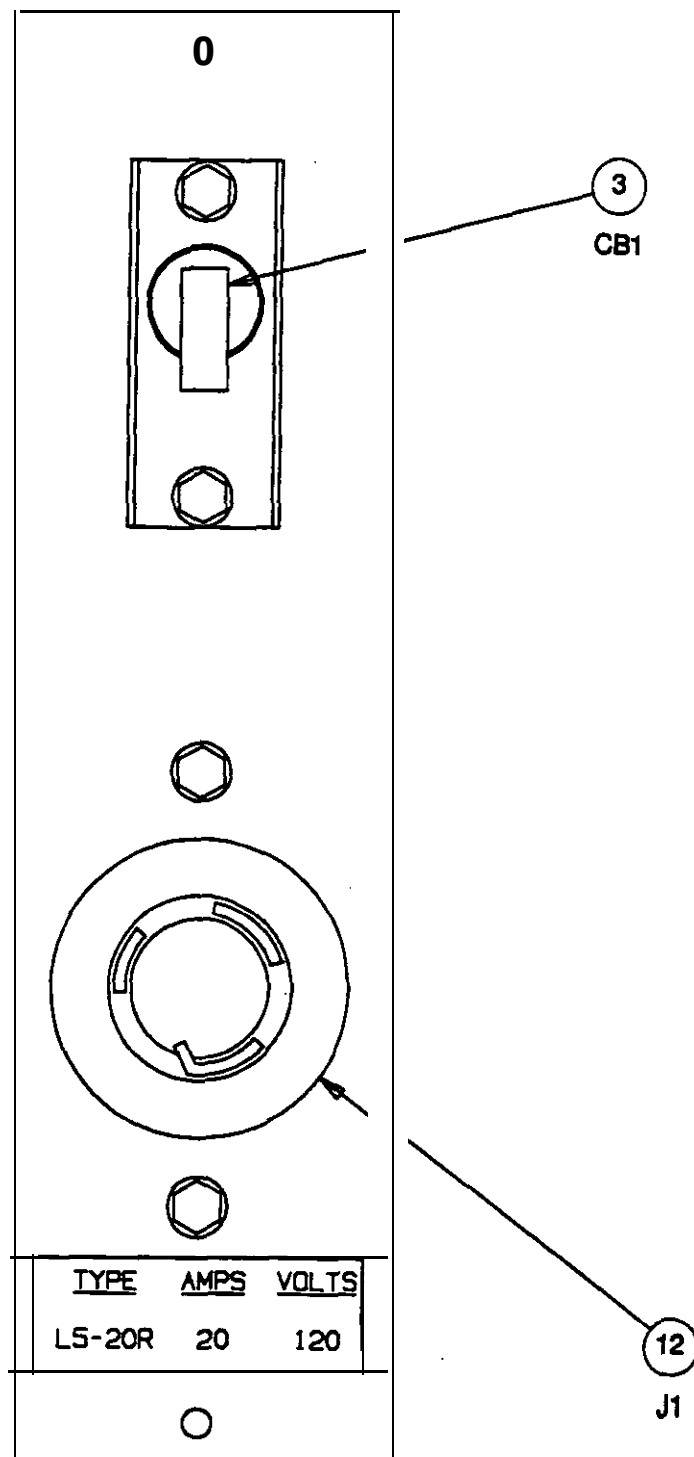
110253899

Figure 8-6 Output Panel "E"

OUTPUT PANEL "F" (FIGURE 8-7)

101258861

REF	PART NUMBER	DESCRIPTION	QTY	DESIGNATION
03	122130078-002	CRKT BREAKER 50/60HZ 1P 20A	1	
12	154108094	TWIST-LOCK RECEPT L5-20R-1	1	



110253900

Figure 8-7 Output Panel "F"

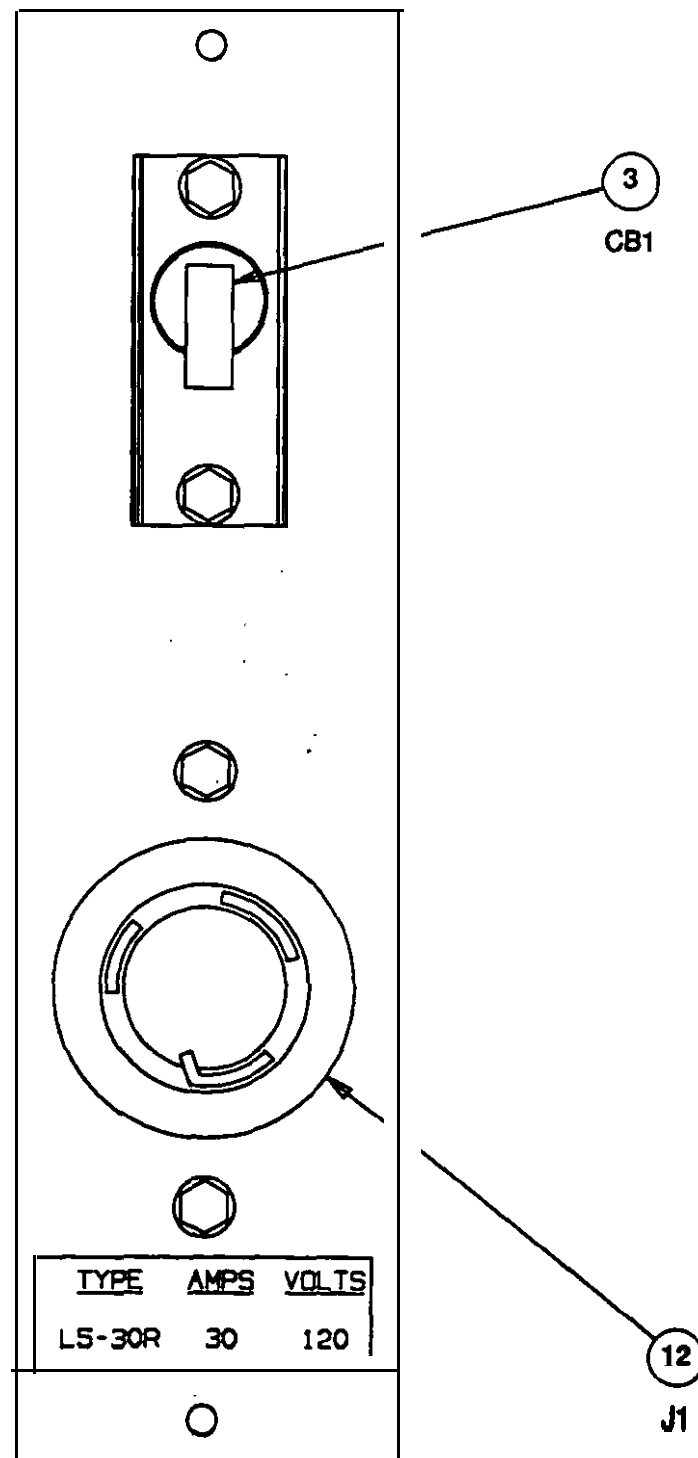
OUTPUT PANEL "G" (FIGURE 8-8)

101258862

REP PART NUMBER DESCRIPTION

QTY DESIGNATION

03	122130078-008	CRKT BREAKER 50/60HZ 30A	1
12	154108095	TWIST-LOCK RECEPT L5-30R-1	1



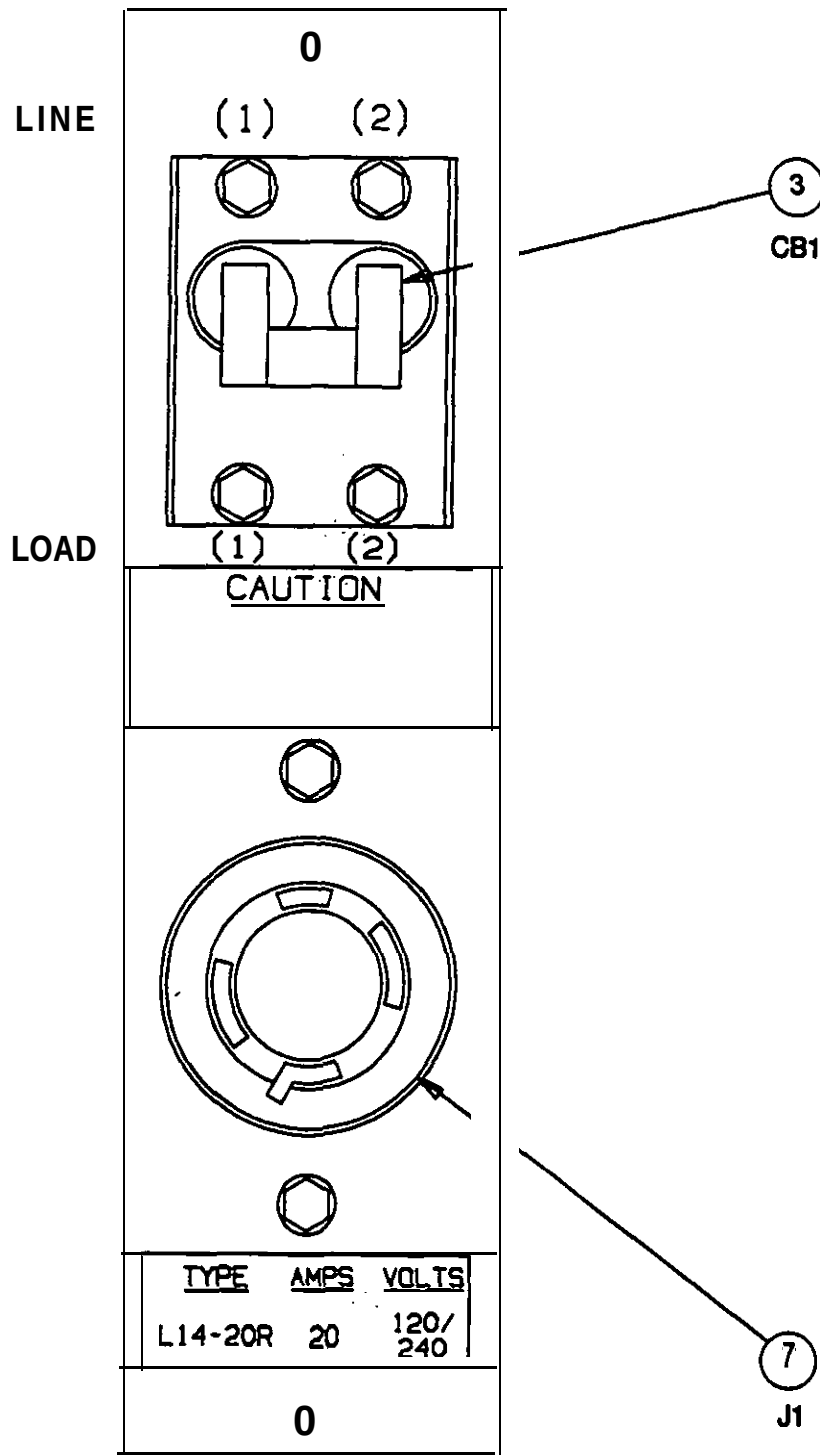
110253901

Figure 8-8 Output Panel "G"

OUTPUT PANEL "J" (FIGURE 8-9)

101258863

REF	PART NUMBER	DESCRIPTION	QTY	DESIGNATION
03	122130078-004	CRKT BREAKER 50/60HZ 2P 20A	1	
07	154108101	TWIST-LOCK RECBP L14-20R-1	1	



110253902

Figure 8-9 Output Panel "J"

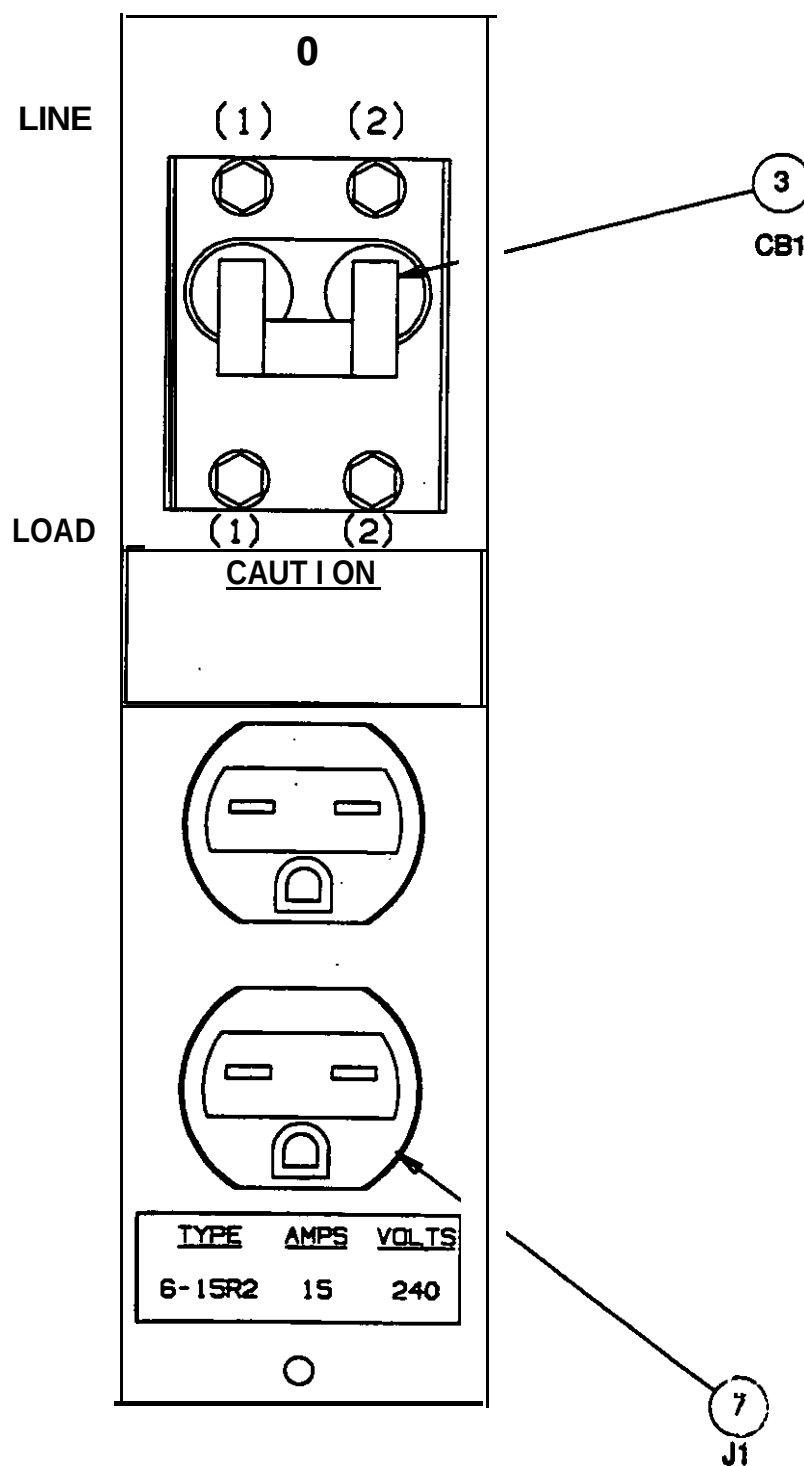
OUTPUT PANEL "K" (FIGURE 8-10)

101258864

REF PART NUMBER DESCRIPTION

QTY DESIGNATION

03	122130078-006	CRKT BREAKER 50/60HZ 15A	1
07	154108079	STRAIGHT BLADE RECEPTACLE	1



110253903

Figure 8-10 Output Panel "K"

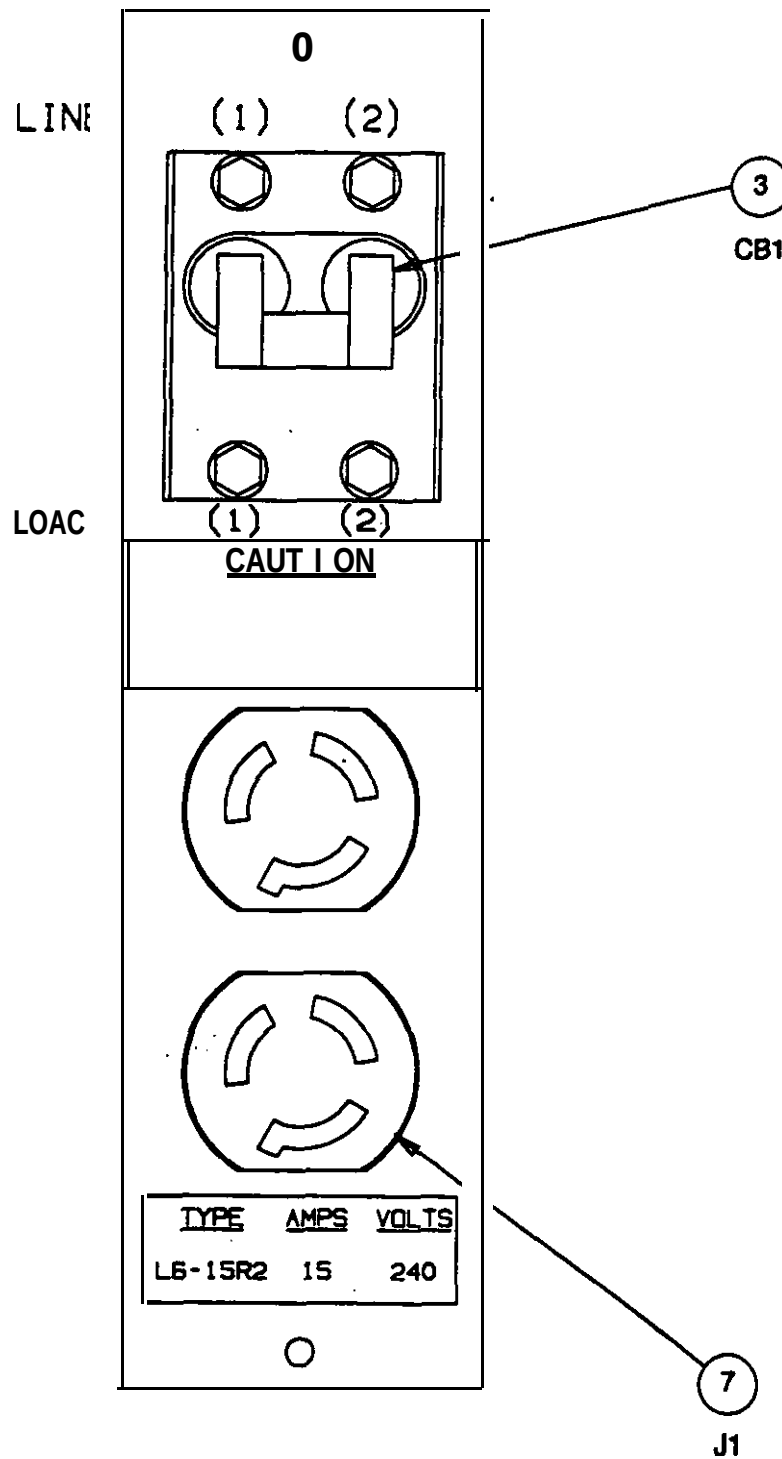
OUTPUT PANEL "L" (FIGURE S-11)

101258865

REP PARTNUMBER DESCRIPTION

QTY DESIGNATION

03	122130078-006	CRKT BREAKER 50/60HZ 15A	1
07	154108097	TWIST-LOCK RECEPT L6-15R-2	1



110253904

Figure 8-11 Output Panel "L"

OUTPUT PANEL "MM" (FIGURE 8-12)

101258905

REF PARTNUMBER DESCRIPTION

QTY DESIGNATION

03	122130078-009	CRKT BREAKER 50/60HZ 20A	1
12	1541080105	TWIST-LOCK RECEP L21-20R-1	1

OUTPUT PANEL "NN" (FIGURE 8-12)

101258906

REF PARTNUMBER DESCRIPTION

QTY DESIGNATION

03	122130078-010	CRKT BREAKER 30A	1
12	1541080106	TWIST-LOCK RECEP L2 1-30R- 1	1

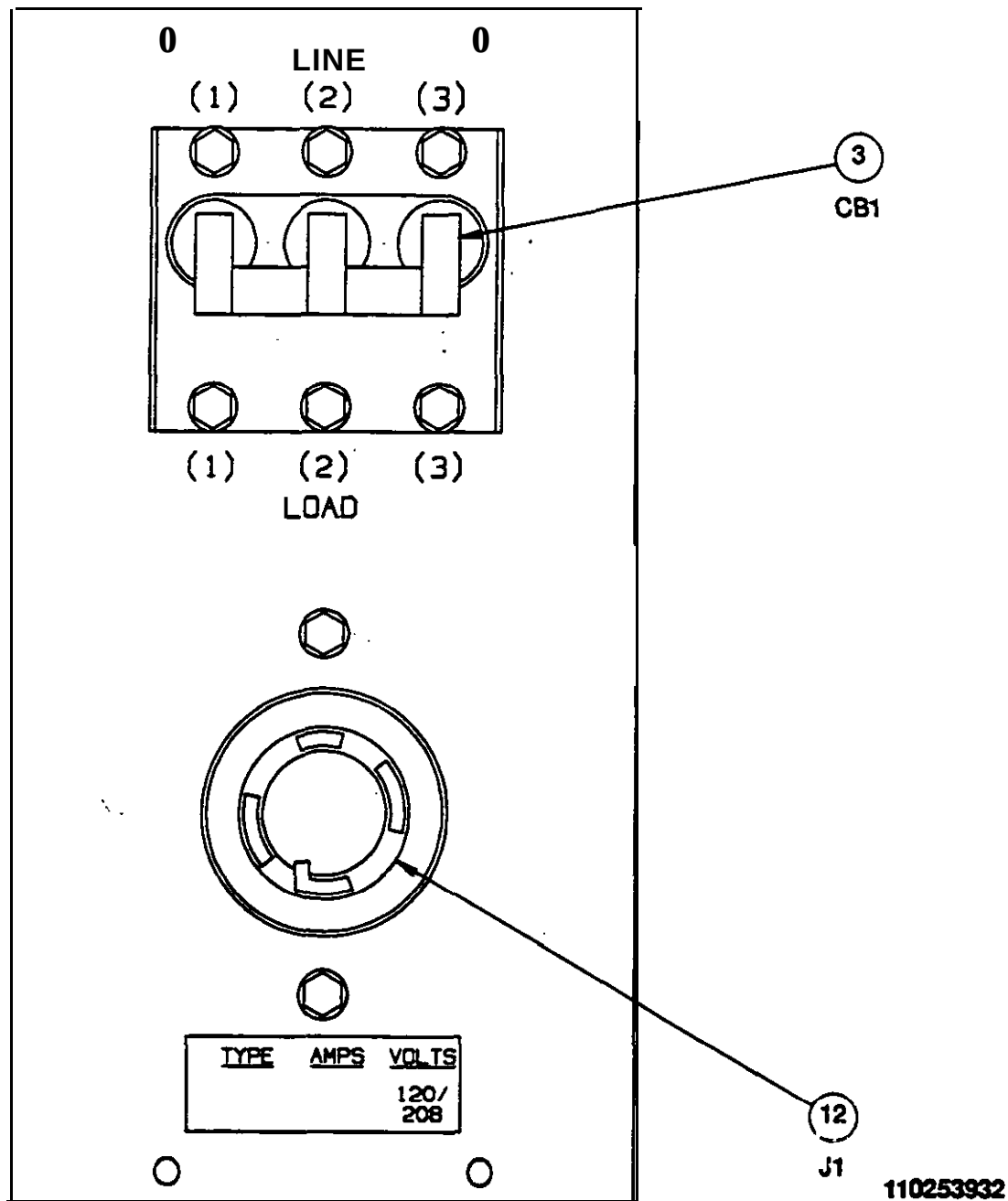


Figure 8-12 Output Panel "MM" and "NN"

OUTPUT PANEL "000" (FIGURE 8-13)

101258907

REF	PARTNUMBER	DESCRIPTION	QTY	DESIGNATION
03	122130078-009	CRKT BREAKER 20A	1	
10	1541080105	TWIST-LOCK RBCBP L21-20R-1	1	
12	1541080106	TWIST-LOCK RECEP L21-30R-1	1	

OUTPUT PANEL "PPP" (FIGURE 8-13)

101258908

REF	PARTNUMBER	DESCRIPTION	QTY	DESIGNATION
03	122130078-009	CRKT BREAKER 20A	1	
10.12	1541080105	TWIST-LOCK RECEP L21-20R-1	1	

OUTPUT PANEL "QQQ" (FIGURE 8-13)

101258909

REF	PARTNUMBER	DESCRIPTION	QTY	DESIGNATION
03	122130078-010	CRKT BREAKER 30A	1	
10.12	1541080106	TWIST-LOCK RECEP L21-30R-1	1	

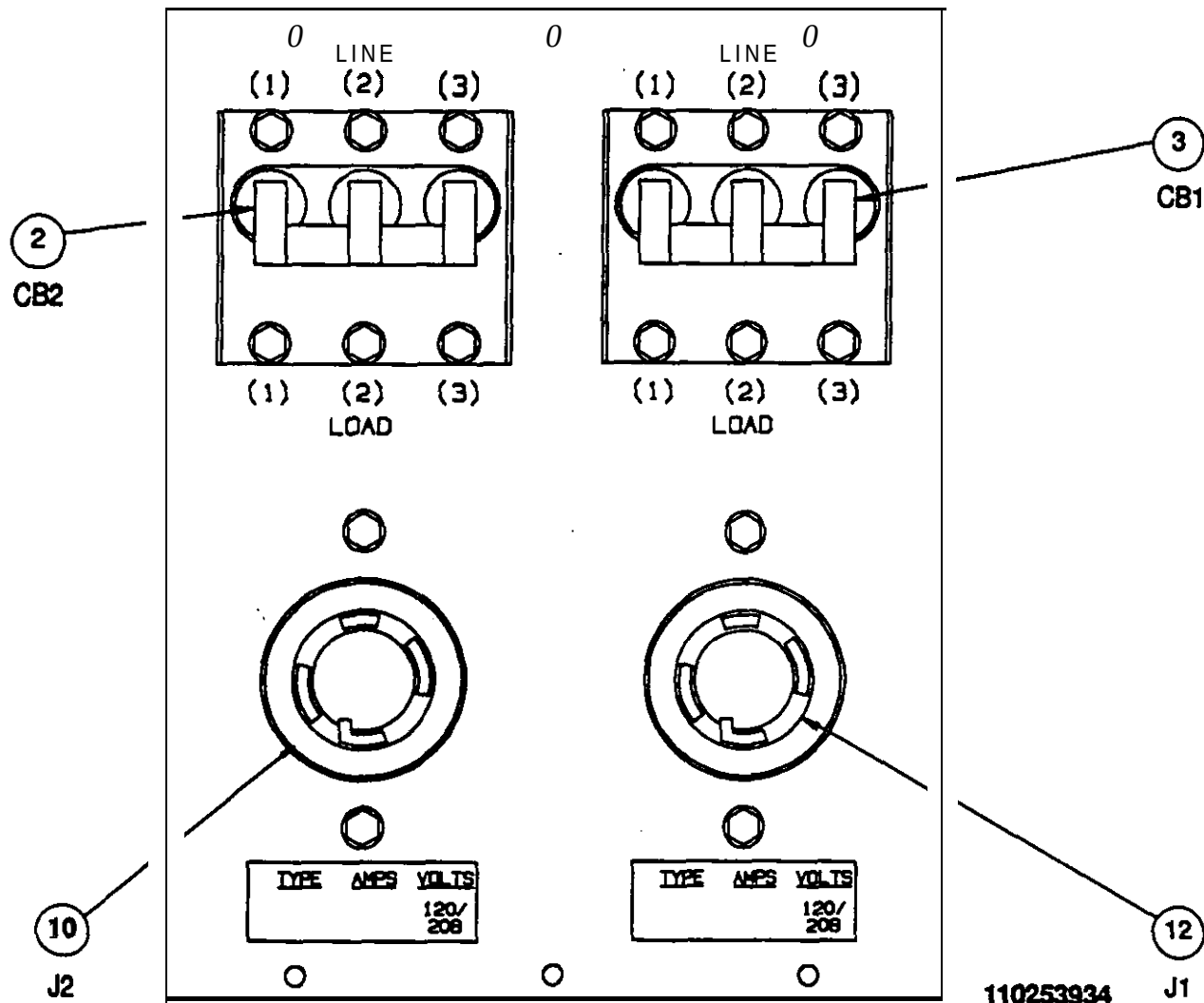


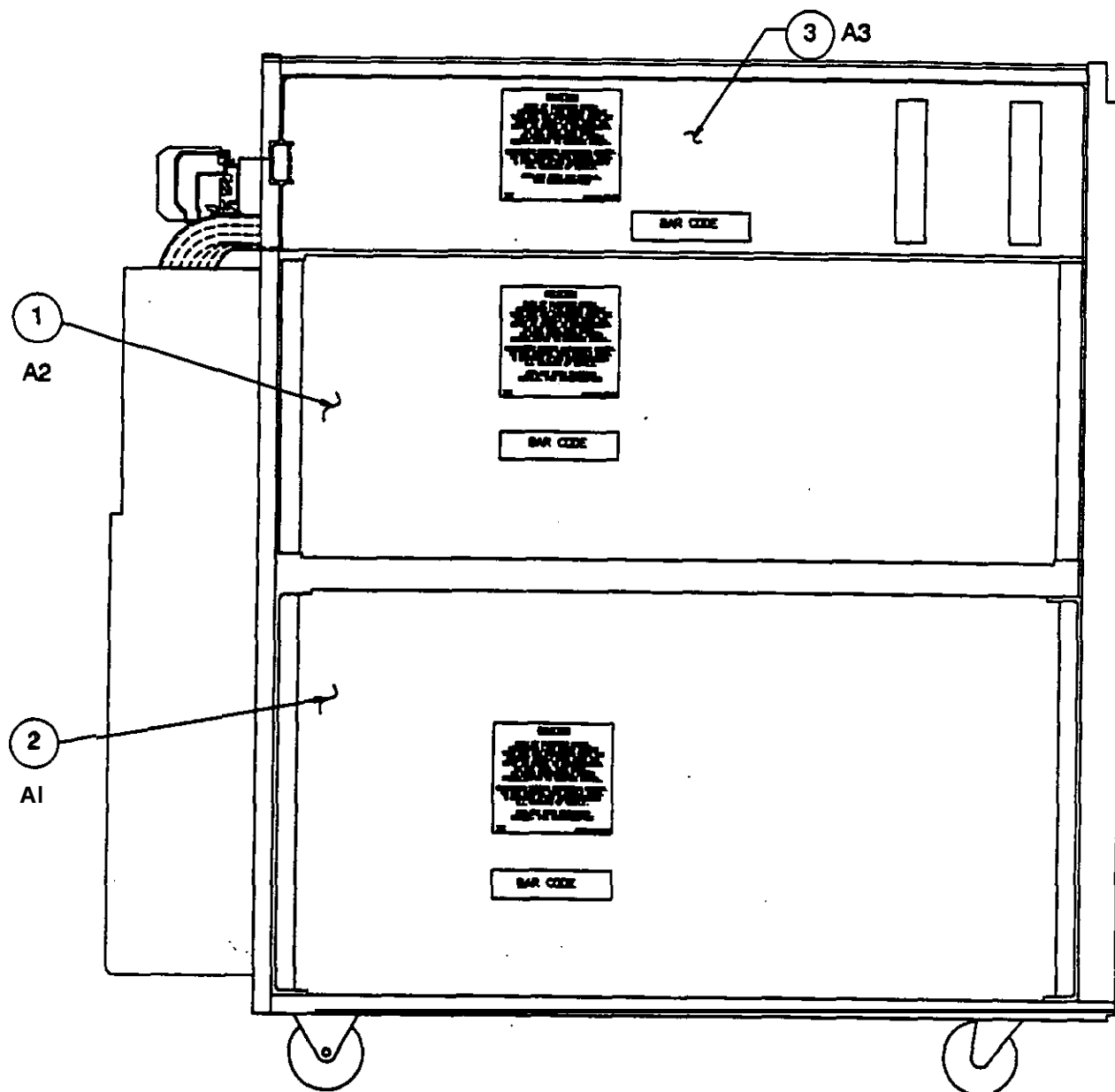
Figure 8-13 Output Panels "000", "PPP", and "QQQ"

TOP ASSEMBLY (FIGURE 8-1)

101614219-003**REF** PARTNUMBER DESCRIPTION**QTY** DESIGNATION

01	101614169-003	PWR PLUS 18 INVERTER
02	101614178-003	PWR PLUS 18 RECTIFIER
03	101614235-003	PWR PLUS 18 J/O ASSEMBLY
25	145902022	SPDT SLIDE SWITCH

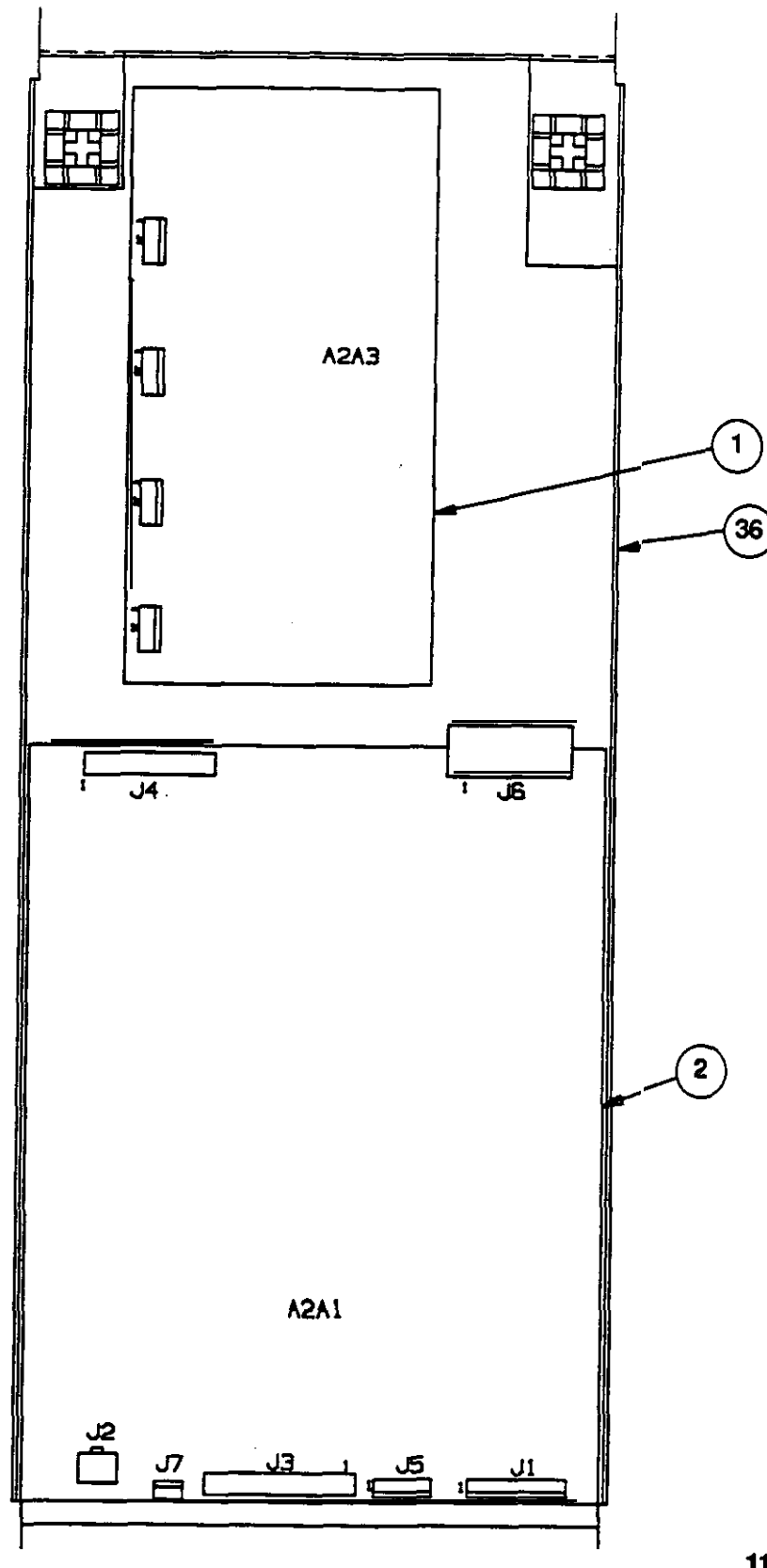
1	A2
1	A1
1	A3
1.	S2



110619182_1

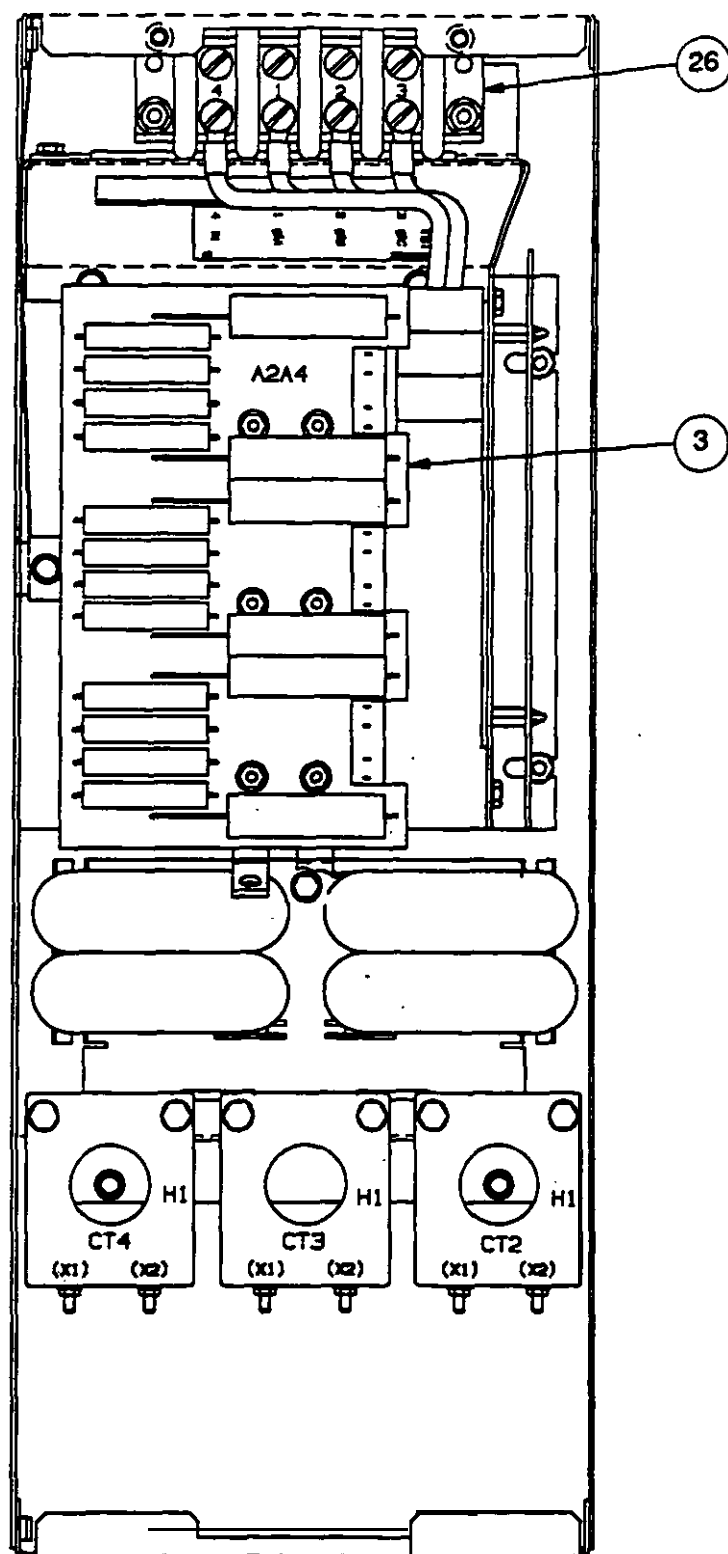
Figure 8-14 Top Assembly

INVERTER		(FIGURES 8-15 to 8-17)	101614169-003	
REF	PART NUMBER	DESCRIPTION	QTY	DESIGNATION
3	101072857	INVERTER SNUBBER BOARD	1	A2A4
2	101072890-001	INVERTER CONTROL BOARD	1	A2A1
1	101072923	GATE DRIVE	2	
7	120306004	CAP DUAL 30UF 150 VAC	3	C6-C8
8	121112081	INDUCTOR L6-L8 150UH 200A	3	L6, L7, L8
9	129101002-006	TERMINAL INTERFACE PAD	3	XU3 -XU5
11	13 1304279	HEAT SINK	1	
23	141931010	RESISTOR ASSEMBLY	3	R4-6
24	143224014	IGBT 600V 150A N/CHANNEL	3	U3-5
26	146106023	TERM GROUND OUTLINE 70A	1	TB1
29	149208333	CURRENT TRANSFORMER	3	CT2-4
30	151101046	FAN, 24 VDC	1	B1
36	157401597	COVER TOP INVERTER	1	



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Figure 8-15 Inverter Assembly



TOP VIEW
WITHOUT TOP COVER,
A2A4 BOARD AND
CAPS C6, C7, C8

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Figure 8-16 Inverter Assembly

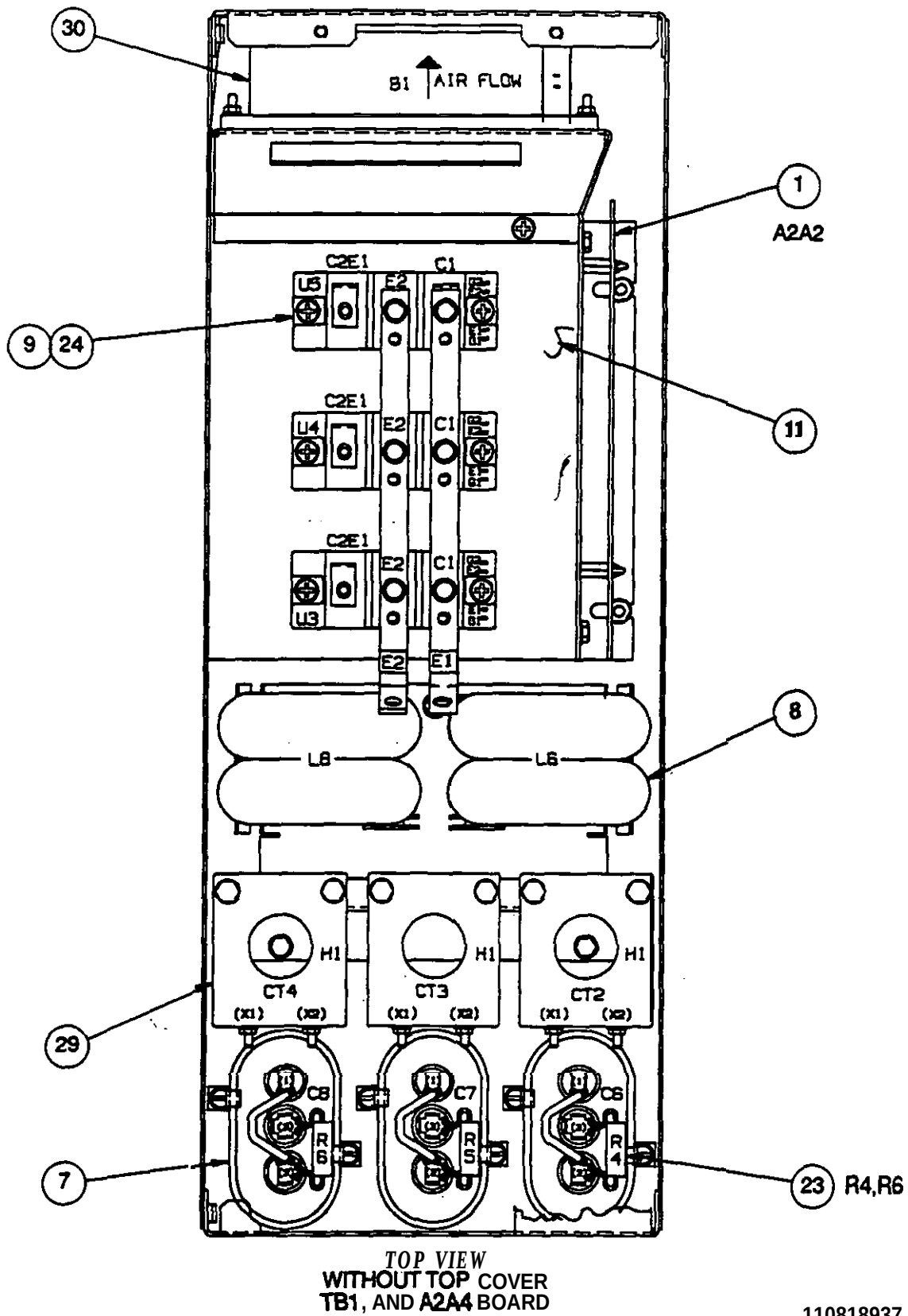
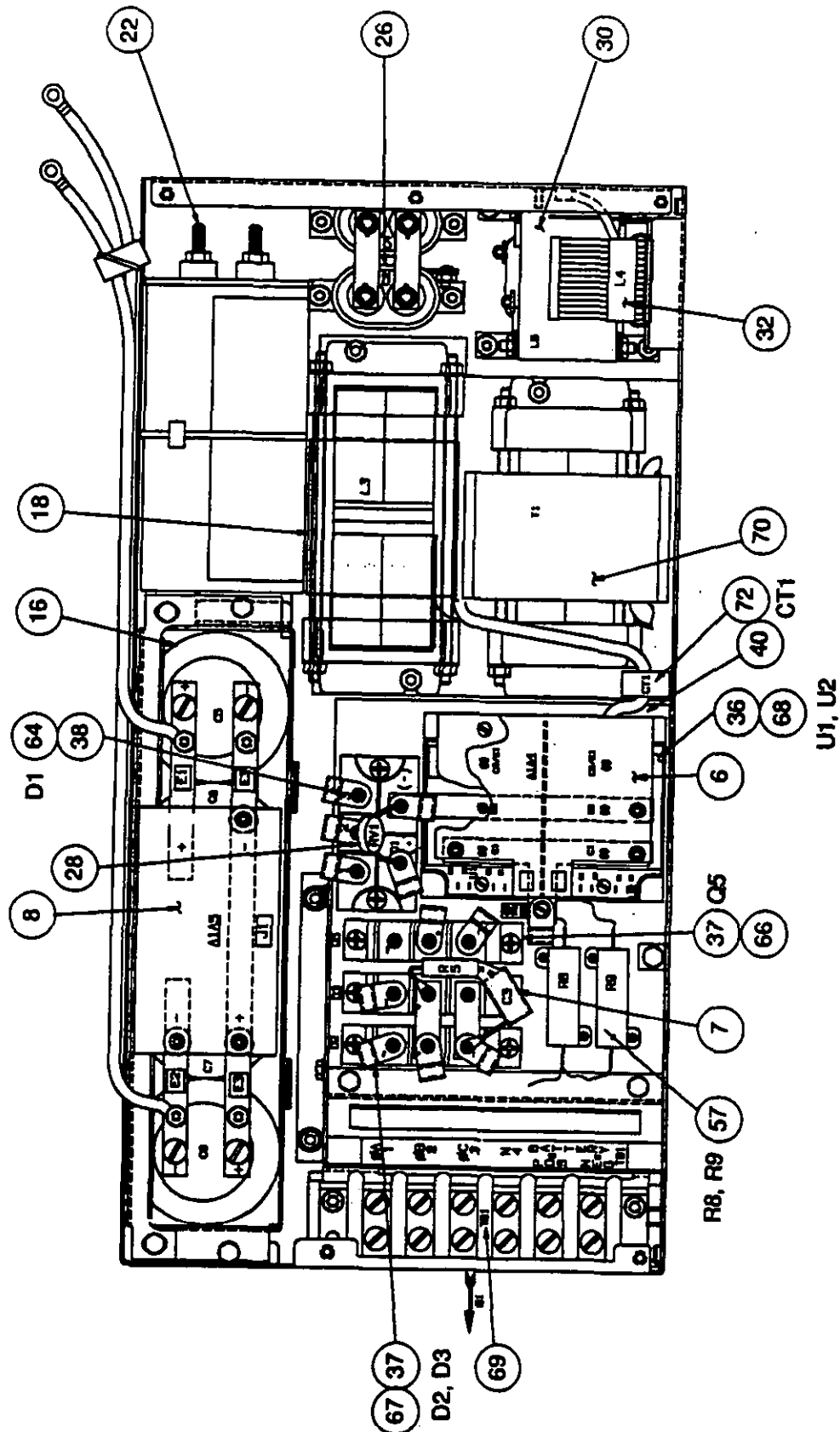


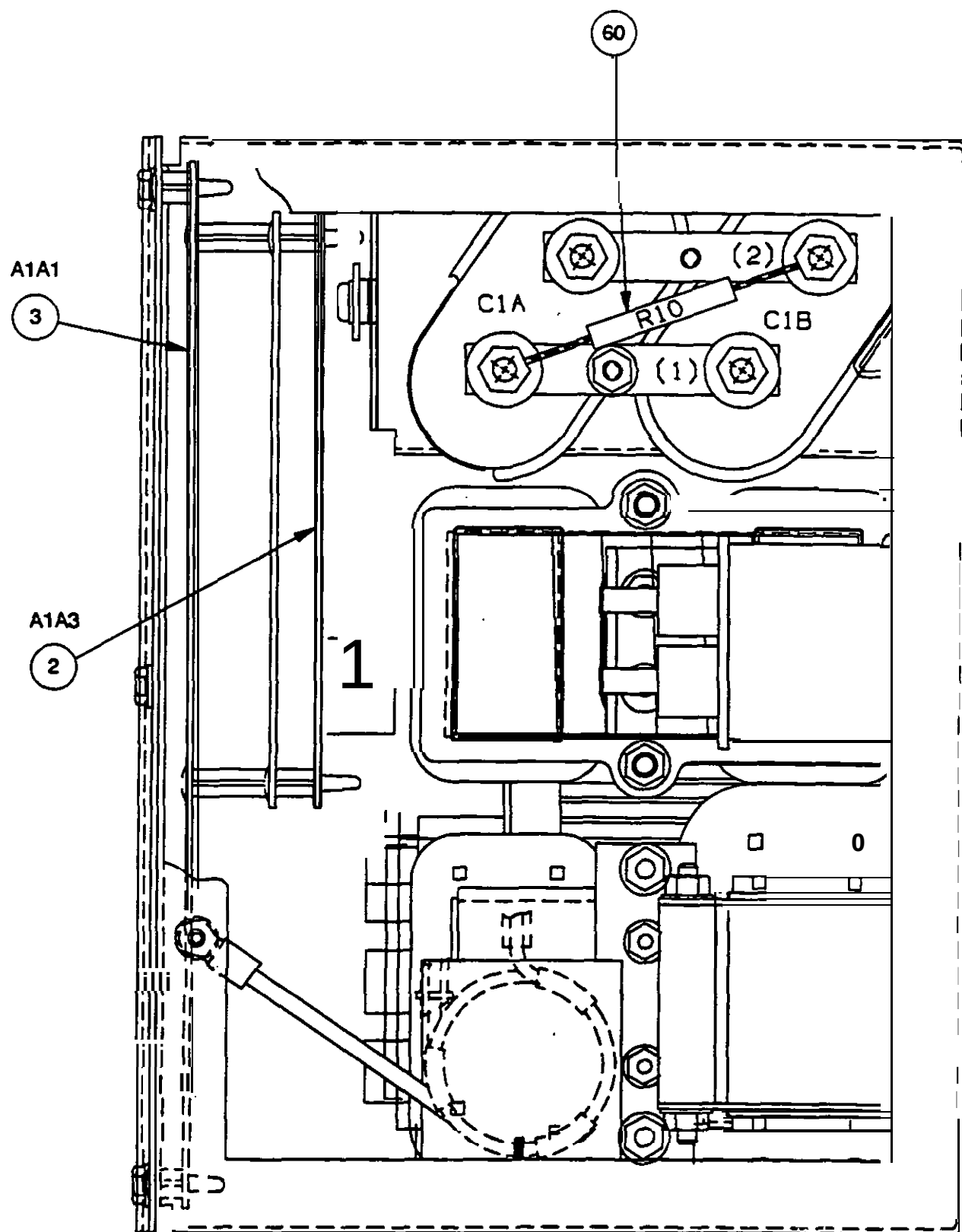
Figure 8-I 7 Inverter Assembly

RECTIFIER		(FIGURES 8-18 to 8-21)	101614178-003	
REF	PARTNUMBER	DESCRIPTION	QTY	DESIGNATION
2	101072806	POWER SUPPLY PCB	1	A1A3
6	101072858	RECTIFIER SNUBBER BOARD	1	A1A4
8	101072859	RECTIFIER BLEEDER BOARD	1	A1A5
3	101072866-004	RECTIFIER CONTROL BOARD	1	A1A1
1	101072923	GATEDRIVE	1	AL42
7	101614334	SNUBBER ASSEMBLY 10W	1	
16	120109016	CAP 1000UF 250VA	4	C5-C8
22	120315017	CAP OIL 20MF 600V	2	C1A, C1B
26	120925014	CAP .5UF 1500v	2	C2, c4
28	120925035	MOV ASSEMBLY 275V	1	RV1
18	121101360	CHOKE L3	1	L3
30	121112074	CHOKE L5	1	L5
32	121112077	INDUCTOR BUS 1.5UH	1	L4
37	129101002-004	THERMAL INTERFACE PAD	3	FOR D2, D3, Q5
38	129101002-005	THERMAL INTERFACE PAD	1	FOR D1
36	129101002-006	THERMAL INTERFACE PAD	2	U1, U2
40	131304278	HEATSINK	1	
57	141115086	RES W/W 20 OHM 50W	2	R8-9
60	141131003	RESISTOR ASSEMBLY 10W 16.0K	1	R10
64	143118063	DIODE 100A 1200V	1	D1
66	143146002	DIODE MODULE 90A 1200V	1	Q5
67	143146003	DIODE 70A 600V DUAL	2	D2, D3
68	143224015	IGBT 600V N/CHANNEL	2	U1, U2
69	146106025	TERMINAL BOARD,	1	
70	149114352	TRANSFORMER	1	T1
72	149208358	CT RECT	1	CT1
74	151101046	FAN 24 VDC	1	



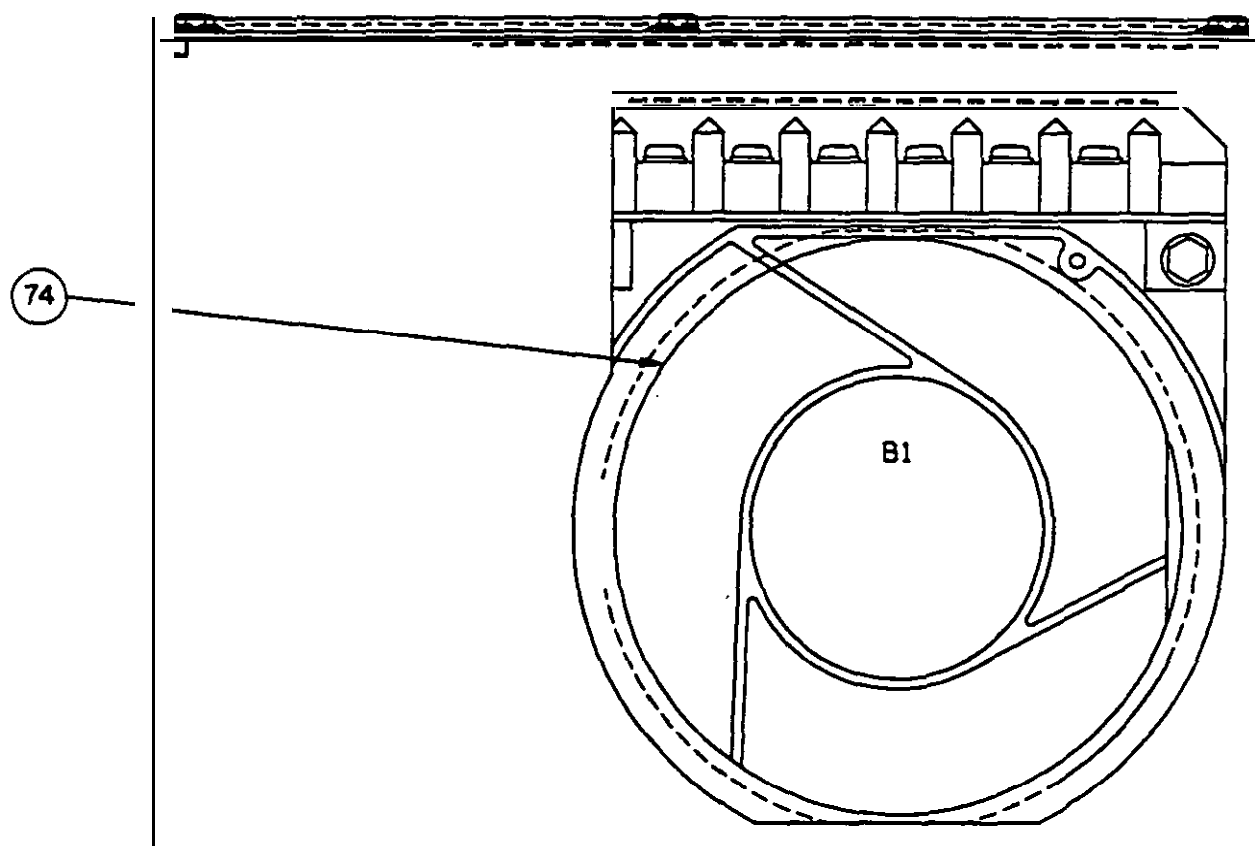
110618946

Figure 8-18 Rectifier Assembly



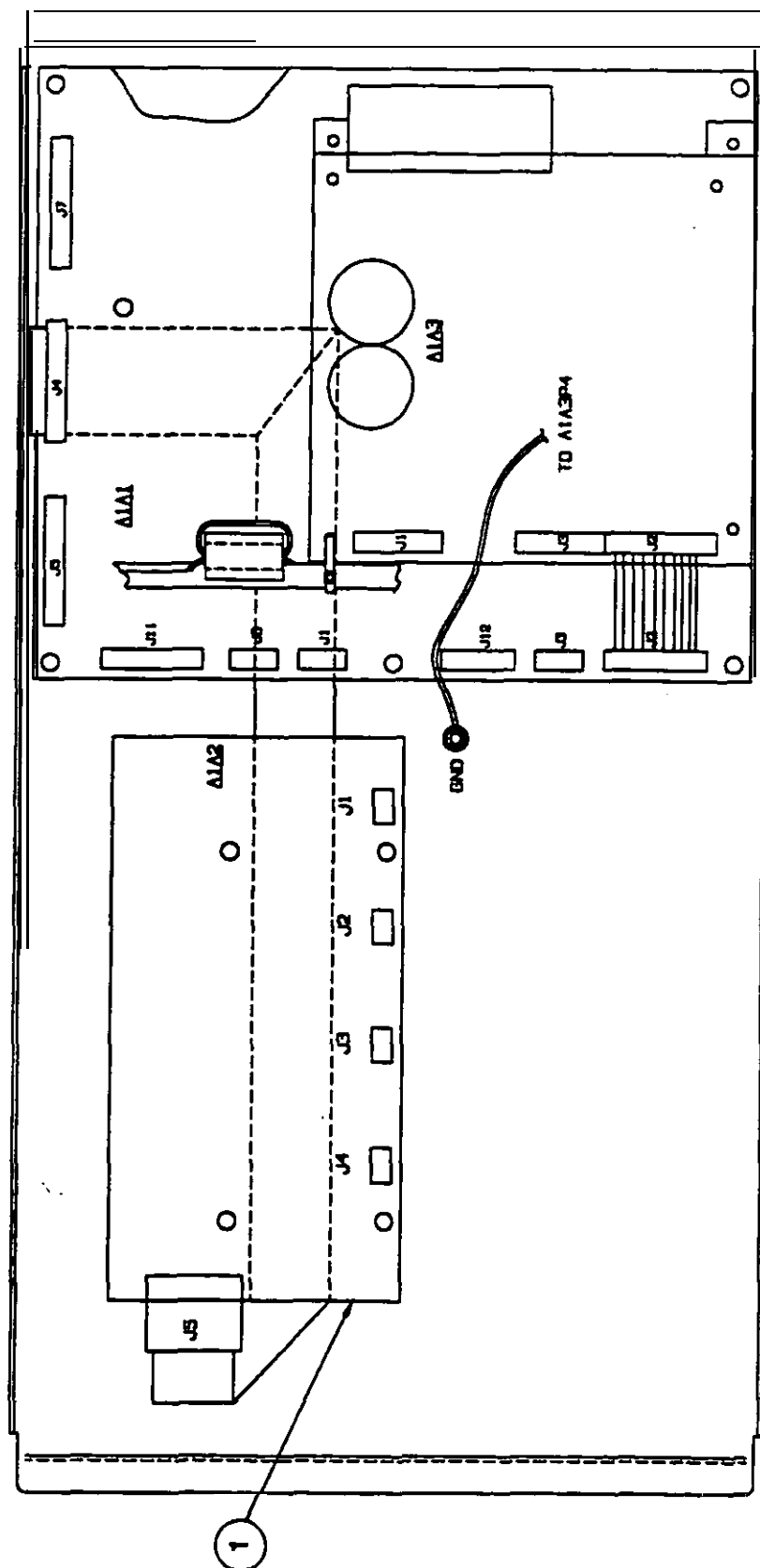
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Figure 8-19 Rectifier Assembly



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Figure 8-20 Rectifier Assembly



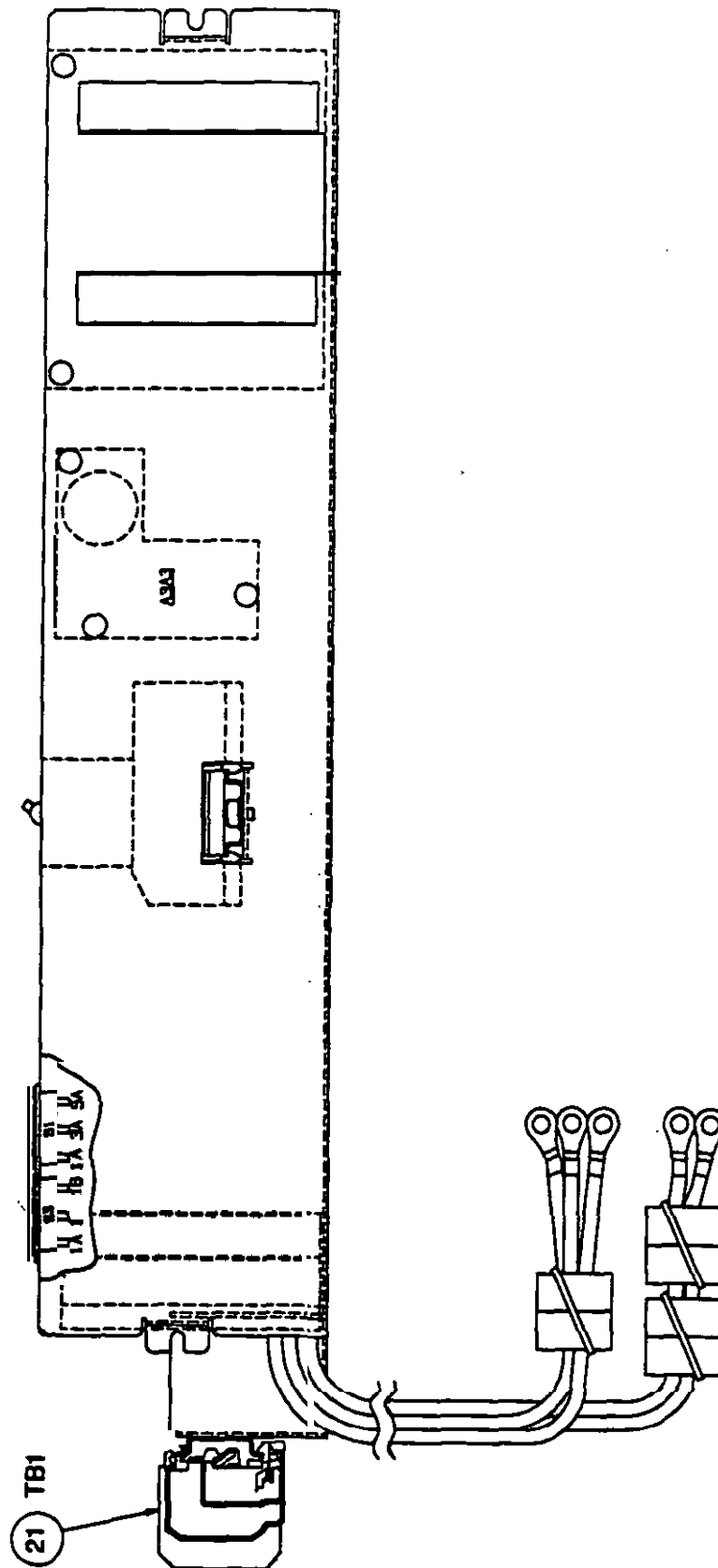
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Figure 8-21 Rectifier Assembly

I/O ASSEMBLY (FIGURES 8-22 and 8-23)

101614235-003

	R E P	PART NUMBER	DESCRIPTION	QTY	DESIGNATION
I	1	101072945	AUTO BYPASS BOARD	1	A3A2
	9	122128185X02	CIRCUIT BRK 2 POLE 63A 250 VAC	1	CB2
	11	122128186	CIRCUIT BRK 3 POLE 63A 240 VAC	1	CB1
	7	~~122128196-002~~	CIRCUIT BRK 3 POLE 63A 240 VAC	1	CB3
	8	123102017	CONTACTOR 25A 240V	3	K1, 2.3
	28	145902022	SLIDE SWITCH SPDT	1	S1
	27	145902023	SLIDE SWITCH DPDT	1	s3
	21	146201033	TERMINAL BLOCK	1	TB1



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Figure 8-23 I/O Assembly

FULL FEATURE FRONT PANEL **FIB/232/EPO** (FIGURE S-24) **101614347-003**

REF	PART NUMBER	DESCRIPTION	QTY	DESIGNATION
6	101072886-001	COMM/RELAY/RS232	1	A4A2
4	101072887	FRONT CONTROL PANEL	1	A4A1
3	132204054	BUTTON PUSH FRONT PANEL	3	
26	145322002	KEYBOARD	1	
39	157309326	CONTROL PANEL	1	

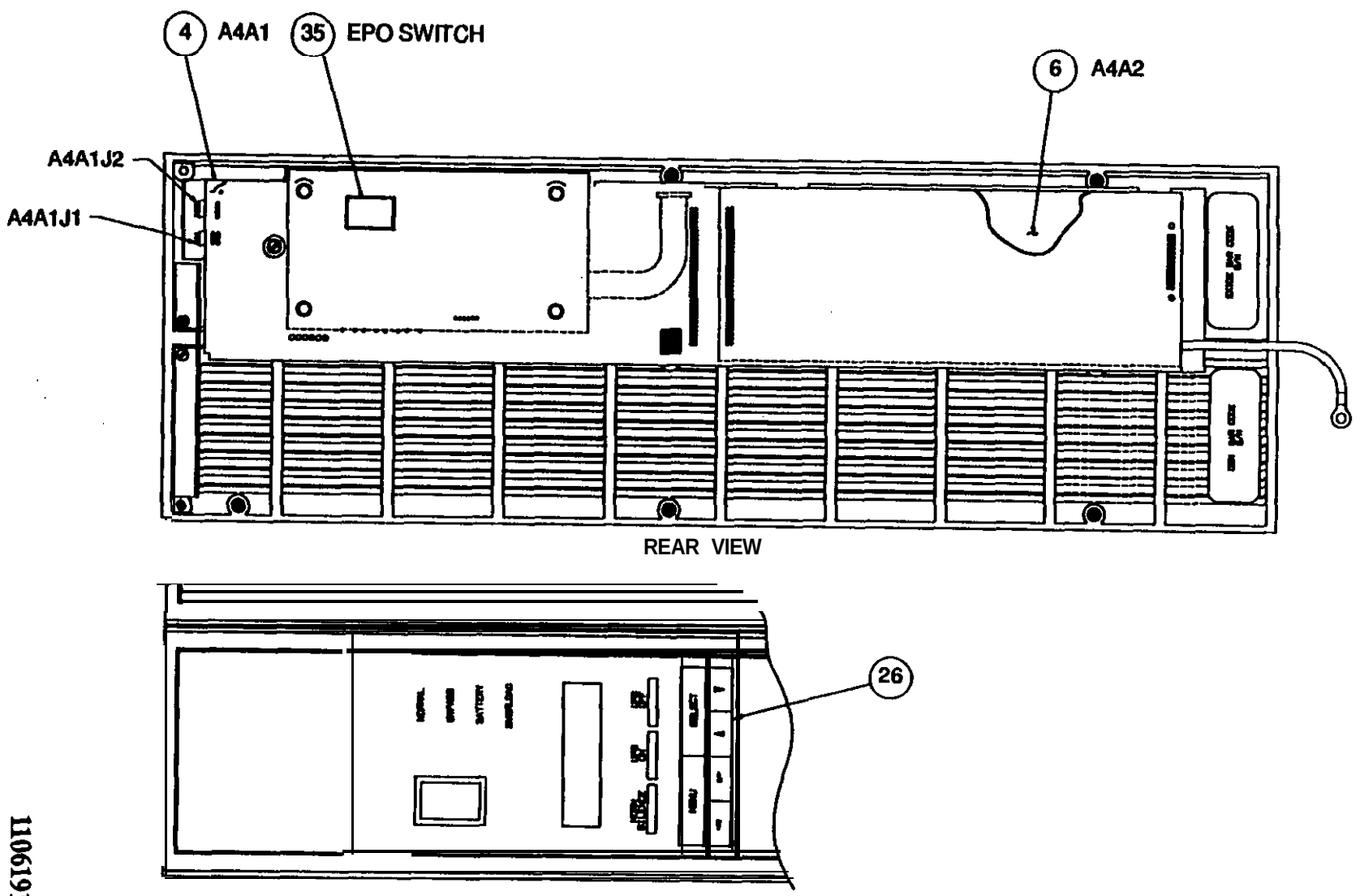


Figure 8-24 Full Feature Front Panel Assembly

110619111

FRONT PANEL EPO/RS232/LANGUAGE ENGLISH		101614410-110	
REF PARTNUMBER	DESCRIPTION	QTY	DESIGNATION
-- 101614347-110	FFF PANEL/FIB/232/EPO	1	
-- 157309361-001	FRONT PANEL-EXIDE	1	
HV18 TRANSFORMER CABINET (FIGURES 8-25 AND 8-26)			101614858-001
REP PARTNUMBER	DESCRIPTION	QTY	DESIGNATION
-- 130901199	KIT JOINING	1	
7 146105003	TERMINAL BOARD, 50 AMP	2	
1 146105009	TERMINALBOARD OUTLINE	2	TB1/TB2
6 146201005	EXLDE BLOCK 1/4 - 20 X 1.7	2	
3 146201040-001	10 POSITION TERMINAL	1	TB3
5 149114404-001	AUTO TRANSFORMER	1	
10 152104092-001	CONN CORD, STRAIN RELIEF	2	
16 152507353-m	INPUT/OUTPUT CORD	2	

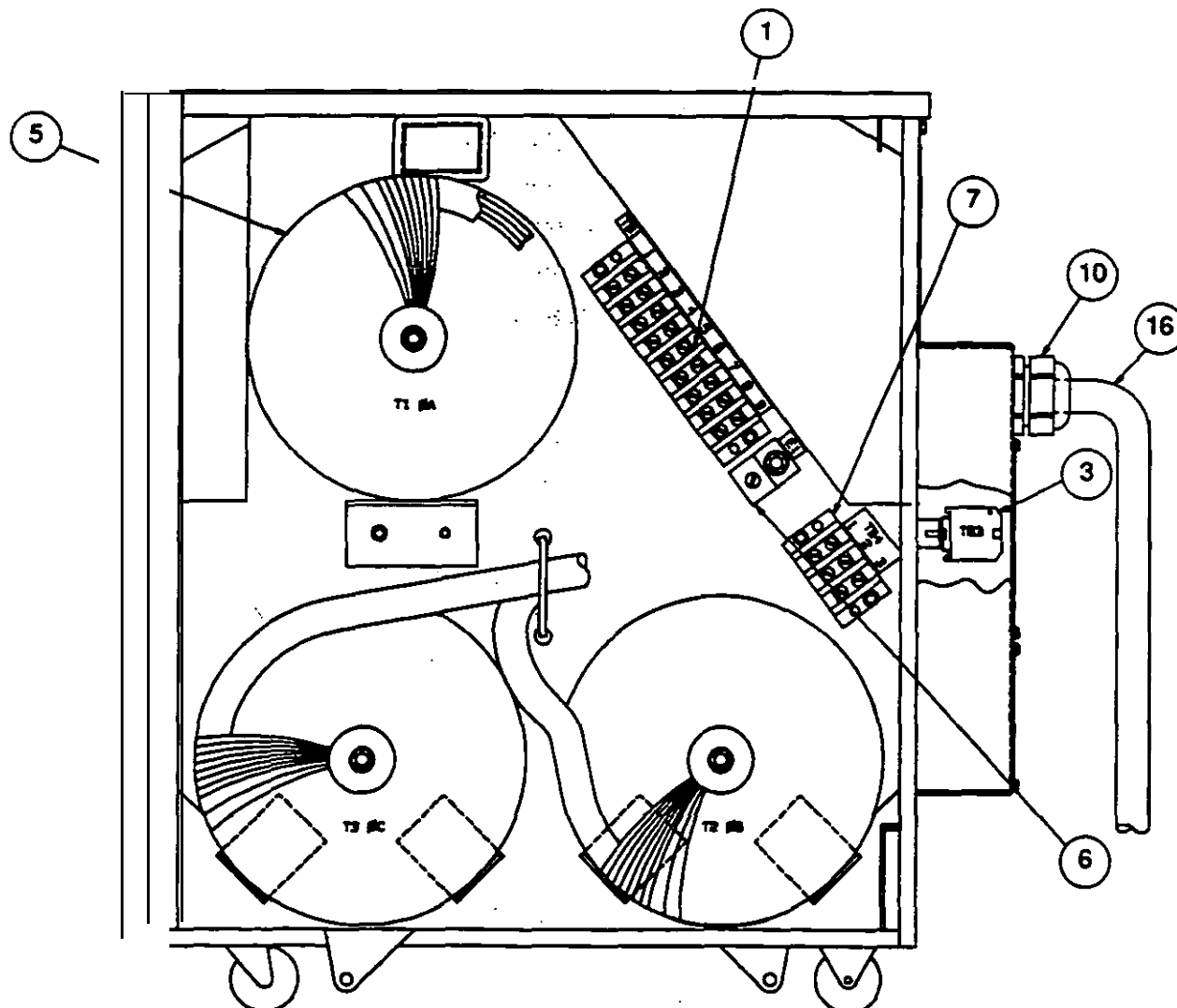
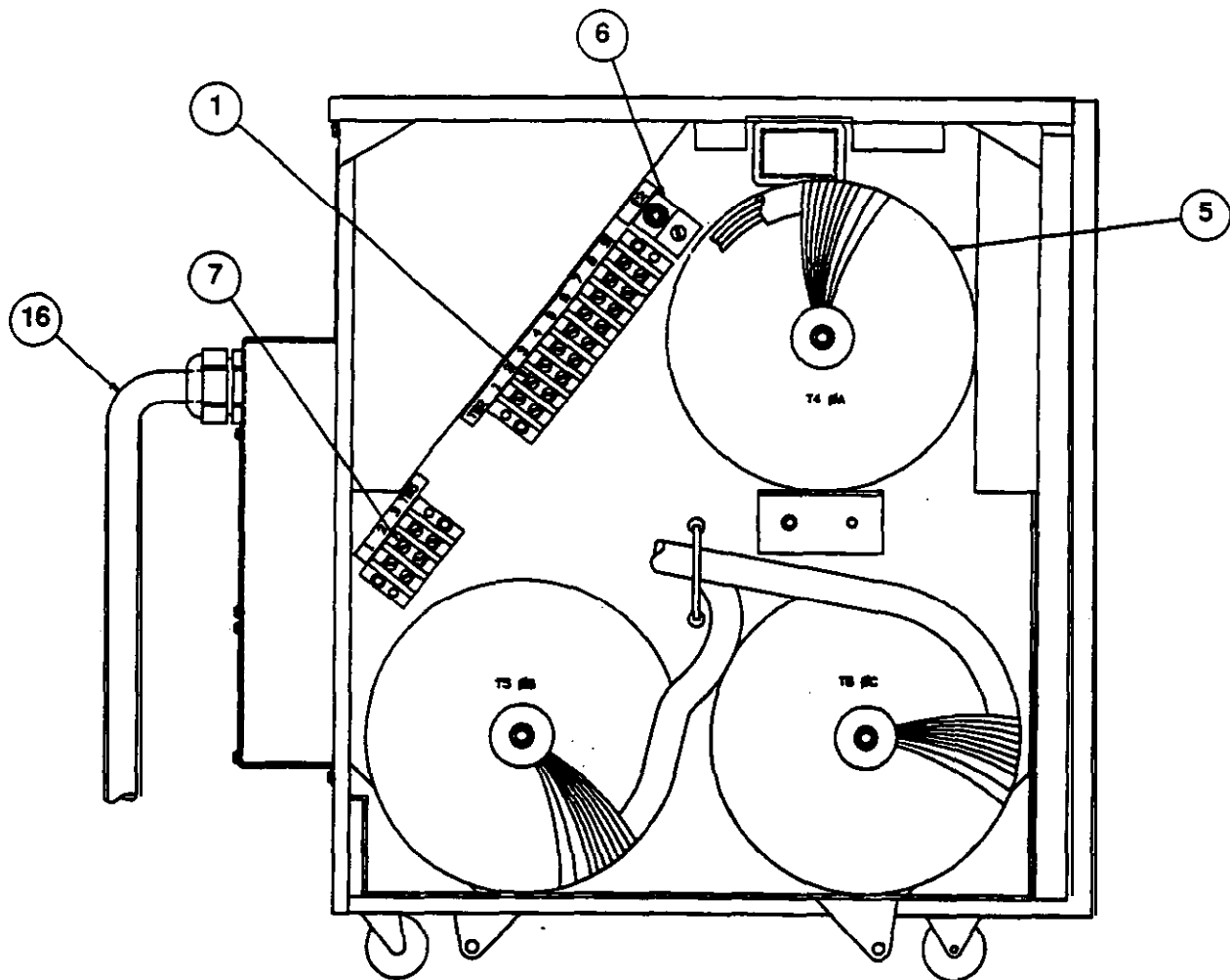


Figure 8-25 HV18 Transformer Cabinet

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Figure 8-26 HV18 Transformer Cabinet

SIEMENS OPTION CABINET

RL151965-400

REF	PART NUMBER	DESCRIPTION	QTY	DESIGNATION
--	PP151965-001	XFMR 30KVA 480VAC	1	
--	PP151965-002	XFMR 30KVA 220VAC	1	
--	PP151965-003	BRKR 220VAC 20 AMP 1 POLE	1	
--	PP151965-004	BRKR 480VAC 20 AMP 3 POLE	1	
--	PP151965-005	BRKR 480VAC 30 AMP 3 POLE	1	
--	PP151965-006	BRKR 277VAC 40 AMP' 1 POLE	1	
--	128304045	FUSES KTK 1 AMP	2	
--	128401094	FUSE BLOCK 30A 600V 2P	1	
--	146201021	TERMINAL BLOCK 1-5 CKTS	10	
--	146201022	TERMINAL BLOCK 6-10 CKTS	2	
--	151101043	FAN TUB AXIAL 230V	1	

COMMON PARTS

PART NUMBER	DESCRIPTION
101614049	BATTERY TRAY
153302025	BATTERY
128308005	BATTERY FUSE
101614178	RECTIFIER FRU
101614169-01	INVERTER FRU
101614347-003	FULL FEATURE F/F
101614347-004	FFFP W/EPO
101614347-005	FFFP W/RELAYS
101614347-010	FFFP W/RS232/EPO/RELAYS
101614347-011	FFFP W/EPO/RELAYS
101614347-015	FFFP W/RS232/RELAYS
101614347-018	FFFP W/RS232
101614347-019	FFFP W/RS232/EPO
101072886-001	C OMM/RELAY/RS232 BOARD
101072886-002	COMM/RS232 BOARD
101071886-003	COMM/RELAY
157309350-001	SIDE PANEL. RIGHT
157309350-002	SIDE PANEL LEFT

Note: For stocking purposes only, the recommended part numbers are:

- * 101614347-010 for units with EPO
- * 101614347-015 for **units** without **EPO**

These Full Feature Front Panels **can** replace the others.

UPGRADE KIT

PART NUMBER DESCRIPTION

101258898	12 TO 15 kVA
101258899	15 TO 18 kVA
101258900	12 TO 18 kVA
101258813-901	COMMUNICATIONS FIELD KIT (DIGITAL FRONT PANEL, RS232, RELAY OPTIONS)

RECOMMENDED SPARE PARTS

PARTNUMBER	DESCRIPTION	QTY
101614178-003	RECTIFIER FRU	1
101614169-003	INVERTER FRU	1
101614235-003	I/O FRU	1
123102017	CONTACTOR	2
122128186	CB 1 BREAKER (AC 3Ø)	1
122128185002	CB2 BREAKER (DC)	1
122128188-002	CB3 BREAKER (AC 3Ø)	1
124801041	EMI FILTER	1
101072945	AUTO BYPASS BOARD	1

9

Prints

POWERWARE PLUS 18			
NOMENCLATURE	PART NO# (BOM)	SCHEMATIC	ASSEMBLY
CTO	-	110717203 D	-
FAMILY TREE	-	199000849 D	-
INVERTER FRU	101614169-02	110611597 D	110618937 D
RECTIFIER FRU	101614178-003	110712198 D	110618946 D
TOP PRINT	101614219-003	110712227 D	110619182 D
I/O FRU	101614235-003	-	110619186 D
BATTERY CABINET 7AH	101614135 FULL 101614217 HALF	-	110618890 D
BATTERY CABINET 18AH	101614244	-	110619025 D
INVERTER 400HZ	101614282	-	110619058 D
FRONT PANEL FULL FEATURE	101614347-003	-	110619111 D
PDM 3 Ø	101614544	-	110619235 D
HV18 XFMR CABINET	101614858-001	110712322 D	110619462 D (2 SHEETS)
CUSTOMER DRAWINGS			
OUTLINE & INSTALLATION	-	-	110719045 D
ONELINE & CONFIG	-	-	110719046 D
BATTERY INSTALLATION	-	-	110719062 D
PDM INSTALLATION	-	-	110719090 D
REMOTE MONITOR INSTALLATION	101259003	110254307 D	-
HIGH VOLTAGE TRANSFORMER CABINET	101614858-001	110719176 D	-
		110719175 D	
SIEMENS OPTION CABINET	RL151965-400	CD-151965 B	-
SIEMENS OUTLINE/ONELINE	RL151965-400	-	110719025 D

POWERWARE PLUS 18 OUTPUT PANELS

[illegible]

[illegible]

Appendix A

Lockout/Tagout Procedures

This procedure establishes requirements for **the** control of machine start up **and** hazardous energy to prevent **injury** during servicing and maintenance of machines or equipment.

A.1 LOCKOUT

A device which **physically** prevents operation of machinery or equipment and **cannot** be removed with out excessive force or **the** use of **metal** cutting tools.

A.2 TAGOUT

A device which physically prevents the **operation** of machinery via **an** attached warning tag.

A **tagout** device **must** be placed in the same location on the equipment where a lockout device might be **used**.

Tagout devices can not be reused **and must** be **strong** enough, to prevent inadvertent or accidental removal.

The originator of the **tagout** must attach a red **warning** tag to the device which includes:

DO NOT START, DO NOT OPEN, DO NOTCLOSE or DO NOT OPERATE instructions.

The originators name.

Date and time lockout or tagout device was installed.

Reasonforinstallation.

When using a **tagout** far **energy control**, notify the Facilities Department to ensure all **affected** employees have reviewed **tagout** procedures.

CAUTION

Performing serviceor maintenance on equipmentwithout using a lockout or ragout device can place any individuals in danger.

A.3 USE OF LOCKOUT AND TAGOUT DEVICES.

When **to** use lockout or **tagout** devices:

Before performing service or maintenance on a machine or electrical **equipment**, a lockout or **tagout** device must **be** attached to prevent **injury** FROM unexpected start up or the release of stored energy which could cause injury.

How to use Lockout or **tagout** devices:

1. **Implementation** of lockout or **tagout** devices shall be performed by **authorized** individuals only.
2. Notify affected people in an area before installing a lockout or **tagout** device. Notification must **include** the reason, for the lockout or **tagout** and the magnitude of **hazards** involved. Each lockout or **tagout** must be entered in the **lockout/tagout** log located in the Facilities Department.
3. **Machinery** and equipment must be shut off and must be **isolated** from **the** **energy** source and stored energy must be dissipated before **installing** a lockout device.
4. The person **performing** the service **is responsible** for placing a lockout device on the equipment, and must assure the key is not accessible to other people.
5. **Before service or maintenance is performed check to verify the energy source has been disconnected:**
 - a. Assure no **personnel** are **exposed**.
 - b. Use the **normal operating** controls to verify the **absence** of Rower.
 - c. Return operating **controls** to "OFF" position.

A.4 REMOVAL OF **LOCKOUT** OR **TAGOUT** DEVICES.

After service or **maintenance** is complete, check the area to ensure no one is exposed to any safety conditions, (i.e., remove all work tools, **reinstall** guards **and** remove lockout or **tagout devices**). **Restore** energy to the equipment.

Only the **originator** of the lockout or **tagout** device **removes** the **lockout/tagout** device.

The originator should never remove the lockout or tagout device!

After removing a lockout device, the originator **is** responsible for returning the device to **the** designated storage area.

NEVER REMOVE TAGS ATTACHED TO TAGOUT DEVICES! Questions about tags and lockout devices left on equipment in the area can be directed to the originator or the Facilities Department.

A.5 DOCUMENTATION

Each time lockouts and **tagouts** are **used they** must be documented in a lockout and **tagout** log.

The log will contain:

- Type(s) and magnitude of energy and hazard.
- Names of **affected** employees.
- Types and **locations** of lockouts or **tagouts**.
- **Types** of stored energy and methods to dissipate or **restrain** it.
- Reason for the lockout or **tagout**.
- **Type** of equipment involved.
- Name of authorized individual(s) who installed the lockout or **tagout**.
- Installation and removal dates.

A.6 INSPECTIONS

Periodic **inspections** by the Facilities **Department** will be performed to ensure compliance **with** these procedures.

Periodic **inspections** will **be documented** and the results **will** be located in the Facilities **Department**.

Any of the following exceptions, must be reported to the Facilities Department immediately:

- **A person other than the originator removing or tampering with a** lockout or **tagout** device.
- A tag not **connected** to the **tagout** device.
- **A** key to a lockout device is accessible to persons other than the originators.
- An installed lockout or **tagout** device damaged or appears to be ineffective.

Failure to comply with these lockout/tagout procedures can lead to disciplinary action.

LOCKOUT/TAGOUT LOG

Lockout ☐ (or) Tagout ☐

Date of installation:

Name of authorized installer(s): _____

specific location:

Types and Magnitude of energy and **Hazard:**

Names of affected employees:

_____	_____
_____	_____
_____	_____
_____	_____

Types of stored energy and methods to dissipate or restrain **it:**

Reason for the lockout or **tagout:**

Type of equipment involved:

Date of **Installation**

Removal Date

Signature of authorized lockout or **tagout** installer

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Appendix B

Fluke 97 Scopemeter

B.1 DESCRIPTION

The **FLUKE 97SCOPEMETER** is a menu driven **instrument**. These menus are accessible by means of the blue key pads below the face of the meter. The top five key pads are used to select the corresponding commands on the **screen** and the two key pads **with** snows **are** used to manipulate the pop-up menus.

CAUTION 1

*The Fluke 97 uses a common reference!! Using more than one reference will cause serious **damage** to the meter, the equipment being **measured**, and possibly, to the person using it.*

B.2 METER FUNCTIONS

To enter meter functions, press the meter key pad. The **scopemeter** automatically defaults to **Vrms AC/DC**. Voltage can be measured by using the red scope probe plugged into **Channel 1**. **Either** the common or **the** “book” adapter can be used for a reference. **If** you use the adapter, make sure that you bear it “click” onto the probe.

B.3 AC VOLTAGE

While in meter mode, press the blue, key pad below the **Vsine** wave. At this point, **Vrms**, waveform, **and** frequency will be displayed. By pressing display **modes**, you can access the **pop-up menu** for VAC. Use the blue key pads with the **arrows** to highlight the menu. When you **have highlighted** the command **that** you want use, **press** the blue key above the **arrows (corresponds to the “enter” on the screen) to select that command**. A large black square indicates which selection **has** been **chosen**. To cancel a selection, go back to that command and **press** the blue “enter” button.

B.4 FREQUENCY

There are three ways to measure frequency:

- 1) using the voltage **function**,
- 2) using **the frequency** selection on the pop-up menu,

3) Disabling "displacement" command on **the** pop-up menu.

(By using it in this manner, VAC and frequency **will** be displayed at the same time and frequency will be **seen** in a larger font.)

B.5 DC VOLTAGE

Press the blue key pad **below** VDC.

B.6 DIODE AND OHMIC CHECKS

Plug a regular probe. into the plug-in next to the **reference**. The scopemeter does have an alarm function for continuity checks.

B.7 SCOPE FUNCTIONS

Press the scope button. This **will** only allow you to use Channel A. To turn on Channel B, press CHAN AB button then press the second blue key pad (B/INVERT). Channels A or B can also be turned off in this manner.

B.8 CALIBRATION

AC/DC calibration should be checked **periodically**. This procedure is outlined **on** page 4-3 of the Owner's Manual.

B.9 AUTO SET

Auto set **will** set the voltage and time increment **comparison** for the signal coming into the **meter**. There is an **offset** when **two channels** are being used. **Ensure** the ground is set on the **zero crossing** after using this **function**.

B.10 ZEROING SCOPE

There are two ways to zero the signal:

- 1) use the ground function and the "move" button on the corresponding channel,
- 2) there are two blocks on the screen labeled A and B.

If **these** blocks are **positioned** at the zero **crossing**, the signals will be **correctly** grounded.

B.11 RECORDING A WAVEFORM

Press record key, then waveform key. Press blue key pad that **corresponds to the on/off** on the **screen**. Move the arrow on the blue **key** pad to Temp. 1 for Channel A and Temp. 2 for Channel B. Press blue key pad for print. Temp. 1 or Temp. 2 should be **highlighted** at this **point**. If not, move the arrow key pad until Temp. 1 or Temp. 2 is highlighted.

Press **the** blue enter key. At **this point**, the scopemeter will use a default memory location. If you want the waveform in a different location, use the blue arrows to **locate** that particular memory and press the blue enter key.

B.12 VIEWING A STORED WAVEFORM

To recall a stored waveform, it must have been stored in a permanent memory location. Press the waveform button; press the blue key pad below the **on/off LCD**. Select the blue arrows for the desired indication, then press the blue enter button.

B.13 POWER SYNC

Put **Channel** 1 on bypass and Channel 2 on the **inverter** output of, the same phase. DO NOT go below 2 volts/division. **If** the scope. is **below** 2 volts/division. **Phase A will** shift **approximately** 400 **usecs**. Press the AB button to access Channel B. The waveforms should be between 20 and 40 **usecs** apart. **PT'8** need to be used **at ail** times, **or damage may occur to the Fluke 97 scopemeter**. **If** both waveforms are stable, the scope has a **dv/dt** function that will give a digital readout of the time between both waveforms.

B.14 MEASURING TRANSFERS

Press the scope button, **then MIN MAX ON** A button (blue hey pad). Spread the waveform apart and press the **record** button. Press the **LCD/cal** button and access the calibrate menu. Use DOT **JOIN** 3 AND DOT **JOIN** . The scope **should** be between 1 and 2 se&iv. **The Fluke 97** does not catch **transfers** the same way the TEKTRONIX 2220 does. This procedure will detect glitches **of** more than 20 **usecs**.

B.15 ZERO CROSSINGS

Press the AB button to turn on **Channel B** . Press auto set button; verify that both signals are **still** grounded. **Press A=(vertical arrow) B=(horizontal arrow)**.

B.16 UV TRANSFERS

Put the **scope** in the meter mode and use the **MIN MAX AVE** function.

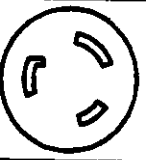
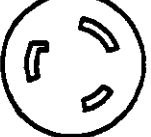
B.17 RECOMMENDED PARTS

Robe Alligator Clips:	Fluke Part Number PM 9084/001 S35-00
Current Robe:	Fluke Part Number 8011010
	Jensen Part Number 317B305

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Appendix C

Receptacles Chart

Nomenclature	Part #	Symbol	Description	Panel Style
5-15R2	154108073		15A, 1P 120V	D
5-20R2	154108075		20A, 1P 120V	E
6-15R2	154108079		15A	K
L5-15R2	154108093		15A, 1P 120V	H
L5-20R1	154108094		20A, 1P 120V	F
L5-30R1	154108095		30A, 1P 120V	G
L6-15R2	154108097		15A 240V	L
L6-20R1	154108098		20A, 2P 240V	B
L6-30R1	154108099		30A, 2P 240V	C

L14-20R	154108101		20A, 120 or 240v	J
L14-30R	154108102		30A, 2P 120 or 240V	A
L21-20R	154108105		20A, 3P 120/208V	Mh4
L21-30R	154108106		30A, 3P 120/208V	QQQ
Receptacle	154108210		20A, 125V	S

An **additional** power flow diagram, not used in the manual.

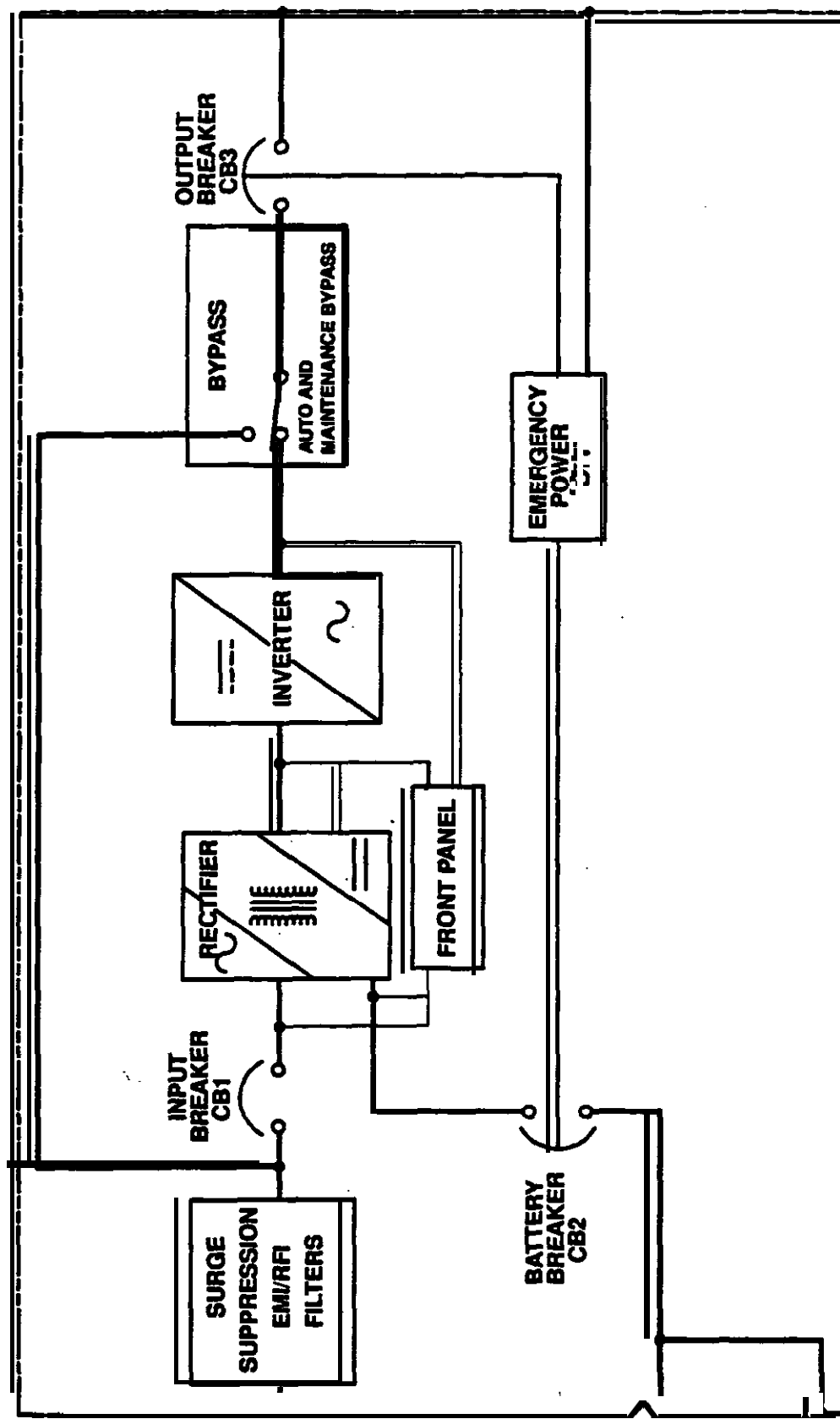
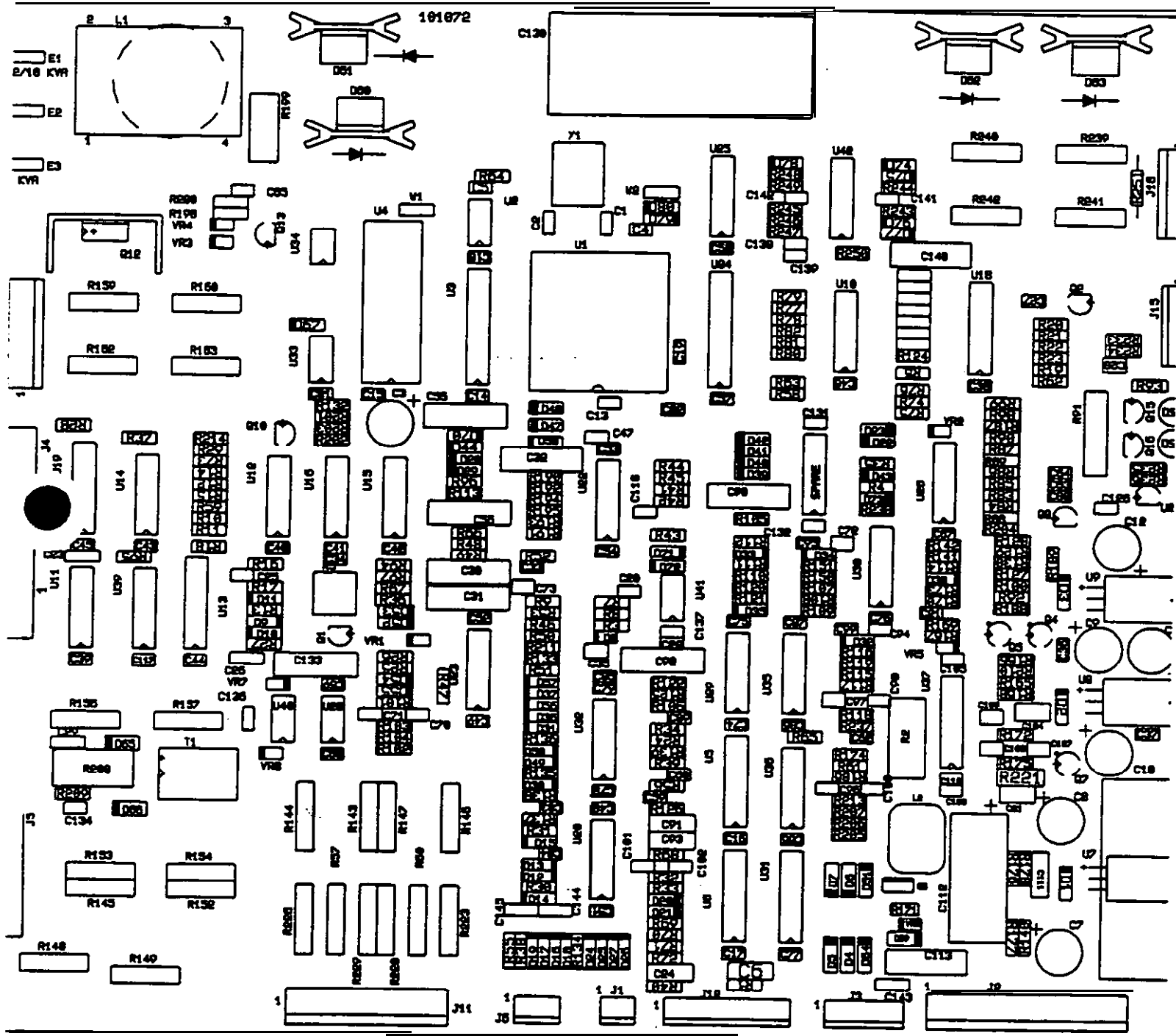


Figure 1-27 Power Flow

a



8

7

6

5

4

3

2

1

H

G

F

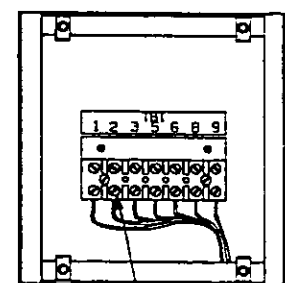
E

D

C

B

A

REMOTE MONITOR PANEL
(FRONT VIEW, COVER REMOVED)

MAX WIRE SIZE
NO. 14 AWG.
STRANDED WIRE
ONLY. RECOMMENDED
TORQUE VALUES
12-15 IN/LBS

1/2" KNOCKOUT
PROVIDED. CONDUIT
AND WIRING
SUPPLIED BY
CUSTOMER

SEE NOTE 5

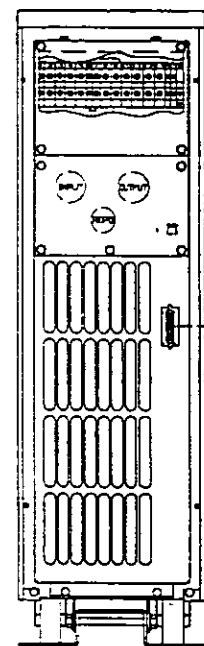
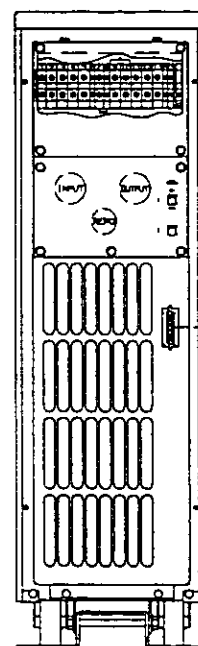
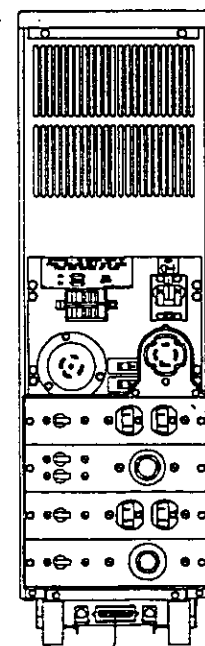
200 FT. MAX.
RECOMMENDED
CABLE LENGTH

FRONT VIEW

PRESS TO SILENCE
LOCAL ALARM

SIDE VIEW

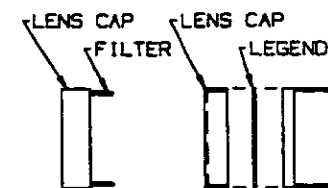
BOTTOM VIEW

REAR VIEW
18KVA UPSREAR VIEW
12KVA UPSREAR VIEW
6KVA UPS

SEE DETAIL A

0.43

4.06

6.00
SQUARE

AS REMOVED
FROM SWITCH

DETAIL A

WARNING:
DANGEROUS VOLTAGES WHICH CAN CAUSE SERIOUS INJURY OR BE FATAL
EXIST WHENEVER POWER IS ON OR HAS BEEN APPLIED TO THE UPS!
BE SURE TO READ ALL WARNINGS AND ALL PROCEDURES PRIOR TO DOING
ANY WIRING, TROUBLESHOOTING, OR ANY OTHER WORK ON THE EQUIPMENT.

DANGER:
VOLTAGES ACROSS CHARGED CAPACITORS CAN BE IN EXCESS OF 300 VOLTS DC!
BE SURE THAT THE LARGE FILTER CAPACITORS ARE FULLY DISCHARGED AND
INPUT POWER IS OFF BEFORE DOING ANY WIRING, TROUBLESHOOTING OR ANY
OTHER WORK INSIDE THE UPS!

REMOTE MONITOR PANEL (RMP) INSTALLATION AND TEST INSTRUCTIONS

CAUTION: CRITICAL LOAD IS DE-ENERGIZED DURING THIS INSTALLATION PROCEDURE.
SHUT YOUR LOAD DOWN IN AN ORDERLY FASHION BEFORE PERFORMING ANY
OF THE FOLLOWING STEPS.

1. SECURELY MOUNT THE RMP STATION (UNIT CAN BE EITHER FLUSH OR SURFACE MOUNTED).
2. SHUTDOWN THE UPS (REFER TO OPERATOR'S MANUAL) AND OPEN ALL BREAKERS.
3. INSTALL CONDUIT (NOT SUPPLIED BY MANUFACTURER) AND WIRING (124902125-XXX) (IF REQUIRED) FROM REMOTE MONITOR PANEL THROUGH KNOCKOUT ON BOTTOM, LOWER REAR, OR UPPER REAR, OF CABINET. USE STRANDED COPPER WIRE NO. 18AWG MAX. USE OF LARGER AWG WIRE WILL REQUIRE THE INSTALLATION OF A JUNCTION OR TRANSITION BOX TO INTERFACE BETWEEN THE CONDUIT WIRE AND THE CONNECTING CABLE FROM THE UNIT.
4. INSTALL THE EXPANDER INTERFACE BOARD (101072994-001) IF IT IS NOT ALREADY INSTALLED. SEE FIELD COMMUNICATIONS UPGRADE KIT (110293861) FOR BOARD INSTALLATION PROCEDURES.
5. CONNECT RMP WIRING BY ATTACHING DB25S CONNECTOR ON THE CABLE TO THE FEMALE DB25S CONNECTOR ON THE UNIT.

RMP WIRE NO.	COMMUNICATIONS INTERFACE DB25
1	24
2	7
3	13
5	16
6	14
8	22
9	8

6. SELECT ALARMS THROUGH THE RELAY SETUP UNDER THE SYSTEM SETUP MENU. (SEE THE COMMUNICATIONS MANUAL P/N 164200076).
7. AFTER SELECTING ALARMS PULL INDICATOR LENS OFF EACH INDICATOR AND PLACE PROPER LEGEND (FROM SHEET SUPPLIED) IN POSITION SHOWN. REPLACE LENS BY PUSHING FIRMLY. (SEE DETAIL A).
8. CLOSE UPS BATTERY, LINE, BYPASS, AND LOAD BREAKERS, AND RESTART UNIT AT THIS TIME. (REFER TO OPERATOR'S MANUAL).
9. IF ALARM IS ACTIVE ON FRONT PANEL, THE CORRESPONDING INDICATOR WILL LIGHT ON THE REMOTE MONITOR PANEL. IF 'SYSTEM NORMAL' IS NOT LIT, A HORN WILL SOUND APPROXIMATELY 30 SECONDS AFTER ALARM DETECTION. LOCAL SILENCING OF ALARM HORN CAN BE ACCOMPLISHED BY PRESSING 'SYSTEM NORMAL' LEGEND ON THE REMOTE MONITOR PANEL. IF 'SYSTEM NORMAL' LIGHTS BEFORE TIME HAS EXPIRED, THE HORN WILL NOT ACTIVATE.

14

DESCRIPTION: INSTALLATION DIAGRAM, REMOTE POWER OFF OPTION, POWERWARE 6.12.18				REVISION: 110254307	
CREATED BY: CUREL/MAN/P	DATE: 30-MAR-1993	FIRST USED ON: PUPS/18	DATE: 30-MAR-1993	SCALE: 1/2"	BY: CUREL/MAN/P
CHECKED BY: CUREL/MAN/P	DATE: 31-MAR-1993	CATEGORY: CUSTOMER	REVISION: 110254307	DATE: 31-MAR-1993	BY: CUREL/MAN/P
RESPONSIBLE ENGINEER: CUREL/MAN/P	DATE: 31-MAR-1993	REVISION: 110254307	DATE: 31-MAR-1993	BY: CUREL/MAN/P	APPROVED BY: CUREL/MAN/P
LAST MODIFIED BY: CUREL/MAN/P	DATE: 31-MAR-1993	REVISION: 110254307	DATE: 31-MAR-1993	BY: CUREL/MAN/P	APPROVED BY: CUREL/MAN/P

PWP12, PWP18, PWP12HV ELECTRONICS

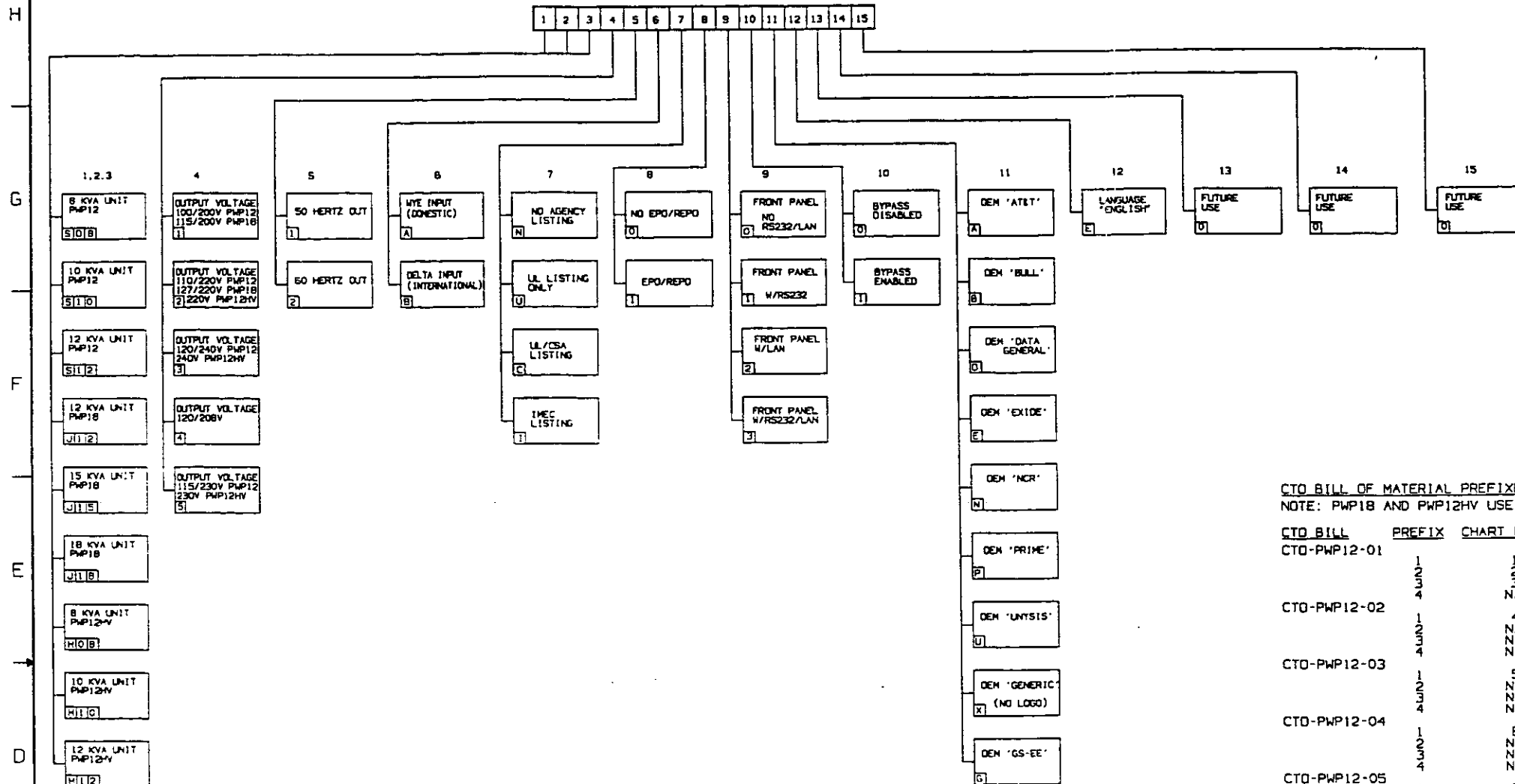
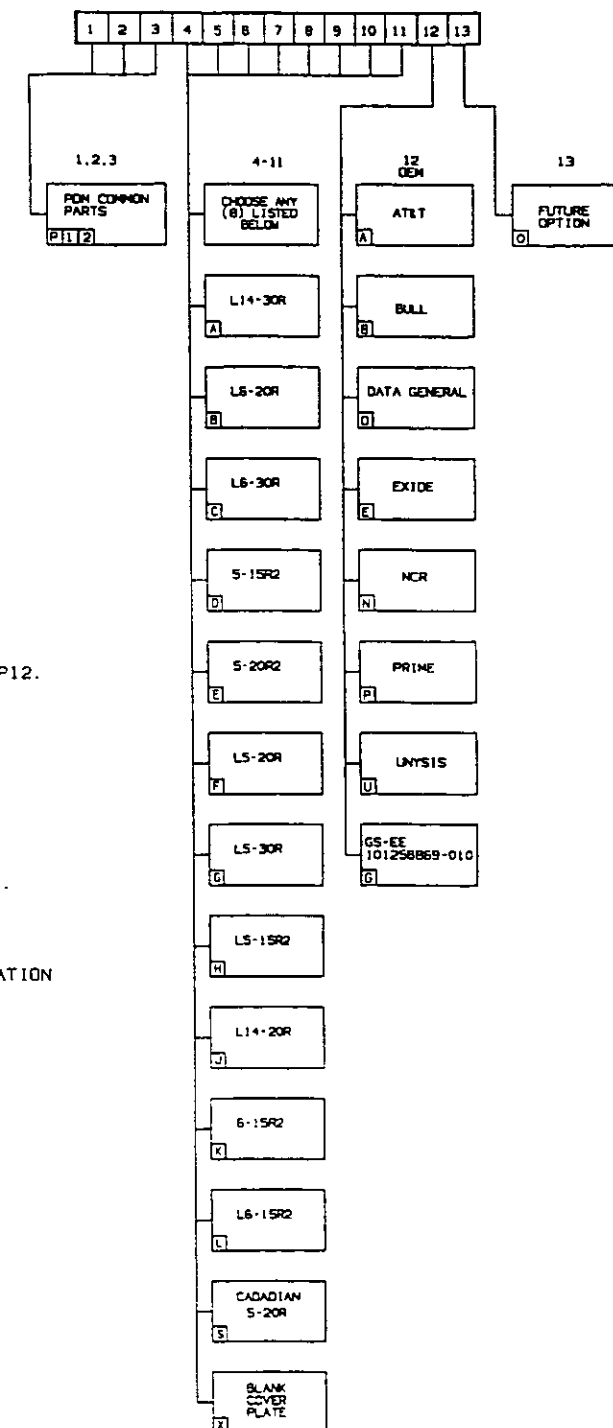


CHART POSITION	DEFINITION	BILL OF MATERIAL USED		
		PWP12	PWP18	PWP12HV
1, 2, 3	KVA RATING COMMON PARTS (ALL KVA RATINGS)	101614219-002	101614219-003	101614219-004
4	OUTPUT VOLTAGE INFORMATION ONLY	NONE	NONE	NONE
5	FREQUENCY SELECTION INFORMATION ONLY	NONE	NONE	NONE
6	NEUTRAL CONFIGURATION INFORMATION ONLY	NONE	NONE	NONE
7	AGENCY LISTING INFORMATION ONLY	NONE	NONE	NONE
E	EPO/REPO EPO PARTS	101072864	101072864	101072864
9	FRONT PANEL/COMM FRONT PANEL PARTS PCBS, PLASTIC, COMM. MANUAL, ETC.	101614410-XXX	101614410-XXX	101614410-XXX
10	BYPASS ENABLE/DISABLE INFORMATION ONLY	NONE	NONE	NONE
11	OEM CUSTOMER BUTTON UP KIT PACKING KIT	101614240 174901132	101614240-003 174901132	101614240-003 174901132
12	LANGUAGE LANGUAGE/OEM SPECIFIC LABELS, MANUALS, ETC.	101258816-XXX	101258876-XXX	NOT AVAILABLE
13	FUTURE USE	NONE	NONE	NONE
14	FUTURE USE	NONE	NONE	NONE
15	FUTURE USE	NONE	NONE	NONE

PWP12 PDM



CTO BILL OF MATERIAL PREFIXES

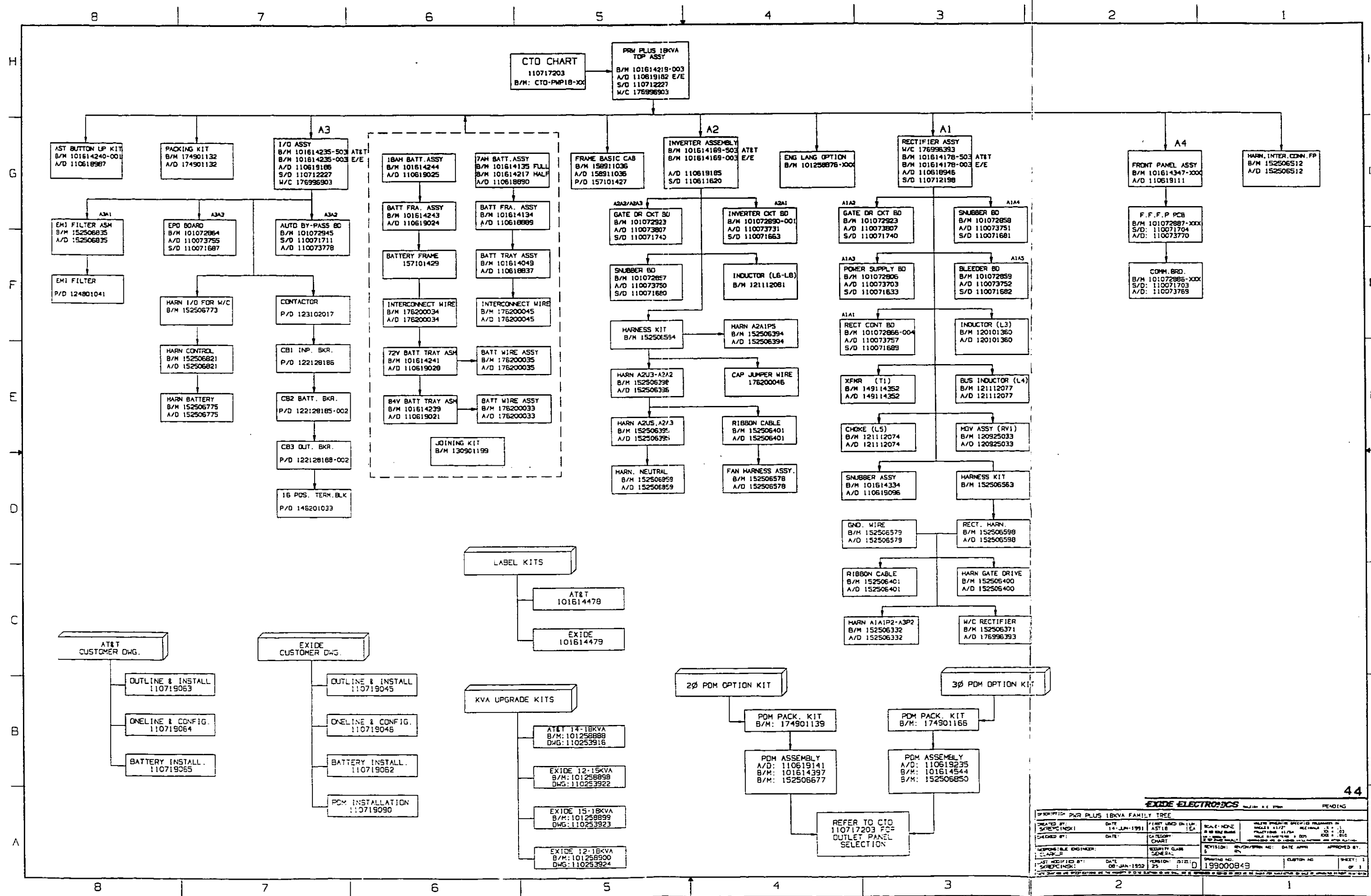
NOTE: PWP18 AND PWP12HV USE THE SAME CTO LOGIC AS THE PWP12.

CTO BILL	PREFIX	CHART POSITION	DESCRIPTION
CTO-PWP12-01	4UN1	1 2 3 N/A	KVA NOT USED
CTO-PWP12-02	4UN1	4 N/A N/A N/A	OUTPUT VOLTAGE NOT USED NOT USED NOT USED
CTO-PWP12-03	4UN1	5 N/A N/A N/A	HERTZ NOT USED NOT USED NOT USED
CTO-PWP12-04	4UN1	6 N/A N/A N/A	NEUTRAL CONFIGURATION NOT USED NOT USED NOT USED
CTO-PWP12-05	4UN1	7 N/A N/A N/A	AGENCY LISTING NOT USED NOT USED NOT USED
CTO-PWP12-06	4UN1	8 9 N/A	OEM EPO NOT USED NOT USED
CTO-PWP12-07	4UN1	11 8 9 N/A	OEM EPO FRONT PANEL NOT USED
CTO-PWP12-08	4UN1	10 N/A N/A	BYPASS NOT USED NOT USED NOT USED
CTO-PWP12-09	4UN1	11 N/A N/A	OEM NOT USED NOT USED NOT USED
CTO-PWP12-10	4UN1	11 12 7 N/A	OEM LANGUAGE AGENCY LISTING NOT USED
CTO-PWP12-11	4UN1	13 N/A N/A N/A	FUTURE USE NOT USED NOT USED NOT USED
CTO-PWP12-12	4UN1	14 N/A N/A N/A	FUTURE USE NOT USED NOT USED NOT USED
CTO-PWP12-13	4UN1	15 N/A N/A N/A	FUTURE USE NOT USED NOT USED NOT USED

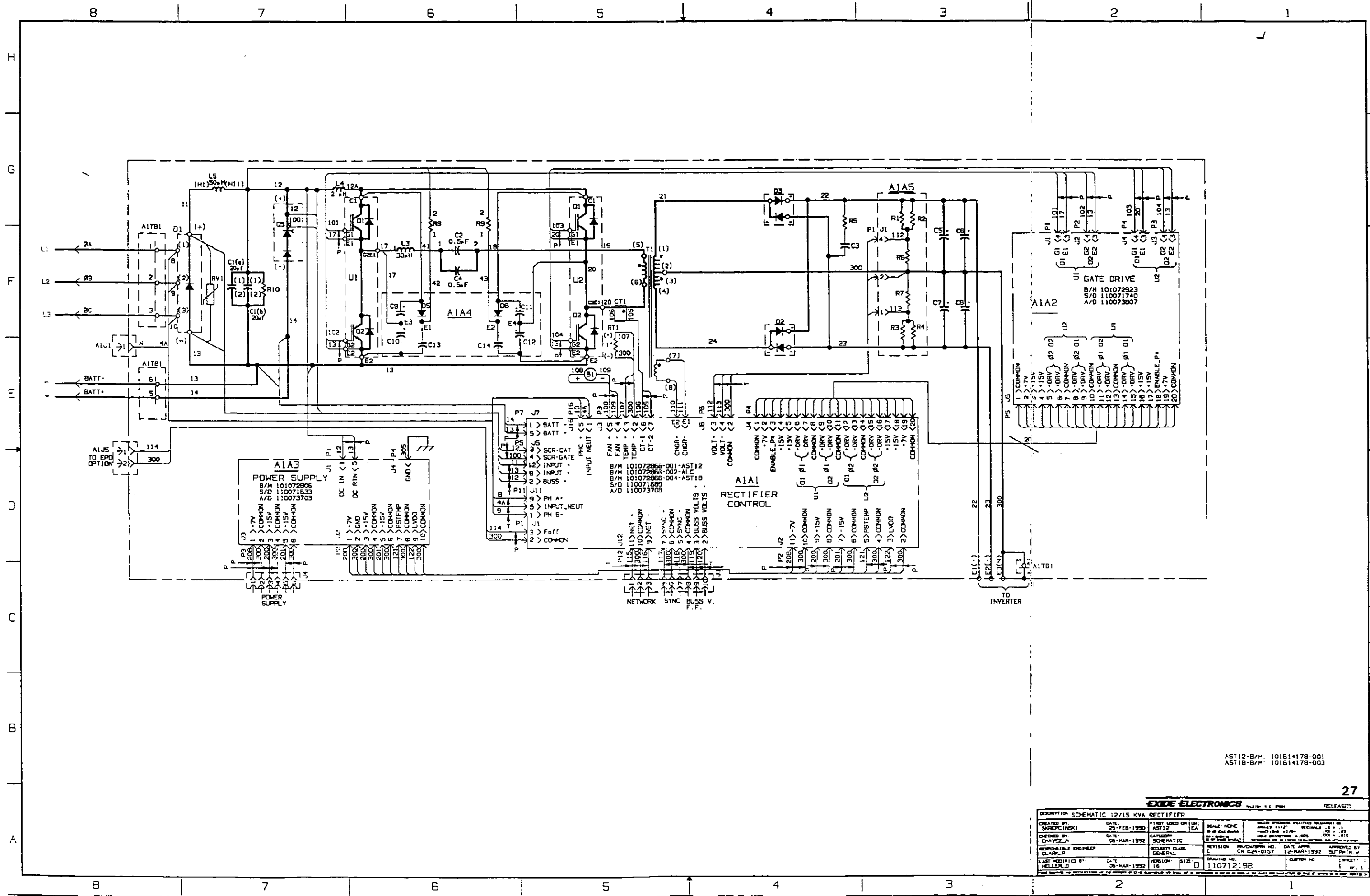
REF TOP LEVEL CTO B/M: CTO-PWP12
CTO-P12HV
CTO-PWP18

EXIDE ELECTRONICS

DESCRIPTION: CTO CHART, PWP12, PWP18	DATE: 04-MAR-1993	DATE: 04-MAR-1993	DATE: 04-MAR-1993	DATE: 04-MAR-1993
DESIGNED BY: VINEGAR, N	DATE: 04-MAR-1993	DATE: 04-MAR-1993	DATE: 04-MAR-1993	DATE: 04-MAR-1993
DESIGNED BY: VINEGAR, N	DATE: 04-MAR-1993	DATE: 04-MAR-1993	DATE: 04-MAR-1993	DATE: 04-MAR-1993
DESIGNED BY: VINEGAR, N	DATE: 04-MAR-1993	DATE: 04-MAR-1993	DATE: 04-MAR-1993	DATE: 04-MAR-1993
DESIGNED BY: VINEGAR, N	DATE: 04-MAR-1993	DATE: 04-MAR-1993	DATE: 04-MAR-1993	DATE: 04-MAR-1993
DESIGNED BY: VINEGAR, N	DATE: 04-MAR-1993	DATE: 04-MAR-1993	DATE: 04-MAR-1993	DATE: 04-MAR-1993
DESIGNED BY: VINEGAR, N	DATE: 04-MAR-1993	DATE: 04-MAR-1993	DATE: 04-MAR-1993	DATE: 04-MAR-1993
DESIGNED BY: VINEGAR, N	DATE: 04-MAR-1993	DATE: 04-MAR-1993	DATE: 04-MAR-1993	DATE: 04-MAR-1993
DESIGNED BY: VINEGAR, N	DATE: 04-MAR-1993	DATE: 04-MAR-1993	DATE: 04-MAR-1993	DATE: 04-MAR-1993
DESIGNED BY: VINEGAR, N	DATE: 04-MAR-1993	DATE: 04-MAR-1993	DATE: 04-MAR-1993	DATE: 04-MAR-1993

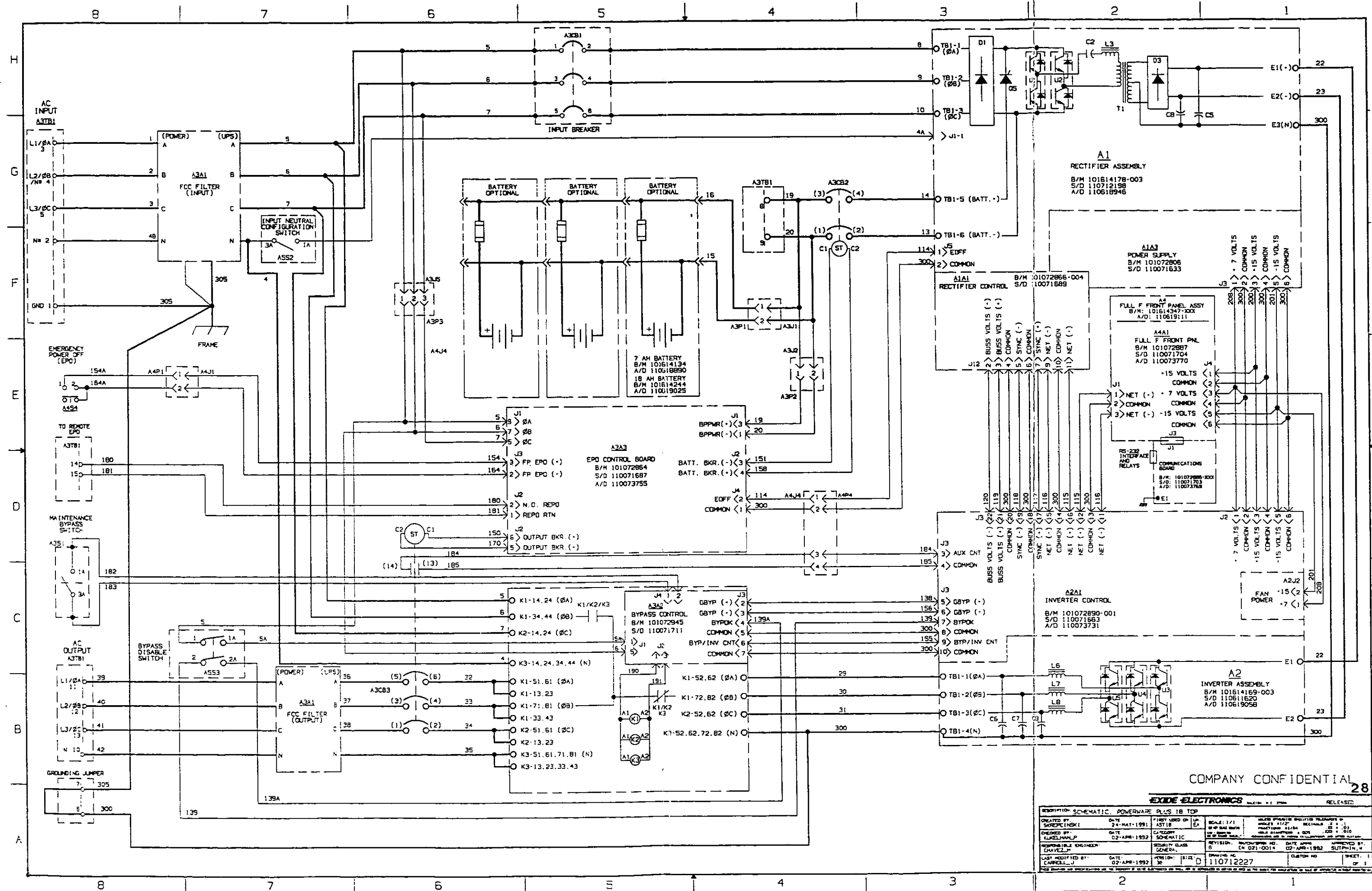


EXIDE ELECTRONICS									
PENDING									
PWR PLUS 18KVA FAMILY TREE									
CREATED BY:	DATE:	FIRST USED ON:	LAST USED ON:	SCALE:	REVISION:	REVISION:	REVISION:	REVISION:	REVISION:
SKRIPINSKI	14-JUN-1991	AST18	EA	1:1	1:1	1:1	1:1	1:1	1:1
CHANGED BY:	DATE:	CHART:	CHART:	CHART:	CHART:	CHART:	CHART:	CHART:	CHART:
SKRIPINSKI	08-JAN-1992	25	D	199000849	1	1	1	1	1



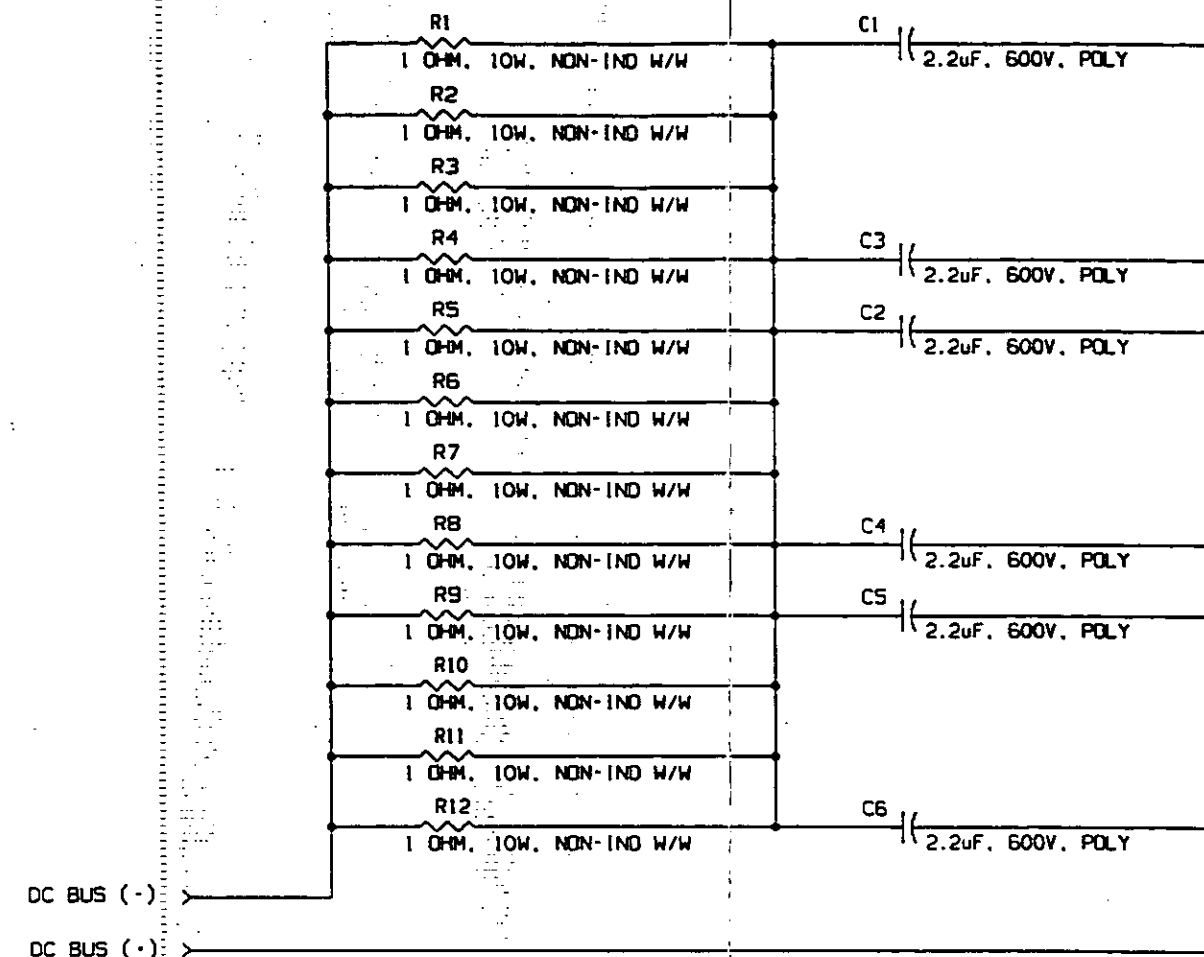
AST12-B/M: 101614178-001
AST18-B/M: 101614178-003

EXIDE ELECTRONICS									
DESCRIPTION: SCHEMATIC 12/15 KVA RECTIFIER									
CREATED BY: SAREPC(HSK)	DATE: 25-FEB-1990	FIRST USED ON: AST12	SCALE: NONE	SHEET: 1 OF 1					
CHECKED BY: CHAYCZL	DATE: 06-MAR-1992	CATEGORY: SCHEMATIC	REVISION: C	SHEET: 1 OF 1					
RESPONSIBLE ENGINEER: CLARK, P	DATE: 06-MAR-1992	SECURITY CLASS: GENERAL	REVISION: C	SHEET: 1 OF 1					
LAST MODIFIED BY: HELLER, D	DATE: 06-MAR-1992	VERSION: 16	SIZE: D	SHEET: 1 OF 1					



COMPANY CONFIDENTIAL 28

EXIDE ELECTRONICS				RELEASED	
REVISION: SCHEMATIC, POWERWARE PLUS 18 TOP					
CREATED BY: SURESHK	DATE 24-MAY-1991	FIRST USED ON A3TB1	SCALE: 1/1 BY: SURESHK	SHEET NUMBER: 11/27 REVISION: 02-APR-1992 DATE: 02-APR-1992	
DESIGNED BY: EURELMANLP	DATE 02-APR-1992	CATEGORY SCHEMATIC	BY: SURESHK	REVISION: 02-APR-1992 DATE: 02-APR-1992	
RESPONSIBLE ENGINEER: CHAVEZ	DATE 02-APR-1992	SECURITY CLASS GENERAL	REVISION: 02-APR-1992 DATE: 02-APR-1992	SHEET: 1	
LAST MODIFIED BY: CARROLL	DATE 02-APR-1992	PERSON: 36 SIZE: D	110712227		SHEET: 1



63

EXIDE ELECTRONICS

RALEIGH, N.C. 27604

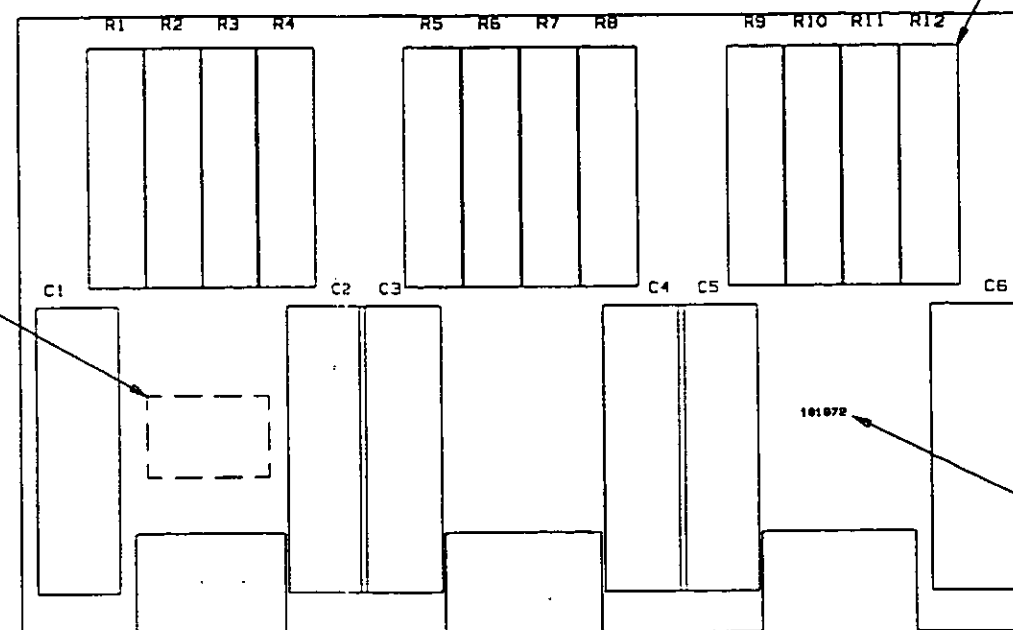
RELEASED

DESCRIPTION: INVERTER SNUBBER BD. SCHEMATIC DIAGRAM

CREATED BY: DIPAULO_G	DATE: 15-MAY-1990	FIRST USED ON: ALC	UM: EA	SCALE: 1/1 DO NOT SCALE DRAWING EAC - GENERATED DO NOT CHANGE MANUALLY	UNLESS OTHERWISE SPECIFIED TOLERANCES ON: ANGLES ±1/2° FRACTIONS ±1/64 HOLE DIAMETERS ±.005 DIMENSIONS ARE IN INCHES (MILLIMETERS) AND AFTER PLATING.
CHECKED BY: BROWN_B	DATE: 08-DEC-1991	CATEGORY: SCHEMATIC	SECURITY CLASS: GENERAL	REVISION: RN/CN/SPRN NO: A1 CN 021-0002	DATE APPR: 09-DEC-1991
RESPONSIBLE ENGINEER: WIDENER_S				APPROVED BY: SUTPHIN_W	
LAST MODIFIED BY: BEAMAN_P	DATE: 20-NOV-1991	VERSION: 2	SIZE: A	DRAWING NO. 110071680	CUSTOM NO. SHEET: 1 OF: 1

THESE DRAWINGS AND SPECIFICATIONS ARE THE PROPERTY OF EXIDE ELECTRONICS AND SHALL NOT BE REPRODUCED OR COPIED OR USED AS THE BASIS FOR MANUFACTURE OR SALE OF APPARATUS WITHOUT PERMISSION.

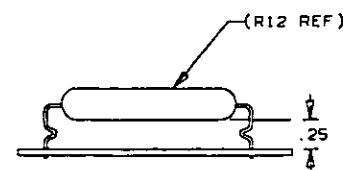
INK STAMP FINISHED ASSEMBLY WITH SERIAL/SEQUENCE
CODE AND VENDOR LOCATION LETTER IN THIS GENERAL
AREA (PER EXIDE ELECTRONICS QC PROCEDURE DCP169).



SEE DETAIL A

INK STAMP ASSEMBLY BILL OF MATERIAL
NUMBER AND REV LEVEL

VIEW OF COMPONENT SIDE



DETAIL A
SIDE VIEW
TYP MTG FOR R1-R12

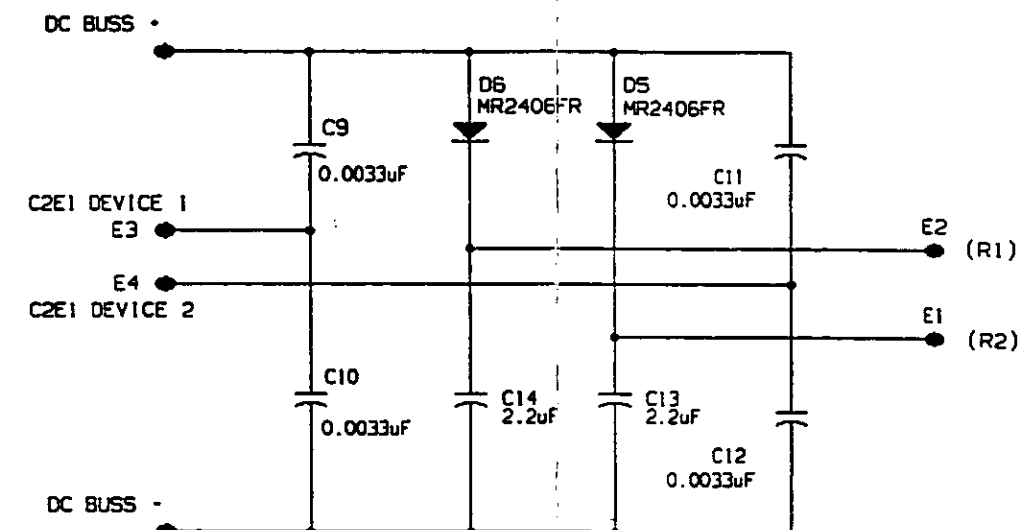
REF S/M 101072857
S/D 110071680
ECB 118302695

EXIDE ELECTRONICS

RALEIGH, N.C. 27604

RELEASED

DESCRIPTION: INVERTER SNUBBER 30. ASSEMBLY DRAWING			
CREATED BY: DIPALLO_G	DATE: 16-MAY-1990	FIRST USED ON: ALC	UP: EA
CHECKED BY: BROWN_B	DATE: 08-DEC-1991	CATEGORY: ASSEMBLY	SCALE: FULL DO NOT SCALE DRAWING DO NOT DIMENSION DO NOT CHANGE DIMENSIONS
RESPONSIBLE ENGINEER: INAM_H	SECURITY CLASS: GENERAL	REVISION: A	DATE APPR: 08-DEC-1991
LAST MODIFIED BY: BEAMAN_P	DATE: 20-NOV-1991	VERSION: 4	SIZE: C
DRAWING NO. 110073750		CUSTOM NO.	SHEET: 1 OF: 1
UNLESS OTHERWISE SPECIFIED TOLERANCES ARE: ANGLES 1/2° DECIMALS .XX ± .01 FRACTIONS 1/64 .XXX ± .010 HOLE DIAMETERS .005 .XXX ± .010 DIMENSIONS ARE IN INCHES (MILLIMETERS) AND AFTER PLATING			
THESE DRAWINGS AND SPECIFICATIONS ARE THE PROPERTY OF EXIDE ELECTRONICS AND SHALL NOT BE REPRODUCED OR COPIED OR USED AS THE BASIS FOR MANUFACTURE OR SALE OF APPARATUS WITHOUT PERMISSION			



64

EXIDE ELECTRONICS

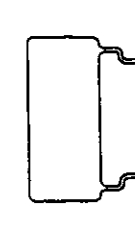
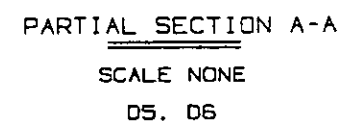
RALEIGH, N.C. 27604

PENDING

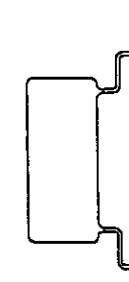
DESCRIPTION: SCHEMATIC DIAGRAM RECTIFIER SNUBBER BD.

CREATED BY: DIPAULO_G	DATE: 06-JUN-1990	FIRST USED ON: AST-ALC	LM: EA	SCALE: NONE DO NOT SCALE DRAWING CNO - GENERATED DO NOT CHANGE MANUALLY	UNLESS OTHERWISE SPECIFIED TOLERANCES ON: ANGLES ±1/2° FRACTIONS ±1/64 HOLE DIAMETERS ±.005 DIMENSIONS ARE IN INCHES (MILLIMETERS) AND AFTER PLATING.
CHECKED BY: WIDENER_S	DATE:	CATEGORY: S/D		REVISION: RN/CN/SPRN NO: A	DATE APPR: CN 024-0007
RESPONSIBLE ENGINEER: INAM_H		SECURITY CLASS: GENERAL		DRAWING NO. 110071681	CUSTOM NO.
LAST MODIFIED BY: DIPAULO_G	DATE: 14-NOV-1990	VERSION: 4	SIZE: A		SHEET: 1 OF: 1

THESE DRAWINGS AND SPECIFICATIONS ARE THE PROPERTY OF EXIDE ELECTRONICS AND SHALL NOT BE REPRODUCED OR COPIED OR USED AS THE BASIS FOR MANUFACTURE OR SALE OF APPARATUS WITHOUT PERMISSION.

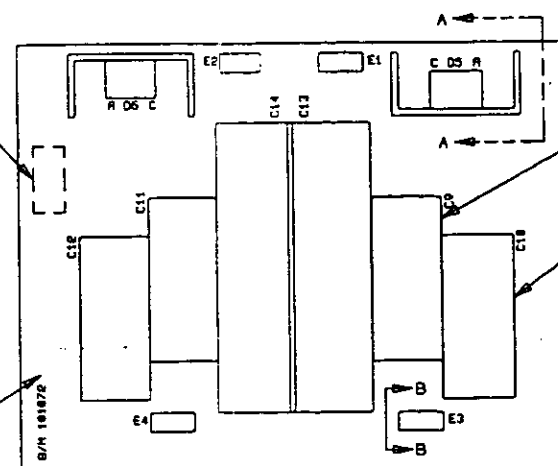


DETAIL A
SCALE NONE
TYP MTG FOR C10 & C12



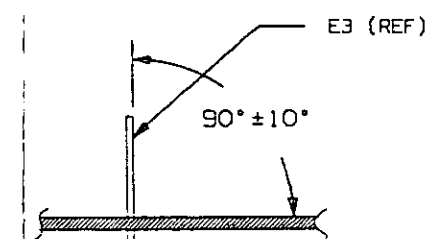
DETAIL B
SCALE NONE
TYP MTG FOR C9 & C11

INK STAMP ASSEMBLY BILL OF —
MATERIAL NUMBER AND REV LEVEL



— SEE DETAIL B

— SEE DETAIL A

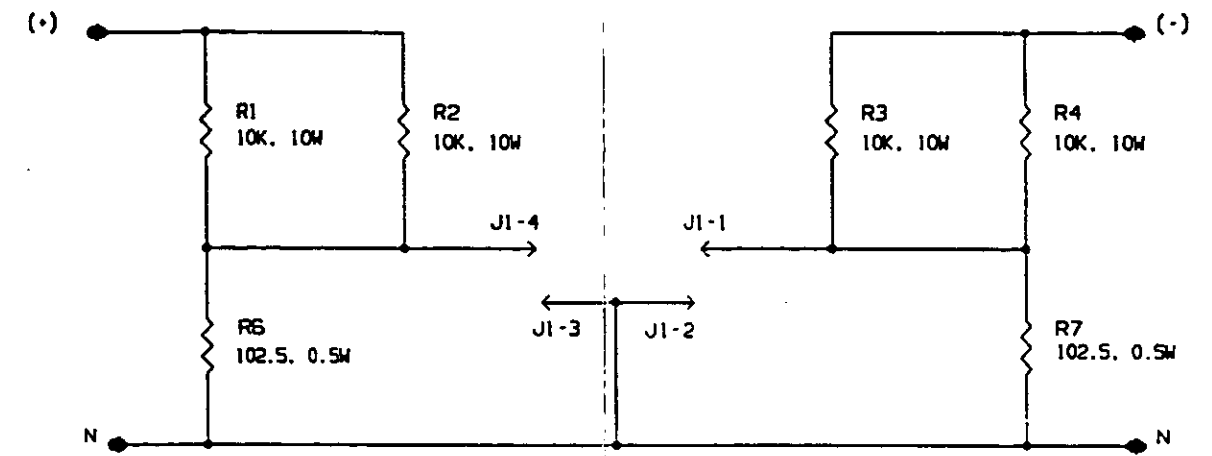


PARTIAL SECTION 8
SCALE NONE
E1-4

EXIDE ELECTRONICS

RELEASED

DESCRIPTION: RECTIFIER SNUBER BOARD									
CREATED BY: DAIDULO_G	DATE: 24-MAY-1996	FIRST USED ON: AST ALC	LM: EA	SCALE: FULL	UNLESS OTHERWISE SPECIFIED TOLERANCES ON: ANGLES 1/2° DECIMALS .X .1 DIMENSIONS 1/16" XX .03 HOLE DIAMETERS .005 XX .010 DIMENSIONS ARE IN INCHES UNLESS OTHERWISE NOTED AND AFTER PLATING				
CHECKED BY: REYNOLDS_G	DATE: 15-JUN-1992	CATEGORY: A/D	SECURITY CLASS: GENERAL	REVISION: B	REV/CHG/SPRN NO: CN 021-0037	DATE APPR: 15-JUL-1992	APPROVED BY: CHAVEZ_M		
RESPONSIBLE ENGINEER: INAM_H				DRAWING NO. 110073751	CUSTOM NO.		SHEET: OF: 1		
LAST MODIFIED BY: GASSELL_M	DATE: 08-JUN-1992	VERSION: 15	SIZE: C	THESE DIMENSIONS AND SPECIFICATIONS ARE THE PROPERTY OF ORSIS ELECTRONICS AND SHALL NOT BE REPRODUCED OR COPIED OR USED AS THE BASIS FOR MANUFACTURE OR SALE OF APPARATUS WITHOUT PERMISSION					



NOTE: ALL RESISTORS ARE 1%

65

EXIDE ELECTRONICS

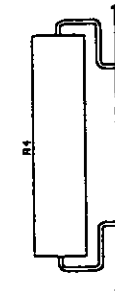
RALEIGH, N.C. 27604

RELEASED

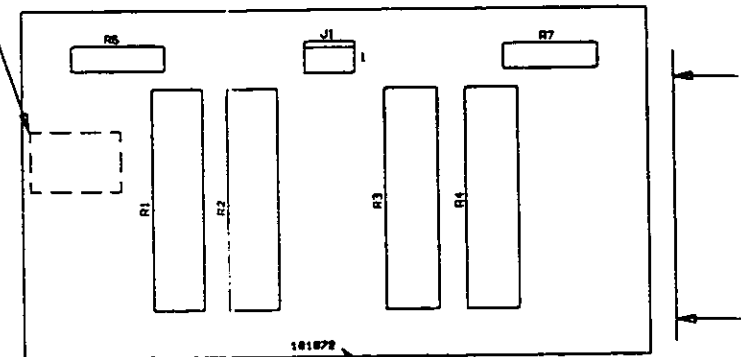
DESCRIPTION: BLEEDER BOARD

CREATED BY: HELDERMAN_T	DATE: 05-JUN-1990	FIRST USED ON: ALC	LIM: EA	SCALE: NONE OR NOT SCALE DRAWING CAG - GENERATED DO NOT CHANGE MANUALLY	UNLESS OTHERWISE SPECIFIED TOLERANCES ON: ANGLES ±1/2° FRACTIONS ±1/64 HOLE DIAMETERS ±.005 DIMENSIONS ARE IN INCHES (MILLIMETERS) AND AFTER PLATING
CHECKED BY: REYNOLDS_G	DATE: 29-JAN-1991	CATEGORY: SCHEMATIC		REVISION: RN/CN/SPRN NO: A CN 024-0008	DATE APPR: 29-JAN-1991
RESPONSIBLE ENGINEER: INAM_H		SECURITY CLASS: GENERAL		APPROVED BY: CHAVEZ_M	
LAST MODIFIED BY: BEAMAN_P	DATE: 29-JAN-1991	VERSION: 12	SIZE: A	DRAWING NO. 110071682	CUSTOM NO.
THESE DRAWINGS AND SPECIFICATIONS ARE THE PROPERTY OF EXIDE ELECTRONICS AND SHALL NOT BE REPRODUCED OR COPIED OR USED AS THE BASIS FOR MANUFACTURE OR SALE OF APPARATUS WITHOUT PERMISSION.				SHEET: 1 OF: 1	

INK STAMP FINISHED ASSEMBLY WITH SERIAL/SEQUENCE
CODE AND VENDOR LOCATION LETTER IN THIS GENERAL
AREA (PER EXIDE ELECTRONICS QC PROCEDURE QCP169).



VIEW A-A
SCALE NONE
TYP MTG FOR R1-R4



VIEW OF COMPONENT SIDE
118302697 A

INK STAMP REV LEVEL ADJACENT TO SILKSCREENED
ASSEMBLY BILL OF MATERIAL NUMBER.

DESCRIPTION: BLEEDER BOARD		FIRST USED ON: UM: EA		SCALE: FULL		UNLESS OTHERWISE SPECIFIED TOLERANCES ON:	
CREATED BY: OIPAULO_G	DATE: 30-MAY-1990	ALC		DO NOT SCALE DRAWING	ANGLES: 31/2°	DECIMALS: .X = .1	
CHECKED BY: REYNOLDS_G	DATE: 25-JAN-1991	CATEGORY: ASSEMBLY		OR - INDICATED	FRACTIONS: 1/64	DECIMALS: .XX = .03	
RESPONSIBLE ENGINEER: INAM_H		SECURITY CLASS: GENERAL		DO NOT DIMENSION UNLESS INDICATED	HOLE DIAMETERS: .005	DECIMALS: .XXX = .010	
LAST MODIFIED BY: BEAMAN_P	DATE: 25-JAN-1991	VERSION: 9	SIZE: C	REVISION: RN/CN/SPRN NO: CN 024-0008		DATE APPR: 28-JAN-1991	APPROVED BY: CHAVEZ_M
				DRAWING NO: 110073752		CUSTOM NO:	SHEET: 1
						OF: 1	

EXIDE ELECTRONICS

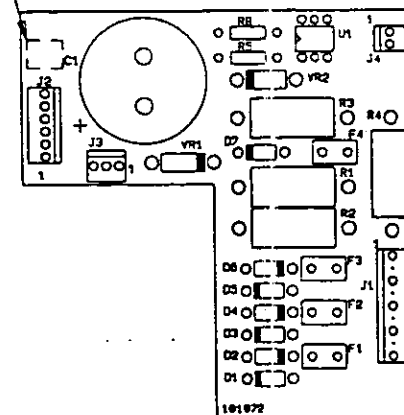
RALEIGH, N.C. 27604

RELEASED

DESCRIPTION: EPD/REPD CONTROL BOARD SCHEMATIC DRAWING				
CREATED BY: DIPAULO_G	DATE: 01-JUN-1990	FIRST USED ON: AST	UN: EA	UNLESS OTHERWISE SPECIFIED TOLERANCES ON: ANGLES $\pm 1/2^\circ$ DECIMALS $\times 0.1$ FRACTIONS $\pm 1/64$ HOLE $\times 0.03$ HOLE DIAMETERS ± 0.005 JOCK $\times 0.010$ DIMENSIONS ARE IN INCHES (MILLIMETERS) AND AFTER PLATING.
CHECKED BY: BROWN_B	DATE: 01-JUL-1991	CATEGORY: SCHEMATIC		
RESPONSIBLE ENGINEER: ULRICH_J		SECURITY CLASS: GENERAL		REVISION: RN/CN/SPRN NO: DATE APPR: APPROVED BY: B CN 022-0407 03-JUL-1991 SUTPHIN_W
LAST MODIFIED BY: BEAMAN_P	DATE: 01-JUL-1991	VERSION: 5	SIZE: B	DRAWING NO. CUSTOM NO. SHEET: 1 110071687 OF: 1

THESE DRAWINGS AND SPECIFICATIONS ARE THE PROPERTY OF EXIDE ELECTRONICS AND SHALL NOT BE REPRODUCED OR COPIED OR USED AS THE BASIS FOR MANUFACTURE OR SALE OF APPARATUS WITHOUT PERMISSION

INK STAMP FINISHED ASSEMBLY WITH SERIAL/SEQUENCE
CODE AND VENDOR LOCATION LETTER IN THIS GENERAL
AREA (PER EXIDE ELECTRONICS QC PROCEDURE DCP169).



INK STAMP REV LEVEL ADJACENT TO SILKSCREENED
ASSEMBLY BILL OF MATERIAL NUMBER.

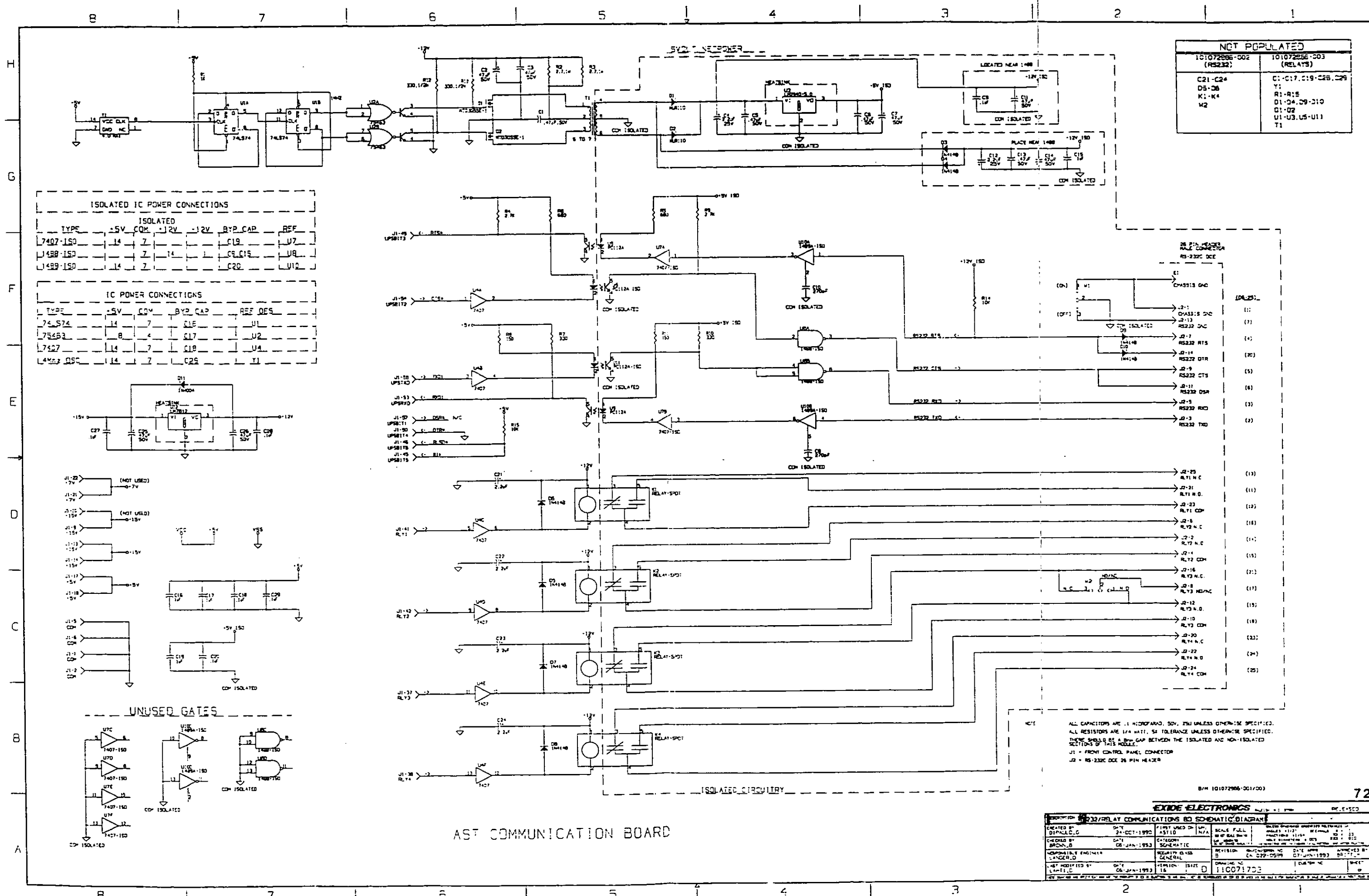
EXIDE ELECTRONICS

RALEIGH, N.C. 27604

RELEASED

DESCRIPTION: EPO BOARD ASSEMBLY DIAGRAM		FIRST USED ON: AST		UN: N/A	SCALE: FULL	UNLESS OTHERWISE SPECIFIED TOLERANCES ON: ANGLES 1/2" DECIMALS .X ± .1 FRACTIONS 1/64 .XX ± .01 HOLE DIAMETERS .005 .XX ± .010 DIMENSIONS ARE IN INCHES (MILLIMETERS) AND AFTER PLATING	
CREATED BY: DIPAULO_G	DATE: 13-JUN-1990	CATEGORY: ASSEMBLY		REVISION: RY/CA/SPIN NO. A1	DATE APPR. 30-JUL-1991	APPROVED BY: REYNOLDS_L	
CHECKED BY: BROWN_B	DATE: 30-JUL-1991	SECURITY CLASS: GENERAL		DRAWING NO. 110073755		CUSTOM NO.	SHEET 1
RESPONSIBLE ENGINEER: LURICH_L	DATE: 28-JUN-1991	VERSION: 4		SIZE: C		DF: 1	
LAST MODIFIED BY: DIPAULO_G		DATE: 28-JUN-1991		VERSION: 4		SIZE: C	

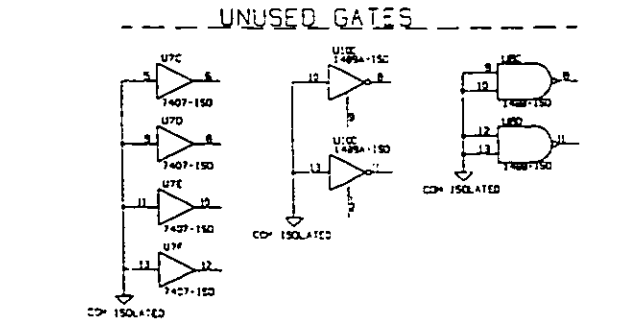
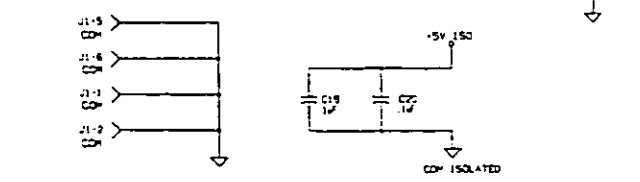
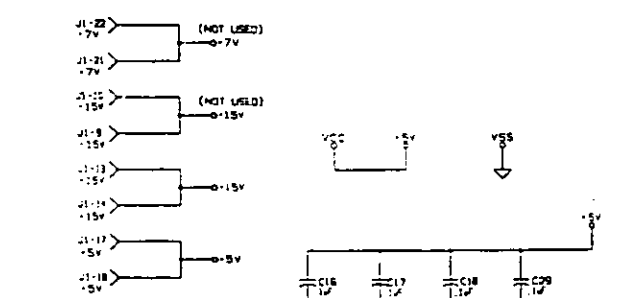
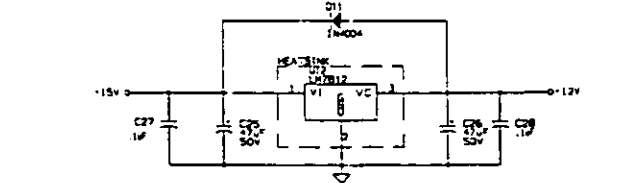
THESE DRAWINGS AND SPECIFICATIONS ARE THE PROPERTY OF EXIDE ELECTRONICS AND SHALL NOT BE REPRODUCED OR COPIED OR USED AS THE BASIS FOR MANUFACTURE OR SALE OF APPARATUS WITHOUT PERMISSION



NOT POPULATED	
101072886-002 (RS232)	101072886-003 (RELAYS)
C21-C24 D5-D8 K1-K4 W2	C1-C17, C19-C25, C29 Y1 R1-R15 D1-D4, D9-D10 D1-D2 U1-U3, U5-U11 T1

ISOLATED IC POWER CONNECTIONS					
TYPE	+5V	+12V	-12V	BYP. CAP.	REF.
7407-150	14	7		C19	U7
7408-150	14	7		C19	U8
7409-150	14	7		C20	U10

IC POWER CONNECTIONS					
TYPE	+5V	+12V	-12V	BYP. CAP.	REF.
7407-150	14	7		C19	U1
7408-150	14	7		C17	U2
7409-150	14	7		C18	U4
7410-150	14	7		C25	Y1



NOTE: ALL CAPACITORS ARE .01 MICROFARAD, 50V, T50 UNLESS OTHERWISE SPECIFIED.
ALL RESISTORS ARE 1/4 WATT, 5% TOLERANCE UNLESS OTHERWISE SPECIFIED.
THERE SHOULD BE A 5MM GAP BETWEEN THE ISOLATED AND NON-ISOLATED SECTIONS OF THIS MODULE.
J1 = FRONT CONTROL PANEL CONNECTOR
J2 = RS-232C DCE 25 PIN HEADER

AST COMMUNICATION BOARD

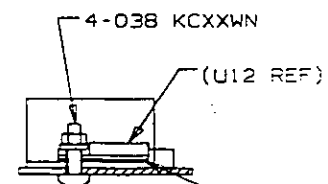
EXIDE ELECTRONICS			
101072886-002/RELAYS RS-232C DCE	101072886-003/RELAYS	101072886-004/RELAYS	101072886-005/RELAYS
CREATED BY: D. J. C. G.	DATE: 24 OCT 1990	SCALE: FULL	REVISION: 1.0
CHECKED BY: BROWN, B.	DATE: 06 JAN 1993	CATEGORY: SCHEMATIC	REVISION: 1.0
DESIGNED BY: L. J. C. G.	DATE: 06 JAN 1993	REVISION: 1.0	REVISION: 1.0
LAST MODIFIED BY: L. J. C. G.	DATE: 06 JAN 1993	REVISION: 1.0	REVISION: 1.0

INK STAMP FINISHED ASSEMBLY WITH SERIAL/SEQUENCE CODE AND VENDOR LOCATION LETTER IN THIS GENERAL AREA (PER EXIDE ELECTRONICS QC PROCEDURE QCP169) FAR SIDE.

INK STAMP ASSEMBLY BILL OF
MATERIAL NUMBER AND REV LEVEL

- SEE DETAIL A

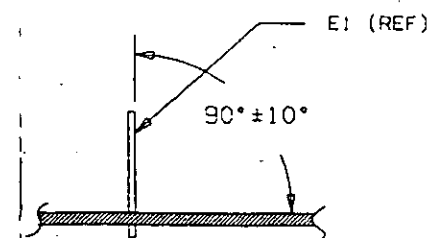
VIEW OF COMPONENT SIDE



DETAIL A - APPLY HEATSINK COMPOUND
(P/N 126303101) WHERE SHOWN

TYP MTG FOR U3 & U12
SCALE NONE

NOT POPULATED	
101072886-002 (RS232)	101072886-003 (RELAYS)
C21-C24 D5-D8 K1-K4 W2	C1-C17, C19-C26, C27 Y1 R1-R15 D1-D4, D9-D10 O1-O2 U1-U3, U5-U11 T1

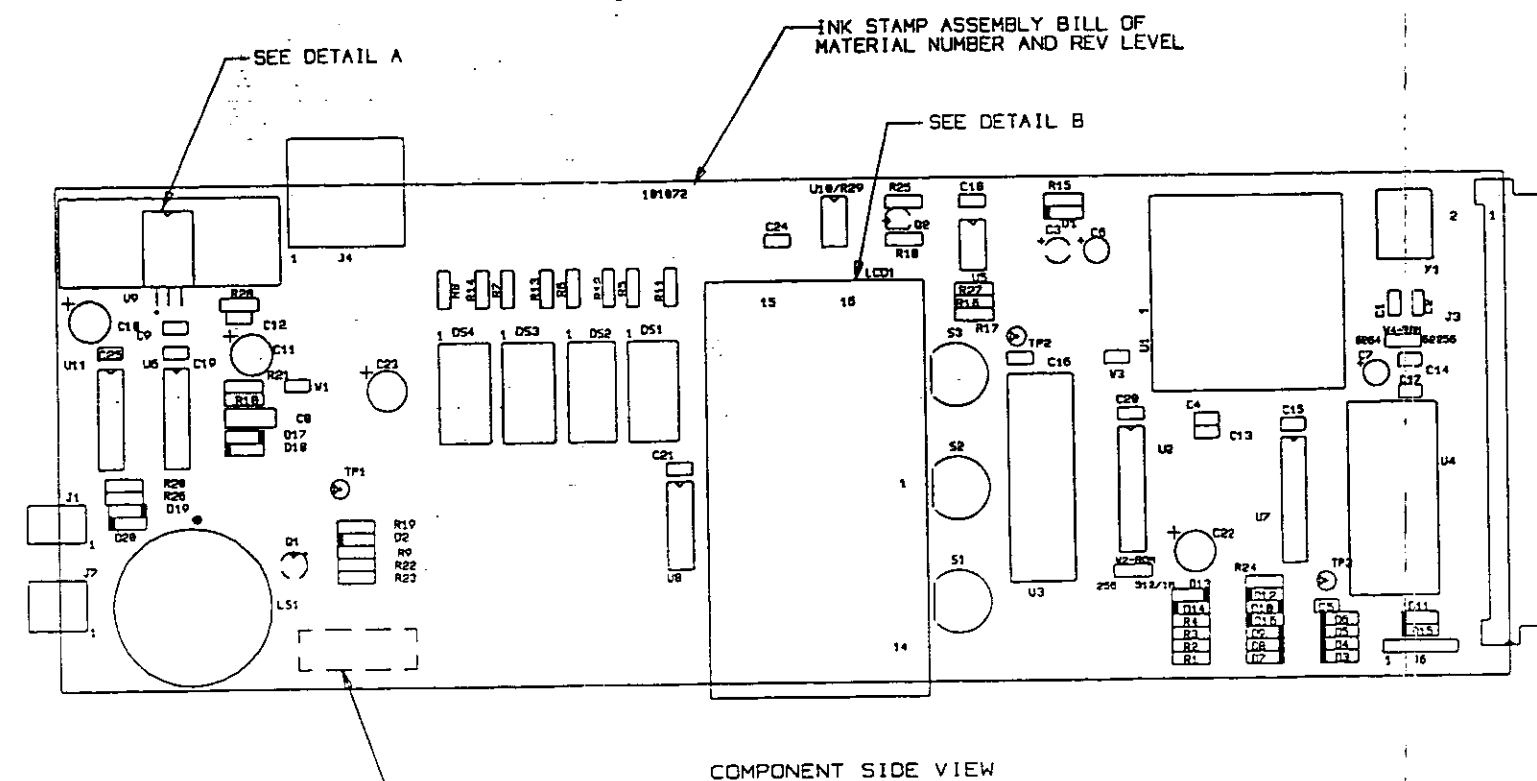
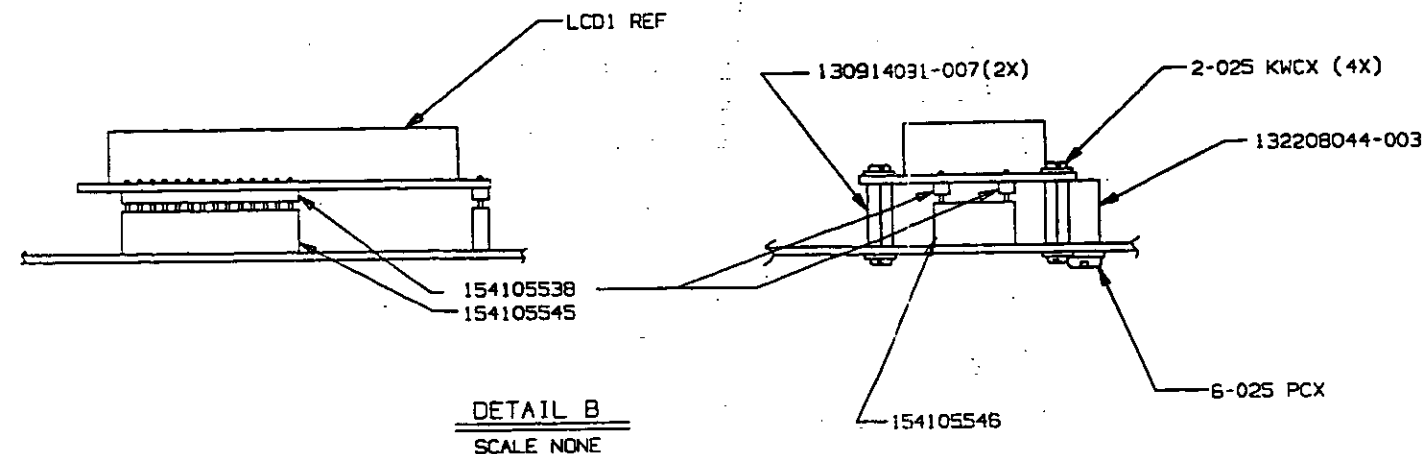


DETAIL B
SCALE NONE

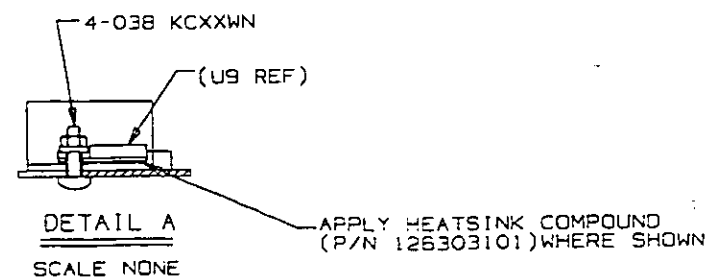
B/M 101072886-001/003

52 |

EXIDE ELECTRONICS RALEIGH, N.C. 27604				PENDING	
DESCRIPTION: RS-322 SERIAL COMMUNICATIONS BD ASSEMBLY DIAGRAM					
CREATED BY:	DATE:	FIRST USED ON:	UP:	SCALE:	UNLESS OTHERWISE SPECIFIED TOLERANCES ON:
DIPAUDL_G	24-OCT-1990	AST10	N/A	FULL TO NET SEE DRAWING	ANGLES 1/12" DECIMALS .X 0.1
CHECKED BY:	DATE:	CATEGORY:		DO - IDENTIFY 2 NET CHANCE SIMILARITY	FRACTIONS 1/16" .XX 0.03 HOLE DIAMETERS 0.005 .XXX 0.010 *DIMENSIONS ARE IN INCHES (PARENTS) AND AFTER PLATING*
RESPONSIBLE ENGINEER:		SECURITY CLASS:		REVISION:	DATE APPR
LANGER_D		GENERAL		7A	CN
LAST MODIFIED BY:	DATE:	VERSION:	SIZE:	DRAWING NO.:	CUSTOM NO.
WINEGAR_N	09-JUN-1993	15	C	110073769	
THE DIMENSIONS AND SPECIFICATIONS ARE THE PROPERTY OF EXIDE ELECTRONICS AND SHALL NOT BE REPRODUCED OR COPIED OR USED AS THE BASIS FOR ANY CONTRACT OR AS THE BASIS FOR THE MANUFACTURE OF EQUIPMENT WITHOUT THE WRITTEN PERMISSION OF EXIDE ELECTRONICS.					



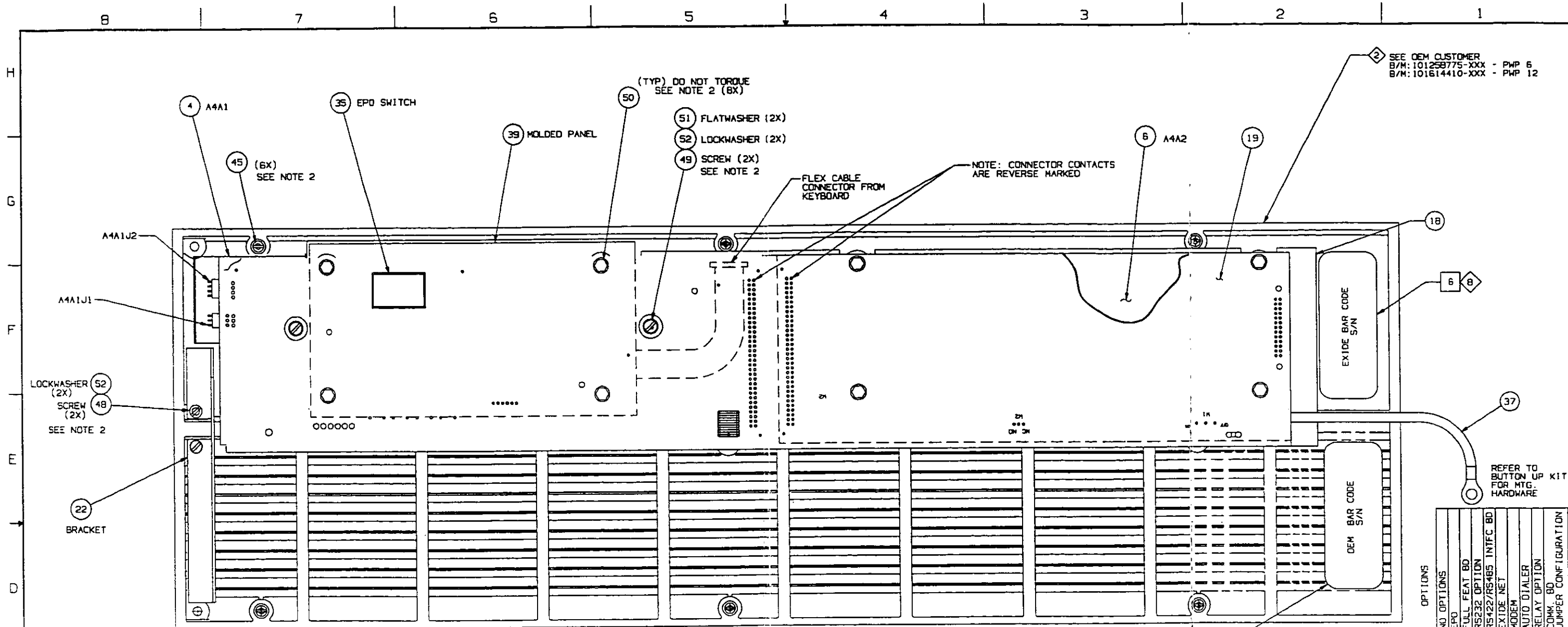
INK STAMP FINISHED ASSEMBLY WITH SERIAL/SEQUENCE CODE AND VENDOR LOCATION LETTER IN THIS GENERAL AREA (PER EXIDE ELECTRONICS QC PROCEDURE OCP169) FAR SIDE.



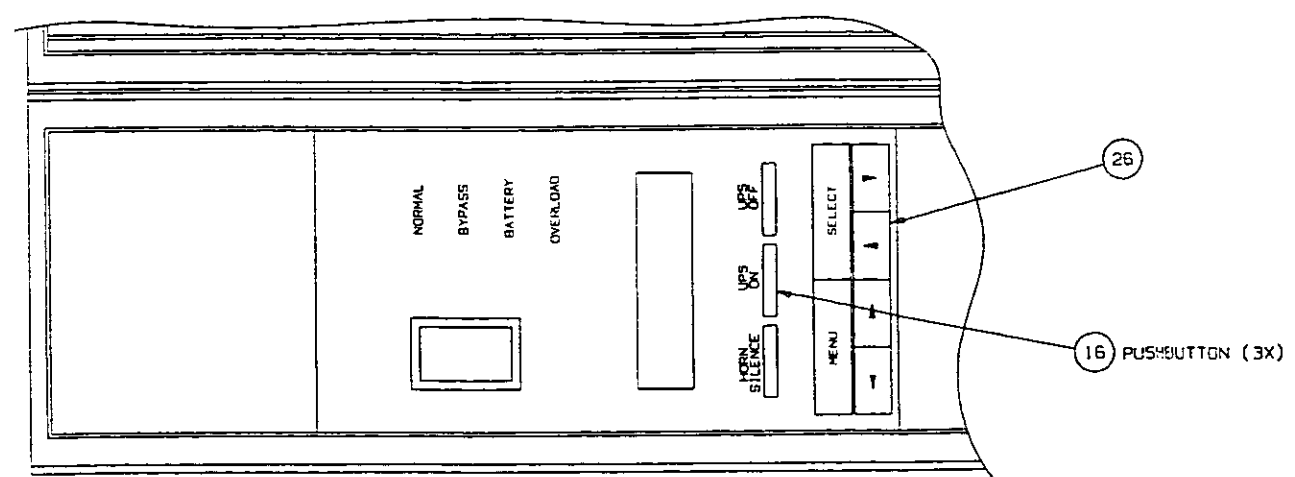
B/M 101072887

53

EXIDE ELECTRONICS				BAILEY, N.C. 27804		RELEASED	
PANEL ASSEMBLY DIAGRAM							
990	FIRST USED ON: AST10	U1: N/A	SCALE: FULL DO NOT SCALE DRAWING	UNLESS OTHERWISE SPECIFIED TOLERANCES ON: ANGLES: 1/2" DECIMALS: .X & .1 FRACTIONS: 1/64 .XXX & .010 HOLE DIAMETERS: .005 .XXX & .010 DIMENSIONS ARE IN INCHES (MILLIMETERS) AND AFTER PLATING			
991	CATEGORY: ASSEMBLY		DO NOT DIMENSION TO UNLESS OTHERWISE SPECIFIED				
	SECURITY CLASS: GENERAL		REVISION: RN/CN/SP/RN NO: A CN 024-0025	DATE APPR: 15-MAR-1991	APPROVED BY: BRITT_M		
991	VERSION: 11	SIZE: C	DRAWING NO. 110073770	CUSTOM NO.	SHEET: 1 OF: 1		
THIS ELECTRONIC IS SHALL NOT BE REPRODUCED OR COPIED OR USED AS THE BASIS FOR MANUFACTURE OF SALE OF APPARATUS WITHOUT PERMISSION							



REAR VIEW



PARTIAL FRONT VIEW

- NOTES:
1. BALLOONED ITEM NUMBERS AND PICTORIAL REPRESENTATION SHOW ALL POSSIBLE COMBINATIONS OF ASSEMBLY. SEE EACH B/M FOR APPLICABLE ITEMS AND QUANTITIES.
 2. CAUTION: STANDARD TORQUE VALUES FOR SCREWS DO NOT APPLY TO THIS ASSEMBLY. DO NOT EXCEED 5 IN/LB INTO THREADED INSERTS. THREAD FORMING SCREWS (ITEM 50) SHALL BE INSERTED WITH ONLY ENOUGH TORQUE TO SECURE PARTS.

COMM. BOARD JUMPER CONFIGURATION		
SYMBOL (SEE CHART)	W1	W2
E	ON 1-2	2-3(NC)
A	OFF 2-3	1-2(NC)

- XX REF: EXIDE LABEL KIT: B/M 101614303 >AST 12 ONLY
 REF: AT&T LABEL KIT: B/M 101614304
 REF: EXIDE LABEL KIT: B/M 101614479 >AST 18 ONLY
 REF: AT&T LABEL KIT: B/M 101614478

- XX REF: EXIDE LABEL KIT: B/M 101614471 >AST 6 ONLY
 REF: AT&T LABEL KIT: B/M 101614472

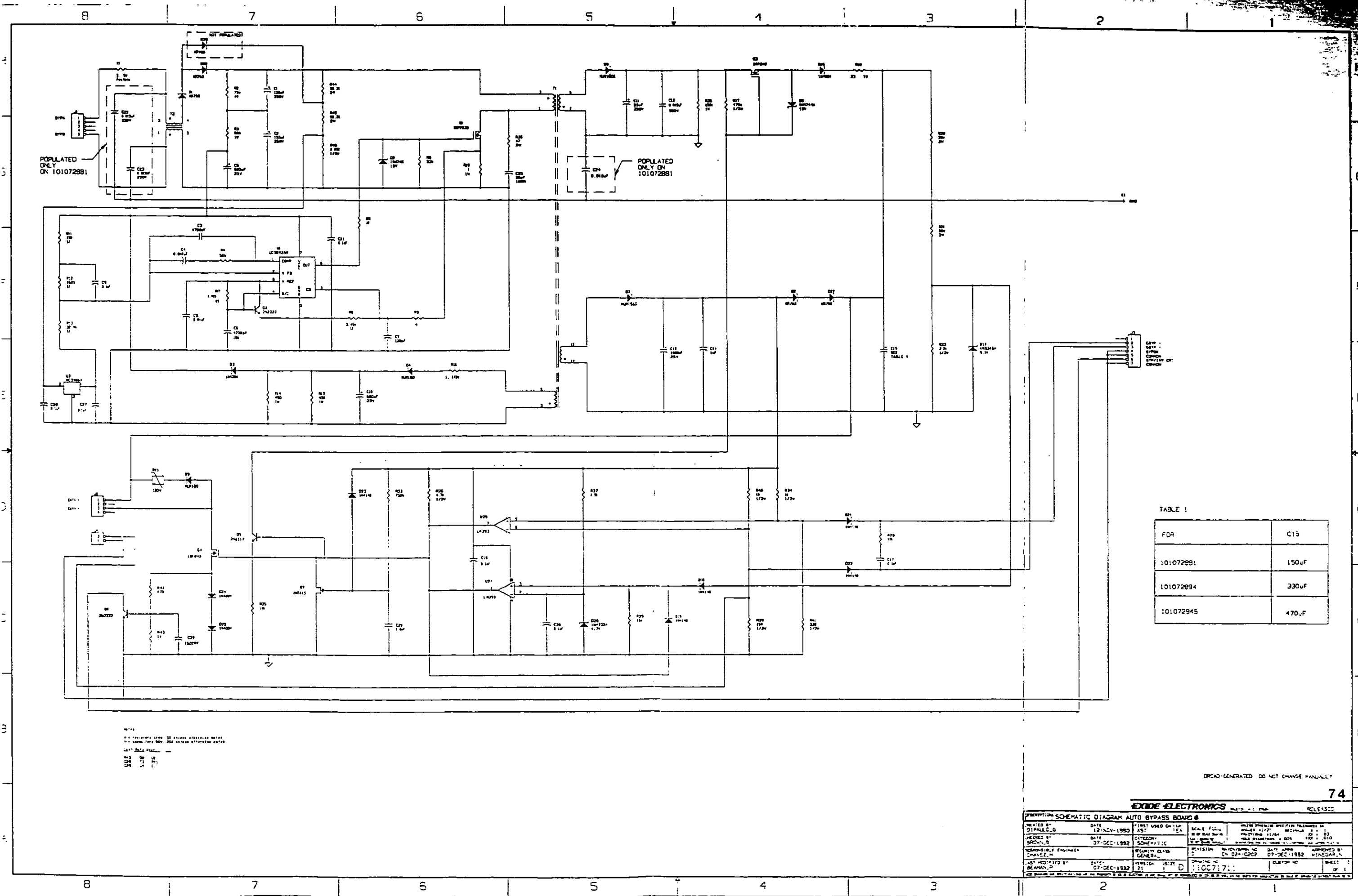
DEM. OPTIONAL 6 8

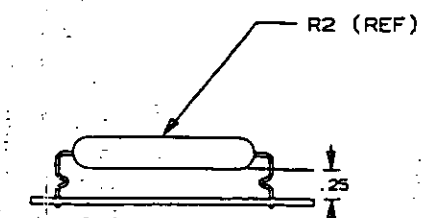
B/M#	NO. OPTIONS	EPD	FULL FEAT. BO	RS232C OPTION	RS422/RS485 INTFC. BO	EXIDE NET	MODEM	AUTO DIALER	RELAY OPTION	COMM. BO JUMPER CONFIGURATION
101614xxx-001	J	0	0	0	0	0	0	0	0	
101614xxx-002	0	1	0	0	0	0	0	0	0	
101614xxx-003	0	0	1	0	0	0	0	0	0	
101614xxx-004	0	1	1	0	0	0	0	0	0	
101614xxx-005	0	1	0	0	0	0	0	0	0	E
101614xxx-006	0	0	1	0	0	0	0	0	0	
101614xxx-007	0	0	1	0	0	0	0	0	0	
101614xxx-008	0	1	0	0	0	0	0	0	0	
101614xxx-009	0	0	1	0	0	0	0	0	0	
101614xxx-010	0	1	1	0	0	0	0	0	0	E
101614xxx-011	0	1	1	0	0	0	0	0	0	E
101614xxx-012	0	1	1	0	0	0	0	0	0	
101614xxx-013	0	1	1	0	0	0	0	0	0	
101614xxx-014	0	1	1	0	0	0	0	0	0	A
101614xxx-015	0	0	1	0	0	0	0	0	0	E
101614xxx-016	0	1	1	0	0	0	0	0	0	A
101614xxx-017	0	1	1	0	0	0	0	0	0	A
101614xxx-018	0	0	1	0	0	0	0	0	0	E
101614xxx-019	0	1	1	0	0	0	0	0	0	E
101614xxx-023	0	1	1	0	0	0	0	0	0	E

(NOT RELEASED)
 (NOT RELEASED)
 (HIGH VOLTAGE)

XX 101614675-XXX PWP 6
 110614347-XXX PWP 6 AT&T
 101614410-XXX PWP 12, 18, 12HV

EXIDE ELECTRONICS				RELEASED	
DESCRIPTION: ASSEMBLY, FRONT PANEL					
CREATED BY: KIMBLE, J.	DATE: 17-JAN-1991	FIRST USED ON: UN	SCALE: FULL	DATE: 11-JAN-1993	
DESIGNED BY: WINEGAR, J.	DATE: 05-JAN-1993	CATEGORY: ASSEMBLY	DATE: 11-JAN-1993	APPROVED BY: WINEGAR, J.	DATE: 11-JAN-1993
RESPONSIBLE ENGINEER: KIMBLE, J.	DATE: 05-JAN-1993	SECURITY CLASS: GENERAL	REVISION: 022-0610	DATE: 11-JAN-1993	APPROVED BY: WINEGAR, J.
LAST MODIFIED BY: KIMBLE, J.	DATE: 05-JAN-1993	VERSION: 45	SIZE: D	110619111	SHEET: 1 OF 1





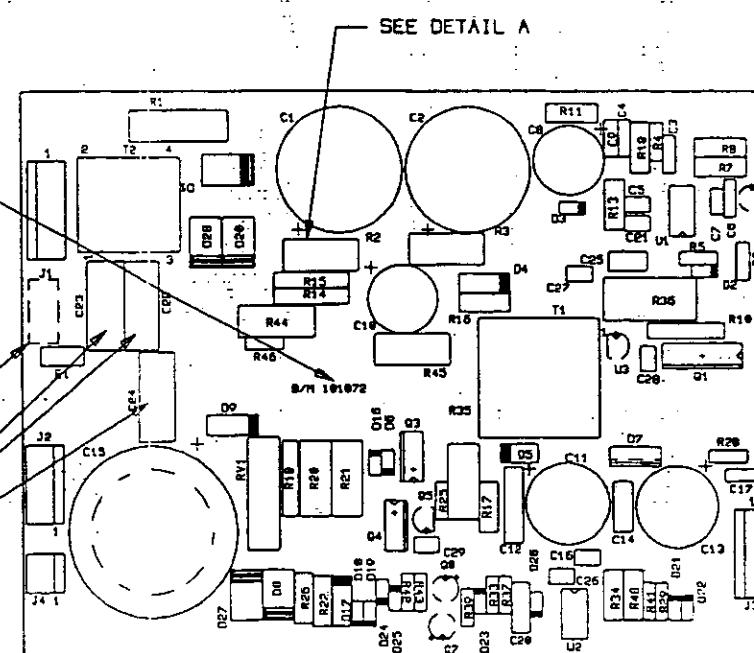
DETAIL A
SIDE VIEW

TYP MTG FOR R1,2,3,10,14,15,18,20,21,35,36,44,45

INK STAMP ASSEMBLY BILL OF
MATERIAL NUMBER AND REV LEVEL

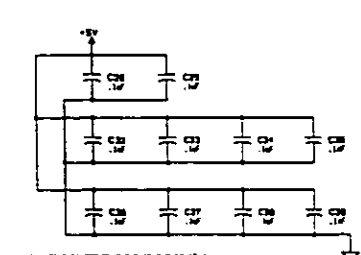
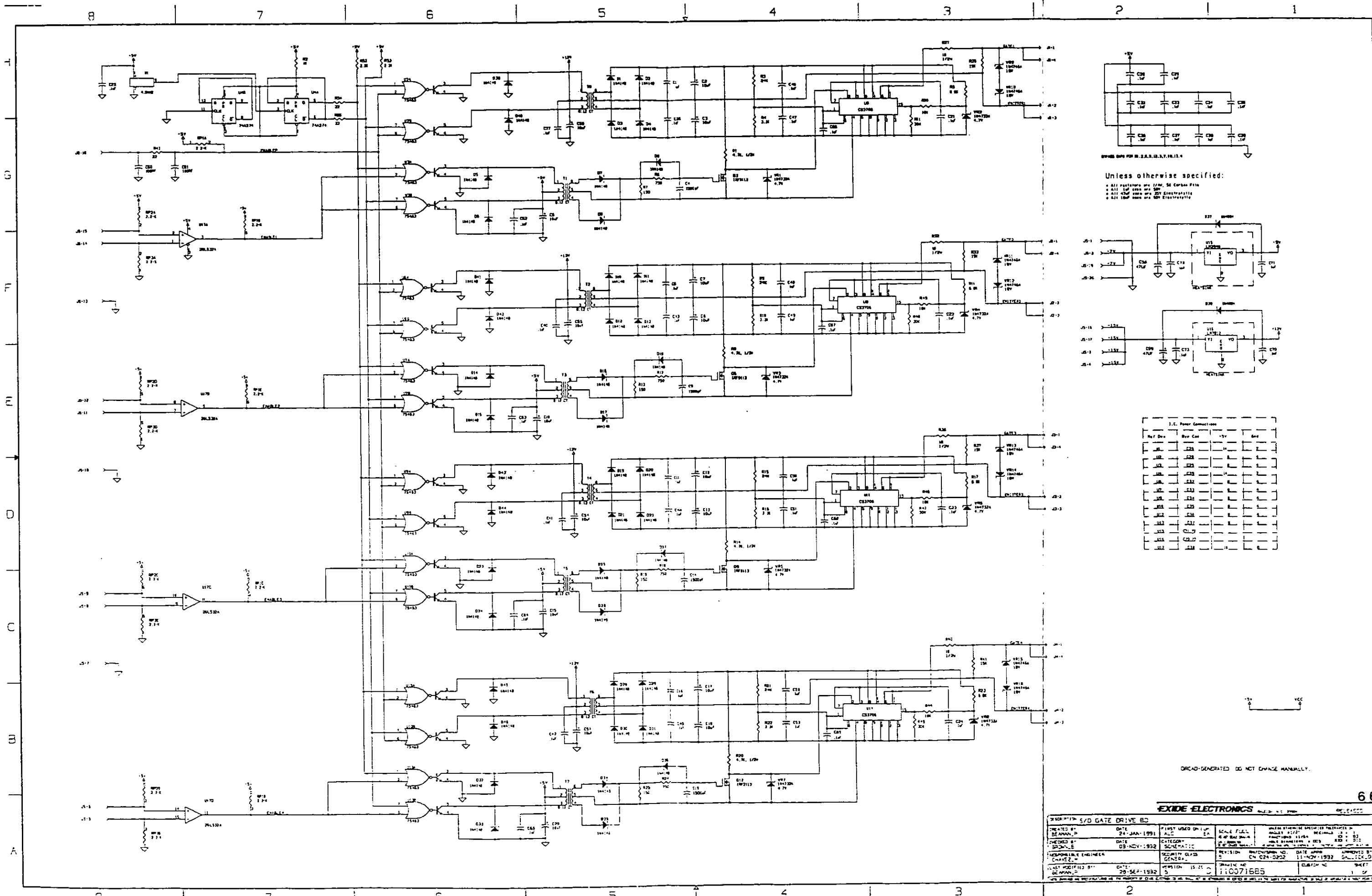
INK STAMP FINISHED ASSEMBLY WITH SERIAL/SEQUENCE
CODE AND VENDOR LOCATION LETTER IN THIS GENERAL
AREA (PER EXIDE ELECTRONICS CC PROCEDURE OCP169).

NOTE: C22,23,24 NOT POPULATED
ON 101072894 & 101072945.

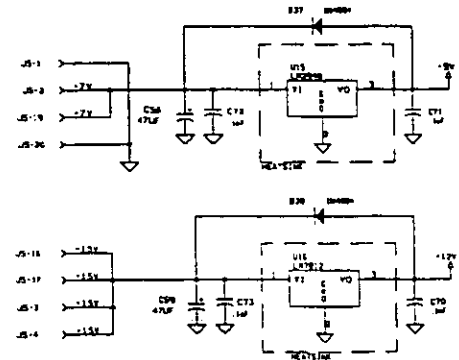


VIEW OF COMPONENT SIDE

DESCRIPTION: BYPASS BOARD ASSEMBLY DIAGRAM				UNLESS OTHERWISE SPECIFIED TOLERANCES ON:			
CREATED BY: DIPALLO_G	DATE: 12-NOV-1990	FIRST USED ON: AST	UM: EA	SCALE: FULL	ANGLES: 1/2"	DECIMALS: .XX ± .03	
CHECKED BY: BROWN_B	DATE: 09-NOV-1992	CATEGORY: ASSEMBLY		DO NOT SCALE DRAWING	FRACTIONS: 1/16"	XXX ± .010	
RESPONSIBLE ENGINEER: CHAVEZ_M		SECURITY CLASS: GENERAL		DO NOT SCALE DRAWING	HOLE DIAMETERS: ± .005		
LAST MODIFIED BY: BEAMAN_P	DATE: 28-SEP-1992	VERSION: 24	SIZE: C	REVISION: RN/CN/SPN NO	DATE APPR:	APPROVED BY:	
				DRAWING NO:	CN 024-0222	11-NOV-1992	GALLICK_D
				CUSTOM NO.			
				SHEET:			OF: 1



Unless otherwise specified:
• All resistors are 1/4W, 5% Carbon Film
• All 100k resistors are 500V
• All 100V resistors are 50V Electrolytic
• All 100V resistors are 50V Electrolytic



I.C. Power Connections			
Ref. Des.	Ref. Des.	Ref. Des.	Ref. Des.
U1	U2	U3	U4
U5	U6	U7	U8
U9	U10	U11	U12
U13	U14	U15	U16
U17	U18	U19	U20
U21	U22	U23	U24
U25	U26	U27	U28
U29	U30	U31	U32
U33	U34	U35	U36
U37	U38	U39	U40
U41	U42	U43	U44
U45	U46	U47	U48
U49	U50	U51	U52
U53	U54	U55	U56
U57	U58	U59	U60
U61	U62	U63	U64
U65	U66	U67	U68
U69	U70	U71	U72
U73	U74	U75	U76
U77	U78	U79	U80
U81	U82	U83	U84
U85	U86	U87	U88
U89	U90	U91	U92
U93	U94	U95	U96
U97	U98	U99	U100

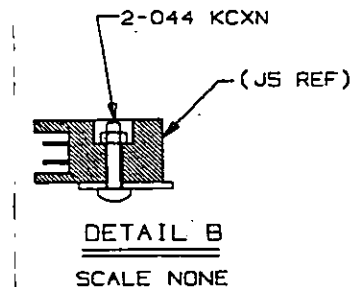
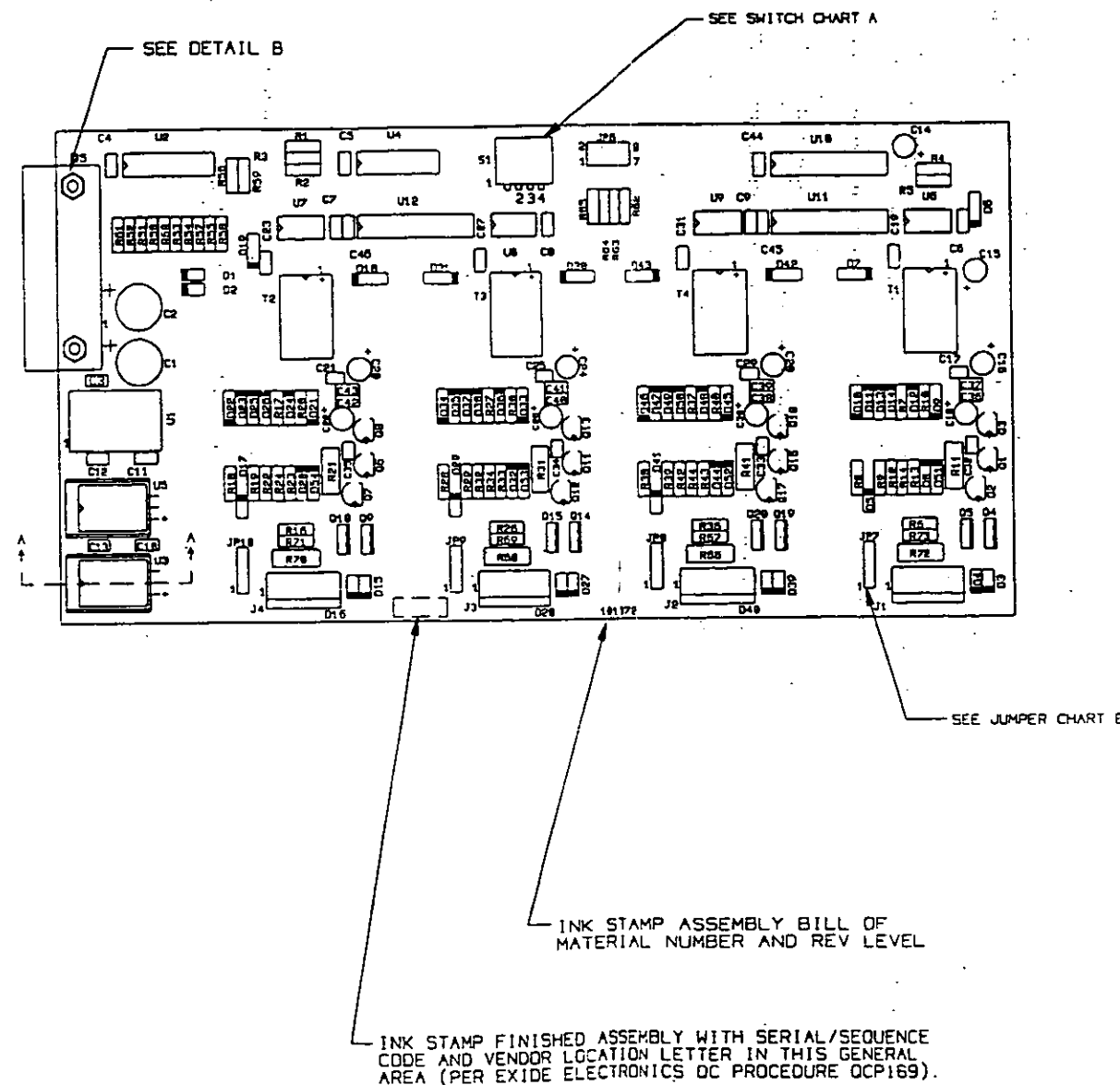
ORCAD-GENERATED. DO NOT CHANGE MANUALLY.

EXIDE ELECTRONICS			
S/D GATE DRIVE BOARD			
DESIGNED BY: BEAMAN, P.	DATE: 24-JAN-1991	FIRST USED ON: 100V 100mA 100V	SCALE: FULL
CHECKED BY: BEAMAN, P.	DATE: 09-NOV-1992	CATEGORY: SCHEMATIC	REVISION: 11-NOV-1992
DESIGNED BY: CHAYE, M.	DATE: 29-SEP-1992	SECURITY CLASS: GENERAL	APPROVED BY: GALLICK, D.
LAST MODIFIED BY: BEAMAN, P.	DATE: 29-SEP-1992	VERSION: 1.0	DRAWING NO: 110071685

SWITCH CHART A

ALL S1 SWITCHES TO BE SET IN "ON" POSITION
WHEN SHIPPED TO EXIDE ELECTRONICS FROM VENDOR
FOR ALL RECTIFIERS: S1-1, 2, 3, 4 ARE ALL ON

S1 POSITION FOR:	1	2	3	4	"X" = ON
6KVA INVERTER	0	X	X	X	
12KVA INVERTER	X	0	0	X	
18KVA INVERTER	X	0	0	X	
36KVA INVERTER		TBD			

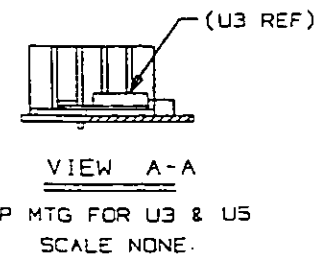


JUMPER CHART B

ALL JUMPERS, JP7 THRU JP10, ARE TO BE INSTALLED ACROSS POSITIONS 3 & 4 (4 PLACES) WHEN SHIPPED TO EXIDE ELECTRONICS FROM VENDOR.

JP7-10 POSITION:	1-2	3-4
6KVA RECT. INV	0	0
12KVA RECT. INV	0	X
18KVA RECT. INV	0	X

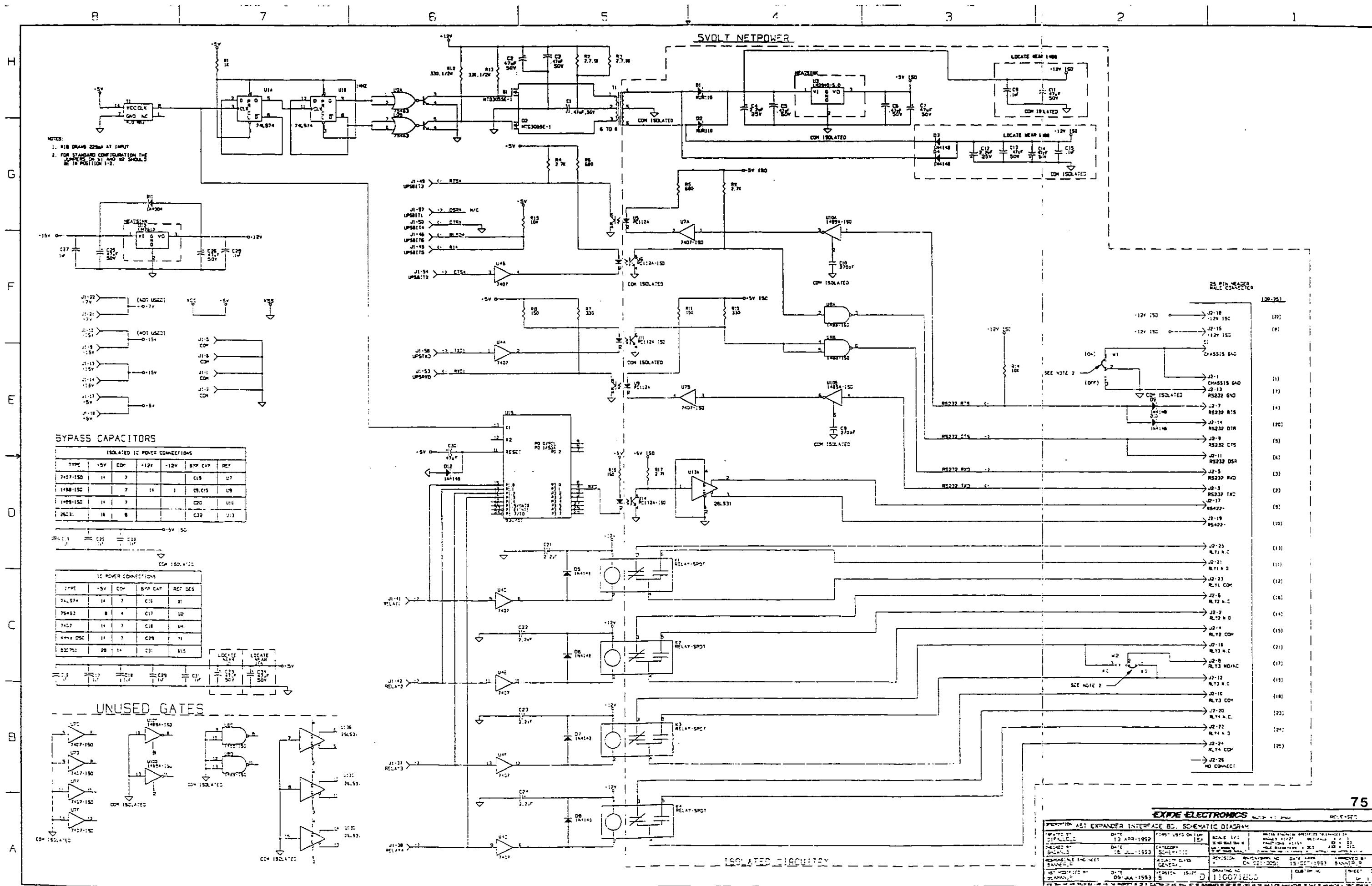
INSTALL JUMPERS ACROSS THE PINS INDICATED WITH AN "X"



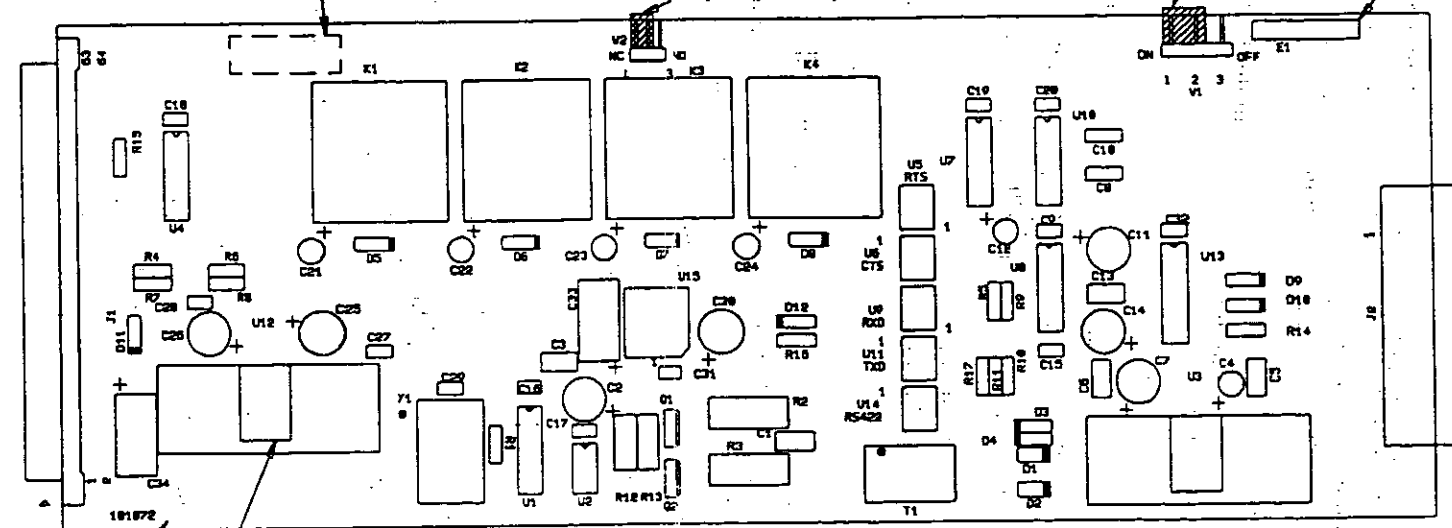
VIEW A-A
TYP MTG FOR U3 & U5
SCALE NONE.

EXIDE ELECTRONICS

DESCRIPTION: GATE DRIVE COST REDUCTION BD. ASSEMBLY DIAGRAM		RELEASED	
CREATED BY: DIPALLO_G	DATE: 28-MAY-1991	FIRST USED ON: U1	EA
CHECKED BY: BROWN_B	DATE: 07-APR-1992	CATEGORY: ASSEMBLY	
RESPONSIBLE ENGINEER: WIDENER_S		SECURITY CLASS: GENERAL	
LAST MODIFIED BY: BEAMAN_P	DATE: 07-APR-1992	VERSION: 18	SIZE: C
SCALE: 1/1		UNLESS OTHERWISE SPECIFIED TOLERANCES ON: ANGLES: 81/2° DECIMALS: .XX ± .03 FRACTIONS: 1/64 HOLE DIAMETERS: .005 .XXX ± .010 DIMENSIONS ARE IN INCHES (PALLIUM) AND AFTER PLATING.	
REVISION: A		DATE APPR: 08-APR-1992	APPROVED BY: SUTPHIN_W
DRAWING NO: 110073807		CUSTOM NO:	SHEET: 1 OF 1

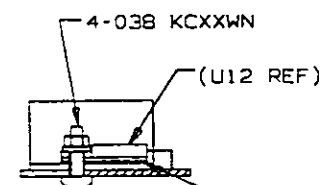


FOR STANDARD CONFIGURATION THE
JUMPERS ON W1 & W2 SHOULD
BE IN POSITION 1-2 AS SHOWN



- SEE DETAIL A

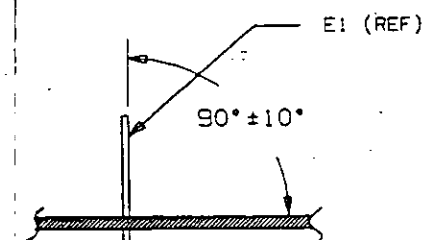
VIEW OF COMPONENT SIDE



DETAIL A — APPLY HEATSINK COMPOUND
(P/N 126303101) WHERE SHOWN

TYP MTG FOR U3 & U12
SCALE NONE

NOT POPULATED	
101072994-002 (RS232)	101072994-003 (RELAYS)
C21-C24,C30,C34 D5-D9,D12 K1-K4 W2 U13,U14,U15 R16,R17	C1-C17,C19-C26,C29, C30,C34 Y1 R1-R17 D1-D4,D9-D10,D12 Q1-Q2 U1-U3,U5-U11,U13-U17 T1



DETAIL B
SCALE NONE

B/M 101072994-0017003

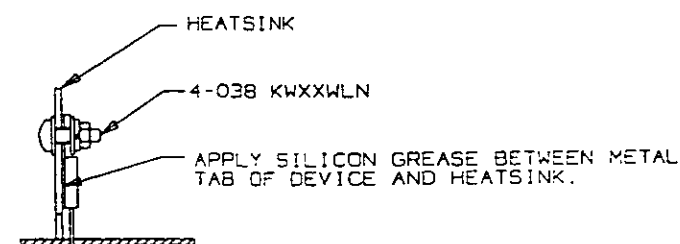
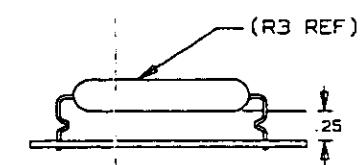
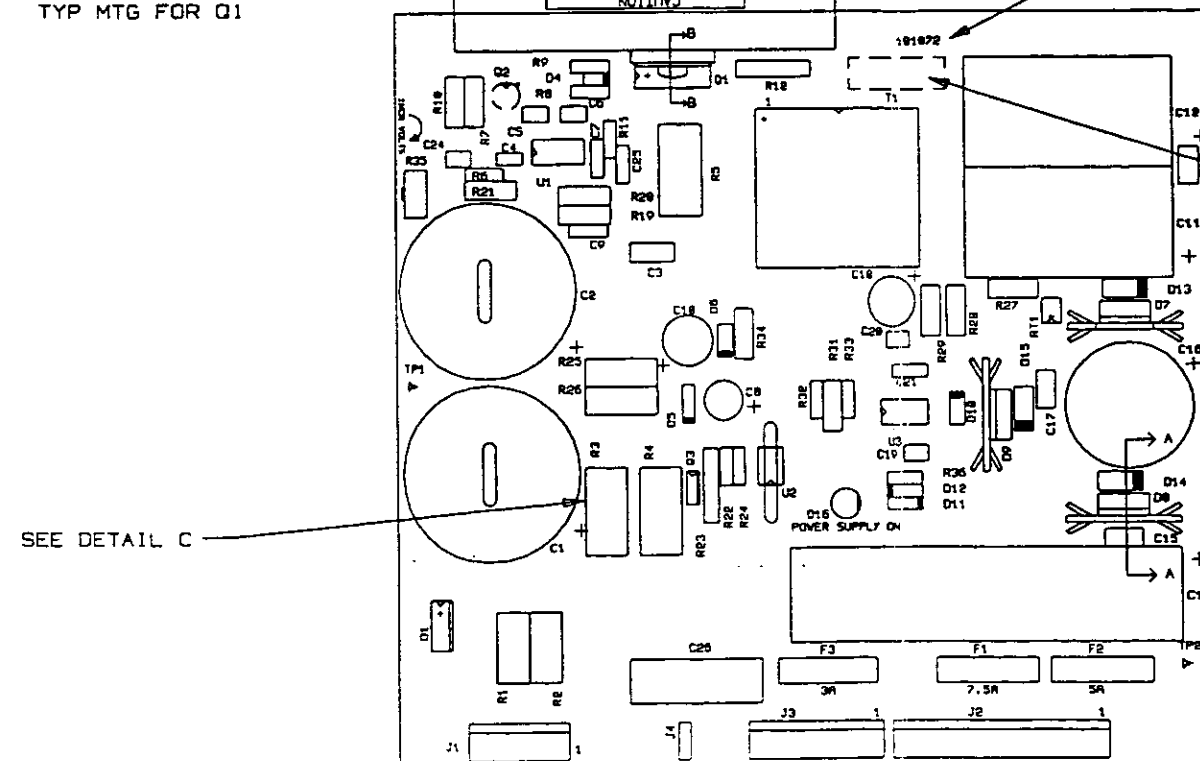
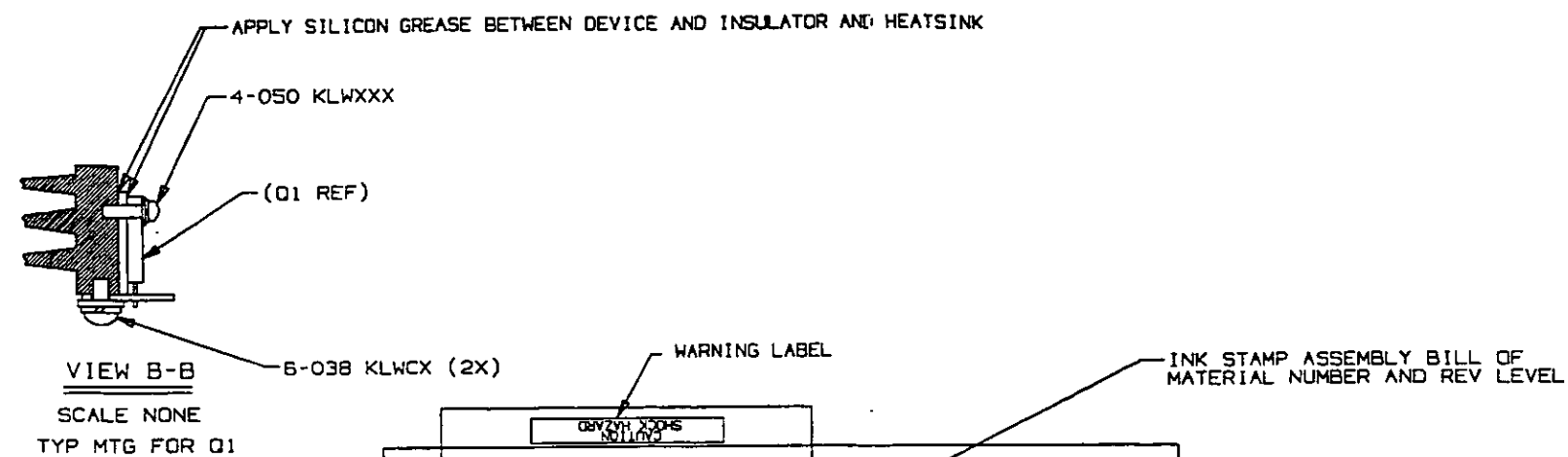
56 |

EXIDE ELECTRONICS

BALEIGH, N. C. 1970-4

CRAHAPPY

DESCRIPTION: AST EXPANDER INTERFACE BD. ASSEMBLY DIAGRAM				
CREATED BY: DIPALU_G	DATE: 10-AUG-1992	FIRST USED ON: AST	UN: EA	SCALE: 1/1
UNLESS OTHERWISE SPECIFIED TOLERANCES ON: ANGLES 1/2° DECIMALS .X .01 FRACTIONS 1/64 .X .03 HOLE DIAMETERS .005 .X .010 DIMENSIONS ARE TO HOLE (HALL PATTERN) AND AFTER PLATING				DO NOT SCALE DRAWING CN - REVISION C - CHANGE ORIGINALLY
CHECKED BY: BROWN_B	DATE: 16-JUL-1993	CATEGORY: ASSEMBLY	REVISION: R1V01/SPR01 NO: A	DATE APPR: CN 021-0051
RESPONSIBLE ENGINEER: BANNER_R	SECURITY CLASS: GENERAL	APPROVED BY: BANNER_R	DRAWING NO: 110073866	CUSTOM NC:
LAST MODIFIED BY: BEAMAN_P	DATE: 09-JUL-1993	VERSION: B	SIZE: C	SHEET: 1 OF: 1

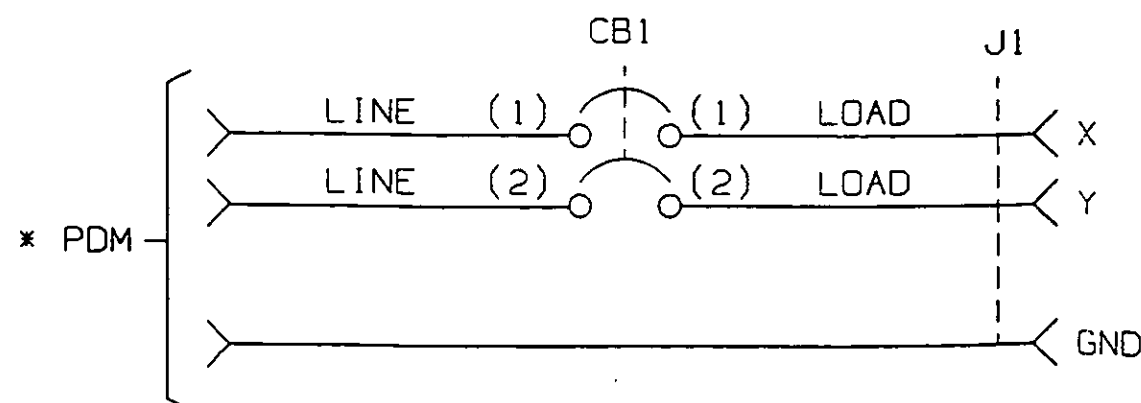
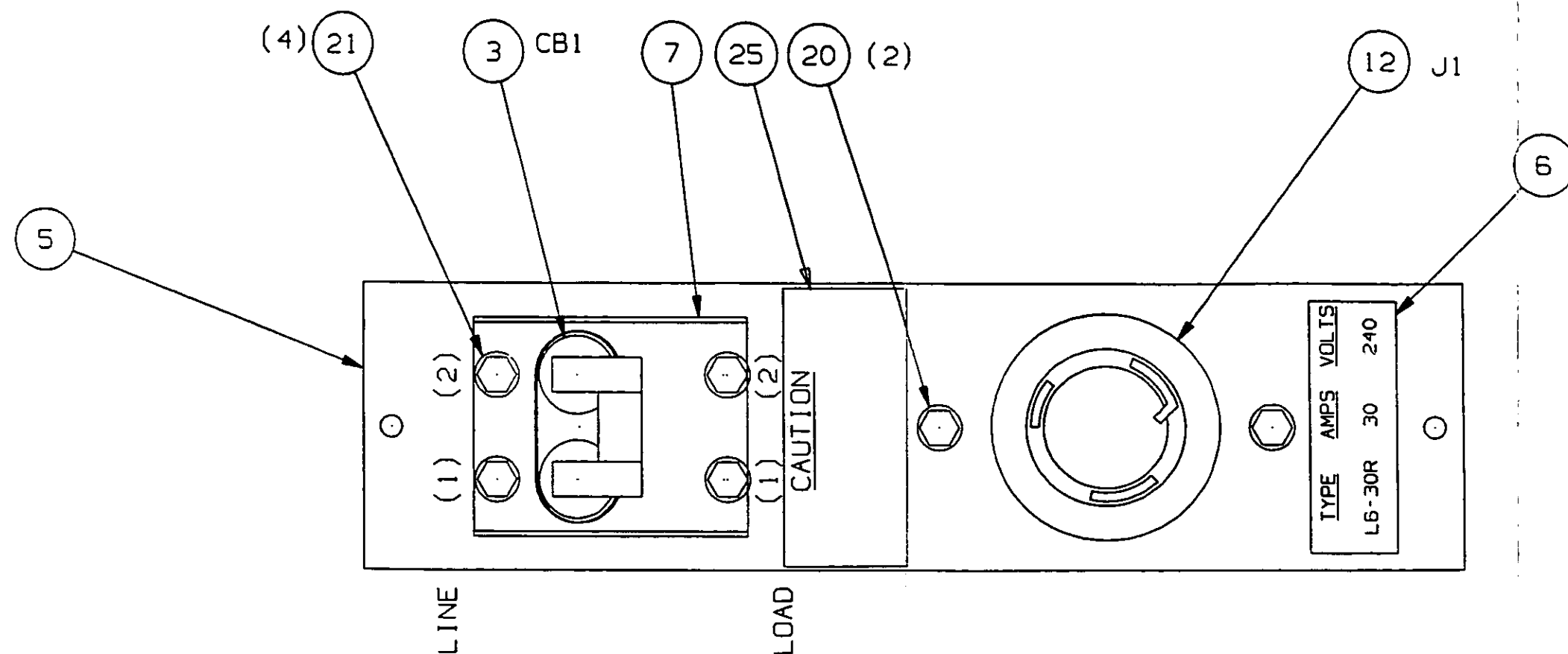


VIEW A-A

SCALE NONE

TYP MTG FOR D7-D9

EXIDE ELECTRONICS				PENDING	
DESCRIPTION: POWER SUPPLY BOA				PENDING	
CREATED BY: DIPAULO.G	DATE: 01-APR-1989	FIRST USED ON: UM: EA	SCALE: NONE	UNLESS OTHERWISE SPECIFIED TOLERANCES ON: ANGLES ±1/2° DECIMALS .X ± .1 FRACTIONS ±1/64 .XX ± .03 HOLE DIAMETERS ±.005 .XXX ± .010 DIMENSIONS ARE IN INCHES UNLESS OTHERWISE SPECIFIED	
CHECKED BY: POWERS_R	DATE:	CATEGORY: A/C	DO NOT SCALE DRAWING	REVISION: R1/CN/SPRN NO. DATE APPR: APPROVED BY POWERS_R	
RESPONSIBLE ENGINEER: POWERS_R	DATE:	SECURITY CLASS: GENERAL	GO - BOUNDED	DRAWING NO. 110073703	
LAST MODIFIED BY: DIPAULO.G	DATE: 14-FEB-1991	VERSION: 2	SIZE: C	CUSTOM NO.	SHEET: 1 OF 1
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* - REFER TO DWG. 110619141 FOR FINAL CONNECTION TO PDM.

B/M 101258842
W/C 176996570

EXIDE ELECTRONICS

RALEIGH, N.C. 27604

RELEASED

DESCRIPTION: ASSY. L6-30R C OUTPUT PANEL

CREATED BY:
SKREPCINSKI

DATE:
20-MAR-1991

FIRST USED ON:
AST12

UN:
EA

CHECKED BY:
WINEGAR_N

DATE:
09-SEP-1992

CATEGORY:
ASSEMBLY

RESPONSIBLE ENGINEER:
CLARK_R

SECURITY CLASS:
GENERAL

LAST MODIFIED BY:
HELLER_O

DATE:
08-SEP-1992

VERSION:
9

SIZE:
B

SCALE: FULL
DO NOT SCALE DRAWING
CAD - GENERATED
DO NOT CHANGE MANUALLY

UNLESS OTHERWISE SPECIFIED TOLERANCES ON:
ANGLES $\pm 1/2^\circ$ DECIMALS .X $\pm .1$
FRACTIONS $\pm 1/64$.XX $\pm .03$
HOLE DIAMETERS $\pm .005$.XXX $\pm .010$
DIMENSIONS ARE IN INCHES (MILLIMETERS) AND AFTER PLATING.

REVISION: RN/CN/SPRN NO:
B CN 022-0578

DATE APPR:
09-SEP-1992

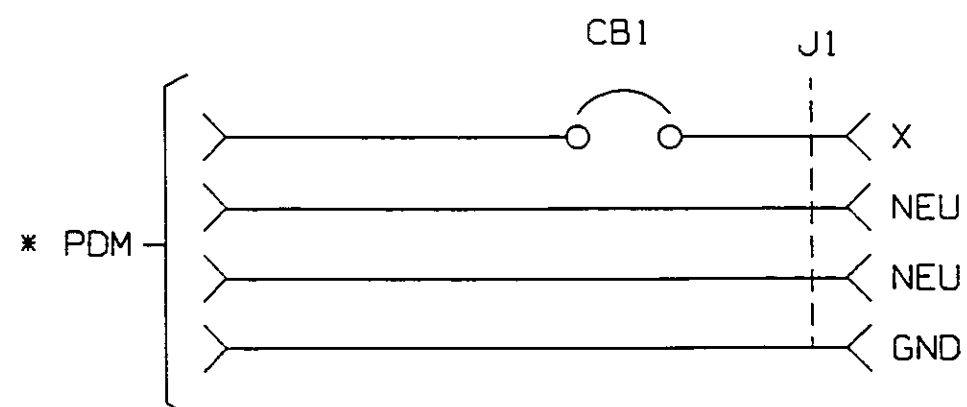
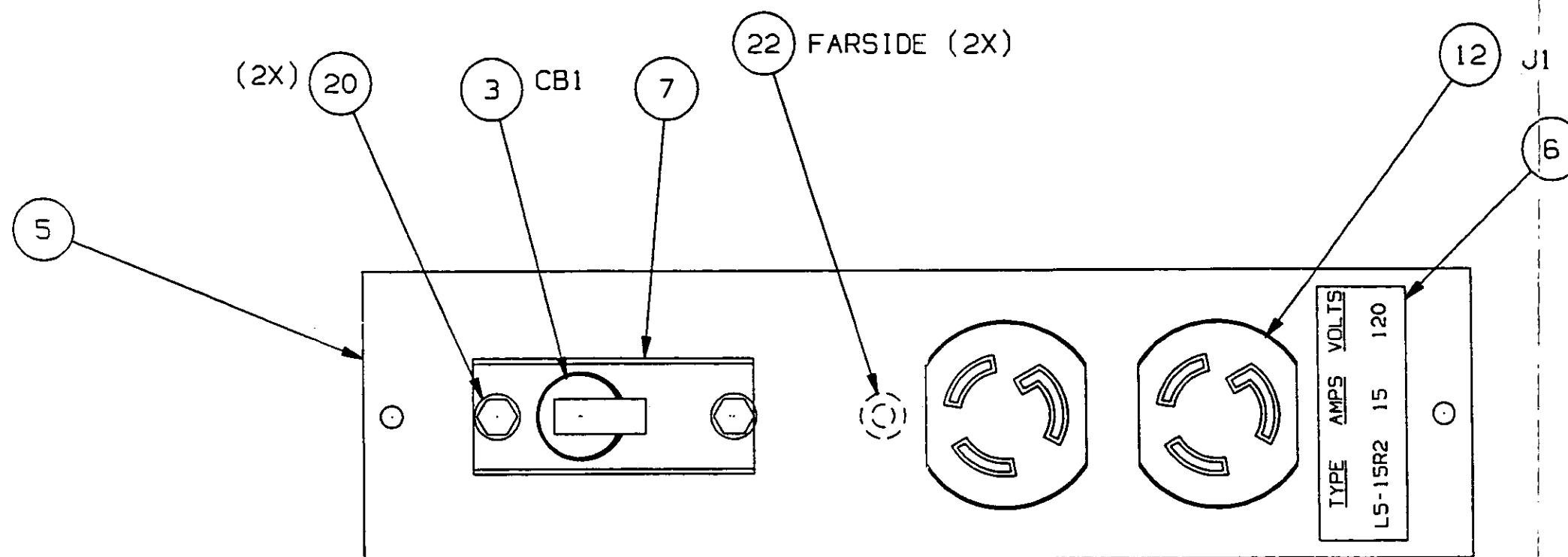
APPROVED BY:
WINEGAR_N

DRAWING NO.
110253889

CUSTOM NO.

SHEET: 1
OF: 1

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B/M 101258843

W/C 176996571

2

EXIDE ELECTRONICS

RALEIGH, N.C. 27604

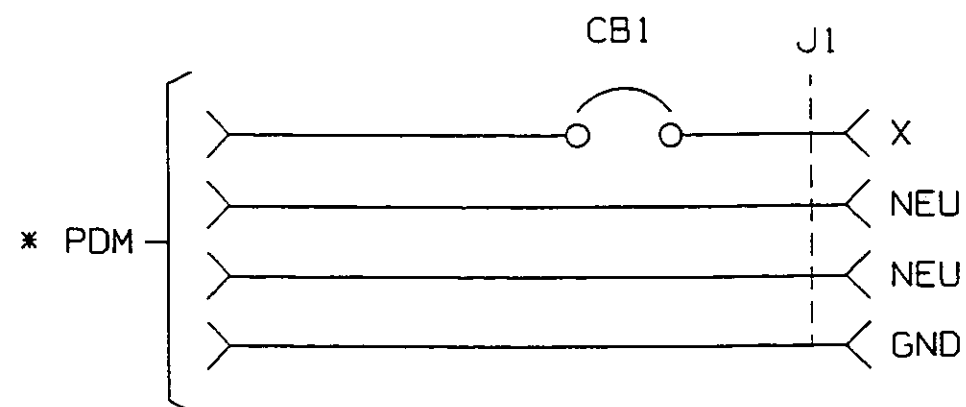
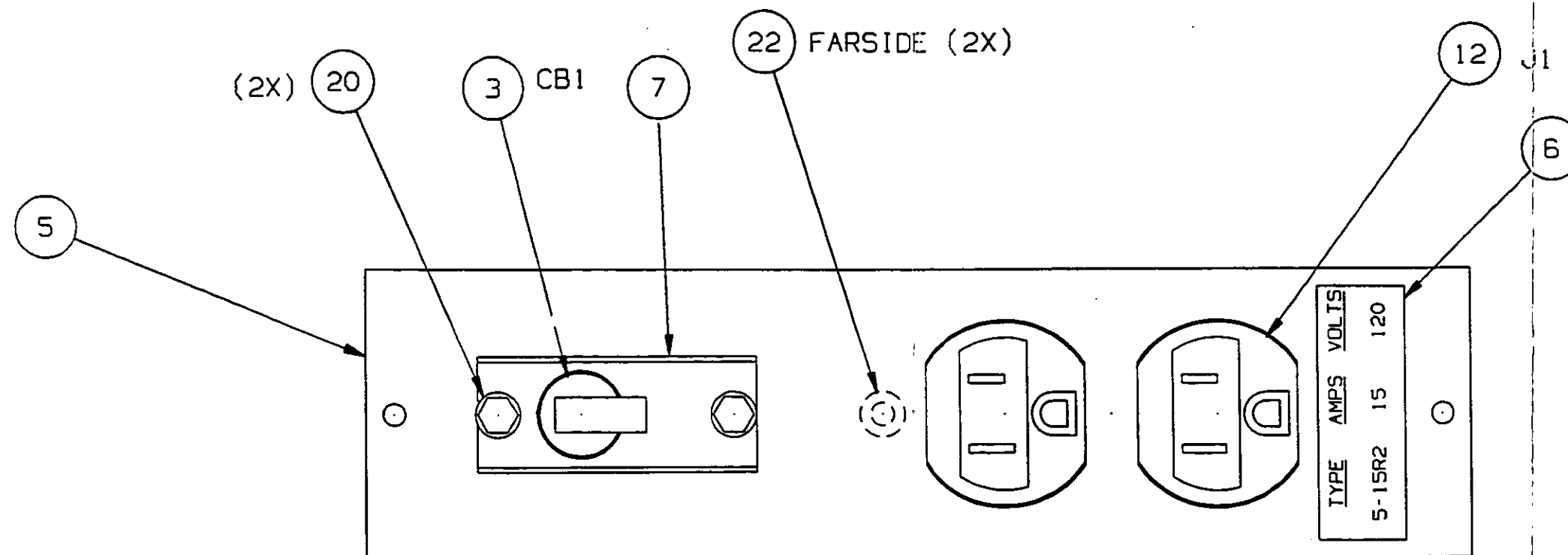
RELEASED

DESCRIPTION: ASSY. L5-15R-2 H OUTPUT PANEL

CREATED BY: SKREPCINSKI	DATE: 20-MAR-1991	FIRST USED ON: AST12	UN: EA
CHECKED BY: CARROLL_J	DATE: 21-AUG-1991	CATEGORY: ASSEMBLY	
RESPONSIBLE ENGINEER: CLARK_R		SECURITY CLASS: GENERAL	
LAST MODIFIED BY: SKREPCINSKI	DATE: 16-AUG-1991	VERSION: 6	SIZE: B

SCALE: FULL DO NOT SCALE DRAWING CNO - GENERATED DO NOT CHANGE MANUALLY	UNLESS OTHERWISE SPECIFIED TOLERANCES ON: ANGLES ±1/2° FRACTIONS ±1/64 HOLE DIAMETERS ±.005 -DIMENSIONS ARE IN INCHES (MILLIMETERS) AND AFTER PLATING-	REVISION: A RN/CN/SPRN NO: CN 024-0103 DATE APPR: 22-AUG-1991 APPROVED BY: SKREPCINSKI
DRAWING NO. 110253890	CUSTOM NO.	SHEET: 1 OF: 1

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* - REFER TO DWG. 110619141 FOR FINAL CONNECTION TO PDM.

B/M 101258850

W/C 176996571

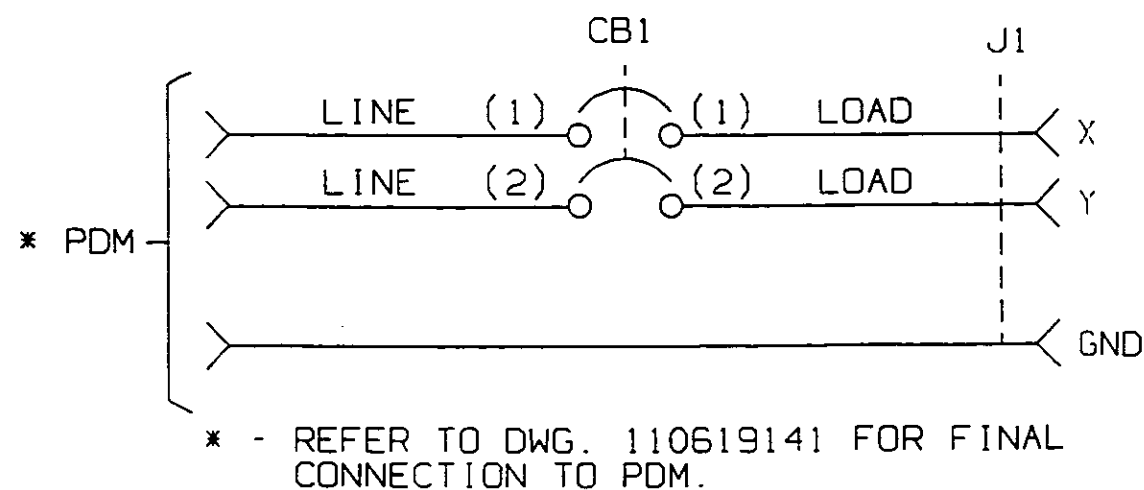
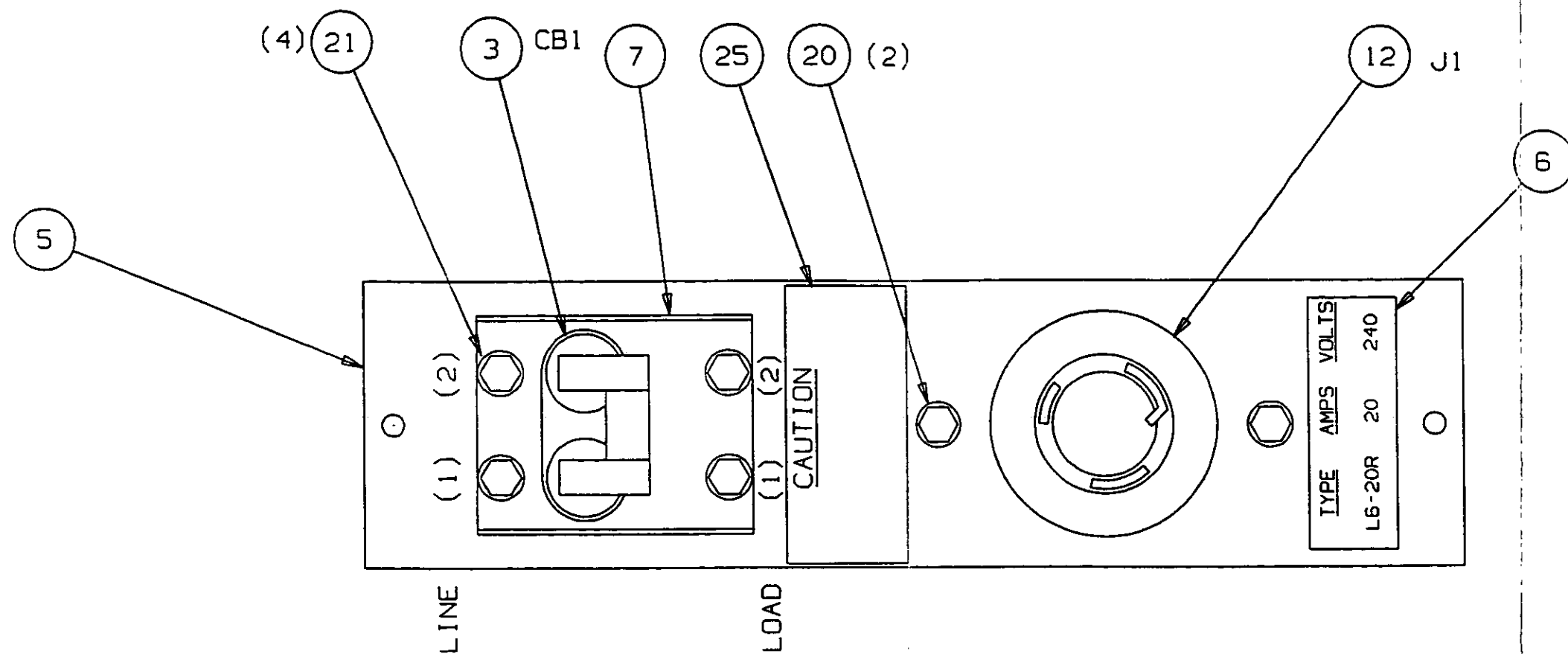
EXIDE ELECTRONICS

RALEIGH, N.C. 27604

RELEASED

DESCRIPTION: ASSY. 5-15R2 D OUTPUT PANEL				UNLESS OTHERWISE SPECIFIED TOLERANCES ON:			
CREATED BY: SKREPCINSKI	DATE: 30-APR-1991	FIRST USED ON: AST12	UN: EA	SCALE: FULL	ANGLES ±1/2°	DECIMALS .X ±.1	
CHECKED BY: WINEGAR_N	DATE: 23-OCT-1991	CATEGORY: ASSEMBLY		DO NOT SCALE DRAWING	FRACTIONS ±1/64	.XX ±.03	
RESPONSIBLE ENGINEER: CLARK_R		SECURITY CLASS: GENERAL		CAD - GENERATED	HOLE DIAMETERS ±.005	.XXX ±.010	
LAST MODIFIED BY: LYNAM_L	DATE: 03-OCT-1991	VERSION: 7	SIZE: B	REVISION: B	RN/CN/SPRN NO: CN 024-0132	DATE APPR: 01-NOV-1991	APPROVED BY: SUTPHIN_W
DRAWING NO. 110253893				CUSTOM NO.		SHEET: 1	
						OF: 1	

THESE DRAWINGS AND SPECIFICATIONS ARE THE PROPERTY OF EXIDE ELECTRONICS AND SHALL NOT BE REPRODUCED OR COPIED OR USED AS THE BASIS FOR MANUFACTURE OR SALE OF APPARATUS WITHOUT PERMISSION.



B/M 101258859

W/C 176996891

EXIDE ELECTRONICS

RALEIGH, N.C. 27604

RELEASED

DESCRIPTION: ASSEMBLY, L6-20R OUTLET PANEL B

CREATED BY: SKREPCINSKI DATE: 19-AUG-1991 FIRST USED ON: UN: EA

CHECKED BY: WINEGAR_N DATE: 19-MAR-1992 CATEGORY: ASSEMBLY

RESPONSIBLE ENGINEER: SKREPCINSKI SECURITY CLASS: GENERAL

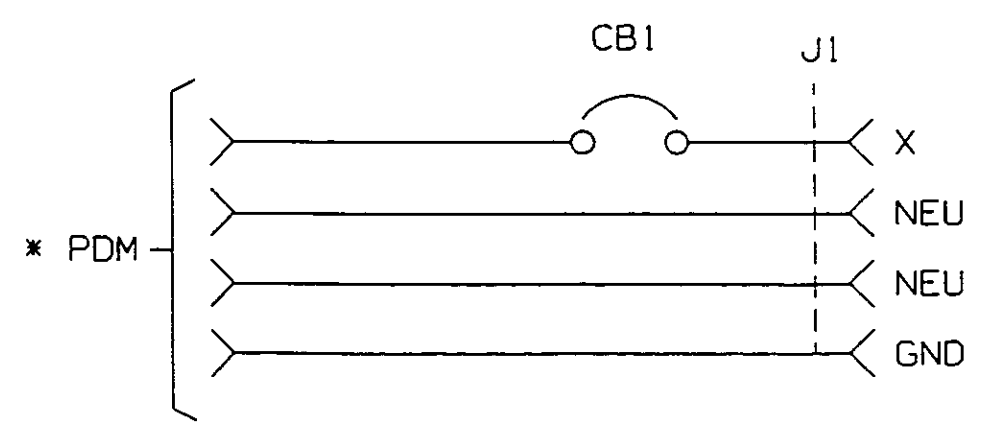
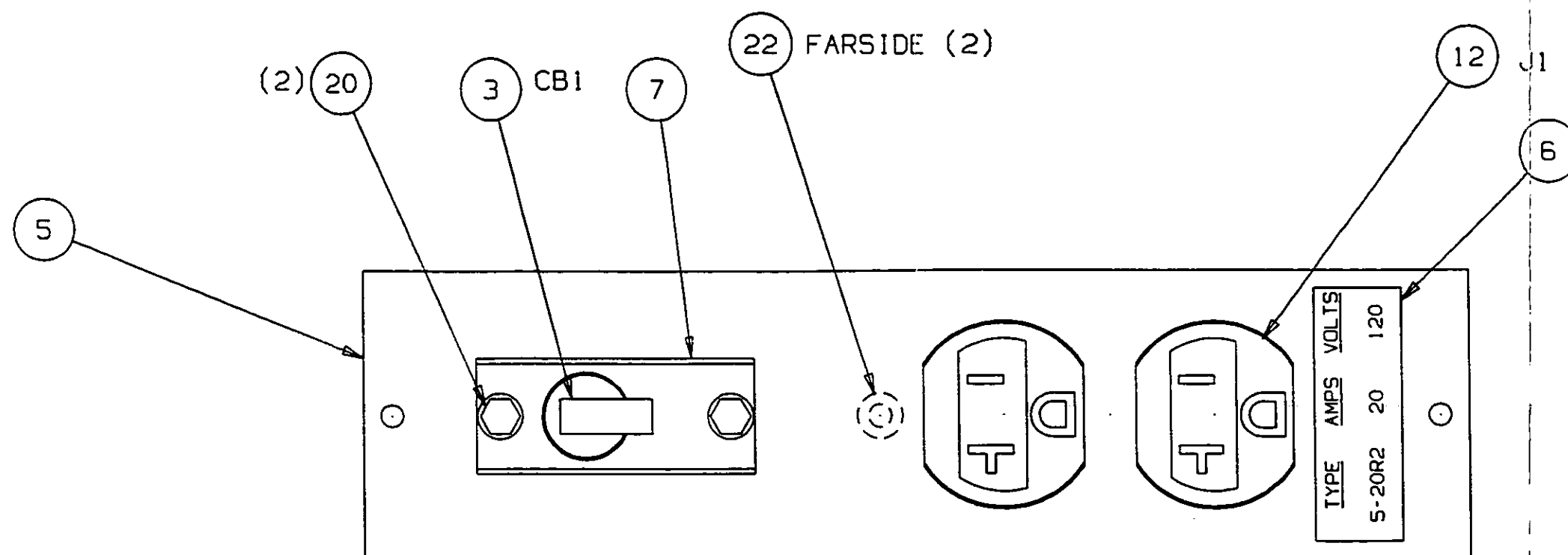
LAST MODIFIED BY: HELLER_D DATE: 11-MAR-1992 VERSION: 7 SIZE: B

SCALE: 1/1
DO NOT SCALE DRAWING
UNLESS OTHERWISE SPECIFIED TOLERANCES ON:
ANGLES ±1/2° DECIMALS .XX ±.03
FRACTIONS ±1/64 .XXX ±.010
HOLE DIAMETERS ±.005
DIMENSIONS ARE IN INCHES (MILLIMETERS) AND AFTER PLATING.

REVISION: RN/CN/SPRN NO: CN 022-0517 DATE APPR: 19-MAR-1992 APPROVED BY: WINEGAR_N

DRAWING NO. 110253898 CUSTOM NO. SHEET: 1 OF: 1

THESE DRAWINGS AND SPECIFICATIONS ARE THE PROPERTY OF EXIDE ELECTRONICS AND SHALL NOT BE REPRODUCED OR COPIED OR USED AS THE BASIS FOR MANUFACTURE OR SALE OF APPARATUS WITHOUT PERMISSION.



* - REFER TO DWG. 110619141 FOR FINAL CONNECTION TO PDM.

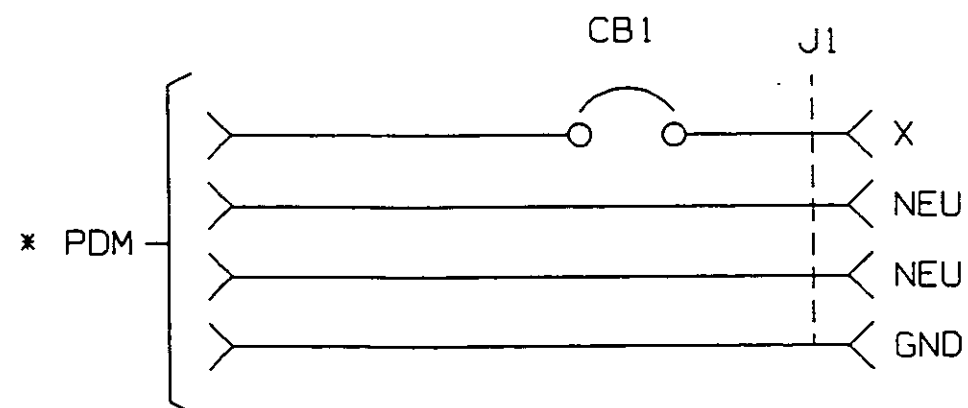
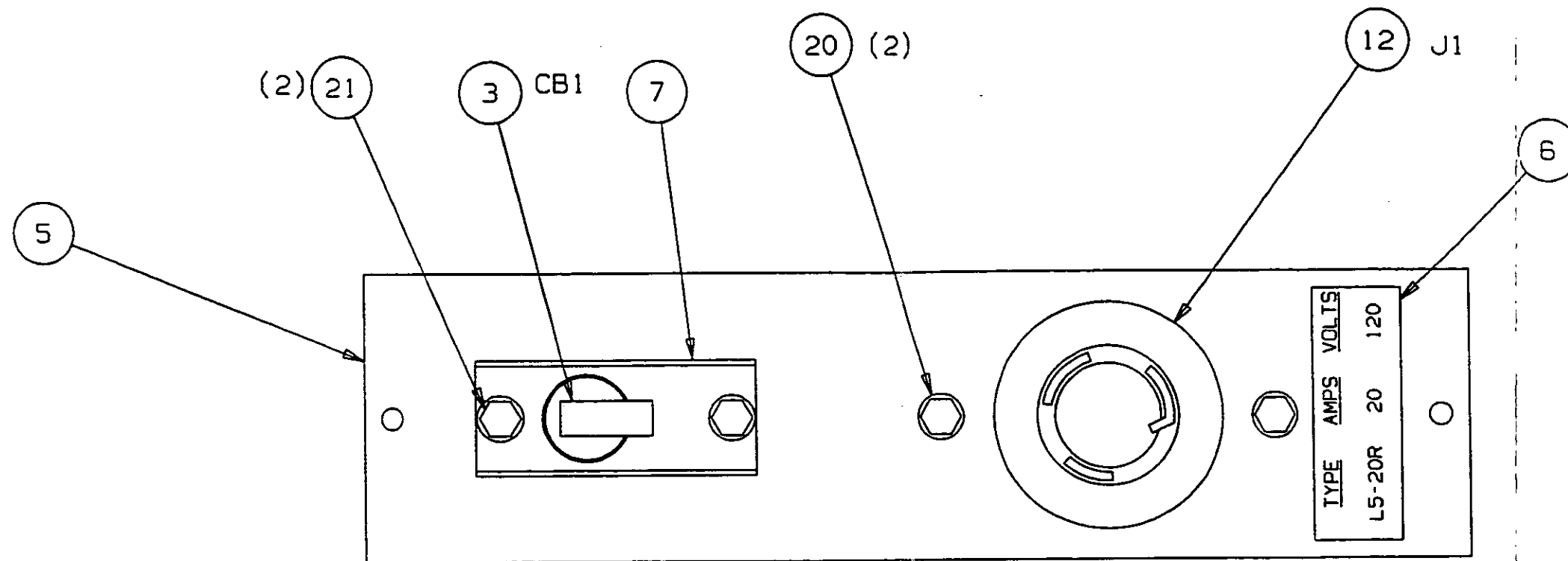
B/M 101258860
W/C 176996571

EXIDE ELECTRONICS

RALEIGH, N.C. 27604

RELEASED

DESCRIPTION: ASSEMBLY. 5-20R2 OUTLET PANEL E							
CREATED BY: SKREPCINSKI	DATE: 19-AUG-1991	FIRST USED ON: AST12	UN: EA	SCALE: 1/1 DO NOT SCALE DRAWING CNO - GENERATED DO NOT CHANGE MANUALLY	UNLESS OTHERWISE SPECIFIED TOLERANCES ON: ANGLES ±1/2" DECIMALS .X ± .1 FRACTIONS ±1/64 .XX ± .03 HOLE DIAMETERS ±.005 .XXX ± .010 -DIMENSIONS ARE IN INCHES (MILLIMETERS) AND AFTER PLATING-		
CHECKED BY: WINEGAR_N	DATE: 23-OCT-1991	CATEGORY: ASSEMBLY		REVISION: B	RN/CN/SPRN NO: CN 024-0132	DATE APPR: 01-NOV-1991	APPROVED BY: SUTPHIN_W
RESPONSIBLE ENGINEER: SKREPCINSKI		SECURITY CLASS: GENERAL		DRAWING NO. 110253899	CUSTOM NO.	SHEET: 1 OF: 1	
LAST MODIFIED BY: LYNAM_L	DATE: 03-OCT-1991	VERSION: 6	SIZE: B				
THESE DRAWINGS AND SPECIFICATIONS ARE THE PROPERTY OF EXIDE ELECTRONICS AND SHALL NOT BE REPRODUCED OR COPIED OR USED AS THE BASIS FOR MANUFACTURE OR SALE OF APPARATUS WITHOUT PERMISSION.							



* - REFER TO DWG. 110619141 FOR FINAL CONNECTION TO PDM.

B/M 101258861

W/C 176996894

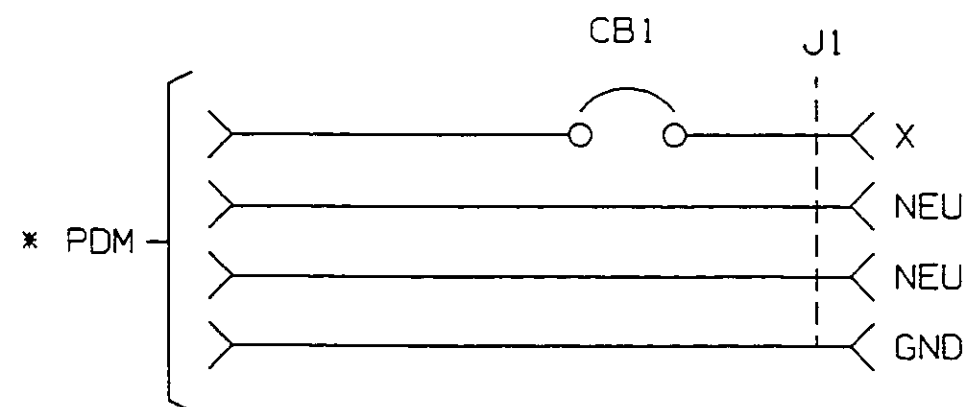
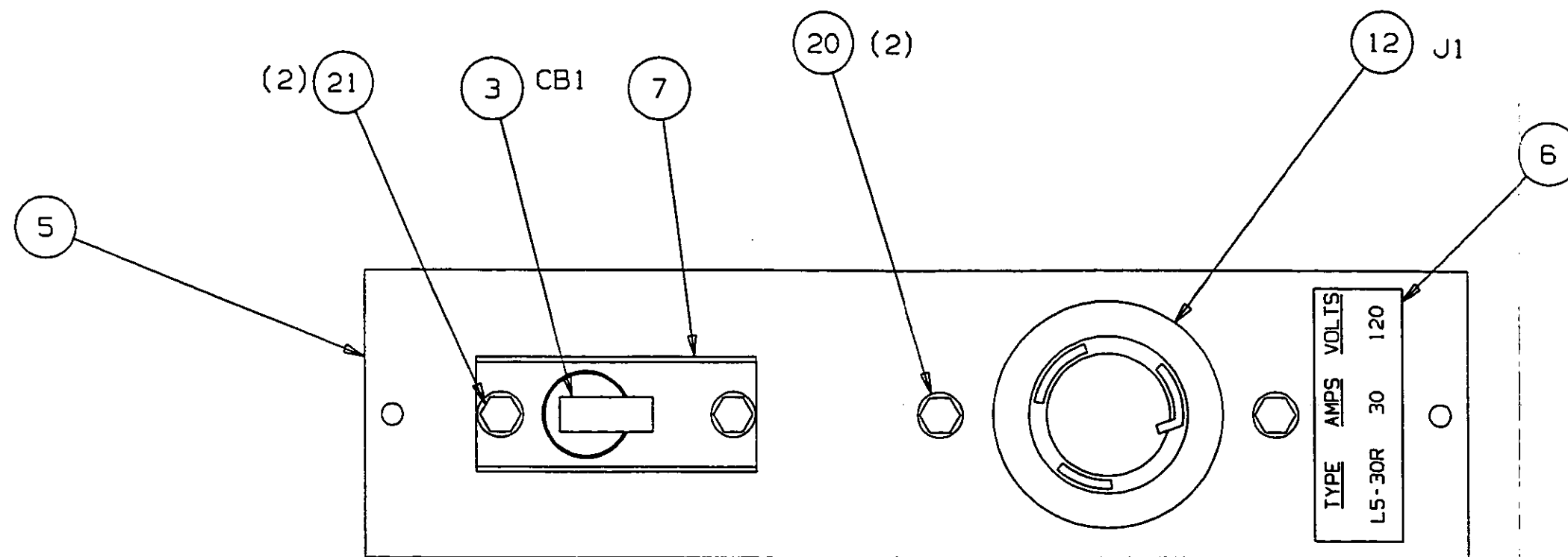
EXIDE ELECTRONICS

RALEIGH, N.C. 27604

RELEASED

DESCRIPTION: ASSEMBLY, L5-20R OUTLET PANEL F				
CREATED BY: SKREPCINSKI	DATE: 19-AUG-1991	FIRST USED ON: AST12	UM: EA	SCALE: 1/1 DO NOT SCALE DRAWING CNO - GENERATED DO NOT DIMANCE MANUALLY UNLESS OTHERWISE SPECIFIED TOLERANCES ON: ANGLES $\pm 1/2^\circ$ DECIMALS .X $\pm .1$ FRACTIONS $\pm 1/64$.XX $\pm .03$ HOLE DIAMETERS $\pm .005$.XXX $\pm .010$ -DIMENSIONS ARE IN INCHES (MILLIMETERS) AND AFTER PLATING-
CHECKED BY: WINEGAR_N	DATE: 23-OCT-1991	CATEGORY: ASSEMBLY		
RESPONSIBLE ENGINEER: SKREPCINSKI		SECURITY CLASS: GENERAL		
LAST MODIFIED BY: LYNAM_L	DATE: 03-OCT-1991	VERSION: 4	SIZE: B	REVISION: RN/CN/SPRN NO: DATE APPR: APPROVED BY: B CN 024-0132 01-NOV-1991 SUTPHIN_W
DRAWING NO. 110253900			CUSTOM NO.	SHEET: 1 OF: 1
THESE DRAWINGS AND SPECIFICATIONS ARE THE PROPERTY OF EXIDE ELECTRONICS AND SHALL NOT BE REPRODUCED OR COPIED OR USED AS THE BASIS FOR MANUFACTURE OR SALE OF APPARATUS WITHOUT PERMISSION				

THESE DRAWINGS AND SPECIFICATIONS ARE THE PROPERTY OF EXIDE ELECTRONICS AND SHALL NOT BE REPRODUCED OR COPIED OR USED AS THE BASIS FOR MANUFACTURE OR SALE OF APPARATUS WITHOUT PERMISSION.



* - REFER TO DWG. 110619141 FOR FINAL CONNECTION TO PDM.

B/M 101258862
W/C 176996894

EXIDE ELECTRONICS

RALEIGH, N.C. 27604

RELEASED

DESCRIPTION: ASSEMBLY, L5-30R OUTLET PANEL

CREATED BY: SKREPCINSKI DATE: 19-AUG-1991 FIRST USED ON: AST12

CHECKED BY: CARROLL_U DATE: 21-AUG-1991 CATEGORY: ASSEMBLY

RESPONSIBLE ENGINEER: SKREPCINSKI SECURITY CLASS: GENERAL

LAST MODIFIED BY: SKREPCINSKI DATE: 19-AUG-1991 VERSION: 1 SIZE: B

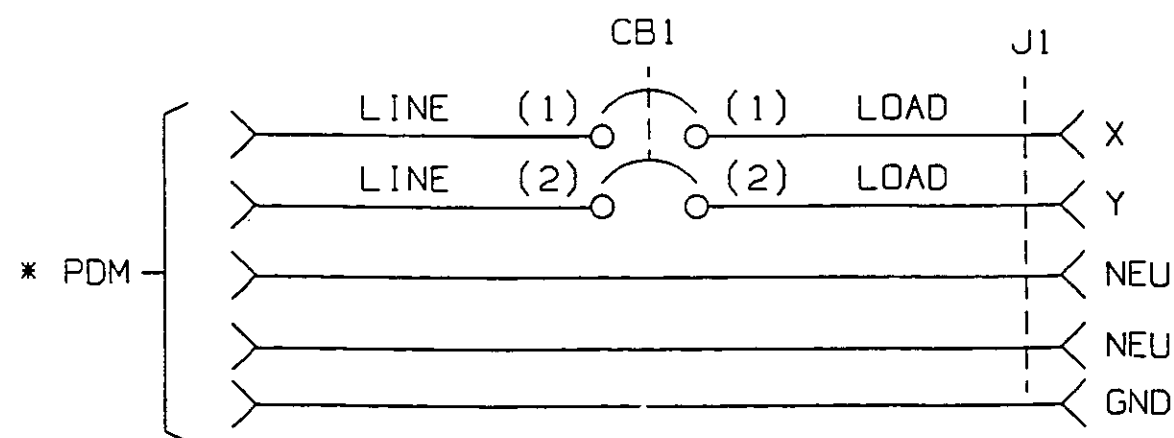
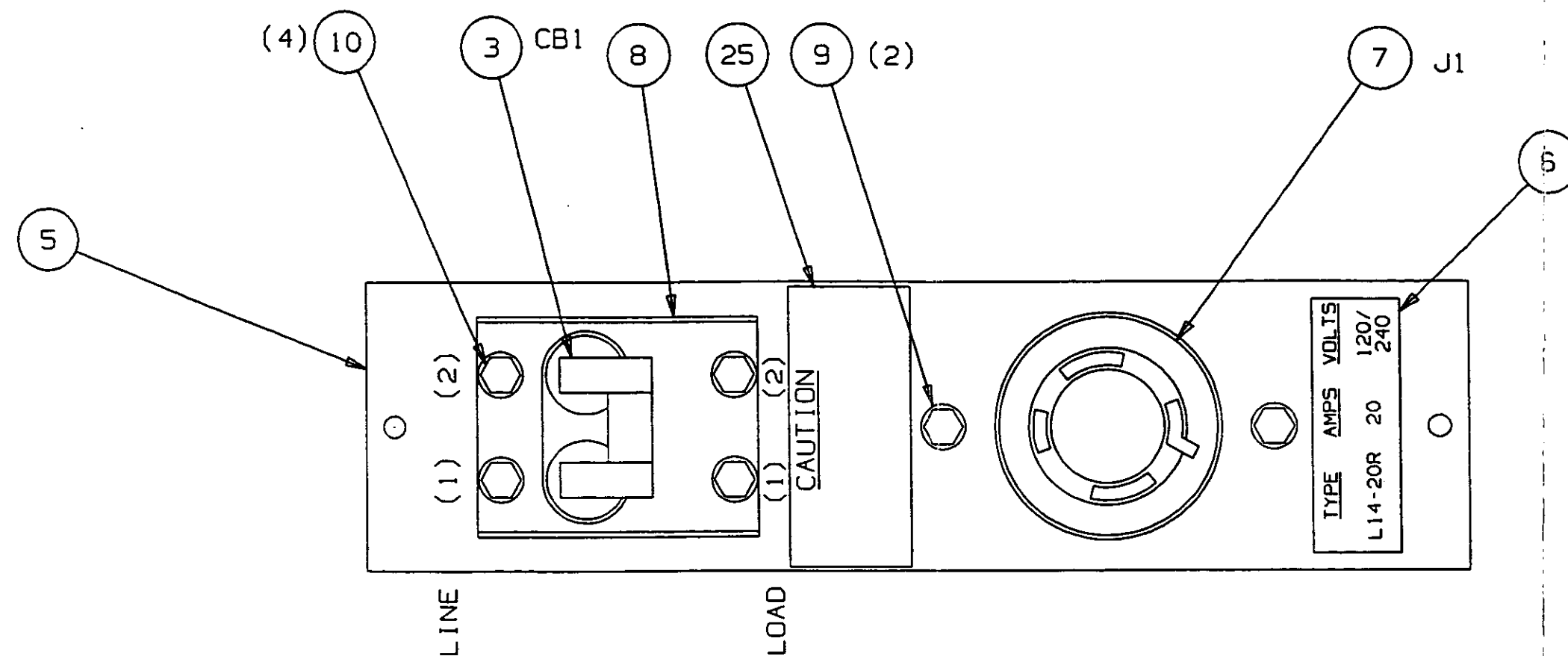
SCALE: 1/1
DO NOT SCALE DRAWING
CNO - GENERATED
DO NOT CHANGE MANUALLY

UNLESS OTHERWISE SPECIFIED TOLERANCES ON:
ANGLES $\pm 1/2^\circ$ DECIMALS .X $\pm .1$
FRACTIONS $\pm 1/64$.XX $\pm .03$
HOLE DIAMETERS $\pm .005$.XXX $\pm .010$
-DIMENSIONS ARE IN INCHES (MILLIMETERS) AND AFTER PLATING-

REVISION: A RN/CN/SPRN NO: CN 024-0103 DATE APPR: 22-AUG-1991 APPROVED BY: SKREPCINSKI

DRAWING NO. 110253901 CUSTOM NO. SHEET: 1 OF: 1

THESE DRAWINGS AND SPECIFICATIONS ARE THE PROPERTY OF EXIDE ELECTRONICS AND SHALL NOT BE REPRODUCED OR COPIED OR USED AS THE BASIS FOR MANUFACTURE OR SALE OF APPARATUS WITHOUT PERMISSION.



* - REFER TO DWG. 110619141 FOR FINAL CONNECTION TO PDM.

B/M 101258863
W/C 176996895

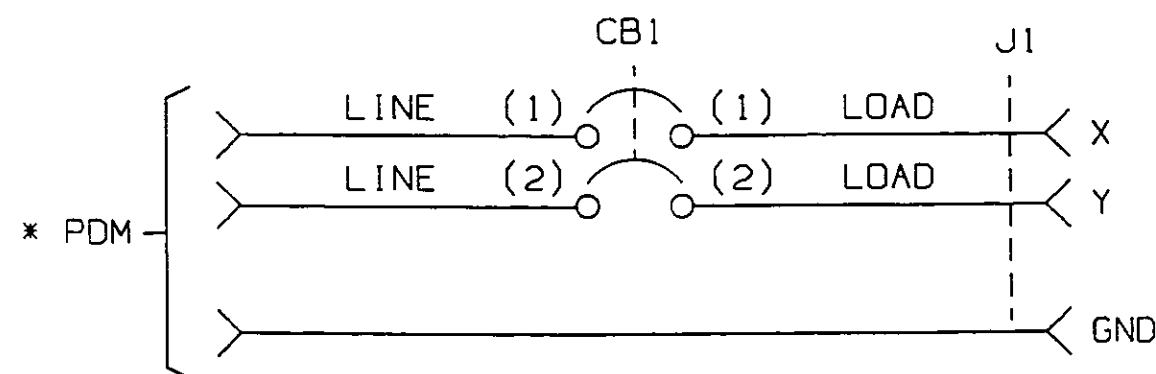
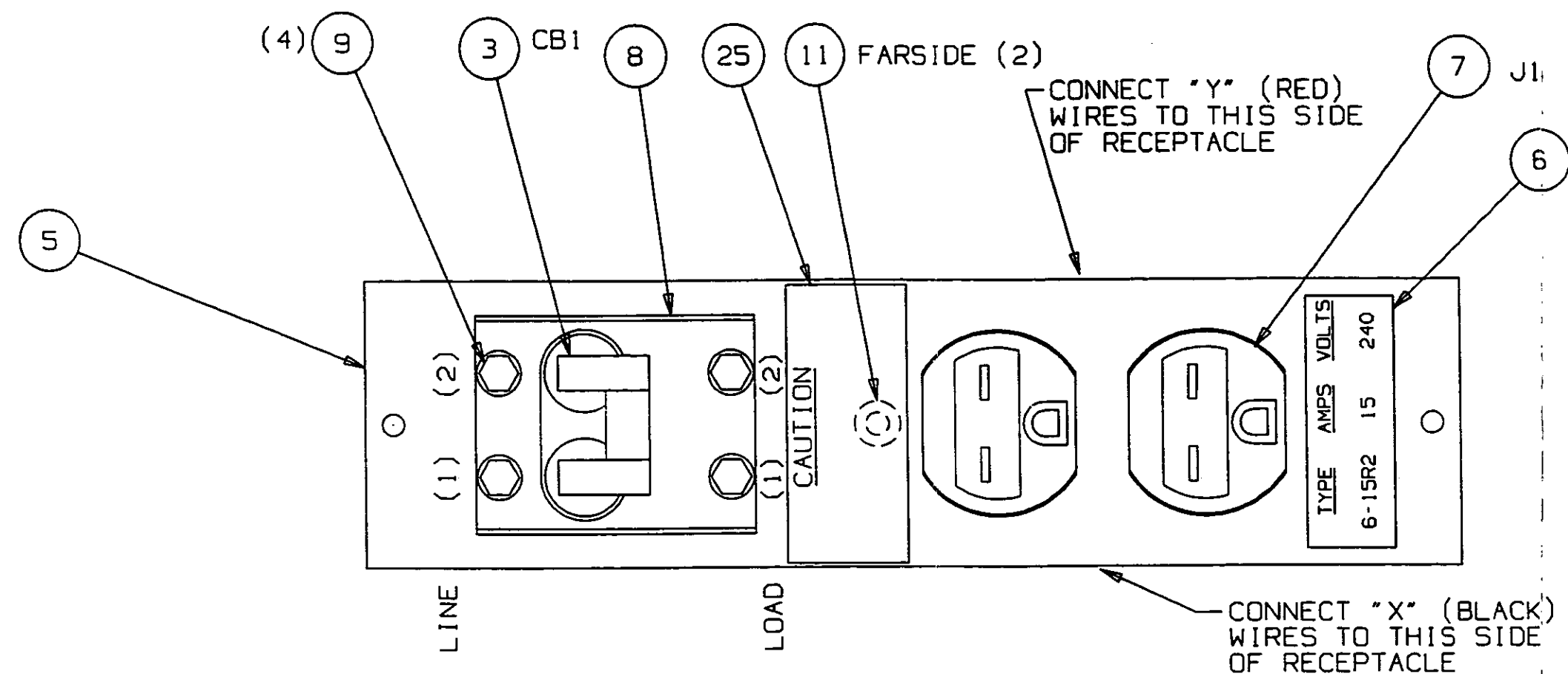
EXIDE ELECTRONICS

RALEIGH, N.C. 27604

RELEASED

DESCRIPTION: ASSEMBLY, L14-20R OUTPUT PANEL J				SCALE: 1/1		UNLESS OTHERWISE SPECIFIED TOLERANCES ON:	
CREATED BY: SKREPCINSKI	DATE: 19-AUG-1991	FIRST USED ON: AST12	LM: EA	DO NOT SCALE DRAWING		ANGLES ±1/2°	DECIMALS .X ± .1
CHECKED BY: WINEGAR_N	DATE: 19-MAR-1992	CATEGORY: ASSEMBLY		CAD - GENERATED		FRACTIONS ±1/64	.XX ± .03
RESPONSIBLE ENGINEER: SKREPCINSKI		SECURITY CLASS: GENERAL		DO NOT CHANGE MANUALLY		HOLE DIAMETERS ±.005	.XXX ± .010
LAST MODIFIED BY: HELLER_D	DATE: 11-MAR-1992	VERSION: 4	SIZE: B	REVISION: RN/CN/SPRN NO: CN 022-0517		DATE APPR: 19-MAR-1992	APPROVED BY: WINEGAR_N
DRAWING NO. 110253902		CUSTOM NO.		SHEET: 1		OF: 1	

THESE DRAWINGS AND SPECIFICATIONS ARE THE PROPERTY OF EXIDE ELECTRONICS AND SHALL NOT BE REPRODUCED OR COPIED OR USED AS THE BASIS FOR MANUFACTURE OR SALE OF APPARATUS WITHOUT PERMISSION.



* - REFER TO DWG. 110619141 FOR FINAL CONNECTION TO PDM.

B/M 101258864
W/C 176996897

EXIDE ELECTRONICS

RALEIGH, N.C. 27604

RELEASED

DESCRIPTION: ASSEMBLY, 6-15R2 OUTPUT PANEL K

CREATED BY: SKREPCINSKI DATE: 19-AUG-1991 FIRST USED ON: AST12 LFI: EA

CHECKED BY: WINEGAR_N DATE: 19-MAR-1992 CATEGORY: ASSEMBLY

RESPONSIBLE ENGINEER: SKREPCINSKI SECURITY CLASS: GENERAL

LAST MODIFIED BY: HELLER_D DATE: 11-MAR-1992 VERSION: 4 SIZE: B

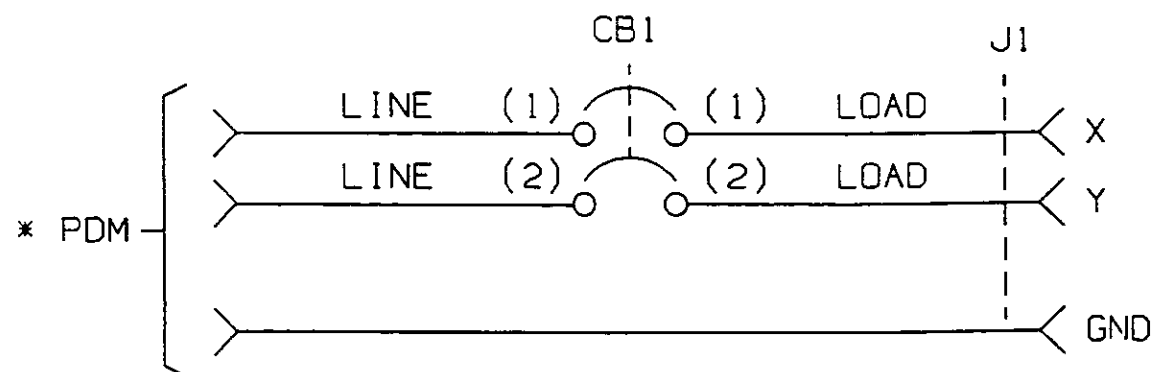
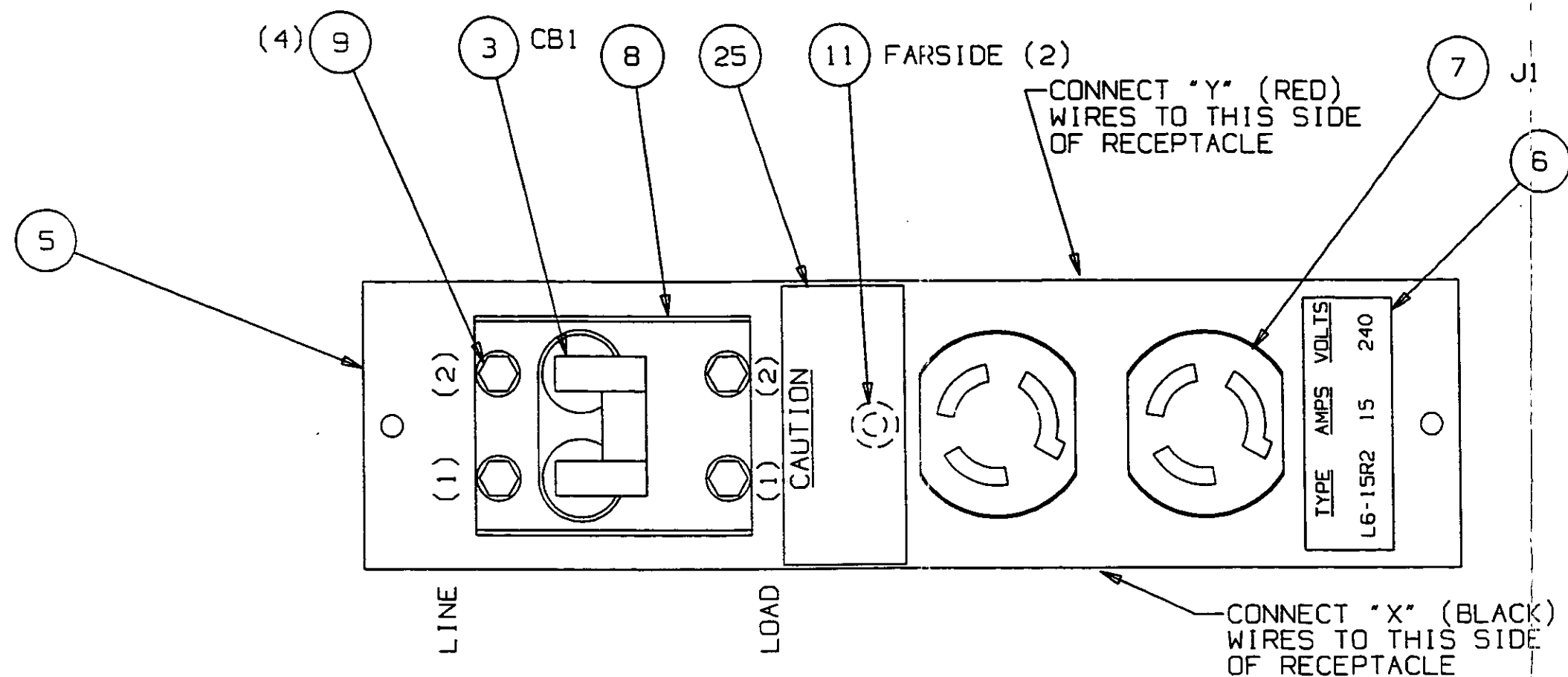
SCALE: 1/1
DO NOT SCALE DRAWING
CNO - GENERATED
DO NOT CHANGE MANUALLY

UNLESS OTHERWISE SPECIFIED TOLERANCES ON:
ANGLES $\pm 1/2^\circ$ DECIMALS .X $\pm .1$
FRACTIONS $\pm 1/64$.XX $\pm .03$
HOLE DIAMETERS $\pm .005$.XXX $\pm .010$
DIMENSIONS ARE IN INCHES (MILLIMETERS) AND AFTER PLATING

REVISION: RN/CN/SPRN NO: CN 022-0517 DATE APPR: 19-MAR-1992 APPROVED BY: WINEGAR_N

DRAWING NO. 110253903 CUSTOM NO. SHEET: 1 OF: 1

THESE DRAWINGS AND SPECIFICATIONS ARE THE PROPERTY OF EXIDE ELECTRONICS AND SHALL NOT BE REPRODUCED OR COPIED OR USED AS THE BASIS FOR MANUFACTURE OR SALE OF APPARATUS WITHOUT PERMISSION



* - REFER TO DWG. 110619141 FOR FINAL CONNECTION TO PDM.

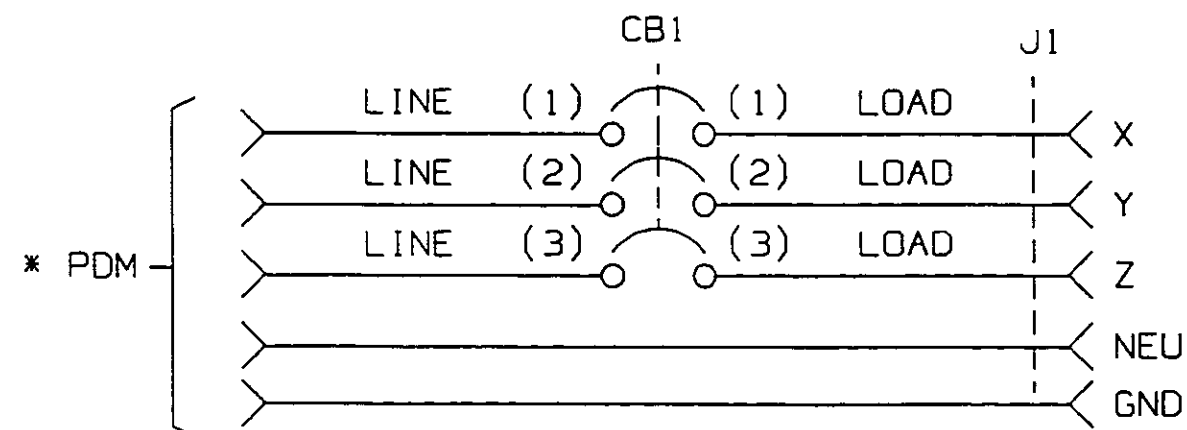
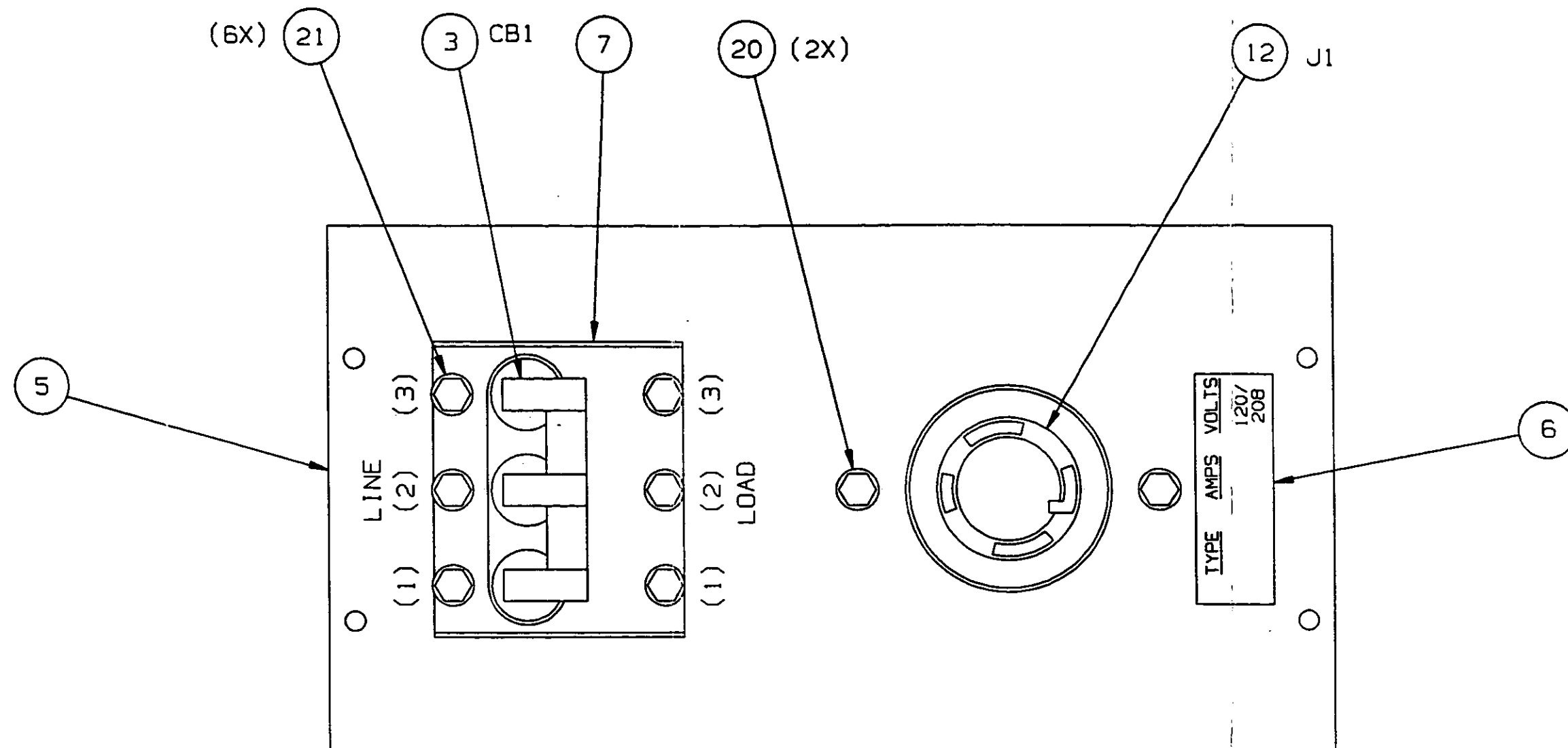
B/M 101258865
W/C 176996897

EXIDE ELECTRONICS

RALEIGH, N.C. 27604

RELEASED

DESCRIPTION: ASSEMBLY, L6-15R2 OUTPUT PANEL				UNLESS OTHERWISE SPECIFIED TOLERANCES ON:			
CREATED BY: SKREPCINSKI	DATE: 19-AUG-1991	FIRST USED ON: AST12	UM: EA	SCALE: 1/1	ANGLES ±1/2°	DECIMALS .X ±.1	
CHECKED BY: WINEGAR_N	DATE: 19-MAR-1992	CATEGORY: ASSEMBLY		DO NOT SCALE DRAWING	FRACTIONS ±1/64	.XX ±.03	
RESPONSIBLE ENGINEER: SKREPCINSKI		SECURITY CLASS: GENERAL		CAD GENERATED	HOLE DIAMETERS ±.005	.XXX ±.010	
LAST MODIFIED BY: HELLER_D	DATE: 11-MAR-1992	VERSION: 4	SIZE: B	REVISION: B	RN/CN/SPRN NO: CN 022-0517	DATE APPR: 19-MAR-1992	APPROVED BY: WINEGAR_N
THESE DRAWINGS AND SPECIFICATIONS ARE THE PROPERTY OF EXIDE ELECTRONICS AND SHALL NOT BE REPRODUCED OR COPIED OR USED AS THE BASIS FOR MANUFACTURE OR SALE OF APPARATUS WITHOUT PERMISSION.				DRAWING NO. 110253904	CUSTOM NO.	SHEET: 1 OF: 1	



* - REFER TO DWG. 110619235 FOR FINAL CONNECTION TO PDM.

W/C 176996924

B/M 101258905 - L21-20 PANEL

B/M 101258906 - L21-30 PANEL

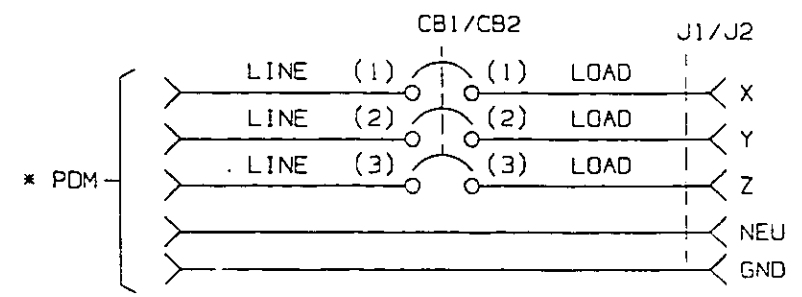
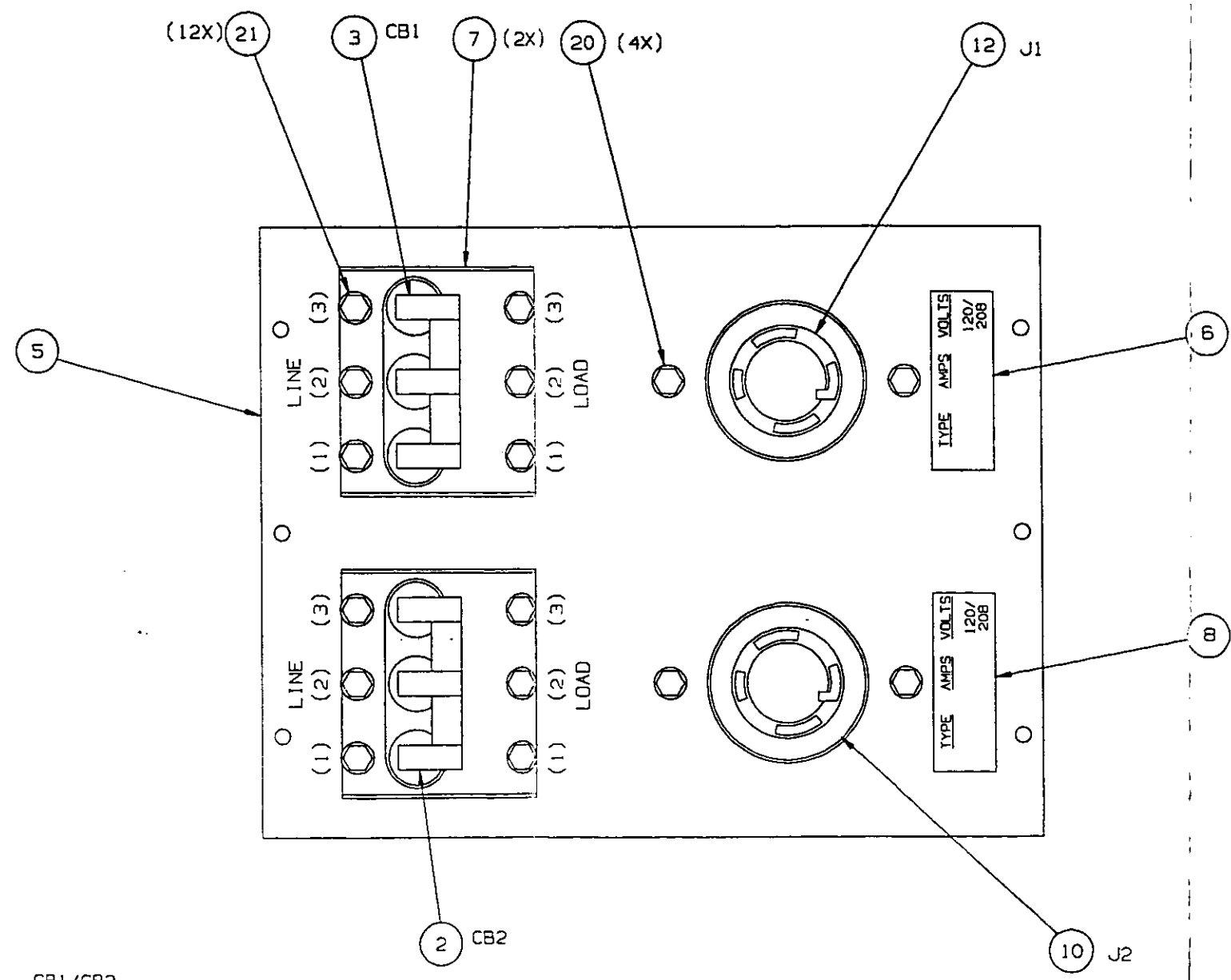
12

EXIDE ELECTRONICS

RALEIGH, N.C. 27604

RELEASED

DESCRIPTION: L21-20R-1/L21-30R-1 SINGLE PANEL ASSY.					
CREATED BY: SKREPCINSKI	DATE: 02-JAN-1992	FIRST USED ON: AST18	UM: EA	SCALE: 1/1	UNLESS OTHERWISE SPECIFIED TOLERANCES ON: ANGLES ±1/2° DECIMALS .X ±.1 FRACTIONS ±1/64 .XX ±.03 HOLE DIAMETERS ±.005 .XXX ±.010 -DIMENSIONS ARE IN INCHES (MILLIMETERS) AND AFTER PLATING-
CHECKED BY: LAHTI_D	DATE: 29-NOV-1992	CATEGORY: ASSEMBLY		DO NOT SCALE DRAWING CNO - GENERATED DO NOT CHANGE MANUALLY	REVISION: RN/CN/SPRN NO: DATE APPR: APPROVED BY: A CN 021-0039 21-JAN-1993 SKREPCINSKI
RESPONSIBLE ENGINEER: SKREPCINSKI		SECURITY CLASS: GENERAL		DRAWING NO. 110253932	CUSTOM NO.
LAST MODIFIED BY: LAHTI_D	DATE: 30-JUL-1992	VERSION: 4	SIZE: B		SHEET: 1 OF: 1
THESE DRAWINGS AND SPECIFICATIONS ARE THE PROPERTY OF EXIDE ELECTRONICS AND SHALL NOT BE REPRODUCED OR COPIED OR USED AS THE BASIS FOR MANUFACTURE OR SALE OF APPARATUS WITHOUT PERMISSION.					



* - REFER TO DWG. 110619235 FOR FINAL CONNECTION TO PDM.

W/C 176996924
 B/M 101258907 - L21-20/L21-30 COMBINATION
 B/M 101258908 - (2) L21-20 COMBINATION
 B/M 101258909 - (2) L21-30 COMBINATION

EXIDE ELECTRONICS				RELEASED	
21-30R-1 OUTPUT PANEL					
991	FIRST USED ON: AST18	UP: EA	SCALE: 1/1 2-D OR 3-D DRAWING	UNLESS OTHERWISE SPECIFIED TOLERANCES DR. ANGLES 31/2° DECIMALS .XX ± .1 FRACTIONS 1/64 .XX ± .03 HOLE DIAMETERS .005 .XX ± .010 (DIMENSIONS ARE IN INCHES (MILLIMETERS) AND AFTER PLATING)	
992	CATEGORY: ASSEMBLY		REVISION: RVCN/SPRN NO: CN 021-0039	DATE APPR: 21-JAN-1993	APPROVED BY: SKREPCINSKI
	SECURITY CLASS: GENERAL		DRAWING NO. 110253934	CUSTOM NO.	SHEET: 1 OF: 1
992	VERSION: 9	SIZE: C			
THIS ELECTRONICS AND SHALL NOT BE REPRODUCED OR COPIED OR USED AS THE BASIS FOR MANUFACTURE OR SALE OF APPARATUS WITHOUT PERMISSION					

INTEGRATED CIRCUIT POWER CONNECTIONS AND BYPASS CAPACITOR REFERENCE NUMBERS

IC & TYPE	BYPASS CAPACITORS	+5-VOLT PIN NUMBER	+12-VOLT PIN NUMBER	GROUND PIN NUMBER	+12-VOLT PIN NUMBER
U2 80C537	C125, C126	28, 84		37, 59, 83	
U3 74ALS32	C101	29		15	
U3 2784/2789	C102	29		15	
U4 74LS94	C103	14		7	
U5 74LS245	C104		2	4	
U6 74LS245	C105	14		7	
U7 6254	C106	29		14	
U8 74LS24	C107	14		3	
U9 74LS24	C108	14		3	
U10 25LS31	C109	14		8	
U11 25LS32	C110	14		8	
U12 74LS24	C111		11	12, 13	
U13 74LS24	C112	20		10	
U14 74LS110	C113	14		7	
U15 83C48	C114	8		5	
U16 74LS24	C115	14		7	
U17 7406	C116	14		7	
U18 1456	C117, C118		8	7	4
U19 74LS23	C119		8	4	
U20 74LS24	C120	14		3	
U21 74LS24	C121	20		8	
U22 74LS24	C122	14		7	
U23 74LS24	C123	14		7	
U24 74LS24	C124	14		7	
U25 74LS24	C125, C126		4		11

INTEGRATED CIRCUIT POWER CONNECTIONS AND BYPASS CAPACITOR REFERENCE NUMBERS

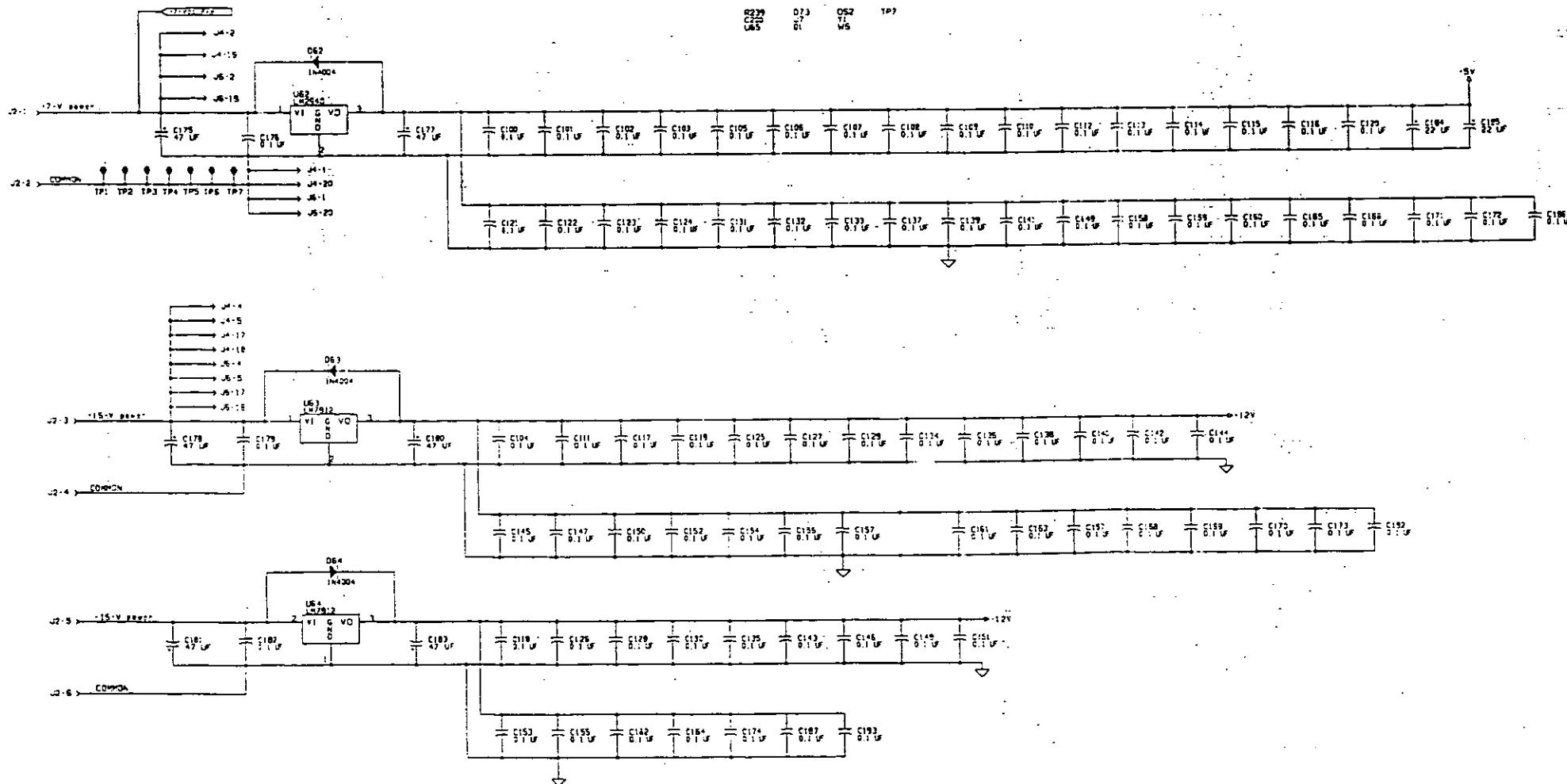
IC & TYPE	BYPASS CAPACITORS	+5-VOLT PIN NUMBER	+12-VOLT PIN NUMBER	GROUND PIN NUMBER	+12-VOLT PIN NUMBER
U27 CA3212	C127, C128		8		4
U28 CA3290	C129, C130		8		4
U29 7426	C131	14		7	
U30 74LS132	C132	14		7	
U31 25LS31	C133	14		8	
U32 1458	C134, C135		8	4	
U33 74LS24	C136	14		7	
U34 74LS24	C137	14		7	
U35 CA3292	C138		8	4	
U36 74LS24	C139	14		7	
U37 7406	C140		14	7	
U38 74LS24	C141	14		7	
U39 CA3240	C142, C143		8	4	
U40 CA3292	C144		8	4	
U41 7406	C145, C146		4		11
U42 7406	C147, C148		4		11
U43 1458	C149	14		7	
U44 CA3290	C150, C151		8	4	
U45 7406	C152, C153		4		11
U46 1458	C154, C155		8	4	
U47 74LS24	C156	7		8	
U48 CA3290	C157		8	4	
U49 25LS31	C158	14		8	
U50 74LS24	C159	14		7	
U51 CA3240	C160, C161		8	4	
U52 CA3290	C162, C163		8	4	

INTEGRATED CIRCUIT POWER CONNECTIONS AND BYPASS CAPACITOR REFERENCE NUMBERS

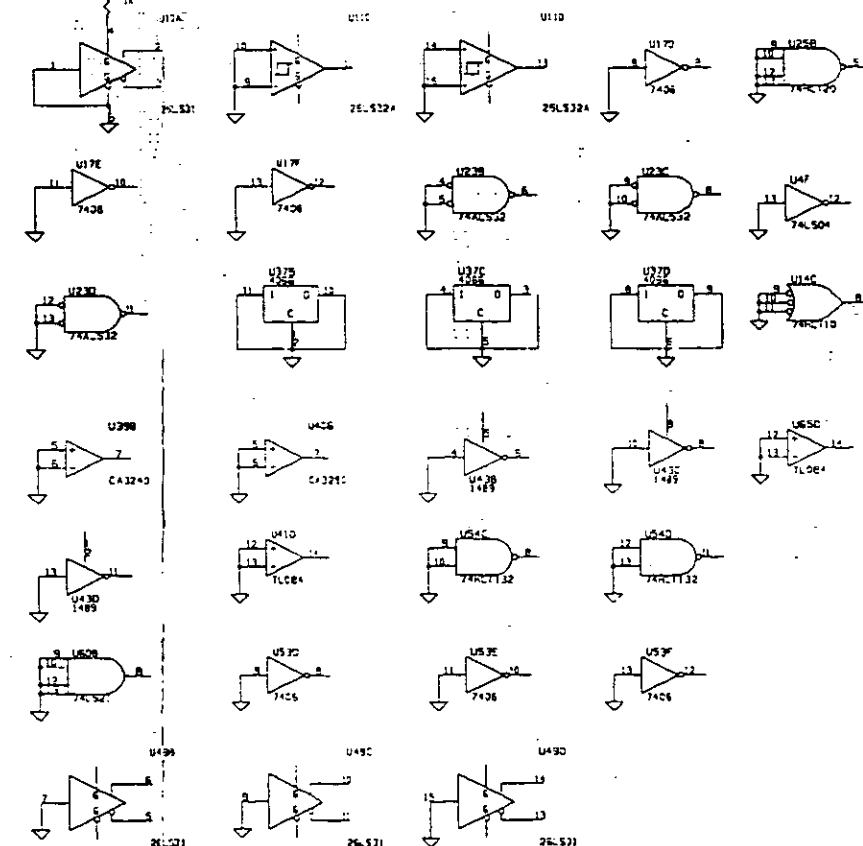
IC & TYPE	BYPASS CAPACITORS	+5-VOLT PIN NUMBER	+12-VOLT PIN NUMBER	GROUND PIN NUMBER	+12-VOLT PIN NUMBER
U53 7406	C164	14		7	
U54 74LS132	C165	14		7	
U55 1458	C166, C167		8	4	
U56 74LS24	C168		7	8	
U57 7406	C169, C170		4		11
U58 CA3290	C171		8	4	
U59 74LS24	C172	14		7	
U60 74LS24	C173	14		7	
U61 CA3290	C174		8	4	
U62 74LS24	C175, C176				
U63 74LS24	C177				
U64 74LS24	C178				
U65 74LS24	C179				
U66 74LS24	C180				
U67 74LS24	C181, C182				
U68 74LS24	C183, C184				

LAST COMPONENT REFERENCES USED

8229 023 052 1P7
U45 U1 U5



UNUSED GATES

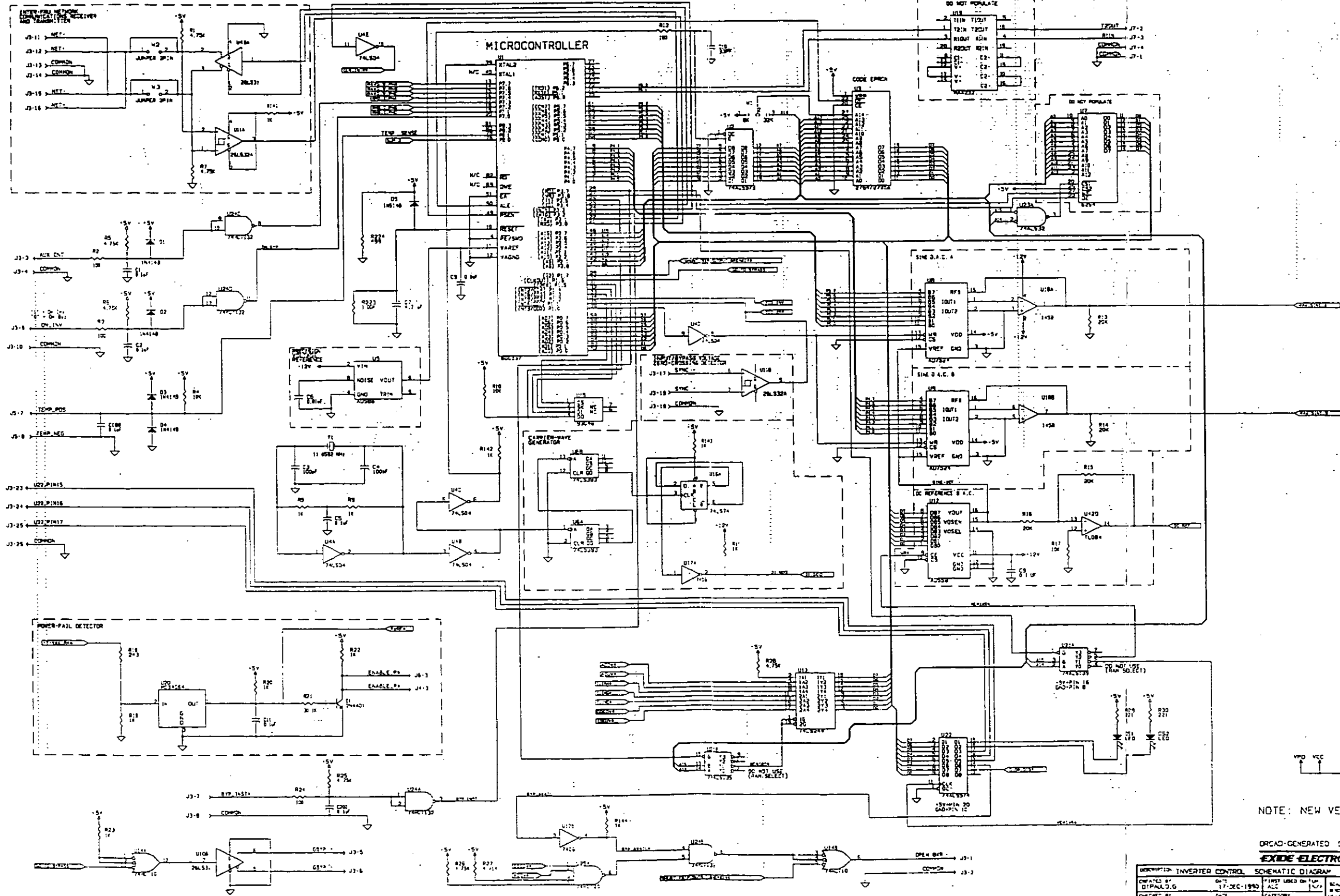


ORCAD-GENERATED DO NOT CHANGE MANUALLY.

58

EXIDE ELECTRONICS

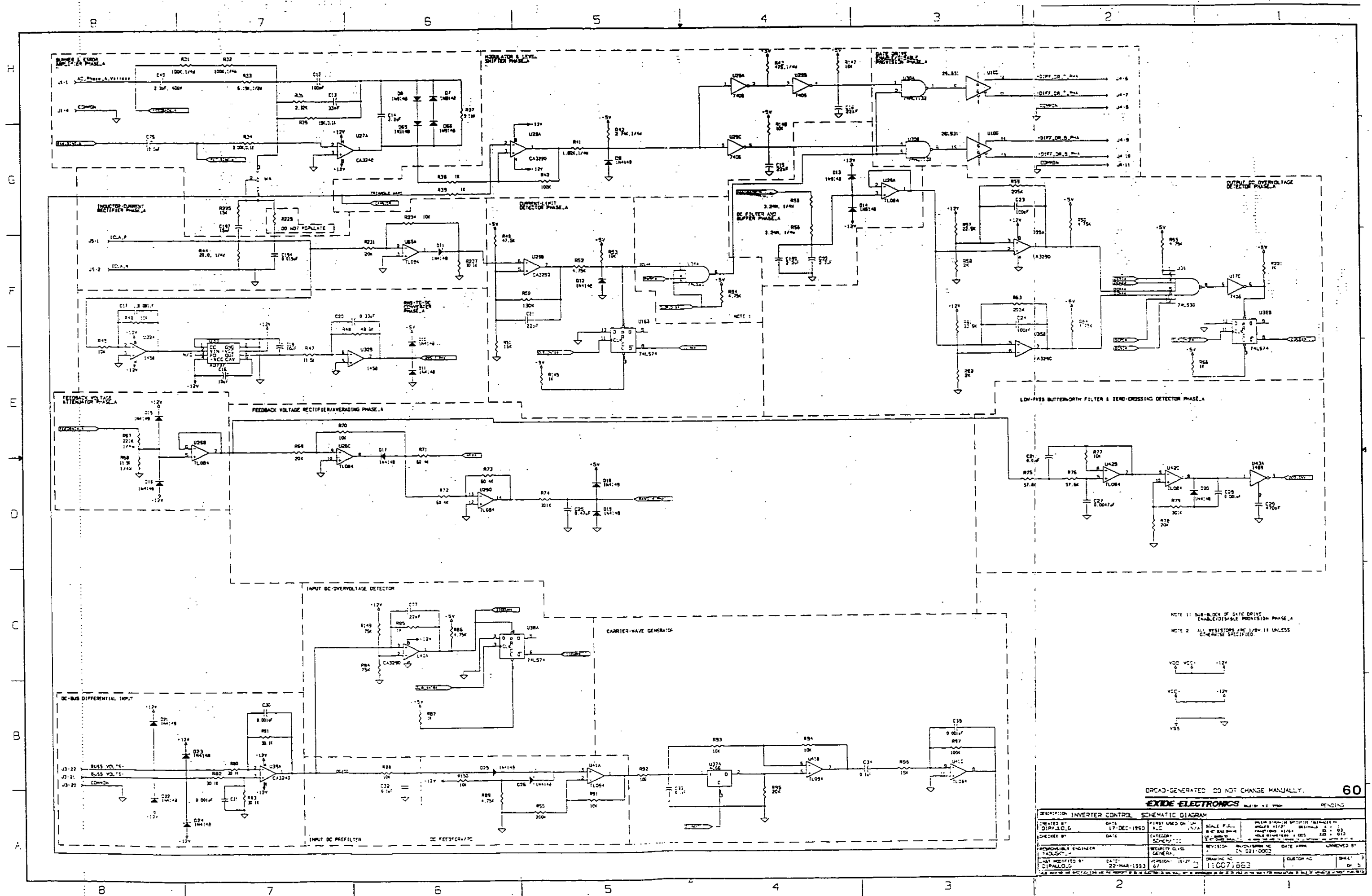
EXIDE ELECTRONICS 1100071663		1100071663	
DESIGNED BY CHECKED BY DATE	DRAWN BY DATE	SCALE 1:1	TITLE INVERTER CONTROL
RESPONSIBLE ENGINEER TACISAT	SECURITY CLASS UNCLASSIFIED	REVISION 1	DATE APPROVED 11/07/1993



NOTE: NEW VERSION WITH 80C537.

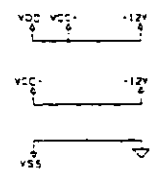
ORCAD-GENERATED. DO NOT CHANGE MANUALLY.

DESCRIPTION: INVERTER CONTROL		SCHEMATIC DIAGRAM		REVISIONS	
CREATED BY: DIPALL.S.G.	DATE: 17-DEC-1990	FIRST USED ON: LUP. ALL	SCALE: FULL	WHEN SPECIFIC REVISIONS ARE REQUIRED, THE REVISION NUMBER, DATE, AND DESCRIPTION SHOULD BE ENTERED IN THE FOLLOWING TABLE.	REVISIONS
CHECKED BY: DATE:		CATEGORY: SCHEMATIC	REVISION: 0	REVISION: 0	REVISION: 0
APPROVED BY: DATE:		REVISION: 0	REVISION: 0	REVISION: 0	REVISION: 0
LAST MODIFIED BY: DATE:		REVISION: 0	REVISION: 0	REVISION: 0	REVISION: 0
FILE: DIPALL.S.G.	DATE: 22-MAR-1993	REVISION: 0	REVISION: 0	REVISION: 0	REVISION: 0



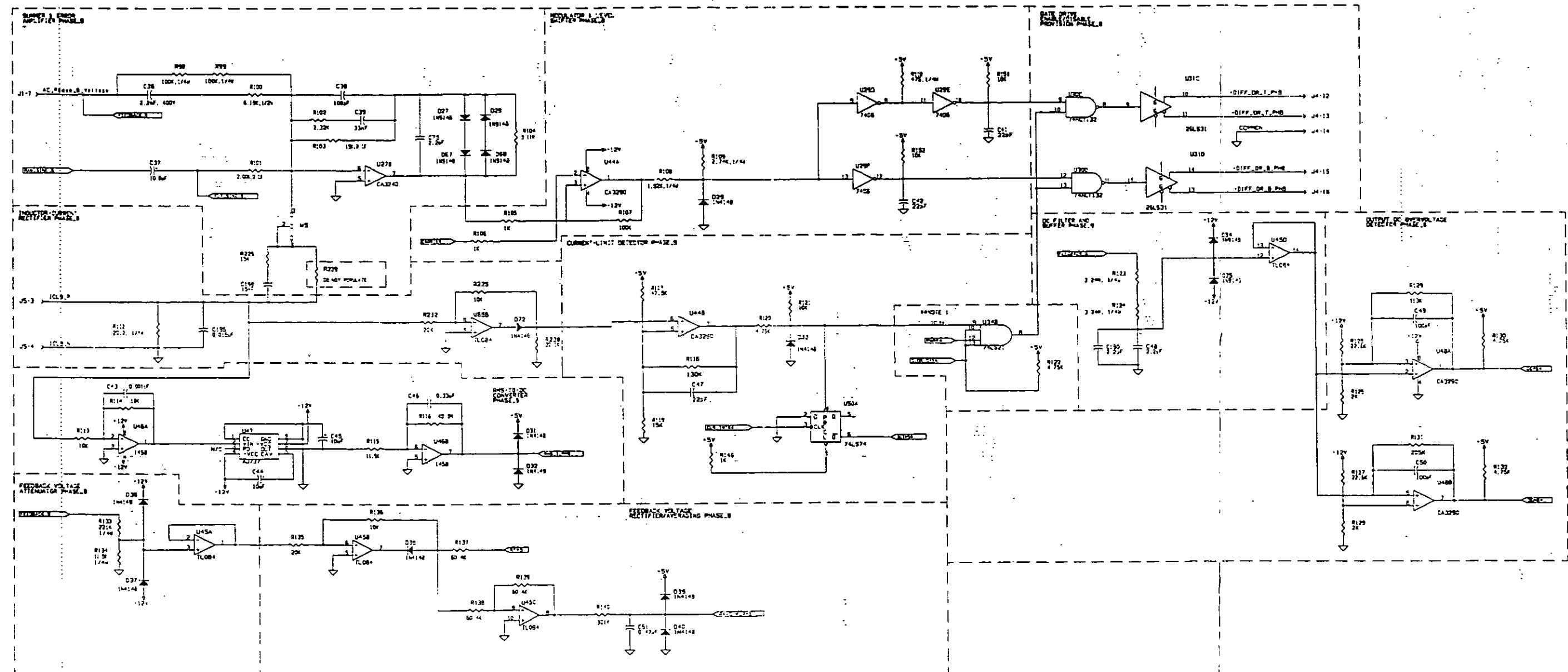
NOTE 1: SUB-BLOCK OF GATE DRIVE
ENABLE/DISABLE PROVISION PHASE A

NOTE 2: ALL RESISTORS ARE 1/8W 1% UNLESS
OTHERWISE SPECIFIED

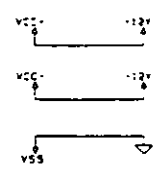


ORCAD-GENERATED. DO NOT CHANGE MANUALLY.

ORCAD-GENERATED. DO NOT CHANGE MANUALLY.			
EXIDE ELECTRONICS			
INVERTER CONTROL SCHEMATIC DIAGRAM			
CREATED BY DIPALLO, G	DATE 17-DEC-1980	SCALE F.L.	REVISION 1
CHECKED BY DATE	DATE	SCALE F.L.	REVISION 1
DESIGNED BY DATE	DATE	SCALE F.L.	REVISION 1
APPROVED BY DATE	DATE	SCALE F.L.	REVISION 1
LAST MODIFIED BY DIPALLO, G	DATE 22-MAR-1983	VERSION 1.0	DRAWING NO. 110071663
ALL DIMENSIONS ARE IN INCHES UNLESS OTHERWISE SPECIFIED		DATE APPROVED BY	

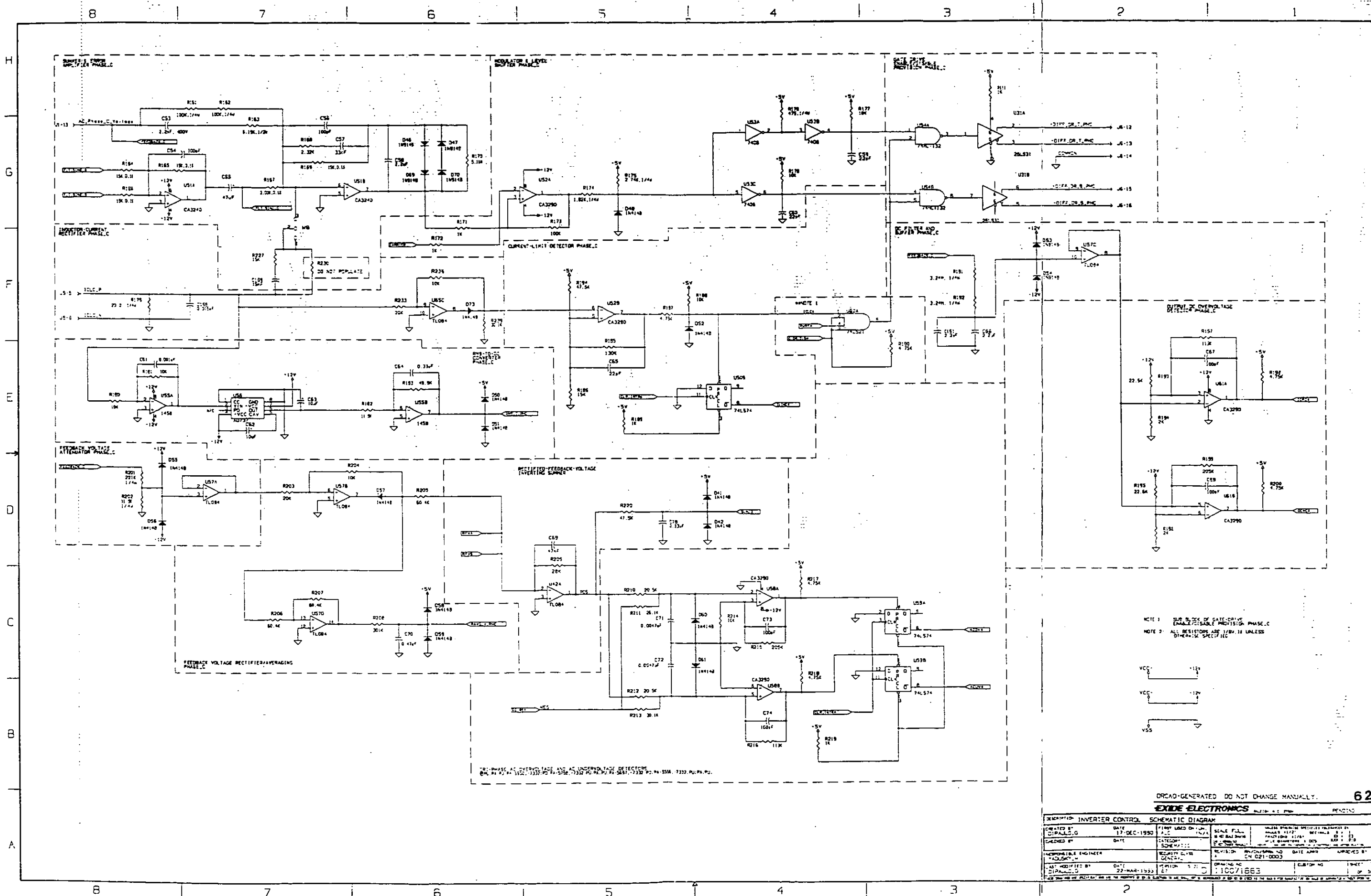


NOTE 1: SUB-BLOCK OF GATE DRIVE
ENABLE/INHIBIT PROVISION PHASE_B
NOTE 2: ALL RESISTORS ARE 1/4W 1% UNLESS
OTHERWISE SPECIFIED

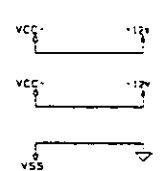


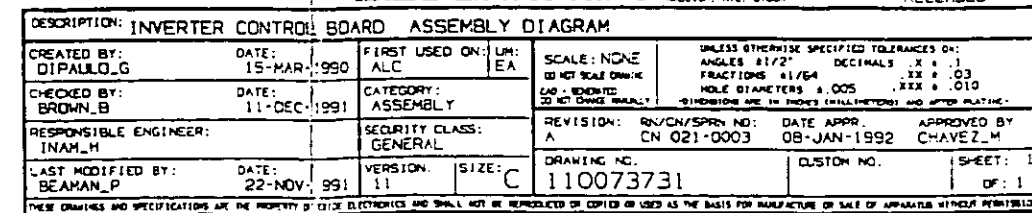
ORCAD-GENERATED DO NOT CHANGE MANUALLY

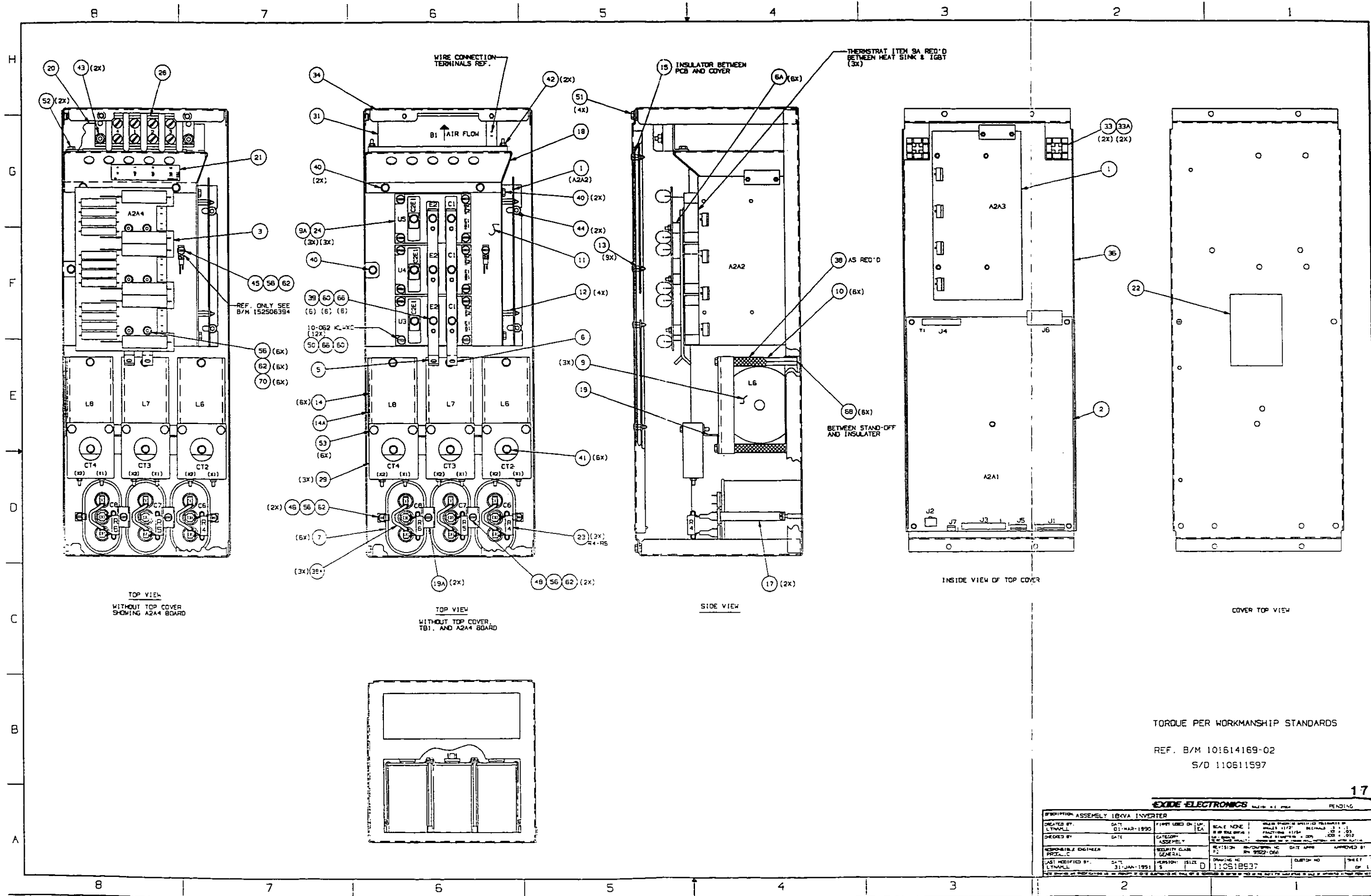
INVERTER CONTROL SCHEMATIC DIAGRAM			
CREATED BY DIPALDO	DATE 17-DEC-1990	FIRST USED ON 1000	SCALE FULL
DESIGNED BY DIPALDO	DATE 17-DEC-1990	CATEGORY SCHEMATIC	REVISION 1
RESPONSIBLE ENGINEER DIPALDO	DATE 17-DEC-1990	SECURITY CLASS CONFIDENTIAL	APPROVED BY DIPALDO
LAST MODIFIED BY DIPALDO	DATE 20-MAR-1991	REVISION 1	DATE 20-MAR-1991



NOTE 1: SUB BLOCK OF GATE-DRIVE ENABLE/PROTECTION PHASE.C
NOTE 2: ALL RESISTORS ARE 1/8W, 1% UNLESS OTHERWISE SPECIFIED



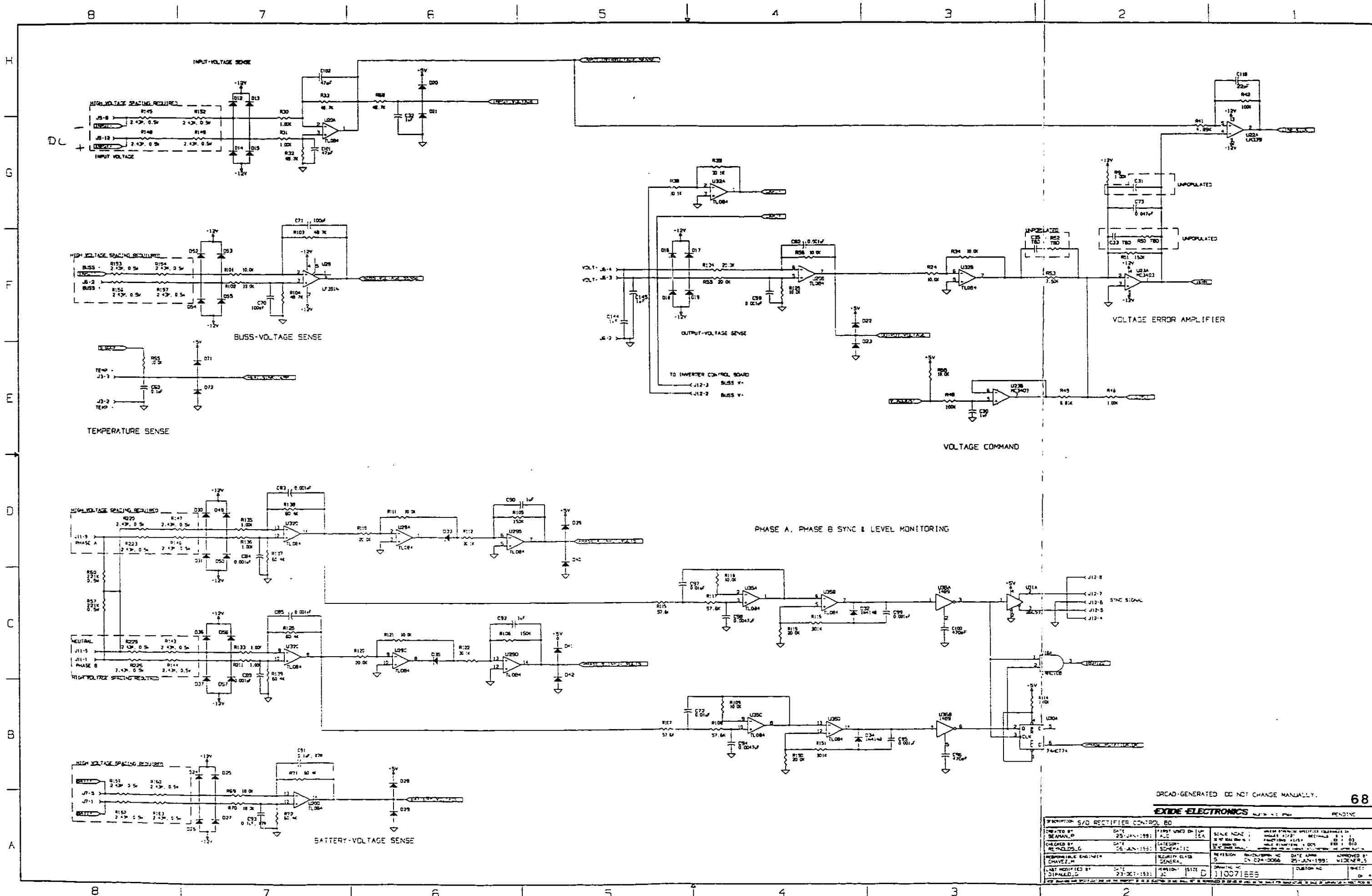




TORQUE PER WORKMANSHIP STANDARDS

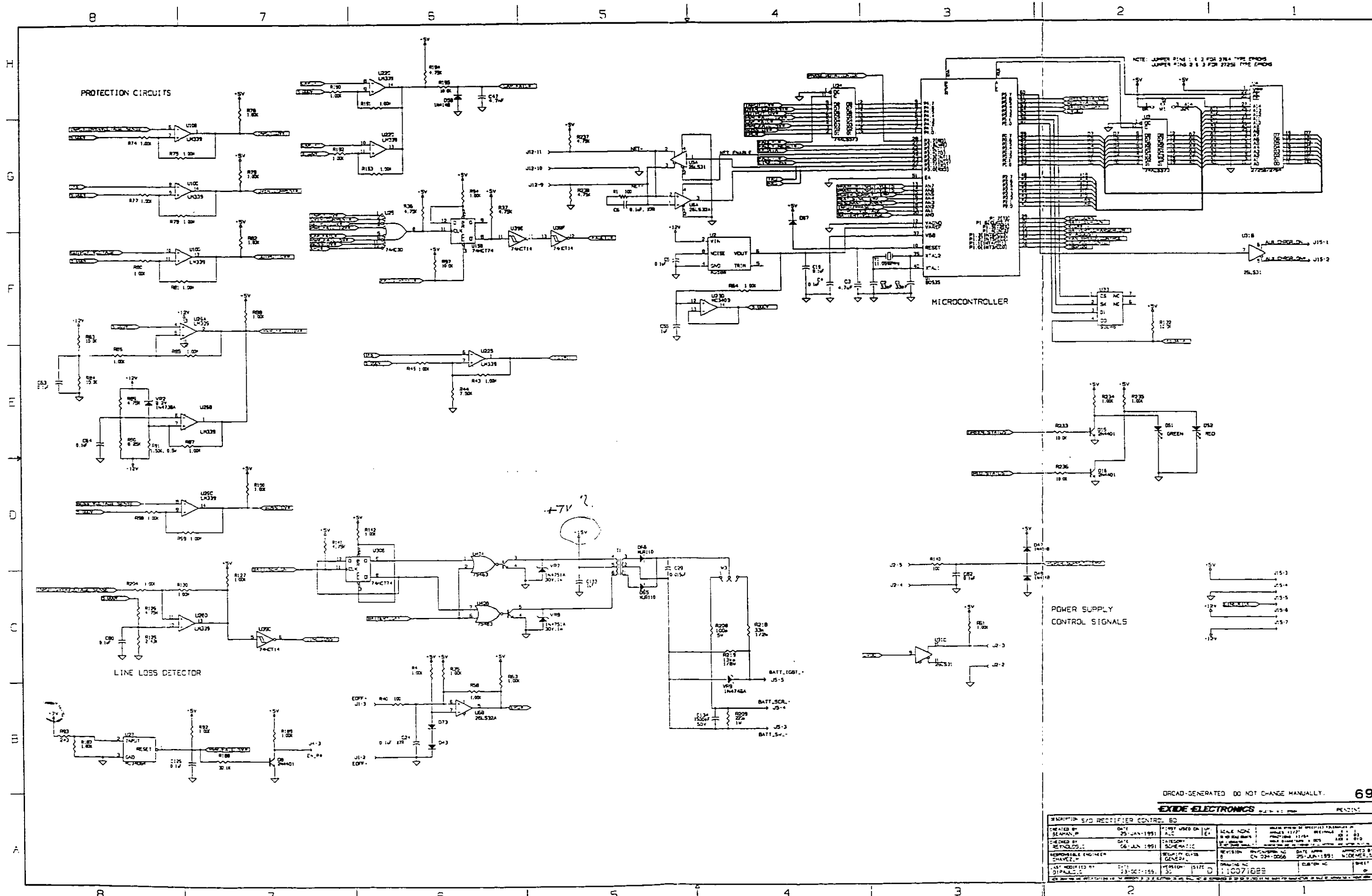
REF. B/M 101614169-02
S/D 110611597

EXIDE ELECTRONICS				PENDING	
DESCRIPTION: ASSEMBLY 18kVA INVERTER					
CREATED BY:	DATE:	FIRST USED ON:	SCALE:	VALUES SHOWN ARE SPECIFIED TOLERANCES BY	
LYNNALL	01-MAR-1990	EA	1:1	DIMENSIONS IN INCHES 1/16 1/32 1/64	
CHECKED BY:	DATE:	CATEGORY:	REVISION:	VALUES SHOWN ARE SPECIFIED TOLERANCES BY	
PROJ. C		GENERAL	1	DIMENSIONS IN INCHES 1/16 1/32 1/64	
DESIGNED BY:	DATE:	VERSION:	SIZE:	DRAWING NO.	
LYNNALL	31-JAN-1991	5	D	110611597	
DRAWING NO.				CUSTOM NO.	SHEET
110611597					1



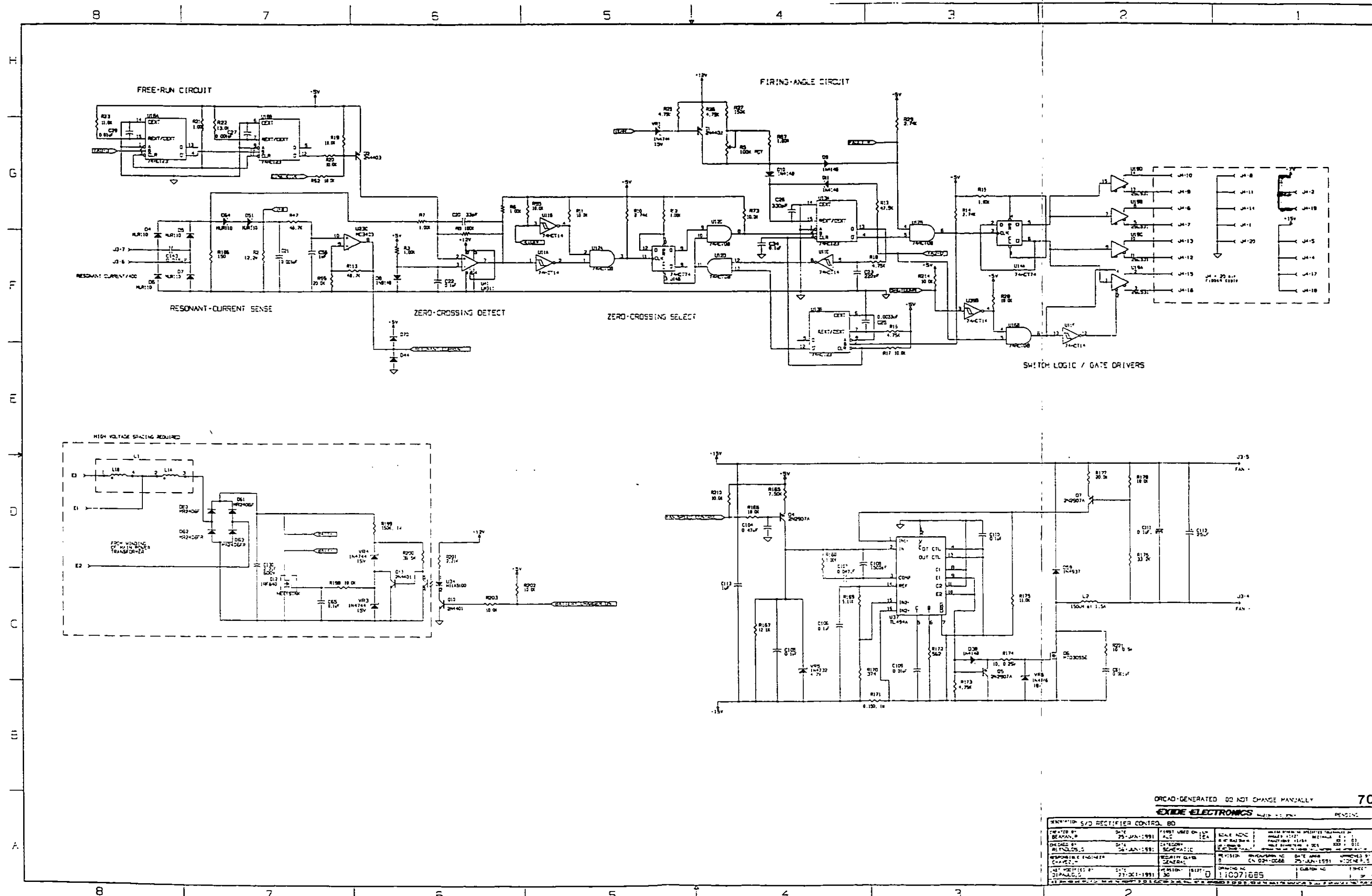
ORCAD-GENERATED DO NOT CHANGE MANUALLY.

EXIDE ELECTRONICS			
DESCRIPTION: 5/0 RECTIFIER CONTROL BD			
CREATED BY: SEAMAN, P.	DATE: 25-JAN-1991	FIRST USED ON: 15A	SCALE: NONE
CHECKED BY: REYNOLDS, G.	DATE: 26-JUN-1991	CATEGORY: SCHEMATIC	WHEN SPECIFIC TESTED: 15A
APPROVED BY: CHAVEZ, M.	DATE: 25-JUN-1991	SECURITY CLASS: GENERAL	REVISION: 5
LAST MODIFIED BY: DIPALLO, G.	DATE: 23-OCT-1991	REVISION: 5	DATE: 25-JUN-1991
DRAWING NO: 110071855		SHEET: 1	



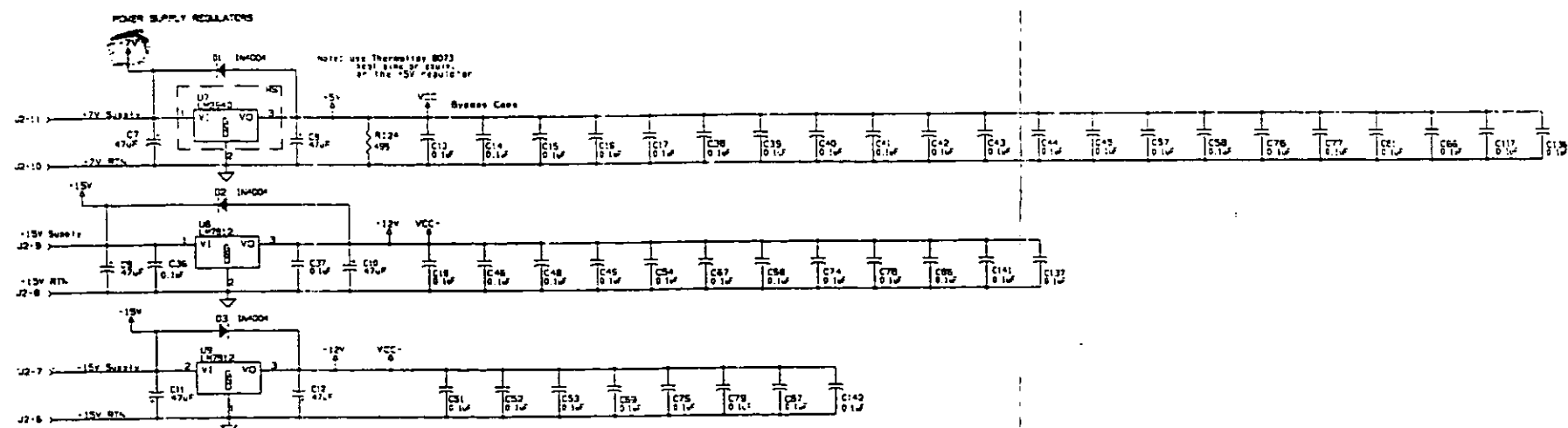
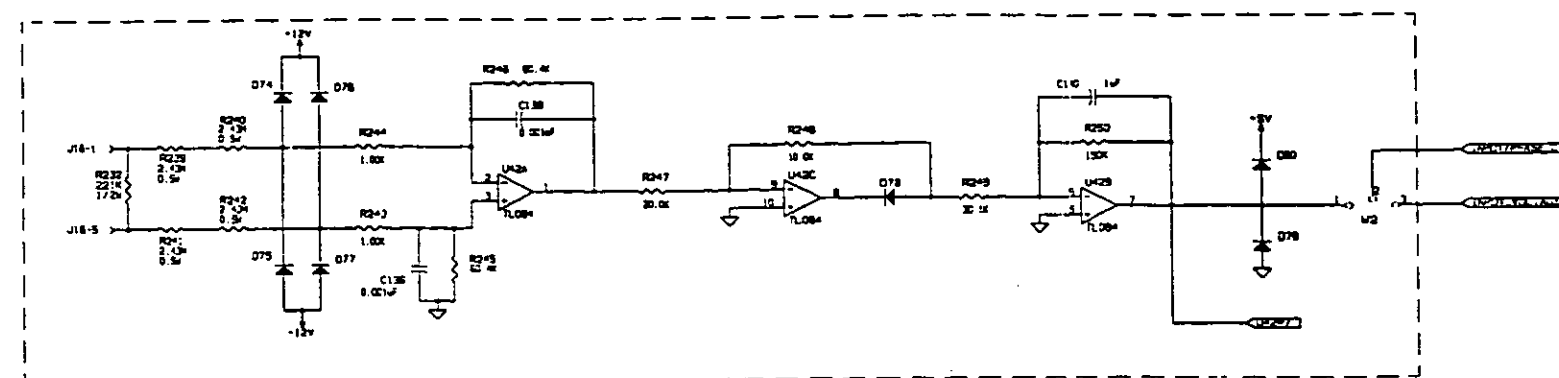
EXIDE ELECTRONICS

DESCRIPTION: SVD RECTIFIER CONTROL, BD	DATE: 25-JAN-1991	SCALE: NONE	REVISION: 0
DESIGNED BY: SENAN, P	DATE: 06-JUN-1991	CATEGORY: SCHEMATIC	REVISION: 0
CHECKED BY: RETNOL, S	DATE: 06-JUN-1991	REVISION: 0	REVISION: 0
APPROVED BY: CHAVEZ, M	DATE: 23-OCT-1991	REVISION: 0	REVISION: 0
LAST MODIFIED BY: DIPAL, C	DATE: 23-OCT-1991	REVISION: 0	REVISION: 0



ORCAD-GENERATED DO NOT CHANGE MANUALLY

ORCAD-GENERATED DO NOT CHANGE MANUALLY			
EXIDE ELECTRONICS			
REVISION: S/D RECTIFIER CONTROL BD			
DESIGNED BY	DATE	1997 VERO ON	SCALE
BEAMAN, R	25-JUN-1991	ALL	1:1
CHECKED BY	DATE	1997 VERO ON	SCALE
REYNOLDS, G	26-JUN-1991	ALL	1:1
APPROVED BY	DATE	1997 VERO ON	SCALE
GENERAL	25-JUN-1991	ALL	1:1
DESIGNED BY	DATE	1997 VERO ON	SCALE
DIPALLO, G	27-OCT-1991	ALL	1:1
DESIGNED BY	DATE	1997 VERO ON	SCALE
DIPALLO, G	27-OCT-1991	ALL	1:1

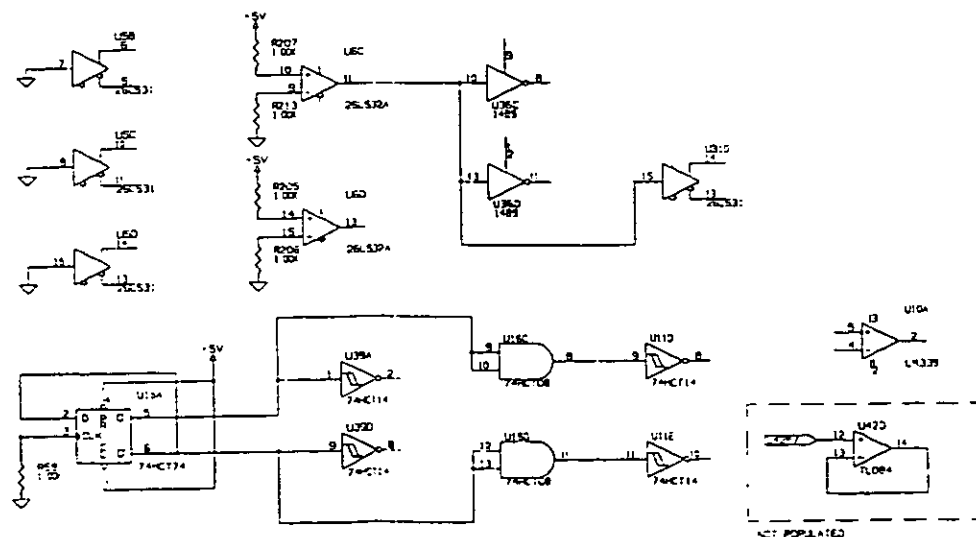


IC #		TYPE	BYPASS CAPACITORS	-5-VOLT PIN NUMBER	-12-VOLT PIN NUMBER	GROUND PIN NUMBER	-12-VOLT PIN NUMBER
U1	80C135		C13	64		28	
U2	60C86		C18		2	1	
U3	74LS123		C14	20		12	
U4	2755/2756		C15	20		10	
U5	28331		C16	16		8	
U6	29LS02A		C17	16		8	
U7	LS294						
U8	LS294						
U9	LS294						
U10	LS339		C19			12	
U11	74LS14		C20	14		7	
U12	74LS08		C21	14		7	
U13	74LS122		C22	16		8	
U14	74LS74		C23	14		7	
U15	74LS74		C24	14		7	
U16	74LS04		C25	14		7	
U17	6CT-VEED						
U18	74LS123		C26	16		8	
U19	28331		C27	16		8	
U20	LS294		C28				
U21	LS339		C29				
U22	74LS123		C30	20		12	
U23	74LS123		C31	20		12	
U24	74LS123		C32	20		12	
U25	74LS123		C33	20		12	
U26	74LS123		C34	20		12	
U27	74LS123		C35	20		12	
U28	74LS123		C36	20		12	
U29	74LS123		C37	20		12	
U30	74LS123		C38	20		12	
U31	74LS123		C39	20		12	
U32	74LS123		C40	20		12	
U33	74LS123		C41	20		12	
U34	74LS123		C42	20		12	
U35	74LS123		C43	20		12	
U36	74LS123		C44	20		12	
U37	74LS123		C45	20		12	
U38	74LS123		C46	20		12	
U39	74LS123		C47	20		12	
U40	74LS123		C48	20		12	
U41	74LS123		C49	20		12	
U42	74LS123		C50	20		12	

LAST USED						
R	C	U	VR	D	J	D
250	145	42	B	BC	16	16

NOTES

ALL DIODES ARE 1N4148 UNLESS OTHERWISE NOTED
ALL RESISTORS ARE 1/8W. 1% UNLESS OTHERWISE NOTED



NOT USED
C5: 113, 114, 115
C16: 113, 114, 115
C25: 113, 114, 115
C28: 113, 114, 115
D45: 46
J. 9.10
Q. 9.11, 14
R123: 124, 131, 132, 133
R151: 152, 153, 154, 155
R155: 156, 157, 158, 159
R277: 278, 279, 280, 281
U17: 21, 22

FILE:	Rectifier Control Board

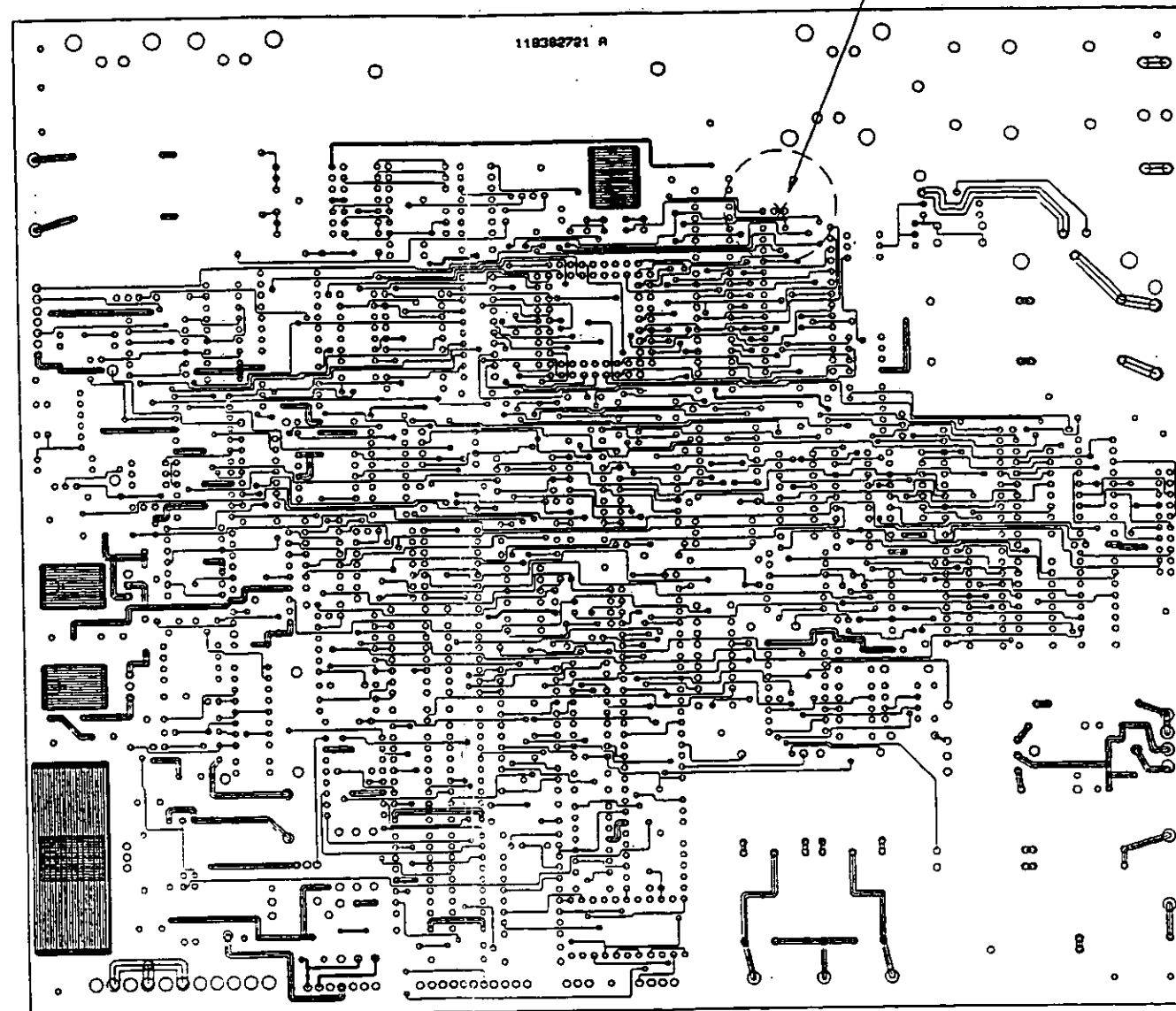
ORCAD-GENERATED DO NOT CHANGE MANUALLY.

71

EXIDE ELECTRONICS

[illegible]

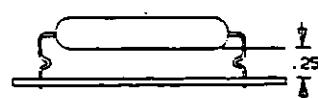
CUT TRACE WHERE INDICATED BY X



WIRING SIDE VIEW LAYER 4
118382721 R

EXIDE ELECTRONICS SALEM, N.C. 27084 RELEASED

DESCRIPTION: ASSEMBLY DIAGRAM, RECTIFIER CONTROL BOARD			
CREATED BY: BEAMAN_P	DATE: 22-OCT-1990	FIRST USED ON: UM: ALC EA	SCALE: FULL IF OR SCALE SHOWN UNLESS OTHERWISE SPECIFIED TOLERANCES ON: ANGLES 1/2" DECIMALS .XX .03 FRACTIONS 1/64 .XX .010 HOLE DIAMETERS .005 .XX .010 DO NOT DIMENSION UNLESS SPECIFIED OTHERWISE
CHECKED BY: BROWN_B	DATE: 20-SEP-1996	CATEGORY: ASSEMBLY	REVISION: RN/CN/SPRN NO: CN 024-0364 DATE APPR: 25-SEP-1996 APPROVED BY: NAVARRO_G
RESPONSIBLE ENGINEER: REYNOLDS_G		SECURITY CLASS: GENERAL	DRAWING NO. 110073757 CUSTOM NO. SHEET: 2 OF: 2
LAST MODIFIED BY: BEAMAN_P	DATE: 10-SEP-1996	VERSION: 51 SIZE: C	



DETAIL D
SIDE VIEW
SCALE NONE

TYP MTG FOR
R2, R199 & R208

INK STAMP FINISHED ASSEMBLY WITH SER(IAL/SEQUENCE
CODE AND VENDOR LOCATION LETTER IN THIS GENERAL
AREA (PER EXIDE ELECTRONICS DC PROCEDURE DCP169).

INK STAMP ASSEMBLY BILL OF
MATERIAL NUMBER AND REV LEVEL

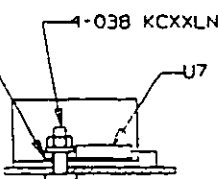
MOUNT D62, D63 AS SHOWN.
DISREGARD SILKSCREEN

SEE DETAIL D

APPLY HEATSINK
COMPOUND
P/N 126303101
4-025 KXXLN

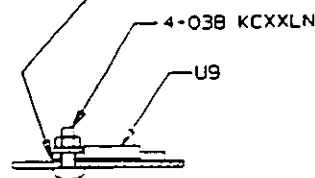
PARTIAL VIEW L-L
SCALE NONE
D62, D63

APPLY HEATSINK COMPOUND WHERE SHOWN

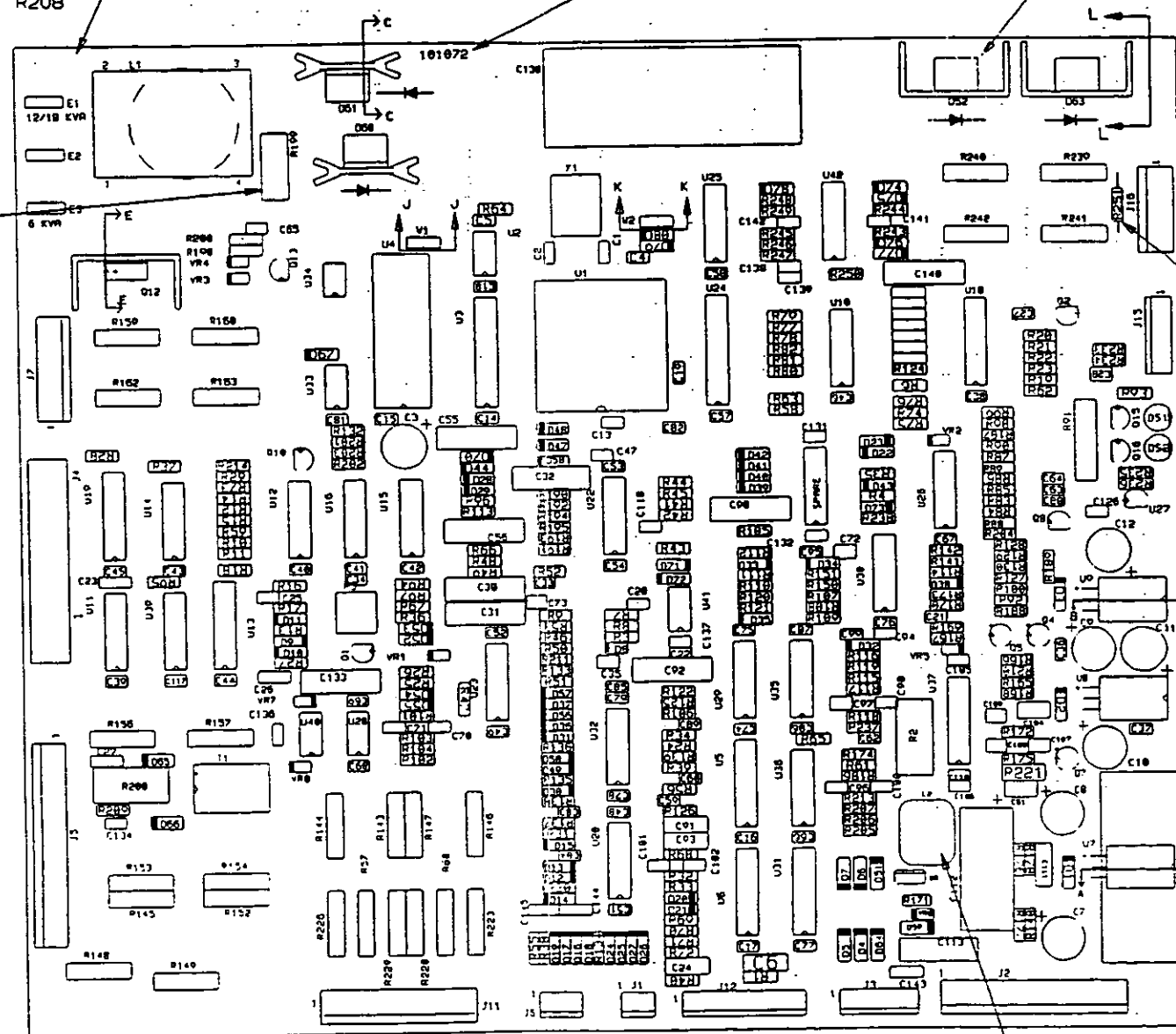


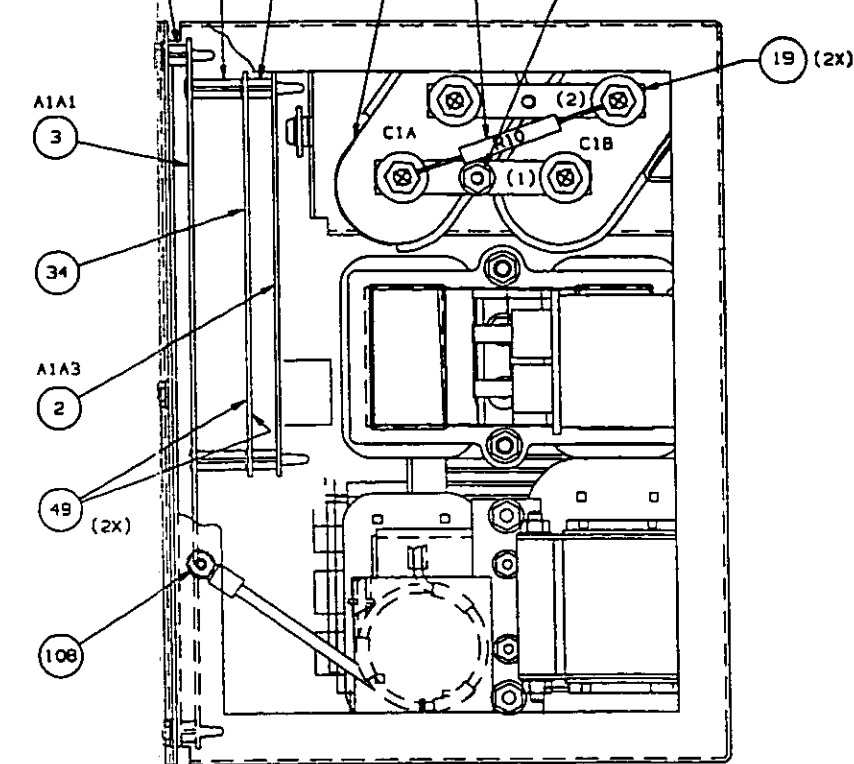
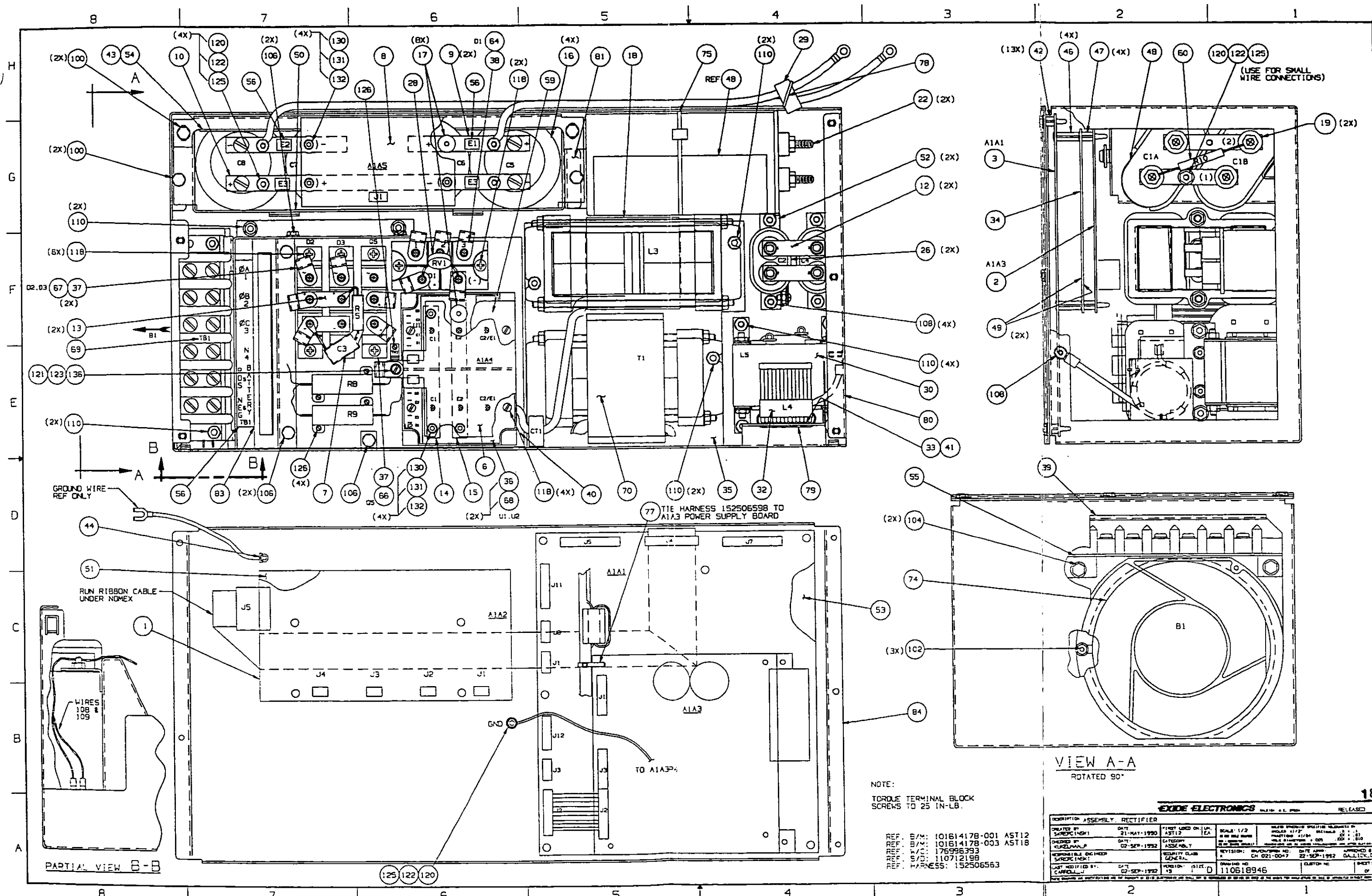
VIEW A-A
SCALE NONE

APPLY HEATSINK COMPOUND WHERE SHOWN



VIEW B-B
SCALE NONE
TYP MTG FOR U8, U9



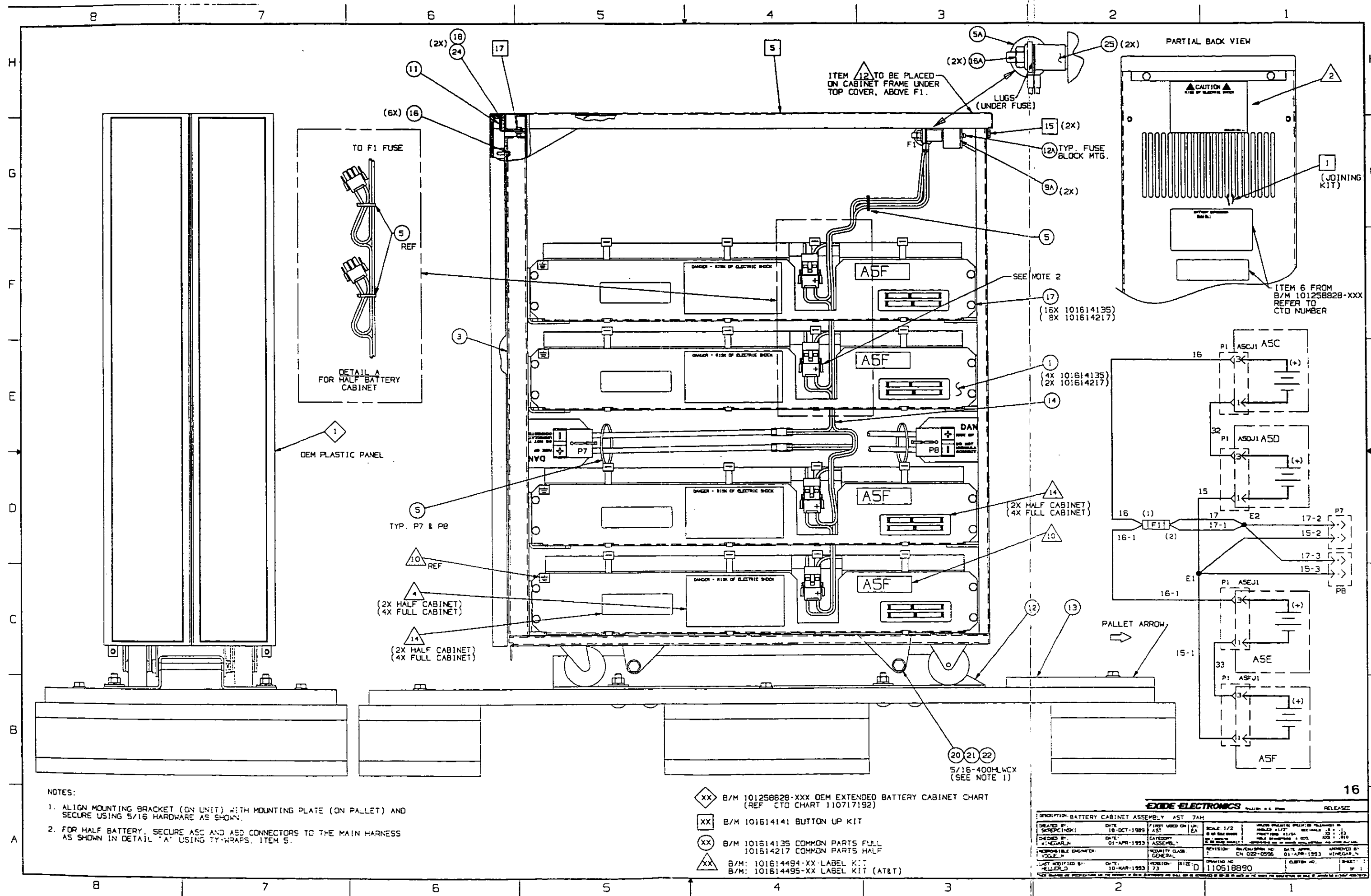


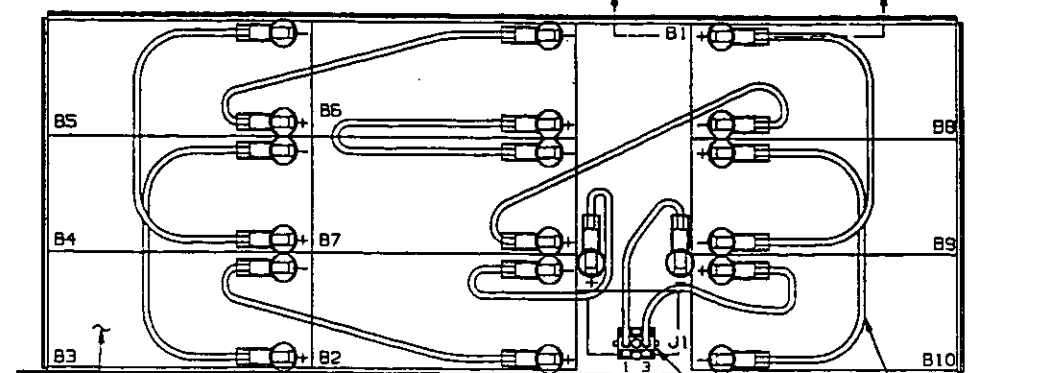
NOTE:
TORQUE TERMINAL BLOCK
SCREWS TO 25 IN.-LB.

REF. B/M: 101614178-001 AST12
REF. B/M: 101614178-003 AST18
REF. W/C: 176996393
REF. S/D: 110712198
REF. HARNESS: 152506563

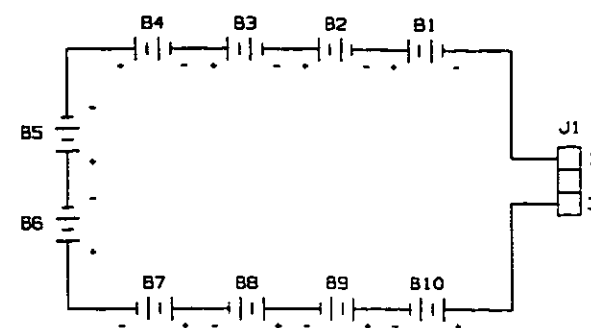
VIEW A-A
ROTATED 90°

DESCRIPTION: ASSEMBLY - RECTIFIER		RELEASED	
CREATED BY: SUREC/HK1	DATE: 21-MAY-1990	FIRST USED ON: 12A	SCALE: 1/2
DESIGNED BY: KUDZUNALP	DATE: 02-SEP-1992	CATEGORY: ASSEMBLY	WIRE SPECIFICATIONS: MIL-W-8838, 11/84
RESPONSIBLE ENGINEER: SUREC/HK1	DATE: 02-SEP-1992	SECURITY CLASS: GENERAL	REVISION: 001-00017
LAST MODIFIED BY: CARROLL	DATE: 02-SEP-1992	VERSION: 13	SIZE: D
DRAWING NO: 110618946		CUSTOMER: 110618946	

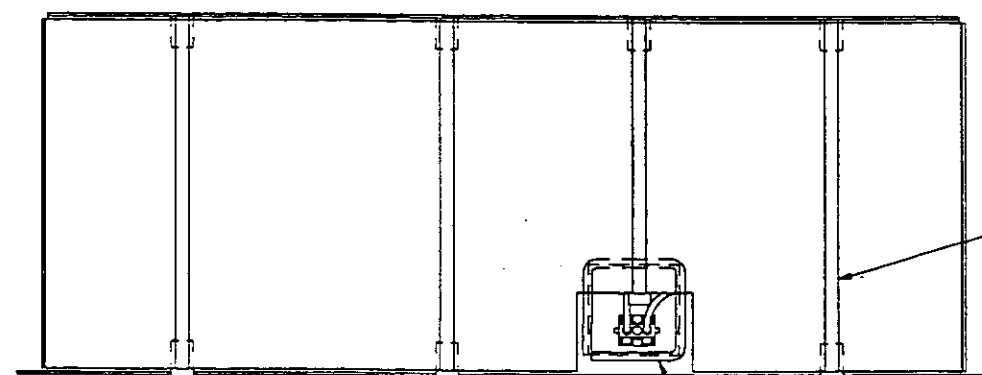




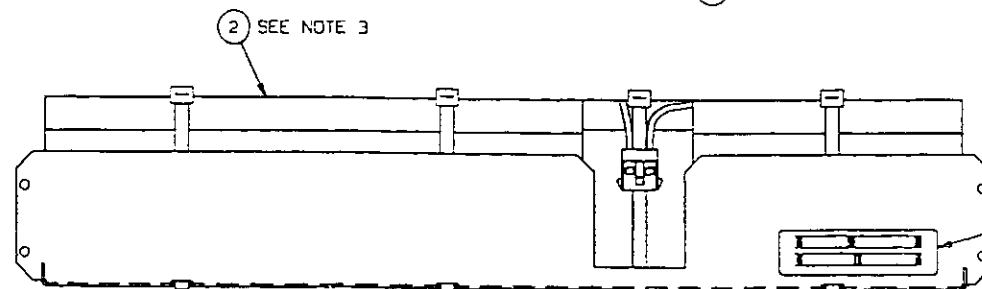
DETAIL C
TOP VIEW WITH TY-WRAP
AND NOMEX REMOVED



DETAIL B
SCHEMATIC - BATTERY TRAY

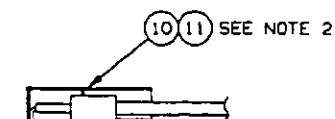


TOP VIEW



FRONT VIEW

REF. EXIDE S/N LABEL
PER LABEL KITS 101614471
OR 101614472



SECTION A-A
SCALE = 2:1

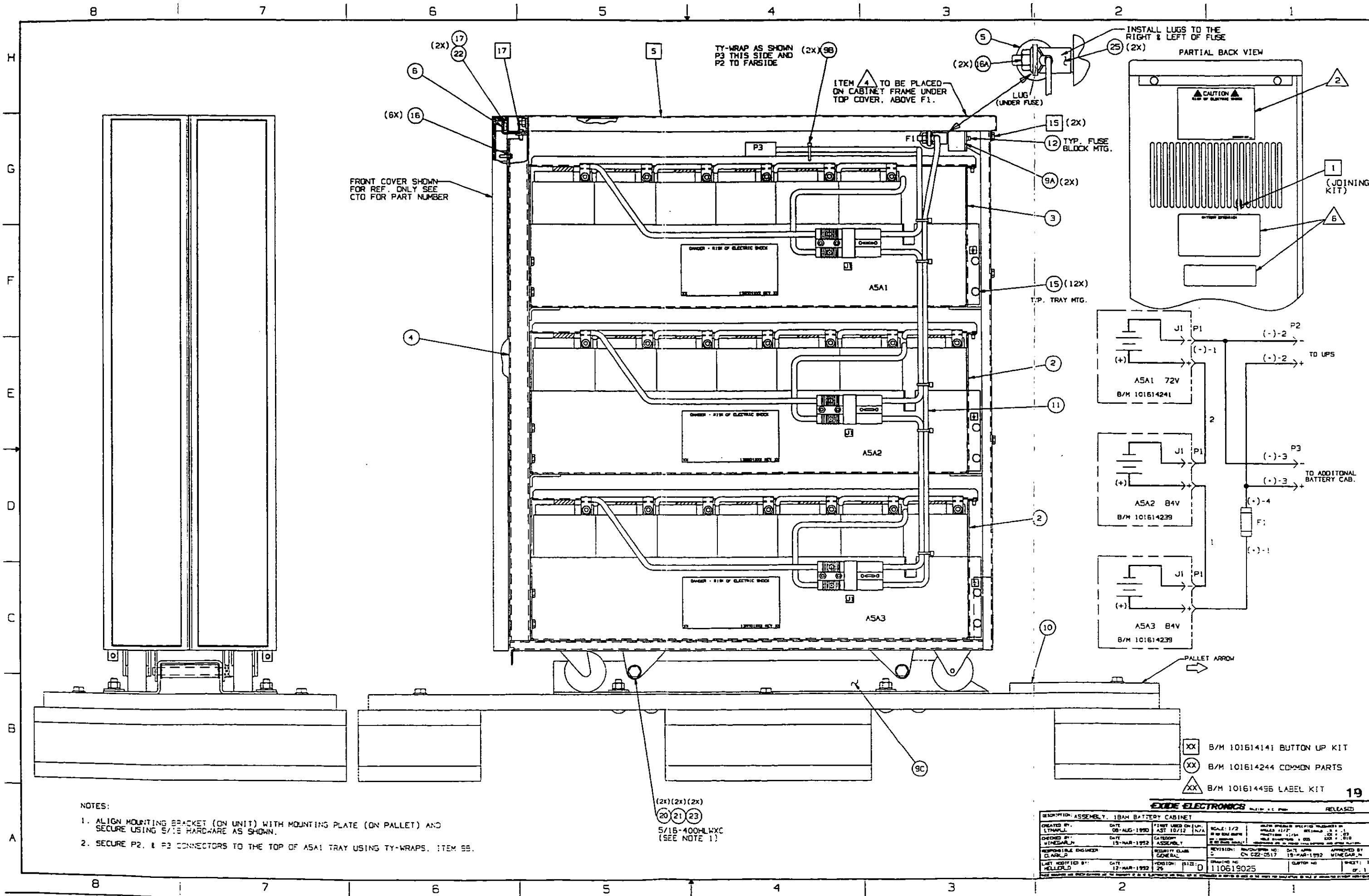


SIDE VIEW

1. WIRE BATTERIES PER DETAIL C.
2. INSTALL BOOTS OVER WIRE ENDS AS SHOWN SUCH THAT ITEM 10 (BLACK BOOT) COVERS NEGATIVE TERMINALS AND ITEM 11 (RED BOOT) COVERS POSITIVE TERMINALS.
3. INSTALL ITEM 2 AS SHOWN BEFORE SECURING WITH ITEM 9.
4. SECURE BATTERIES AND ITEM 2 USING ITEM 9 AS SHOWN.
5. APPLY GROMMET, ITEM 6, AROUND 2" X 2" CUTOUT IN BOTTOM OF TRAY.

REF B/M 101614049

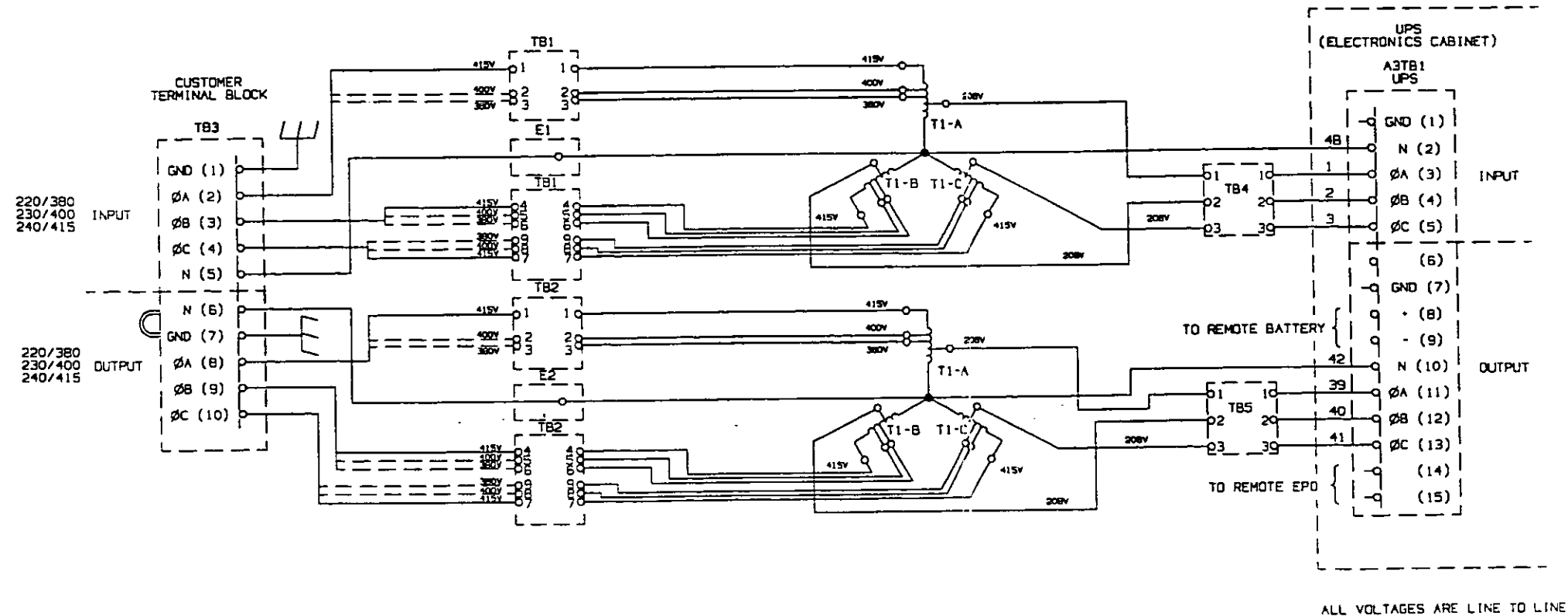
EXIDE ELECTRONICS				RELEASED	
DESCRIPTION: BATTERY TRAY					
DESIGNED BY: CARROLL, J.	DATE: 06-MAY-1989	FIRST USED ON: EA	SCALE: 1/2	UNLESS OTHERWISE SPECIFIED, DIMENSIONS IN INCHES ARE TO BE USED. DIMENSIONS IN PARENTHESES ARE TO BE USED.	
CHECKED BY: SKREPCINSKI, J.	DATE: 06-NOV-1992	CATEGORY: A/C	REVISION: CH 022-1004	DATE: 11-NOV-1992	APPROVED BY: GALLICK, S.
DESIGNABLE ENGINEER: CUSTODIAN	DATE: 01-OCT-1992	REVISION: 12	SIZE: D	DRIVING NO: 110618937	SHEET: 1 OF 1



NOTES:

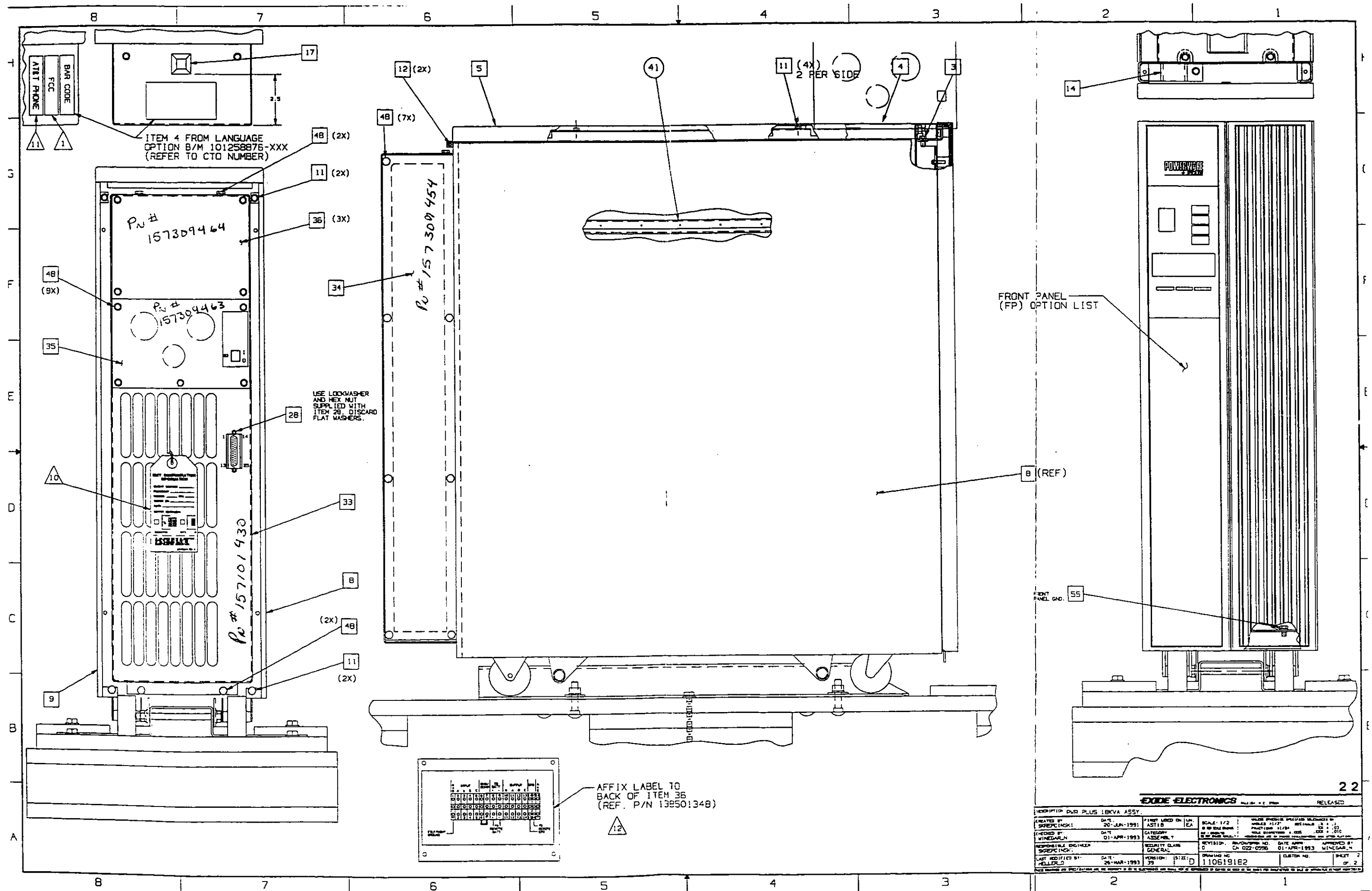
1. ALIGN MOUNTING BRACKET (ON UNIT) WITH MOUNTING PLATE (ON PALLET) AND SECURE USING 5/16 HARDWARE AS SHOWN.
2. SECURE P2, & P3 CONNECTORS TO THE TOP OF ASA1 TRAY USING TY-WRAP. ITEM 55.

DESCRIPTION: ASSEMBLY: 19A BATTERY CABINET		SCALE: 1/2		DATE: 13-MAR-1992	
CREATED BY: LTHANAL	DATE: 08-AUG-1990	FIRST USED ON: 10/12/90	IN/A	MULTI-SHEETED DRAWING: 1 OF 1	
CHECKED BY: WINEGAR	DATE: 13-MAR-1992	CATEGORY: ASSEMBLY		REVISION: 1	
RESPONSIBLE ENGINEER: CLARK	DATE: 12-MAR-1992	SECURITY CLASS: GENERAL		APPROVED BY: WINEGAR	
LAST MODIFIED BY: WINEGAR	DATE: 12-MAR-1992	POSITION: 25		DRAWING NO: 110619025	
110619025		CUSTOMER NO:		SHEET: 1	



REF. A/D: 110619462
REF. W/C: 176995283

EXIDE ELECTRONICS				RELEASED
DESCRIPTION: SCHEMATIC, POWERWARE PLUS 18 HIGH VOLTAGE				
CREATED BY: SOREPCINSEK1	DATE: 27-MAY-1993	FIRST USED ON: HW18	SCALE: 1/1	DATE ENGINEERED/REVIEWED BY: SOREPCINSEK1
CHECKED BY: SOREPCINSEK1	DATE: 20-JUL-1993	CATEGORY: SCHEMATIC	DATE: 20-JUL-1993	REVISION: 1
RESPONSIBLE ENGINEER: PLATSC	DATE: 20-JUL-1993	SECURITY CLASS: GENERAL	DATE: 20-JUL-1993	APPROVED BY: SOREPCINSEK1
LAST MODIFIED BY: SOREPCINSEK1	DATE: 20-JUL-1993	VERSION: 13	SIZE: D	PROJECT NO: 110712322
SHEET: 1				OF: 1



				22	
EXIDE ELECTRONICS				RELEASED	
DESCRIPTION: PWR PLUS 18KVA ASSY.					
CREATED BY: SREPC/MSK	DATE: 20-JUN-1991	FIRST USED ON: AST18	UN: EA	SCALE: 1/2	VALUES PROVIDED BY: SREPC/MSK
DESIGNED BY: WINEGAR	DATE: 01-APR-1993	CATEGORY: ASSEMBLY		BY: SREPC/MSK	VALUES PROVIDED BY: SREPC/MSK
RESPONSIBLE ENGINEER: SREPC/MSK	DATE: 01-APR-1993	SECURITY CLASS: GENERAL		REVISION: 0	VALUES PROVIDED BY: SREPC/MSK
LAST MODIFIED BY: WINEGAR	DATE: 26-MAR-1993	VERSION: 39	SIZE: D	DRAWING NO: 1106191E2	SHEET: 2 OF 2

GENERAL PANEL WIRING INSTRUCTIONS

1. DETERMINE IN WHICH WIRING GROUP(S) THE PANELS YOU HAVE SELECTED FALL (SEE TABLE A BELOW).
2. FOR A 2Ø OR 3Ø HARDWIRED PDM THE ALLOWABLE POSITIONS AVAILABLE FOR ADDITIONAL RECEPTACLE PANELS ARE 1-3. FOR A NON-HARDWIRED PDM ALLOWABLE POSITIONS AVAILABLE ARE 1-6.
3. EACH WIRING GROUP IS CONNECTED IN A DIFFERENT MANNER, AND THE CONNECTION OF WIRING GROUP 1 IS CRITICAL TO LOAD BALANCE.
4. SEE EACH WIRING GROUP'S SET OF INSTRUCTIONS (LOCATED BELOW AND TO THE RIGHT) FOR PANEL CONNECTIONS.

TABLE A

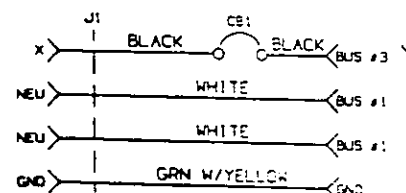
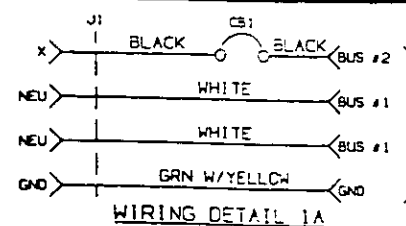
PDM PANEL DESIGNATION CHART			
PANEL P/N	PANEL IDENTIFICATION	WIRING GROUP	NEMA CONFIGURATION
101258849	A	2	L14-30R
101258859	B	3	L6-20R
101258842	C	3	L6-30R
101258850	D	1	5-15R2
101258860	E	1	5-20R2
101258861	F	1	L5-20R
101258862	G	1	L5-30R
101258843	H	1	L5-15R2
101258863	J	2	L14-20R
101258864	K	3	6-15R2
101258865	L	3	L6-15R2
101258905	MM	4	L21-20R-1
101258906	NN	4	L21-30R-1
101258907	OOO	4	L21-20R/30R-1
101258908	PPP	4	L21-20R/20R-1
101258909	QQQ	4	L21-30R/30R-1
101258981	S	1	CANADIAN 5-20R2
137909558	X	-	BLANK PANEL (1 POS.)
137909653	YYY	-	BLANK PANEL (3 POS.)
101258912	ZZZZZ	-	HARDWIRED OPTION

5. TABLE B (BELOW) SHOWS ALLOWABLE CONFIGURATIONS. EACH COLUMN REPRESENTS A COMBINATION OF PANELS MOUNTED IN POSITIONS 1 THROUGH 6.

- "-" INDICATES A BLANK PANEL (UNUSED PANEL) OR A PANEL FROM WIRING GROUP 4.
- "A" INDICATES A PANEL FROM WIRING GROUPS 1-3 TO BE CONNECTED PER DETAIL 1A, 2A OR 3A.
- "B" INDICATES A PANEL FROM WIRING GROUPS 1-3 TO BE CONNECTED PER DETAIL 1B, 2B OR 3B.
- "C" INDICATES A PANEL FROM WIRING GROUPS 1-3 TO BE CONNECTED PER DETAIL 1C, 2C OR 3C.

TABLE B

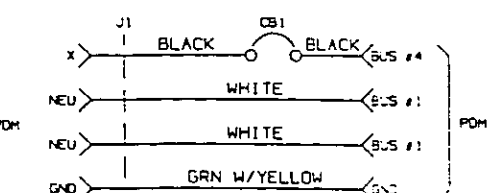
ALLOWABLE WIRING GROUP 1 CONFIGURATIONS							
	1	2	3	4	5	6	
POSITION 1	A	A	A	A	A	A	
POSITION 2	B	B	B	B	B	B	
POSITION 3	C	C	C	C	-	-	
POSITION 4	A	A	A	-	-	-	
POSITION 5	B	B	-	-	-	-	
POSITION 6	C	-	-	-	-	-	



WIRING DETAIL 1B

WIRING GROUP 1 INSTRUCTIONS:

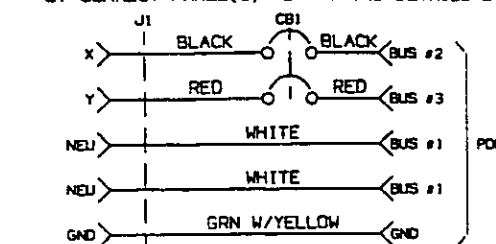
1. DETERMINE PLACEMENT (REFERENCE FIGURE 1) OF EACH PANEL FROM WIRING GROUP 1.
2. CONNECT PANEL(S) PER WIRING DETAILS 1A, 1B OR 1C.



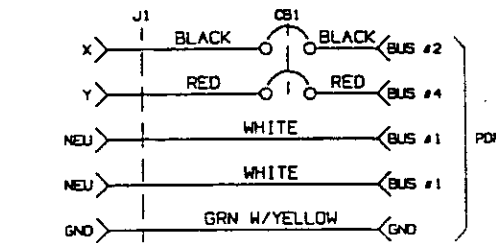
WIRING DETAIL 1C

WIRING GROUP 2 INSTRUCTIONS:

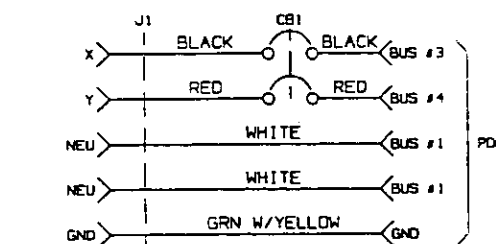
1. DETERMINE PLACEMENT (REFERENCE FIGURE 1) OF EACH PANEL FROM WIRING GROUP 2.
2. CONNECT PANEL(S) PER WIRING DETAILS 2A, 2B OR 2C



WIRING DETAIL 2A



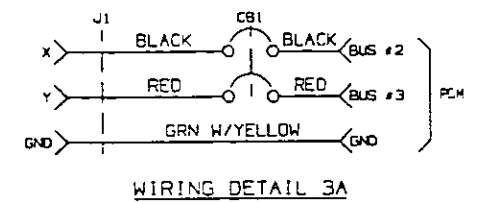
WIRING DETAIL 2B



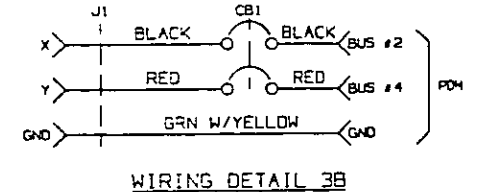
WIRING DETAIL 2C

WIRING GROUP 3 INSTRUCTIONS:

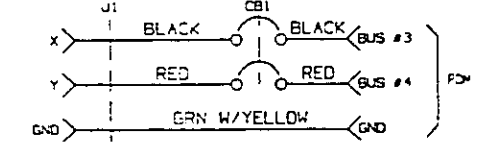
1. DETERMINE PLACEMENT (REFERENCE FIGURE 1) OF EACH PANEL FROM WIRING GROUP 3.
2. CONNECT PANEL(S) PER WIRING DETAILS 3A, 3B OR 3C.



WIRING DETAIL 3A



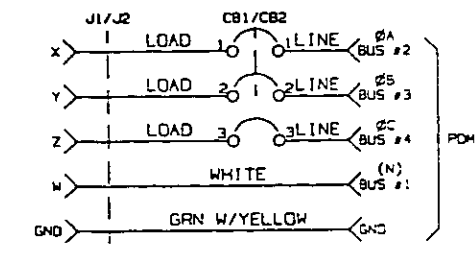
WIRING DETAIL 3B



WIRING DETAIL 3C

WIRING GROUP 4 INSTRUCTIONS:

1. DETERMINE PLACEMENT (REFERENCE FIGURE 1) OF EACH PANEL FROM WIRING GROUP 4.
2. CONNECT PANEL(S) PER WIRING DETAIL 4 (BELOW).



WIRING DETAIL 4

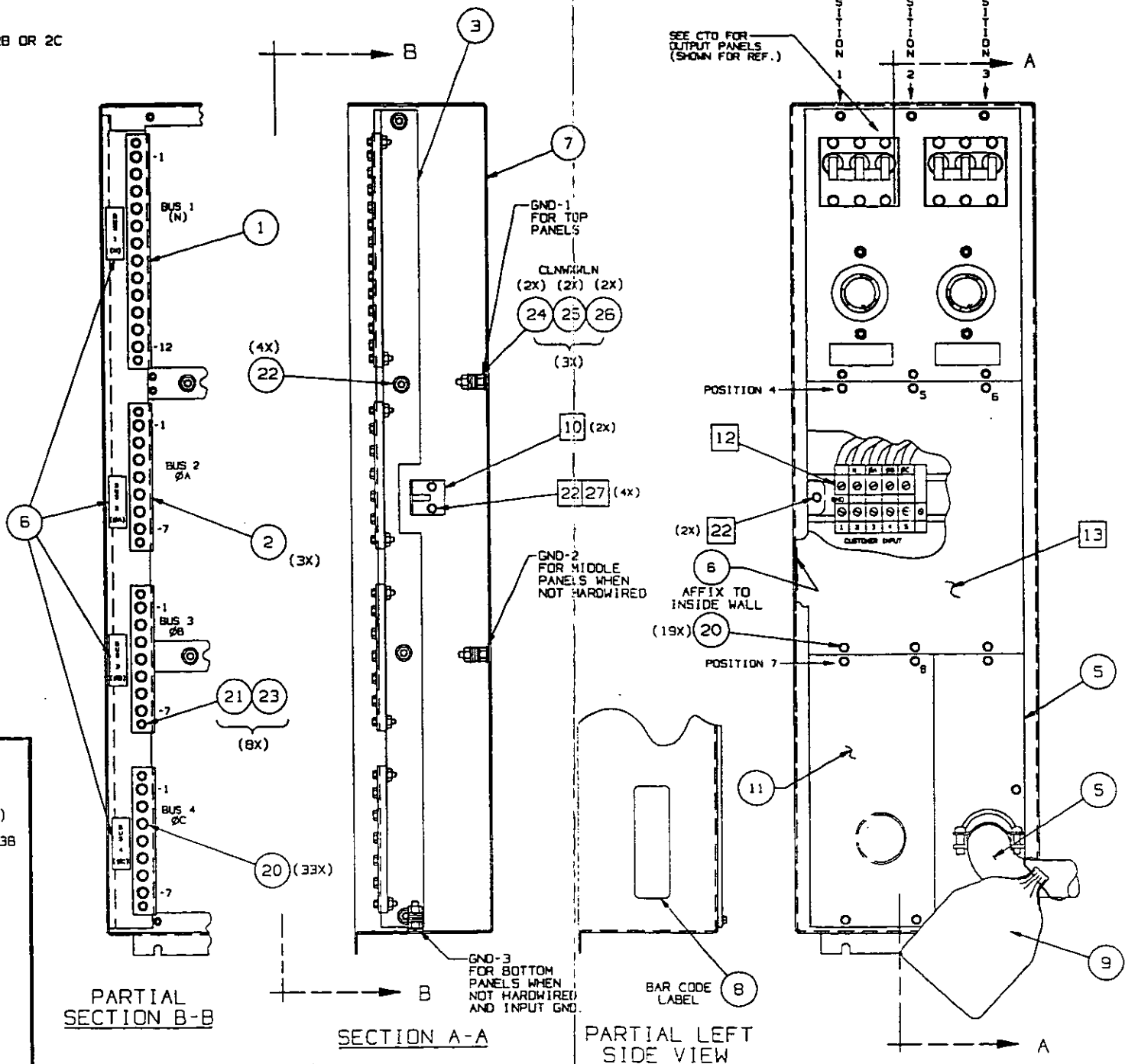


FIGURE 1

XX REF. B/M: 101614544
XX REF. B/M: 101258912
REF. W/C: 176996927

EXIDE ELECTRONICS

DESCRIPTION: ASSEMBLY, AST18 PDM	DATE: 10-JAN-1992	SCALE: 1/2"	REVISION: 1
CREATED BY: SIORECHINSKI	DATE: 10-JAN-1992	AST18	EA
CHECKED BY: LTHALL	DATE: 25-JAN-1993	ASSEMBLY	EA
RESPONSIBLE ENGINEER: SIORECHINSKI	DATE: 01-FEB-1993	GENERAL	EA
LAST MODIFIED BY: LTHALL	DATE: 25-JAN-1993	18	EA
REVISION: 1	DATE: 01-FEB-1993	110619235	EA
CLUTON NO:			
SHEET: 1			

CAUTION: RISK OF ELECTRIC SHOCK. DO NOT REMOVE COVERS. NO USER-SERVICABLE PARTS INSIDE. REFER SERVICING TO TRAINED SERVICE PERSONNEL.

CAUTION: REMOTE BATTERY TERMINALS (8, 9) HAVE VOLTAGE WHEN THE BATTERY CABINET IS CONNECTED TO THE UPS.

CAUTION: THE UPS CONTAINS ITS OWN ENERGY SOURCE (BATTERY). THE OUTPUT TERMINALS MAY HAVE VOLTAGE EVEN WHEN THE UPS IS NOT CONNECTED TO AN AC SUPPLY.

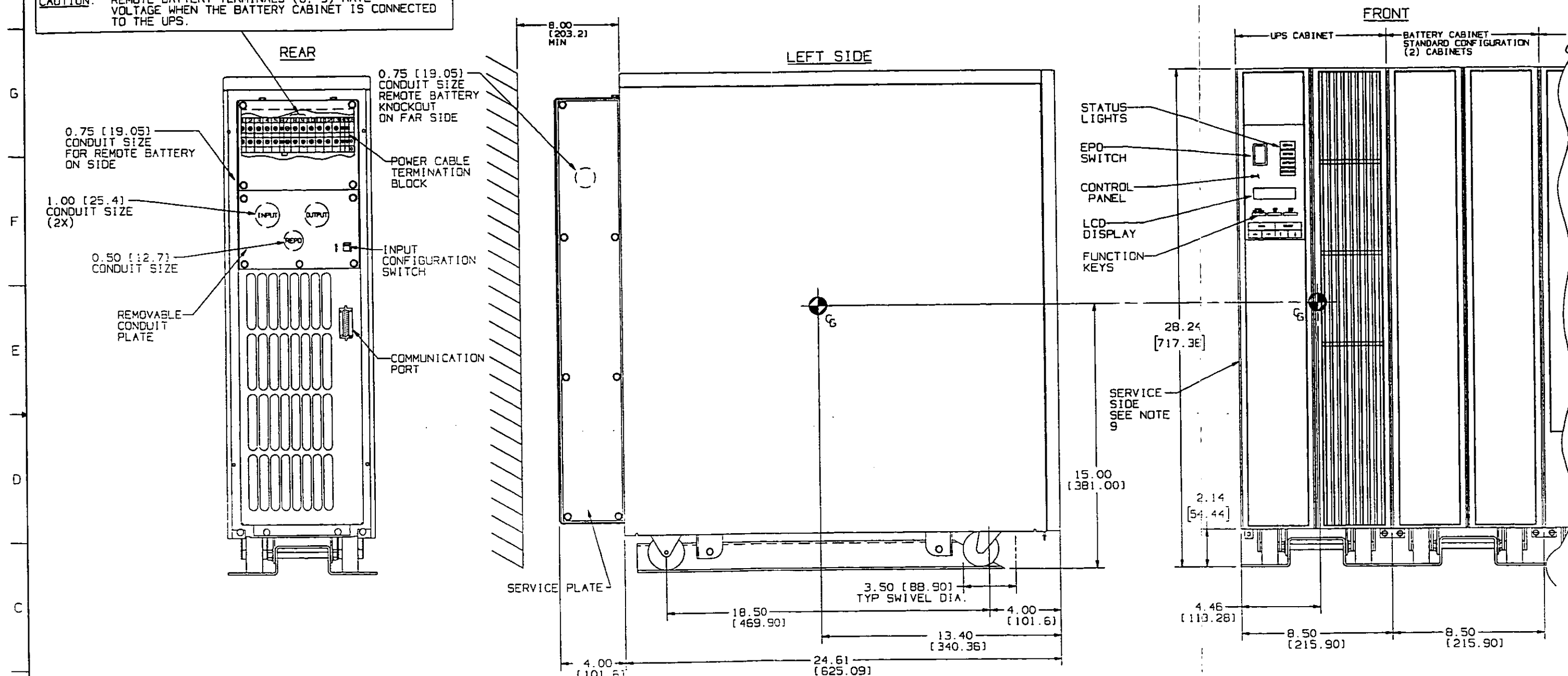


TABLE 1

EQUIPMENT WEIGHTS		MODEL 12	MODEL 15	MODEL 18
POWER PROCESSOR CABINET		210 LB (95 KG)	210 LB (95 KG)	210 LB (95 KG)
FULL BATTERY CAB. (7AH)		295 LB (134KG)	295 LB (134KG)	295 LB (134KG)
FULL BATTERY CAB. (18AH)		350 LB (159KG)	350 LB (159KG)	350 LB (159KG)
HEAT DISSIPATION		5200 BTU/HR	6500 BTU/HR	7800 BTU/HR
208 V INPUT		(1310 Kg-Cal/Hr)	(1638 Kg-Cal/Hr)	(1965 Kg-Cal/Hr)
FULL LOAD OUTPUT AT 0.8 PF				
FLOOR LOADING	POWER PROCESSOR	1.73 LB/SQ. IN. (.12KG/CM ²)	1.73 LB/SQ. IN. (.12KG/CM ²)	1.73 LB/SQ. IN. (.12KG/CM ²)
	FULL BATTERY (7AH)	2.43LB/SQ. IN. (.17KG/CM ²)	2.43LB/SQ. IN. (.17KG/CM ²)	2.43LB/SQ. IN. (.17KG/CM ²)
	FULL BATTERY (18AH)	2.68LB/SQ. IN. (.20KG/CM ²)	2.68LB/SQ. IN. (.20KG/CM ²)	2.68LB/SQ. IN. (.20KG/CM ²)
SHIPPING CONTAINERS	WIDTH	15.5" (394MM)	15.5" (394MM)	15.5" (394MM)
	DEPTH	40.0" (1016MM)	40.0" (1016MM)	40.0" (1016MM)
	HEIGHT	34.0" (864MM)	34.0" (864MM)	34.0" (864MM)
CONTAINER WEIGHTS		40 LB (18KG)	40 LB (18KG)	40 LB (18KG)

NOTES:

1. DIMENSIONS ARE IN INCHES (MILLIMETERS).
2. VENTILATION:
UPS CABINET: FAN COOLED - INLET FRONT/OUTLET REAR.
BATTERY CABINET: NATURAL CONVECTION.
3. MAXIMUM ELEVATION FOR NORMAL OPERATION: 5000 FEET (1500 METERS). DERATING IS REQUIRED FOR HIGHER ELEVATIONS.
4. DO NOT TILT THE CABINET MORE THAN 12 DEGREES (UNIT MAY TIP OVER).
5. EQUIPMENT WEIGHTS ARE PROVIDED FOR TYPICAL CONFIGURATIONS. CONTACT YOUR LOCAL SALES REPRESENTATIVE IF ADDITIONAL INFORMATION IS NEEDED.
6. ADDITIONAL BATTERY CABINETS MAY BE ADDED FOR EXTENDED BATTERY TIME. REFER TO DRAWING 110719062 FOR INSTALLATION INSTRUCTIONS. INSTALLATION MUST BE MADE BY QUALIFIED SERVICE PERSONNEL.
7. FOR OPTIONS, CONTACT THE FACTORY OR YOUR DEALER.
8. REFER TO DRAWING 110719046 BEFORE CONNECTING INPUT AND OUTPUT WIRING.
9. IT IS RECOMMENDED THAT THE UNIT BE INSTALLED ALLOWING 24" MINIMUM OF SPACE ON ITS LEFT SIDE FOR ACCESS BY QUALIFIED SERVICE PERSONNEL.

DESCRIPTION: OUTLINE AND INSTALLATION DRAWING PWR PLUS 18		DATE: 08-JUN-1991		FIRST USED ON: 18-JUN-1991		SCALE: NONE		DRAWN BY: J. J. J.		CHECKED BY: J. J. J.	
CREATED BY: J. J. J.		DATE: 08-JUN-1991		CATEGORY: CUSTOMER		REVISION: 1		REVISION: 1		REVISION: 1	
DRAWN BY: J. J. J.		DATE: 08-JUN-1991		CATEGORY: CUSTOMER		REVISION: 1		REVISION: 1		REVISION: 1	
CHECKED BY: J. J. J.		DATE: 08-JUN-1991		CATEGORY: CUSTOMER		REVISION: 1		REVISION: 1		REVISION: 1	
APPROVED BY: J. J. J.		DATE: 08-JUN-1991		CATEGORY: CUSTOMER		REVISION: 1		REVISION: 1		REVISION: 1	
LAST MODIFIED BY: J. J. J.		DATE: 08-JUN-1991		CATEGORY: CUSTOMER		REVISION: 1		REVISION: 1		REVISION: 1	
DRAWING NO: 110719045		DATE: 08-JUN-1991		CATEGORY: CUSTOMER		REVISION: 1		REVISION: 1		REVISION: 1	
CUSTOMER NO: 110719045		DATE: 08-JUN-1991		CATEGORY: CUSTOMER		REVISION: 1		REVISION: 1		REVISION: 1	

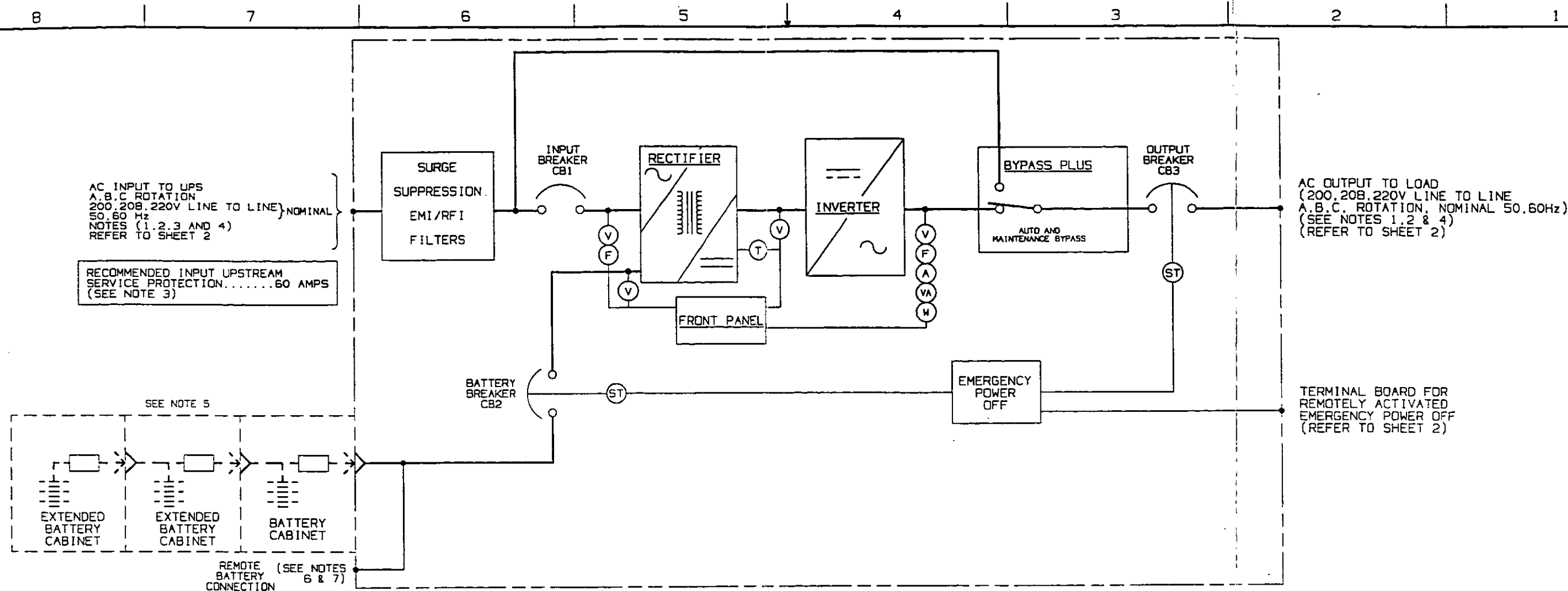


TABLE 1

	NOMINAL VOLTAGE	NOMINAL INPUT CURRENT PER PHASE *			NOMINAL OUTPUT CURRENT PER PHASE			NOMINAL OUTPUT POWER			BATTERY CURRENT		
		MODEL 12	MODEL 15	MODEL 18	MODEL 12	MODEL 15	MODEL 18	MODEL 12	MODEL 15	MODEL 18	MODEL 12	MODEL 15	MODEL 18
THREE-PHASE INPUT	200/115	29 A	36 A	43 A	34 A	42 A	50 A	8 KW	10 KW	12 KW	40 A	50 A	60 A
THREE-PHASE OUTPUT	208/120	28 A	35 A	42 A	34 A	42 A	50 A	8 KW	10 KW	12 KW	40 A	50 A	60 A
	220/127	26 A	33 A	39 A	31 A	39 A	47 A	8 KW	10 KW	12 KW	40 A	50 A	60 A

* INPUT CURRENT IS THE SAME AS THE OUTPUT CURRENT WHEN LOAD IS POWERED THROUGH THE BYPASS

NOTES:

1. REFER TO NATIONAL AND LOCAL ELECTRICAL CODES FOR ACCEPTABLE EXTERNAL WIRING PRACTICES.
2. MATERIAL AND LABOR FOR EXTERNAL WIRING ARE TO BE PROVIDED BY OTHERS.
3. AN EXTERNAL PROTECTIVE DEVICE FOR THE INPUT SOURCE MUST BE PROVIDED, AND SIZED FOR THE CURRENTS INDICATED ON THE NAMEPLATE, PER NATIONAL AND LOCAL ELECTRICAL CODES. (NOTE: UPSTREAM PROTECTION MUST BE COORDINATED WITH LOAD CURRENT REQUIREMENTS UNDER NOMINAL AS WELL AS LOW LINE AND OVERLOAD CONDITIONS.)
4. THE UNIT SHALL BE GROUNDED AT THE INPUT TERMINAL BLOCK TO A SINGLE POINT LOCAL OR UTILITY EARTH GROUND. THE GROUND CONDUCTOR SHALL BE SIZED PER NATIONAL AND LOCAL ELECTRICAL CODE REQUIREMENTS. ON THE OUTPUT, FOLLOW APPLICABLE ELECTRICAL GROUNDING GUIDELINES. IN THE UNITED STATES THE OUTPUT IS A "SEPARATELY DERIVED SOURCE".
5. WARNING: TO AVOID FIRE AND ELECTRIC SHOCK HAZARD, DO NOT CONNECT MORE THAN THREE BATTERY CABINETS TO THE UPS UNIT.
6. REMOTE BATTERIES REQUIRE DC BREAKER SUITABLE FOR BRANCH CIRCUIT PROTECTION (TO BE PROVIDED BY OTHERS), RATED 250V, 75A.
7. MAXIMUM PERMITTED AVAILABLE FAULT CURRENT FROM A REMOTE BATTERY SUPPLY IS 4500 AMPS

CAUTION - RISK OF ELECTRIC SHOCK.

NO USER-SERVICEABLE PARTS INSIDE.
REFER SERVICING TO QUALIFIED SERVICE PERSONNEL.

CAUTION:
THE UPS CONTAINS ITS OWN ENERGY SOURCE (BATTERY). THE OUTPUT TERMINALS MAY HAVE VOLTAGE EVEN WHEN THE UPS IS NOT CONNECTED TO AN AC SUPPLY.

LEGEND

- (ST) SHUNT TRIP
- (F) FREQUENCY METER
- (A) AMMETER
- (V) VOLTMETER
- (VA) VOLT-AMP METER
- (W) WATTMETER
- (T) TEMPERATURE

DESCRIPTION: ONE LINE DIAGRAM, INSTALLATION & CONFIGURATION REQUIREMENTS (BKVA)									
CREATED BY: SIOPEC/INSK	DATE: 27-JAN-1991	FIRST USED ON: AST 19	SCALE: NONE	SHEET: 1 OF 1					
CHECKED BY: CHAVEZ, J	DATE: 23-JAN-1992	CATEGORY: CUSTOMER	REVISION: 1	SHEET: 1 OF 1					
RESPONSIBLE ENGINEER: CLARK, J	DATE: 22-JAN-1992	SECURITY CLASS: GENERAL	REVISION: 1	SHEET: 1 OF 1					
LAST MODIFIED BY: SIOPEC/INSK	DATE: 22-JAN-1992	VERSION: 1	REVISION: 1	SHEET: 1 OF 1					

CAUTION: RISK OF ELECTRIC SHOCK.
REMOTE BATTERY TERMINALS (8,9) HAVE HIGH VOLTAGE WHEN THE BATTERY CABINET IS CONNECTED TO THE UPS.

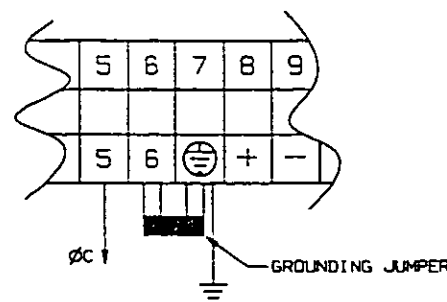


FIGURE 1

INSTALLATION INSTRUCTIONS:

ONLY QUALIFIED SERVICE PERSONNEL SHOULD ATTEMPT TO CONFIGURE THIS EQUIPMENT.

THE OUTPUT VOLTAGE AND FREQUENCY ARE SET USING THE FRONT PANEL. CONSULT THE OPERATOR'S MANUAL FOR DETAILS ON HOW TO CONFIGURE THE OUTPUT.

NOTES:

- 1.0 GROUNDING
 - 1.1 AN INSULATED GROUNDING CONDUCTOR THAT IS IDENTICAL IN SIZE, INSULATION MATERIAL, AND THICKNESS TO THE GROUND AND UNGROUNDED BRANCH-CIRCUIT SUPPLY CONDUCTORS EXCEPT THAT IS GREEN WITH OR WITHOUT ONE OR MORE YELLOW STRIPES IS TO BE INSTALLED AS PART OF THE BRANCH CIRCUIT THAT SUPPLIES THE UNIT, AND CONNECTED TO THE TERMINAL OF THE INPUT TERMINAL BLOCK.
 - 1.2 THE GROUNDING CONDUCTOR DESCRIBED ABOVE IS TO BE GROUNDED TO EARTH AT THE SERVICE EQUIPMENT OR, IF SUPPLIED BY A SEPARATELY DERIVED SYSTEM, AT THE SUPPLY TRANSFORMER.
 - 1.3 THE ATTACHMENT-PLUG RECEPTACLES IN THE VICINITY OF THE UNIT OR SYSTEM ARE ALL TO BE OF A GROUNDING TYPE, AND THE GROUNDING CONDUCTORS SERVING THESE RECEPTACLES ARE TO BE CONNECTED TO EARTH GROUND AT THE SERVICE EQUIPMENT.
 - 1.4 LOCATE THE GROUNDING JUMPER BETWEEN TERMINALS 6 AND 7 AS SHOWN IN FIGURE 1.
 - 1.5 IF OUTPUT NEUTRAL IS NOT TO BE GROUNDED, REMOVE THE GROUNDING JUMPER THAT IS LOCATED BETWEEN TERMINALS 6 AND 7. (IT IS RECOMMENDED THAT THE GROUNDING JUMPER BE REMOVED FOR 3 WIRE-DELTA OUTPUT.)
- 2.0 BYPASS CONFIGURATION
 - 2.1 DETERMINE THE INPUT AND OUTPUT VOLTAGE AND FREQUENCY.
 - 2.2 IDENTIFY THE BYPASS CONFIGURATION SWITCH S3, LOCATED ON THE TOP OF THE UNIT.
 - 2.3 IF INPUT AND OUTPUT VOLTAGE AND FREQUENCY ARE IDENTICAL, AND BYPASS IS DESIRED, SET THE BYPASS CONFIGURATION SWITCH S3 TO THE 'ENABLE' POSITION, AS SHOWN IN FIGURE 2.
 - 2.4 IF INPUT AND OUTPUT VOLTAGE AND FREQUENCY ARE NOT IDENTICAL, OR IF BYPASS IS NOT DESIRED, SET THE BYPASS CONFIGURATION SWITCH S3 TO THE 'DISABLE' POSITION.
- 3.0 INPUT CONFIGURATION SWITCH
 - 3.1 MAKE SURE THAT THE INPUT CONFIGURATION SWITCH S2, LOCATED ON THE REAR OF THE UNIT, (FIGURE 3), IS SET TO THE '1' POSITION FOR WYE (4-WIRE) INPUT, AND TO THE '0' POSITION FOR DELTA (3-WIRE) INPUT.
- 4.0 REMOTE EMERGENCY POWER OFF
 - 4.1 REMOTE EMERGENCY POWER OFF (REPO) SWITCH IS A WALL-MOUNTED, NORMALLY-OPEN, MOMENTARY-CONTACT PUSH-BUTTON SWITCH SUPPLIED BY OTHERS.
 - 4.2 MINIMUM RATINGS OF REPO SWITCH ARE 120V AND 125mA.
 - 4.3 REPO WIRES ARE HIGH VOLTAGE. REFER TO LOCAL ELECTRICAL CODES FOR PROPER INSTALLATION.

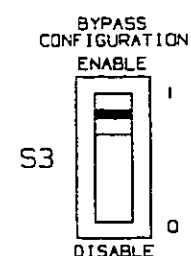
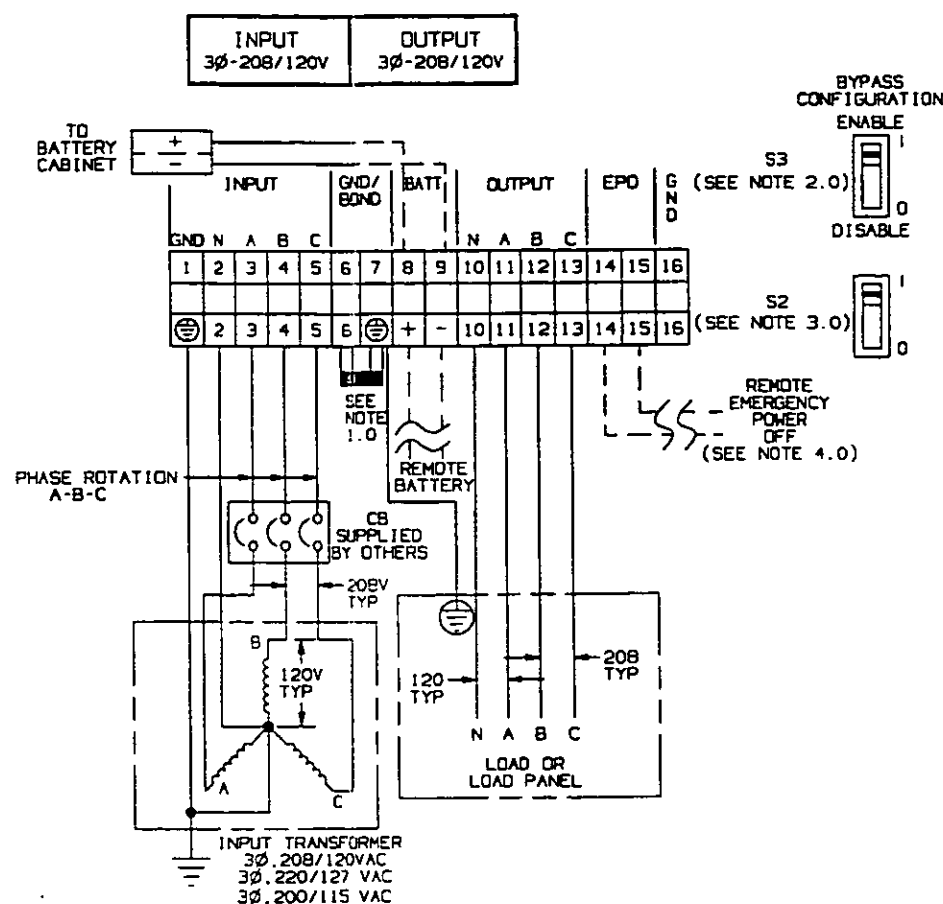


FIGURE 2

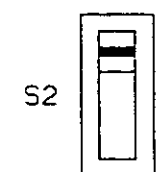


FIGURE 3

REFER TO NATIONAL AND LOCAL ELECTRICAL REGULATIONS FOR ACCEPTABLE EXTERNAL WIRING PRACTICES. TABLE 2 INDICATES INPUT/OUTPUT TERMINAL BLOCK WIRE RANGES AND REQUIRED TIGHTENING TORQUE.

TABLE 2

POWER CABLE TERMINALS			TIGHTENING TORQUE
TERMINAL NO.	DESCRIPTION	WIRE RANGE	
1, 7, 16	GROUND	18-6AWG (0.5-10 mm ²)	10.6-12.3 lb-in
2, 3, 4, 5	INPUT	10-4AWG (2.5-16 mm ²)	10.6-12.3 lb-in
6	NO CONNECTION	18-6AWG (0.5-10 mm ²)	10.6-12.3 lb-in
8	REMOTE BATTERY POS.	10-4AWG (2.5-16 mm ²)	10.6-12.3 lb-in
9	REMOTE BATTERY NEG.	10-4AWG (2.5-16 mm ²)	10.6-12.3 lb-in
10, 11, 12, 13	OUTPUT	10-4AWG (2.5-16 mm ²)	10.6-12.3 lb-in
14, 15	EPO	22-10AWG (0.5-4 mm ²)	3.5 - 5.3 lb-in

USE ONLY #8 AWG 75°C COPPER WIRE, FOR A DOUBLE RATED NEUTRAL.
USE #6 AWG 75°C COPPER WIRE ON TERMINALS 2 AND 10.

LEGEND

1. E.P.O. - EMERGENCY POWER OFF
2. CB - CIRCUIT BREAKER
3. N - NEUTRAL
4. TYP - TYPICAL

DESCRIPTION ONE LINE DIAGRAM, INSTALLATION & CONFIGURATION REQUIREMENTS (BKVA)			
CREATED BY: SUREP/ENK-1	DATE: 22-JAN-1991	FIRST USED ON: 12A	SCALE: NONE
DESIGNED BY: CHAVEZ, JH	DATE: 23-JAN-1992	CATEGORY: CUSTOMER	REVISION: 1/1/92
RESPONSIBLE ENGINEER: CHAVEZ, JH	DATE: 23-JAN-1992	SECURITY CLASS: GENERAL	REVISION: 1/1/92
LAST MODIFIED BY: SUREP/ENK-1	DATE: 22-JAN-1992	FIGURE NO: 110719046	FIGURE NO: 110719046

THE BATTERY IS TO BE INSTALLED BY QUALIFIED SERVICE PERSONNEL ONLY.

CAUTION: THE UPS CONTAINS ITS OWN ENERGY SOURCE (BATTERY). THE OUTPUT TERMINALS MAY HAVE VOLTAGE EVEN WHEN THE UPS IS NOT CONNECTED TO AN AC SUPPLY.

CAUTION: REMOTE BATTERY TERMINALS (8, 9) HAVE VOLTAGE WHEN THE BATTERY CABINET IS CONNECTED TO THE UPS.

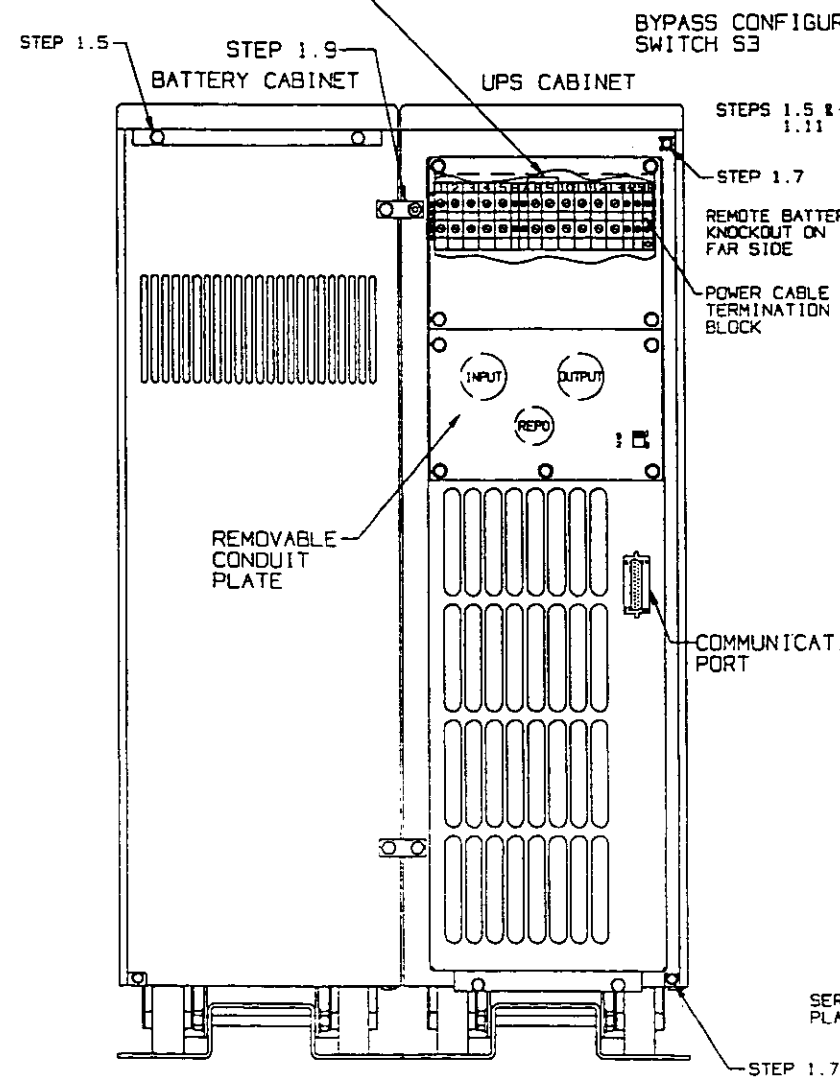
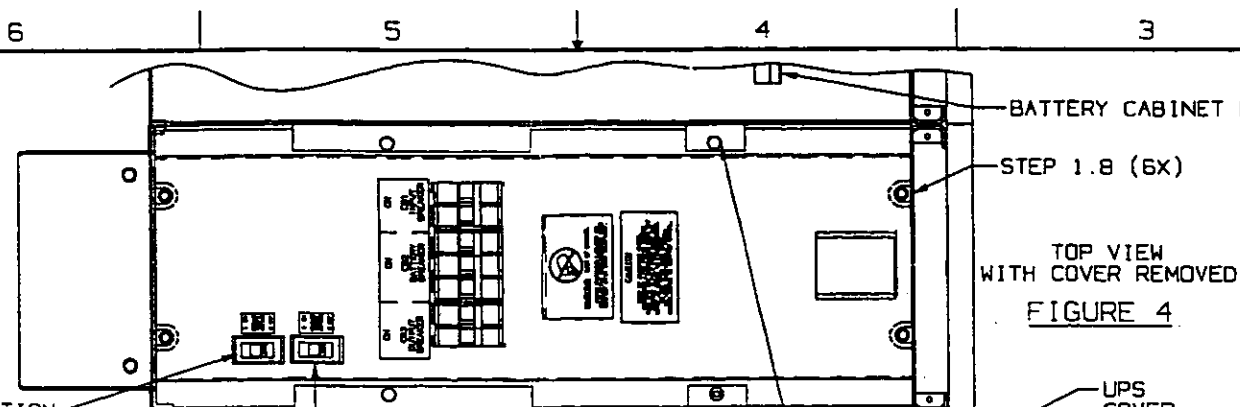


FIGURE 1

1. CABINET JOINING INSTRUCTIONS

- 1.0 READ ALL CAUTION AND DANGER NOTES BEFORE BEGINNING THIS PROCEDURE.
- 1.1 REMOVE JOINING KIT HARDWARE FROM SHIPPING CARTON. HARDWARE KIT SHOULD CONTAIN THE FOLLOWING:
 - (4) JOINING BRACKETS (ONE NOTCHED)
 - (8) #10-32 X .50 LG. HEX HEAD SCREWS
- 1.2 TOOLS REQUIRED: 5/16" NUT DRIVER, 1/4" NUT DRIVER
- 1.3 SHUT DOWN UNIT (REFER TO OPERATORS MANUAL).
- 1.4A POSITION THE CABINET MOUNTING PLATE UNDER CABINET AND BOLT (2 PLACES) THE UNIT TO THE PLATE, AS SHOWN. USE THE ORIGINAL HARDWARE REMOVED FROM THE PALLET. REPEAT FOR THE BATTERY CABINET.
- 1.4B POSITION CABINETS APPROXIMATELY INTO FINAL OPERATING POSITION WITH BATTERY TO THE RIGHT OF THE UPS UNIT AS SHOWN IN FIGURE 3
- 1.5 REMOVE THE TOP COVER OF BATTERY CABINET BY REMOVING THE (2) SCREWS LOCATED AT THE TOP REAR OF THE CABINET SHOWN IN FIGURE 1 AND RETAIN THE SCREWS. PULL THE TOP COVER TOWARD THE REAR OF THE UNIT TO RELEASE COVER LATCH AND LIFT THE COVER OFF OF THE CABINET.



UPS COVER LATCH
CLOSE (STEP 1.6) OPEN (STEP 1.6)

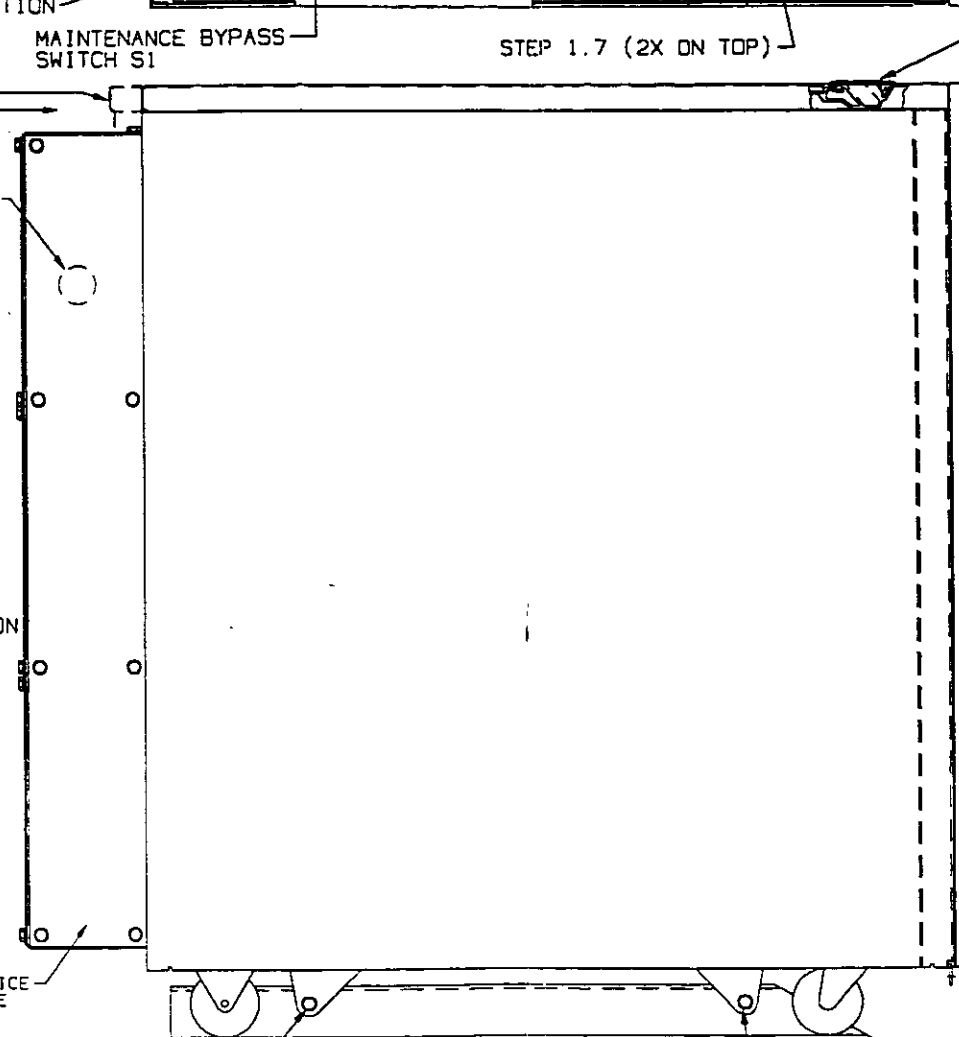


FIGURE 2

- 1.6 OPEN THE TOP COVER OF THE UPS CABINET BY SLIDING THE COVER LATCH FORWARD AS SHOWN IN FIGURE 2.
- 1.7 REMOVE THE RIGHT SIDE COVER OF THE UPS CABINET BY REMOVING THE (4 EACH) MOUNTING SCREWS AS SHOWN ABOVE IN FIGURES 1.4. PULL THE SIDE COVER OUT FROM THE TOP AND THEN DOWN TO DETACH IT FROM THE SYSTEM. RETAIN THE SIDE COVER AND MOUNTING HARDWARE.
- 1.8 REFER TO SHEET 2 FOR BATTERY INTERCONNECT INSTRUCTIONS.
- 1.9 JOIN THE CABINETS TOGETHER IN 4 PLACES AS SHOWN IN FIGURES 1.3 AND 5 USING THE HARDWARE PROVIDED IN THE JOINING KIT.
- 1.10 MOUNT THE SIDE COVER REMOVED FROM UPS CABINET IN STEP 1.7 USING THE ORIGINAL HARDWARE ON TO THE RIGHT HAND SIDE OF THE BATTERY CABINET.
- 1.11 REMOUNT THE TOP COVER OF THE BATTERY CABINET BY OFF-SETTING THE COVER TOWARD THE BACK THEN PUSHING IT FRONTWARD SO THAT COVER LATCH ENGAGES WITH FRAME TOP. SECURE THE COVER USING THE HARDWARE RETAINED. CLOSE THE TOP COVER OF THE UPS UNIT.
- 1.12 REPEAT THE INITIAL STARTUP PER THE INSTRUCTIONS IN THE OPERATORS MANUAL.

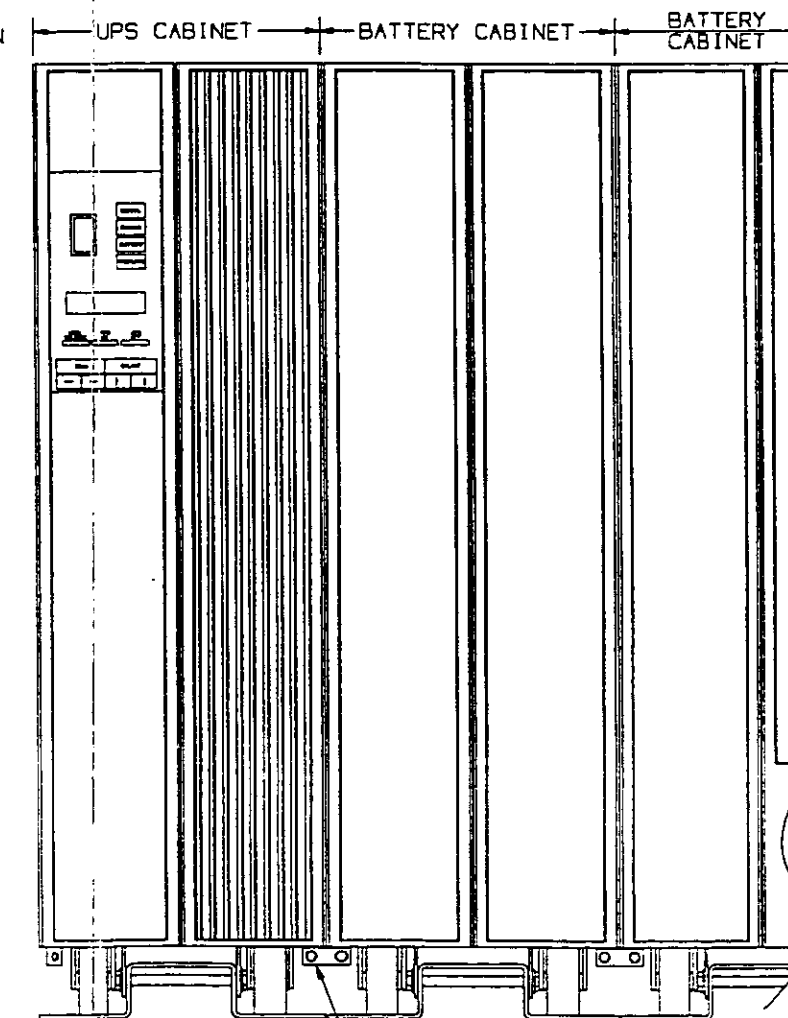
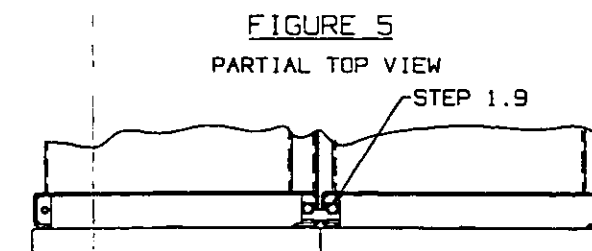


FIGURE 3

CAUTION: THE CRITICAL LOAD IS DEENERGIZED DURING THIS INSTALLATION PROCEDURE. SHUT YOUR LOAD DOWN IN AN ORDERLY FASHION BEFORE PERFORMING ANY STEPS.

DANGER: LETHAL VOLTAGE WILL BE PRESENT: USE CAUTION.

-SAVE THESE INSTRUCTIONS-

DESCRIPTION: BATTERY INSTALLATION AND JOINING 10KVA			
CREATED BY: SKREPCINSKI	DATE: 21-OCT-1993	FIRST USED ON: 10KVA	SCALE: 1/1
DESIGNED BY: MASTY, J	DATE: 10-JAN-1992	CATEGORY: CUSTOMER	REVISION: 1/1
RESPONSIBLE ENGINEER: CLARK, R	SECURITY CLASS: GENERAL	REVISION: 1/1	DATE APPR: 10-JAN-1992
LAST MODIFIED BY: SKREPCINSKI	DATE: 09-JAN-1992	VERSION: 10	SIZE: D
DRAWING NO: 110719062		SHEET: 1 OF 2	

THE BATTERY IS TO BE INSTALLED BY QUALIFIED SERVICE PERSONNEL ONLY.

CAUTION: THE UPS CONTAINS ITS OWN ENERGY SOURCE (BATTERY). THE OUTPUT RECEPTACLES MAY HAVE VOLTAGE EVEN WHEN THE UPS IS NOT CONNECTED TO AN AC SUPPLY.

CAUTION: THE CRITICAL LOAD IS DEENERGIZED DURING THIS INSTALLATION PROCEDURE. SHUT YOUR LOAD DOWN IN AN ORDERLY FASHION BEFORE PERFORMING ANY OF THE FOLLOWING STEPS.

DANGER: LETHAL VOLTAGE WILL BE PRESENT; USE CAUTION.

BATTERY AND UPS CABINET INTERCONNECTION

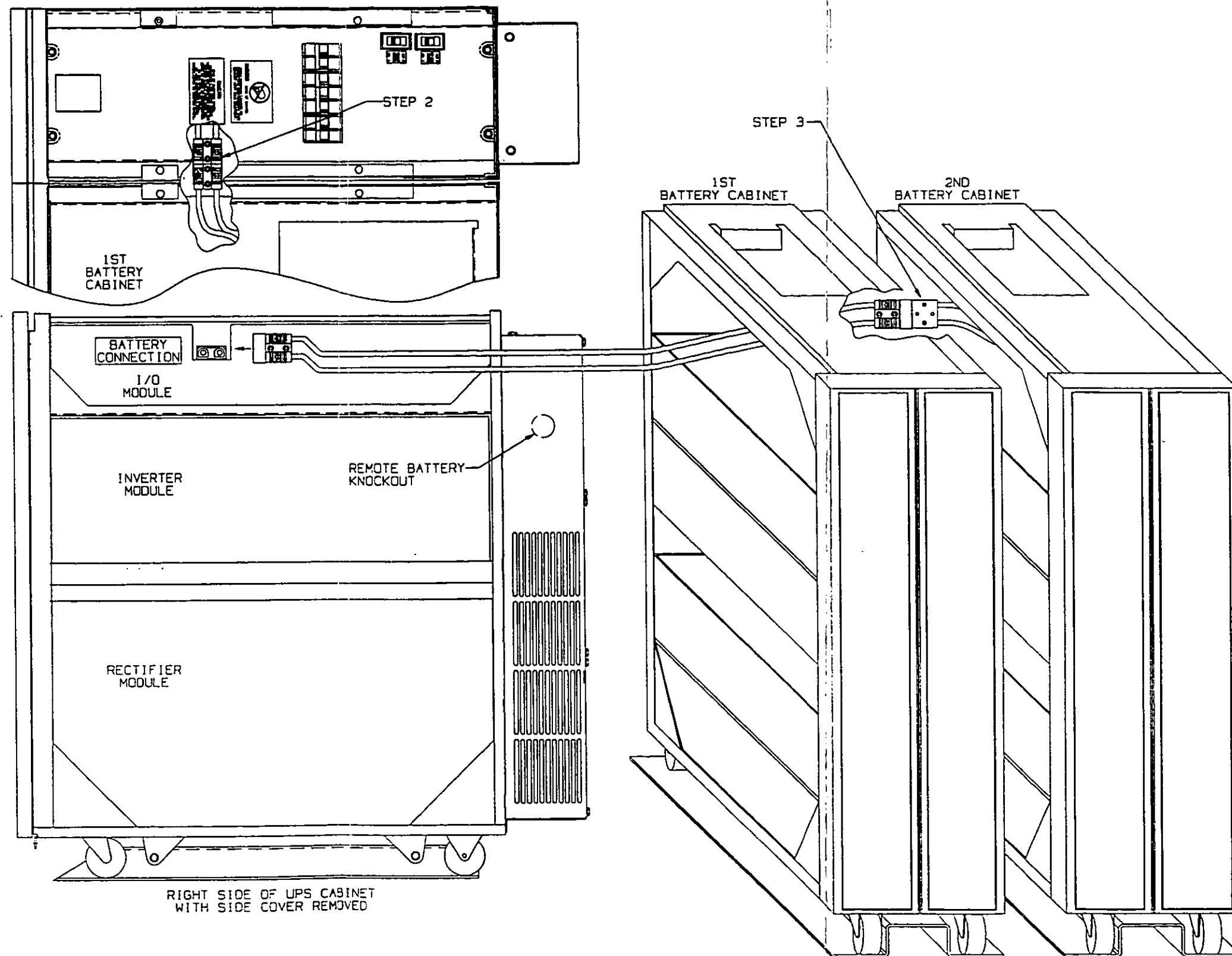
1. FIND THE TWO BATTERY INTERCONNECT CABLES SECURED TO THE TOP OF THE BATTERY TRAY. SELECT EITHER ONE OF THE CABLES. CUT THE RETAINING STRAP. IF A SECOND BATTERY CABINET IS TO BE CONNECTED, CUT THE OTHER RETAINING STRAP.

TO CONNECT THE UPS CABINET AND FIRST BATTERY CABINET:

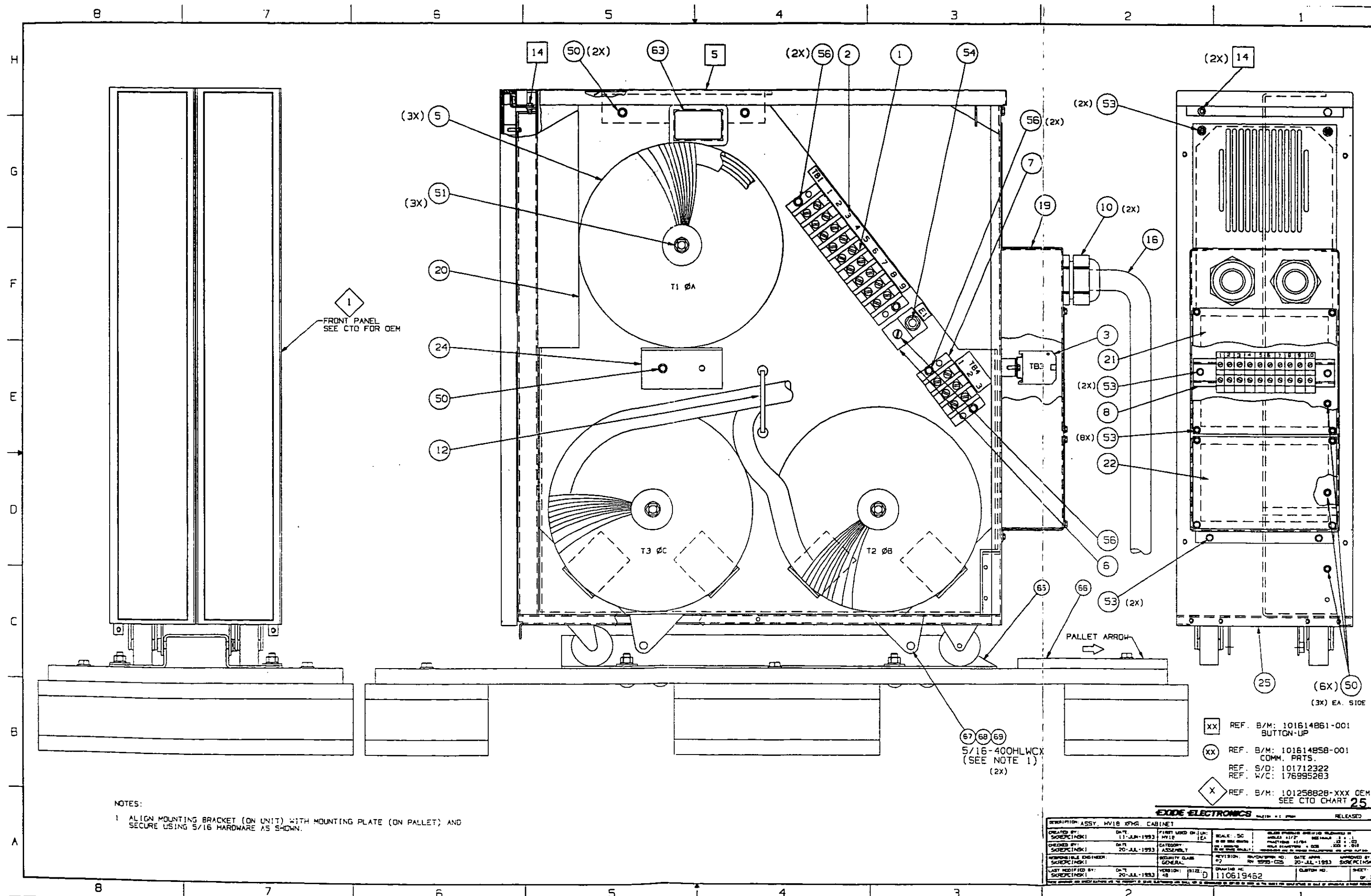
2. CONNECT BATTERY TO THE UPS UNIT THRU THE TOP CUTOUT IN THE BATTERY CABINET. MATE THE CONNECTOR WITH THE MATING HALF LOCATED IN THE I/O AS SHOWN. IF CABINETS ARE NOT PERMANENTLY MOUNTED TO THE FLOOR, THEY MAY BE SLID APART TO MAKE CONNECTION.

TO CONNECT A SECOND BATTERY CABINET:

3. SELECT EITHER ONE OF THE TWO INTERCONNECT CABLES LOCATED IN THE SECOND BATTERY CABINET, CUT AND REMOVE THE RETAINING STRAP. CONNECT TO MATING CONNECTOR IN THE FIRST BATTERY CABINET.



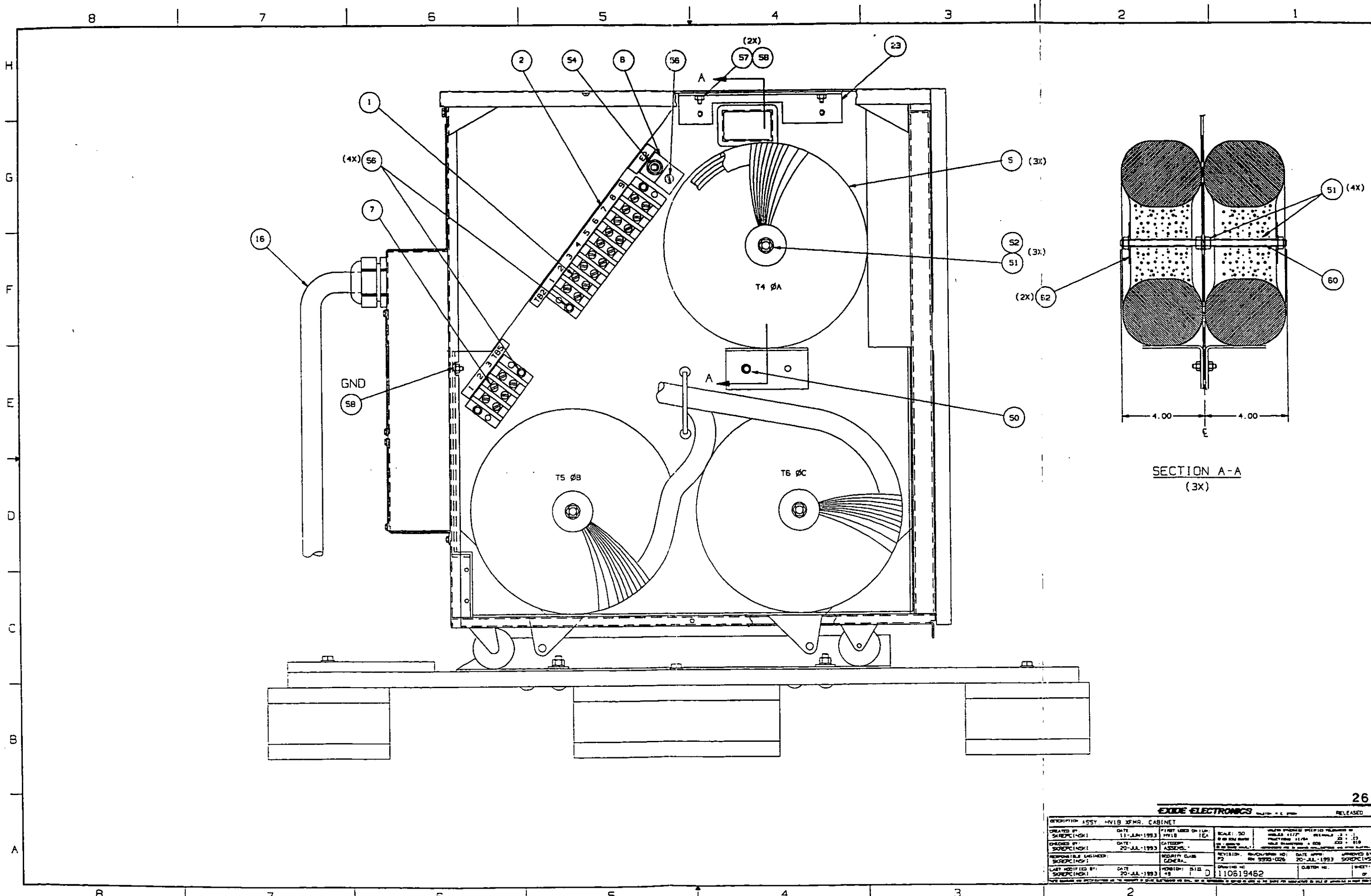
DESCRIPTION: BATTERY INSTALLATION AND JOINING 18KVA			
CREATED BY: SONOCHENI	DATE: 21-OCT-1991	FIRST USED ON: A5118	SCALE: 1/1
CHECKED BY: HARDY, J.	DATE: 10-JAN-1992	CATEGORY: CUSTOMER	REVISION: CH 021-0025
RESPONSIBLE ENGINEER: CLARK, R.	DATE: 09-JAN-1992	REVISION: CH 021-0025	DATE: 10-JAN-1992
LAST MODIFIED BY: SONOCHENI	DATE: 09-JAN-1992	REVISION: CH 021-0025	DATE: 10-JAN-1992
DRAWING NO: 110719052		SHEET: 2	



NOTES:
1 ALIGN MOUNTING BRACKET (ON UNIT) WITH MOUNTING PLATE (ON PALLET) AND SECURE USING 5/16 HARDWARE AS SHOWN.

- XX REF. B/M: 101614861-001
BUTTON-UP
- XX REF. B/M: 101614858-001
COMM. PRTS.
- REF. S/D: 101712322
- REF. W/C: 176995283
- X REF. B/M: 101258828-XXX OEM
SEE CTO CHART 25

EXIDE ELECTRONICS			
DESCRIPTION: ASSY. MV18 XPRG. CABINET	DATE: 11-JUN-1993	REV: 1	REV: 1
CREATED BY: SKEPCHINSKI	DATE: 11-JUN-1993	REV: 1	REV: 1
CHANGED BY: SKEPCHINSKI	DATE: 20-JUL-1993	REV: 2	REV: 2
RESPONSIBLE ENGINEER: SKEPCHINSKI	DATE: 20-JUL-1993	REV: 2	REV: 2
LAST MODIFIED BY: SKEPCHINSKI	DATE: 20-JUL-1993	REV: 2	REV: 2
DESIGNED BY: SKEPCHINSKI	DATE: 11-JUN-1993	REV: 1	REV: 1
CHANGED BY: SKEPCHINSKI	DATE: 20-JUL-1993	REV: 2	REV: 2
RESPONSIBLE ENGINEER: SKEPCHINSKI	DATE: 20-JUL-1993	REV: 2	REV: 2
LAST MODIFIED BY: SKEPCHINSKI	DATE: 20-JUL-1993	REV: 2	REV: 2



EXIDE ELECTRONICS									
DESCRIPTION: ASSY. HV18 XPR. CABINET									
CREATED BY: SKREPCINSKI	DATE: 11-JUN-1993	FIRST USED ON LHM: HV18	SCALE: 30	VALVE SYMBOLS SPECIFIED RELAYED BY: HALL 11/77 RELEASE 12-1-93 FUNCTION: 11/94 HALL 11/94 RELEASE 12-1-93 HALL 11/94 RELEASE 12-1-93					
CHECKED BY: SKREPCINSKI	DATE: 20-JUL-1993	CATEGORY: ASSEMBLY	REVISION: P2	REVISION: P2	REVISION: P2	REVISION: P2	REVISION: P2	REVISION: P2	REVISION: P2
RESPONSIBLE ENGINEER: SKREPCINSKI	DATE: 20-JUL-1993	REVISION: P2	REVISION: P2	REVISION: P2	REVISION: P2	REVISION: P2	REVISION: P2	REVISION: P2	REVISION: P2
LAST MODIFIED BY: SKREPCINSKI	DATE: 20-JUL-1993	REVISION: P2	REVISION: P2	REVISION: P2	REVISION: P2	REVISION: P2	REVISION: P2	REVISION: P2	REVISION: P2
DRAWING NO. 110619462									
SHEET 2 OF 2									

DANGER:
DANGEROUS VOLTAGES WHICH CAN CAUSE SERIOUS INJURY
OR BE FATAL EXIST WHENEVER POWER IS ON OR HAS
BEEN APPLIED TO THE UPS. BE SURE TO
READ ALL WARNINGS AND ALL PROCEDURES PRIOR TO DOING ANY WIRING,
TROUBLESHOOTING OR ANY OTHER WORK ON THE EQUIPMENT.

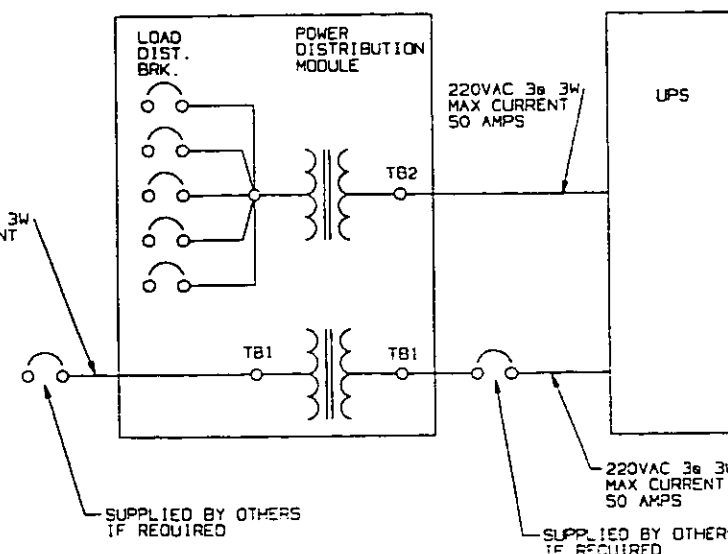
NOTES:

1. DIMENSIONS ARE IN INCHES(MILLIMETERS).
2. VENTILATION:
INPUT/OUTPUT CABINET: IN BOTTOM FRONT, OUT TOP REAR.
3. DO NOT TILT CABINET MORE THAN 10 DEGREES MAX.
4. ALLOW 24" MINIMUM IN FRONT OF ALL CABINETS FOR SERVICING.
DO NOT USE TOP OF CABINET FOR STORAGE.
5. TOTAL CABINET WEIGHT: 820 LB (372 KG).
6. MATERIAL AND LABOR FOR EXTERNAL WIRING TO BE PROVIDED BY OTHERS.
7. REFER TO NEC AND LOCAL CODES FOR ACCEPTABLE EXTERNAL WIRING PRACTICES.
8. REFER TO TABLE 1 & 2 FOR TERMINAL SIZES.
9. SHOULD BE INSTALLED IN CLOSE PROXIMITY TO UPS.
10. USE COPPER, STRANDED WIRING.
11. ALL WIRING TO BE 75°C.

TABLE 1			
TERMINATION	FUNCTION	MIN WIRE SIZE	TORQUE
TB1-1	UTILITY INPUT #A	#8	17.76 lbs-in
TB1-2	UTILITY INPUT #B	#8	17.76 lbs-in
TB1-3	UTILITY INPUT #C	#8	17.76 lbs-in
TB1-4	INPUT TO UPS #A	#8	17.76 lbs-in
TB1-5	INPUT TO UPS #B	#8	17.76 lbs-in
TB1-6	INPUT TO UPS #C	#8	17.76 lbs-in
TB2-1	OUTPUT OF UPS #A	#8	17.76 lbs-in
TB2-2	OUTPUT OF UPS #B	#8	17.76 lbs-in
TB2-3	OUTPUT OF UPS #C	#8	17.76 lbs-in

TABLE 2			
TERMINATION	FUNCTION	MIN WIRE SIZE	TORQUE
E1-E9	LOAD DISTRIBUTION BREAKERS	#8	10.6-12.3 lbs-in
E10-E14	NEUTRAL	#8	10.6-12.3 lbs-in

REAR VIEW



31

EXIDE ELECTRONICS RELEASED

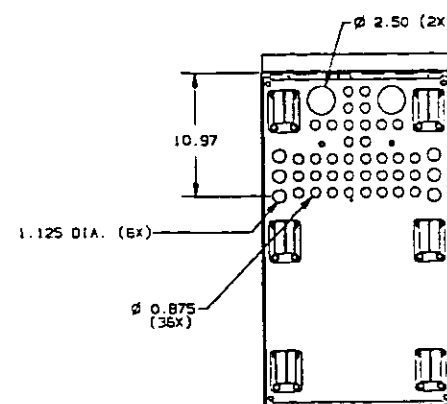
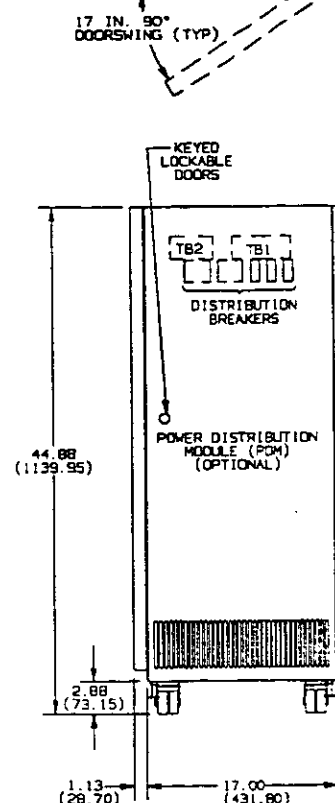
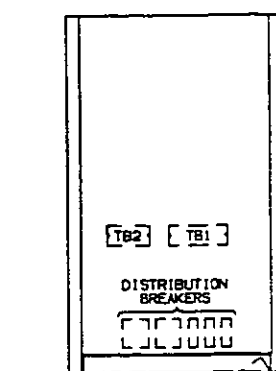
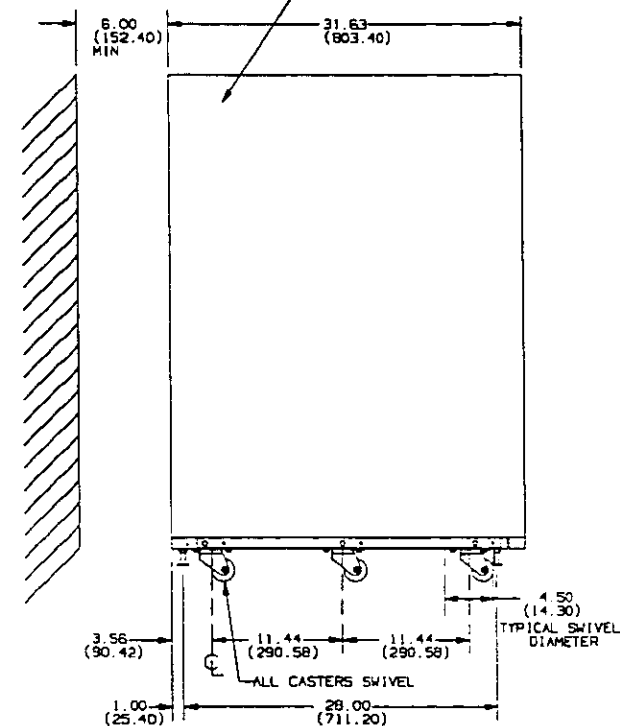
DESCRIPTION: OUTLINE/ONLINE, PDM			
CREATED BY: LYNDA V	DATE: 05-JUN-1992	FIRST USED ON: I.P. SIEMENS PW 1EA	SCALE: 1/8"
DESIGNED BY: NATLOR, T	DATE: 23-SEP-1992	CATEGORY: OUTLINE	REVISION: 1/1/94
RESPONSIBLE ENGINEER: NATLOR, T	DATE: 23-SEP-1992	SECURITY CLASS: GENERAL	REVISION: 1/1/94
LAST MODIFIED BY: LYNDA V	DATE: 23-SEP-1992	VERSION: 15.02	DRAWING NO: 110719025
		DATE APPROVED: 23-SEP-1992	APPROVED BY: NATLOR, T
		DATE: 11/1/95	151965

INSTALLATION INSTRUCTIONS

■ LICENSED ELECTRICIAN OR TRAINED PERSONNEL ONLY.

1. UNPACK UNIT AND REMOVE FROM PALLET.
2. MOVE UNIT INTO PLACE AND LOWER LEVELING FEET.
3. OPEN DOOR. REMOVE TOP AND DEAD FRONT.
4. KNOCKOUTS PROVIDED IN BASE OF UNIT.
5. TROUGH FOR CUSTOMER WIRING PROVIDED ON LEFT SIDE OF UNIT.
6. REFER TO TABLES FOR WIRE PLACEMENT, SIZES, AND TIGHTENING TORQUES.
7. NEUTRAL CONNECTIONS FOR OUTPUT LOCATED ON DIN RAIL (E10-E14).

REQUIRED CLEARANCE FROM
WALL FOR VENTILATION.
(SEE NOTE 2)

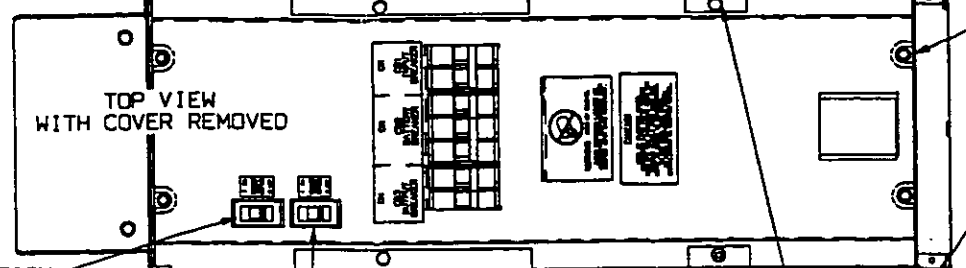


THE BATTERY AND INPUT/OUTPUT CABINETS ARE TO BE INSTALLED BY QUALIFIED SERVICE PERSONNEL ONLY.

CAUTION: THE UPS CONTAINS ITS OWN ENERGY SOURCE (BATTERY). THE OUTPUT TERMINALS MAY HAVE VOLTAGE EVEN WHEN THE UPS IS NOT CONNECTED TO AN AC SUPPLY.

CAUTION: REMOTE BATTERY TERMINALS (8, 9) HAVE VOLTAGE WHEN THE BATTERY CABINET IS CONNECTED TO THE UPS.

FIGURE 4



INPUT/OUTPUT AND BATTERY CABINET LATCH (STEP 1.11)

STEP 1.8 (6X)

FIGURE 5

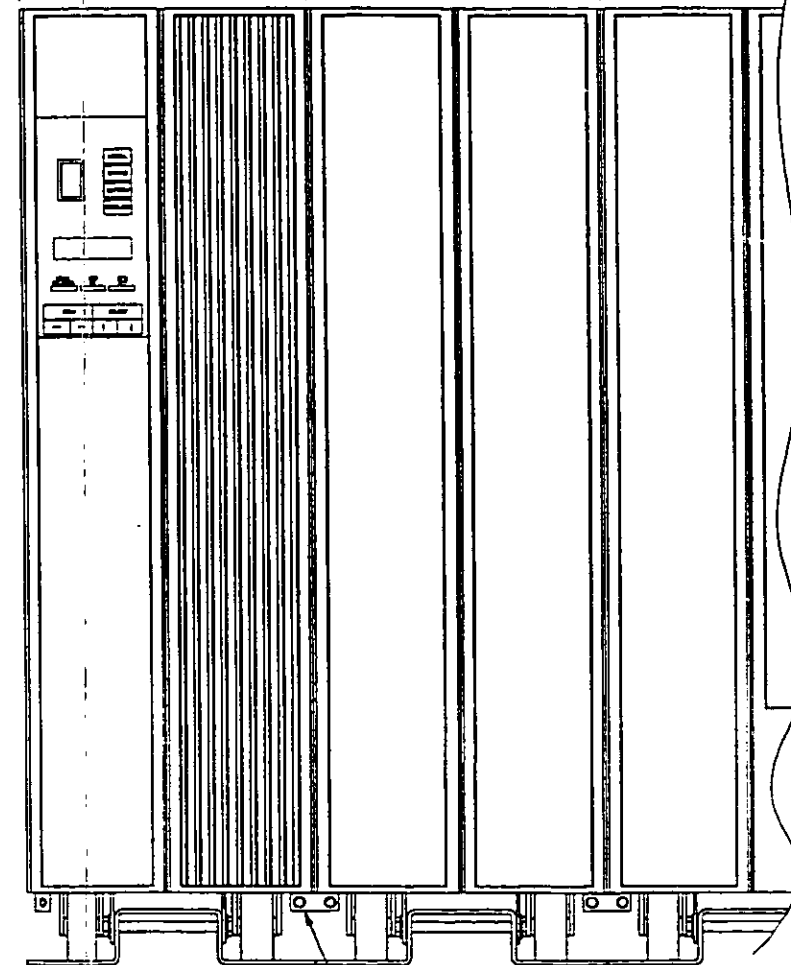
PARTIAL TOP VIEW

STEP 1.9

UPS COVER LATCH

CLOSE OPEN (STEP 1.6)

UPS CABINET INPUT/OUTPUT CABINET BATTERY CABINET



STEP 1.9

FIGURE 3

CAUTION: THE CRITICAL LOAD IS DEENERGIZED DURING THIS INSTALLATION PROCEDURE. SHUT YOUR LOAD DOWN IN AN ORDERLY FASHION BEFORE PERFORMING ANY STEPS.

DANGER: LETHAL VOLTAGE WILL BE PRESENT: USE CAUTION.

-SAVE THESE INSTRUCTIONS-

38

DESCRIPTION ONE LINE: INPUT/OUTPUT CABINET, BATTERY INSTLL. AND JOINING			
CREATED BY: SUREPC/MSK	DATE: 14-JUL-1993	FIRST USED ON: 1001	SCALE: NONE
DESIGNED BY: SUREPC/MSK	DATE: 14-JUL-1993	CATEGORY: CUSTOMER	REVISION: 1
RESPONSIBLE ENGINEER: SUREPC/MSK	DATE: 14-JUL-1993	SECURITY CLASS: GENERAL	REVISION: 1
LAST MODIFIED BY: SUREPC/MSK	DATE: 14-SEP-1993	POSITION: 1	110719175
DRAWING NO. 110719175		SHEET: 2 OF 5	

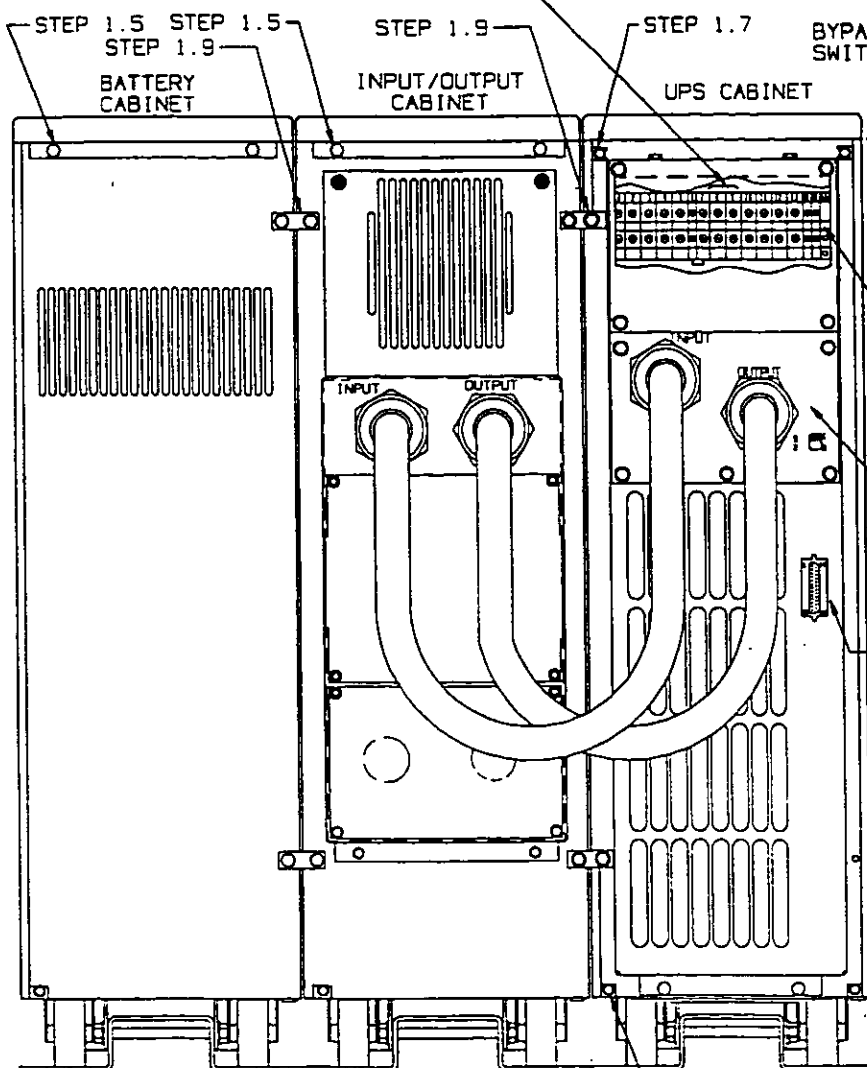


FIGURE 1

STEP 1.7

BYPASS CONFIGURATION SWITCH S3

MAINTENANCE BYPASS SWITCH S1

STEP 1.7 (2X ON TOP)

STEPS 1.5 & 1.11

POWER CABLE TERMINATION BLOCK

REMOVABLE CONDUIT PLATE

COMMUNICATION PORT

SERVICE PLATE

STEP 1.4A

CABINET MOUNTING PLATE

FIGURE 2

STEP 1.4A

CABINET MOUNTING PLATE

1. CABINET JOINING INSTRUCTIONS

1.0 READ ALL CAUTION AND DANGER NOTES BEFORE BEGINNING THIS PROCEDURE.

1.1 REMOVE JOINING KIT HARDWARE BAGS FROM THE BACK OF THE EACH CABINETS TO BE JOINED. HARDWARE KIT SHOULD CONTAIN THE FOLLOWING:

- (4) JOINING BRACKETS (ONE NOTCHED)
- (8) #10-32 X .50 LG. HEX HEAD SCREWS

1.2 TOOLS REQUIRED: 5/16" NUT DRIVER
1/4" NUT DRIVER

1.3 IF OUTPUT VOLTAGE CONFIGURATION CHANGE IS REQUIRED, RE-CONFIGURATION SHOULD BE DONE BEFORE JOINING CABINETS TOGETHER (SEE SHEET 3).

1.4A POSITION THE CABINET MOUNTING PLATE UNDER EACH CABINET AND BOLT (2 PLACES) THE UNIT TO THE PLATE, AS SHOWN. USE THE ORIGINAL HARDWARE REMOVED FROM THE PALLET. REPEAT FOR EACH ADDITIONAL CABINET.

1.4B POSITION CABINETS APPROXIMATELY INTO FINAL OPERATING POSITION WITH BATTERY TO THE RIGHT OF THE UPS AND INPUT/OUTPUT CABINET AS SHOWN IN FIGURE 3.

1.5 REMOVE THE TOP COVERS FROM THE BATTERY AND INPUT/OUTPUT CABINETS BY REMOVING THE (2) SCREWS LOCATED AT THE TOP REAR OF EACH CABINET SHOWN IN FIGURE 1 AND RETAIN THE SCREWS. PULL THE TOP COVER TOWARD THE REAR OF THE UNIT TO RELEASE COVER LATCH AND LIFT THE COVER OFF OF THE CABINET.

1.6 OPEN THE TOP COVER OF THE UPS CABINET BY SLIDING THE COVER LATCH FORWARD AS SHOWN IN FIGURE 2.

1.7 REMOVE THE RIGHT SIDE COVER OF THE UPS CABINET BY REMOVING THE (4 EACH) MOUNTING SCREWS AS SHOWN ABOVE IN FIGURES 1 & 4. PULL THE SIDE COVER OUT FROM THE TOP AND THEN DOWN TO DETACH IT FROM THE SYSTEM. RETAIN THE SIDE COVER AND MOUNTING HARDWARE.

1.8 REFER TO SHEET 3 FOR BATTERY INTERCONNECT INSTRUCTIONS.

1.9 JOIN THE CABINETS TOGETHER IN 4 PLACES AS SHOWN IN FIGURES 1, 3 AND 5 USING THE HARDWARE PROVIDED IN THE JOINING KIT. REPEAT FOR EACH CABINET.

1.10 MOUNT THE SIDE COVER REMOVED FROM UPS CABINET IN STEP 1.7 USING THE ORIGINAL HARDWARE ON TO THE RIGHT HAND SIDE OF THE BATTERY CABINET.

1.11 REMOUNT THE TOP COVERS OF THE BATTERY CABINET AND I/O CABINETS BY OFF-SETTING THE COVER TOWARD THE BACK THEN PUSHING IT FORWARD SO THAT COVER LATCH ENGAGES WITH FRAME TOP. SECURE THE COVER USING THE HARDWARE RETAINED. CLOSE THE TOP COVER OF THE UPS UNIT.

1.12 REFER TO SHEETS 4 AND 5 FOR INSTRUCTIONS ON HOW TO WIRE THE INPUT AND OUTPUT CONNECTIONS.

THE BATTERY AND INPUT/OUTPUT CABINETS ARE TO BE INSTALLED BY QUALIFIED SERVICE PERSONNEL ONLY.

INPUT/OUTPUT CONFIGURATION SET-UP

TO CHANGE TO A VOLTAGE OTHER THAN WHAT YOUR UNIT HAS BEEN FACTORY SET TO, REFER TO TABLE 1 BELOW FOR THE TERMINAL STRIP TB1 AND TB2 CONNECTIONS.

CAUTION: FAILURE TO COMPLETE VOLTAGE CONFIGURATION COULD RESULT IN AN UNBALANCED OUTPUT LOAD.

TB1/TB2.

1	2	3	4	5	6	7	8	9
0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0

TABLE 1

POSITION	VOLTAGE	PHASE
1 YELLOW	415/240V	ØA
2 ORANGE	400/230V	ØA
3 RED	380/220V	ØA
4 YELLOW	415/240V	ØB
5 ORANGE	400/230V	ØB
6 RED	380/220V	ØB
7 YELLOW	415/240V	ØC
8 ORANGE	400/230V	ØC
9 RED	380/220V	ØC

EXAMPLE: FOR A 415/240V CONFIGURATION, PLACE THE WIRE ALREADY ON TB1 (AND TB2) POSITION 1, 2 OR 3 ON POSITION 1. PLACE THE WIRE ALREADY ON TB1 (AND TB2) POSITION 4, 5 OR 6 ON POSITION 4. PLACE THE WIRE ALREADY ON TB1 (AND TB2) POSITION 7, 8 OR 9 ON POSITION 7. (SEE ILLUSTRATION)

BATTERY AND UPS CABINET INTERCONNECTION

DANGER: LETHAL VOLTAGE WILL BE PRESENT: USE CAUTION:

1. FIND THE TWO BATTERY INTERCONNECT CABLES SECURED TO THE TOP OF THE BATTERY TRAY. SELECT THE LONGER OF THE TWO. CUT THE RETAINING STRAP. IF A SECOND BATTERY CABINET IS TO BE CONNECTED, CUT THE OTHER RETAINING STRAP.

TO CONNECT THE UPS CABINET AND FIRST BATTERY CABINET:

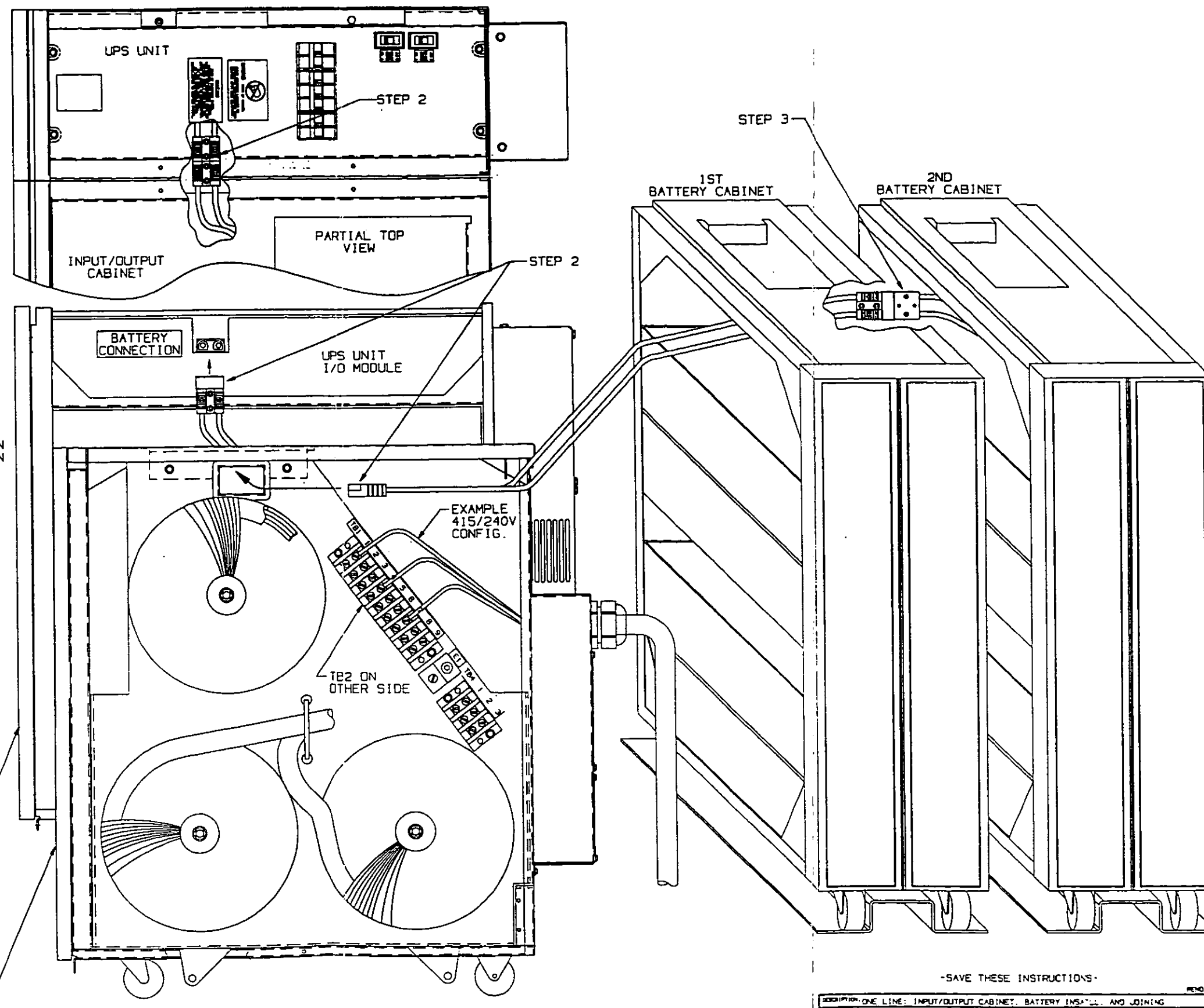
2. CONNECT BATTERY TO THE UPS UNIT THRU THE TOP OUTLET IN THE I/O CABINET. PASS CABLE THRU THE INPUT/OUTPUT CABINET AND MATE THE CONNECTOR WITH THE MATING HALF LOCATED IN THE I/O OF THE UPS CABINET AS SHOWN. IF CABINETS ARE NOT PERMANENTLY MOUNTED TO THE FLOOR, THEY MAY BE SLID APART TO MAKE CONNECTION.

TO CONNECT A SECOND BATTERY CABINET:

3. SELECT EITHER ONE OF THE TWO INTERCONNECT CABLES LOCATED IN THE SECOND BATTERY CABINET. CUT AND REMOVE THE RETAINING STRAP. CONNECT TO MATING CONNECTOR IN THE FIRST BATTERY CABINET.

CAUTION: THE UPS CONTAINS ITS OWN ENERGY SOURCE (BATTERY). THE OUTPUT RECEPTACLES MAY HAVE VOLTAGE EVEN WHEN THE UPS IS NOT CONNECTED TO AN AC SUPPLY.

CAUTION: THE CRITICAL LOAD IS DEENERGIZED DURING THIS INSTALLATION PROCEDURE. SHUT YOUR LOAD DOWN IN AN ORDERLY FASHION BEFORE PERFORMING ANY OF THE FOLLOWING STEPS.



-SAVE THESE INSTRUCTIONS-

39

DESCRIPTION: ONE LINE: INPUT/OUTPUT CABINET, BATTERY INSTALLATION AND JOINING		PENDING	
CREATED BY: SUREPCHSKI	DATE: 14-JUL-1993	FILE: 1001	SCALE: NONE
CHECKED BY:	DATE:	CATEGORY: CUSTOMER	REVISION: 01
RESPONSIBLE ENGINEER: NATS, C	DATE:	SECURITY CLASS: GENERAL	REVISION: 01
LAST MODIFIED BY: SUREPCHSKI	DATE: 14-SEP-1993	VERSION: 01	SIZE: 110715:75
NOTES: 1. THE BATTERY CABINETS ARE TO BE INSTALLED BY QUALIFIED SERVICE PERSONNEL ONLY. 2. THE BATTERY CABINETS ARE TO BE INSTALLED BY QUALIFIED SERVICE PERSONNEL ONLY.		DRAWING NO: 110715:75	

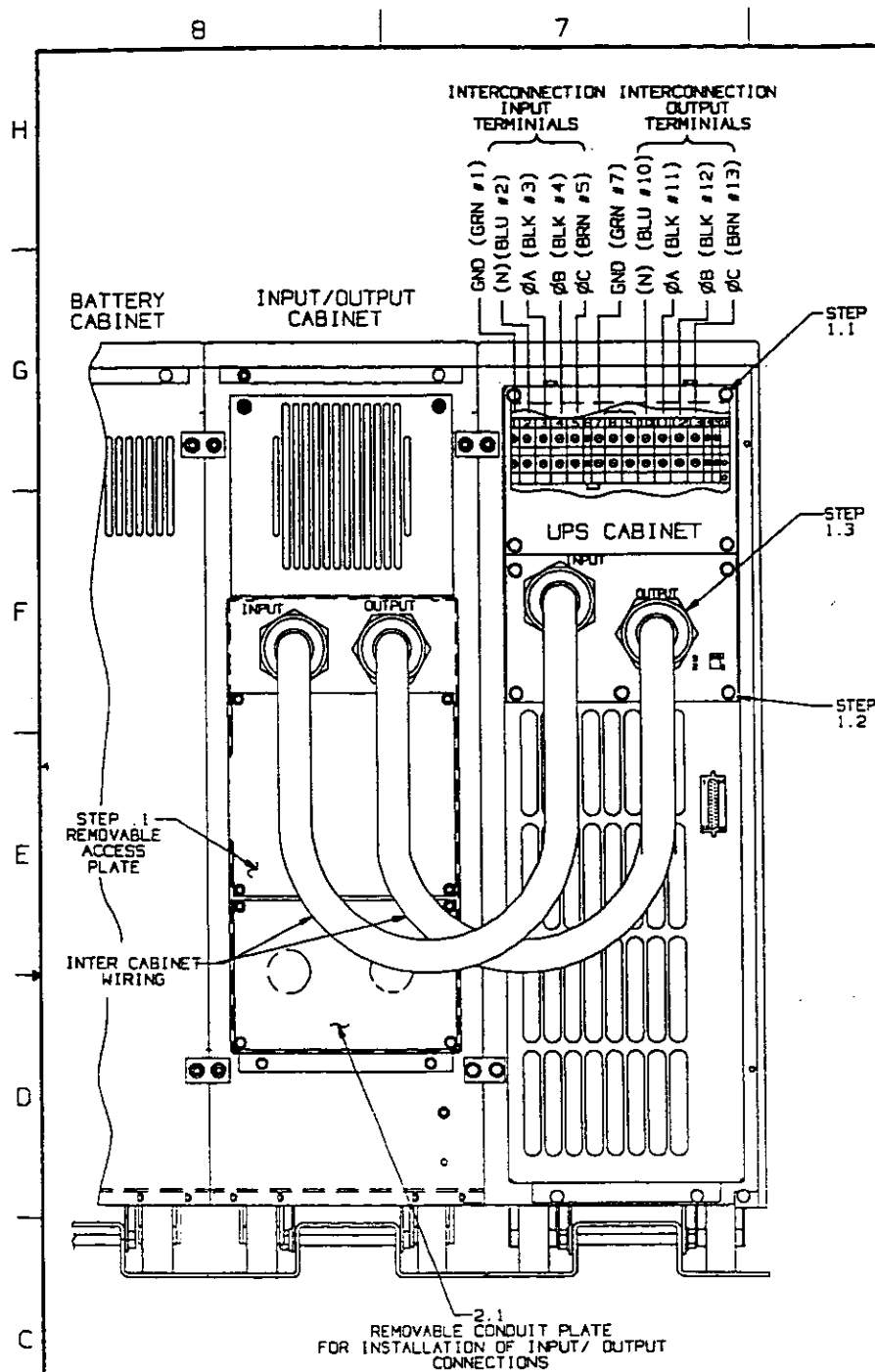


FIGURE 2

CAUTION
REMOTE BATTERY TERMINALS (8, 9) HAVE VOLTAGE WHEN THE BATTERY CABINET IS CONNECTED TO THE UPS.

INPUT/OUTPUT IS TO BE INSTALLED BY QUALIFIED SERVICE PERSONNEL ONLY

INPUT/OUTPUT CABINET WIRING PREPARATION

- BEFORE MAKING ELECTRICAL INTERCONNECTIONS: BATTERY CONNECTIONS, INPUT/OUTPUT VOLTAGE AND CABINET JOINING PROCEDURES MUST BE COMPLETED. SEE SHEET 2.
- OPEN THE TOP OF THE UPS CABINET AND PLACE ALL OF THE BREAKERS (CB1, CB2, CB3) IN THE "OFF" POSITION.

INPUT/OUTPUT CABINET TO UPS CABINET WIRING INSTRUCTIONS

- REMOVE THE TERMINAL BLOCK ACCESS PLATE ON THE UPS BY REMOVING (4) SCREWS AND RETAIN.
- REMOVE THE UPS CONDUIT PLATE BY REMOVING (4) SCREWS, RETAIN SCREWS. DISCARD PLATE AND REPLACE WITH PLATE SUPPLIED WITH KIT.
- ATTACH THE STRAIN RELIEF CONNECTED TO THE END OF EACH CABLE TO THE CONDUIT MOUNTING PLATE, BY REMOVING THE NUT AND PLACING IT ON THE BACK SIDE OF THE CONDUIT MOUNTING PLATE AND SECURING TIGHTLY. TO INSURE PROPER STRAIN RELIEF OF THE CABLE, DO NOT LOOSEN OR REMOVE THE STRAIN RELIEF CLAMP FROM THE CABLE DURING INSTALLATION. CONNECT WIRES FROM THE I/O TO THE UPS OUTPUT TERMINAL BLOCK AS SHOWN IN FIGURE 2. SEE LABEL ON INSIDE OF THE UPS FOR TERMINAL BLOCK TORQUE REQUIREMENTS. ATTACH CONDUIT PLATE TO UPS USING SCREWS RETAINED IN STEP 1.2. RE-ATTACH TERMINAL BLOCK ACCESS PLATE.

INPUT AND LOAD WIRE CONNECTION

- REMOVE THE INPUT/OUTPUT ACCESS PLATE AND CONNECT CONDUIT WIRING TO THE TERMINAL BLOCK PER PHASE DIAGRAM FOR UPS OUTPUT (SEE SHEET 5). USE CONDUIT MOUNTING PLATE FOR CONDUIT LANDING. RE-ATTACH THE ACCESS PLATE AFTER WIRING HAS BEEN COMPLETED. USE ONLY 16mm² AWG 75° COPPER WIRE. REFER TO TABLE 2 ON SHEET 5 FOR TERMINAL BLOCK TORQUE REQUIREMENTS. REPEAT THE INITIAL STARTUP PER THE INSTRUCTIONS IN THE OPERATORS MANUAL.

VOLTAGE METERING SETUP INSTRUCTIONS

- THE SYSTEM SHOULD BE SET TO METER THE CORRECT INPUT AND OUTPUT VOLTAGE WHEN YOU RECEIVE IT. IF THE VOLTAGE METERING INDICATES 208 VAC OR IF YOU HAVE RECONFIGURED THE INPUT/OUTPUT CABINET TO A DIFFERENT VOLTAGE CONTACT YOUR DISTRIBUTOR, AGENT OR THE FACTORY FOR INSTRUCTIONS ON HOW TO RECONFIGURE THE METER SCREEN. THE "SERVICE" PASSWORD IS REQUIRED TO RECONFIGURE THE METER SCREEN.

NOTE:
THE UPS SYSTEM WILL OPERATE CORRECTLY EVEN IF THE METERING READS INCORRECTLY.

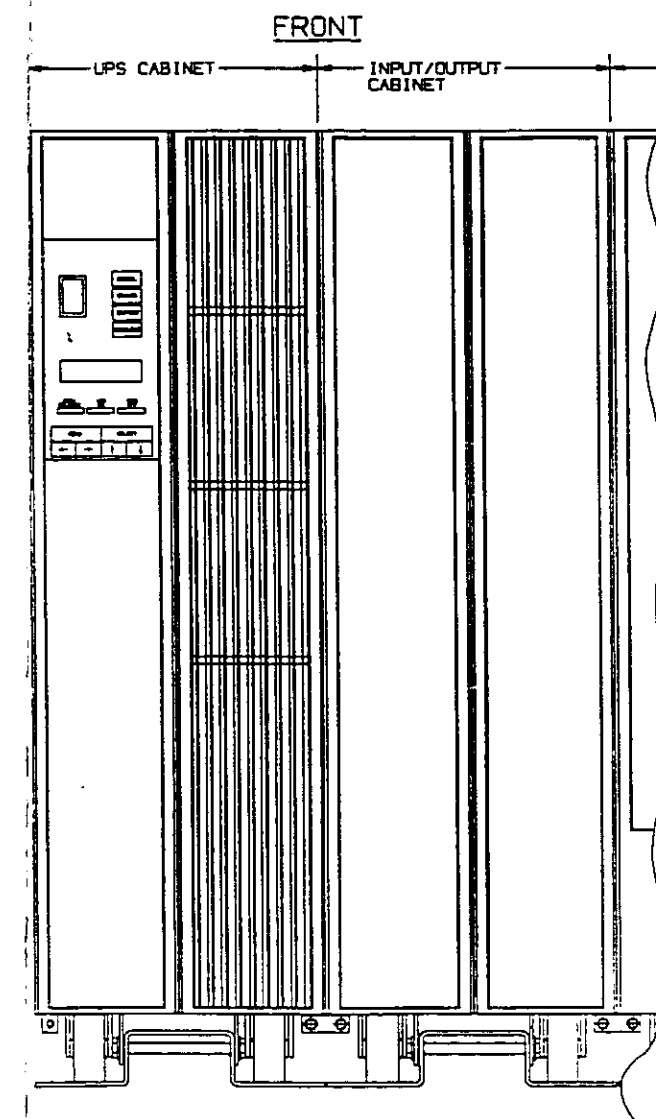


FIGURE 1

-SAVE THESE INSTRUCTIONS-

40

DESCRIPTION ONE LINE: INPUT/OUTPUT CABINET, BATTERY INSTLL. AND JOINING			
CREATED BY: SUREPC/MSK1	DATE: 14-JUL-1993	FIRST USED ON: UP: EA	SCALE: NONE
DESIGNED BY:	DATE:	CATEGORY: CUSTOMER	REVISION: 1.0
RESPONSIBLE ENGINEER: SUREPC/MSK1	DATE:	SECURITY CLASS: GENERAL	REVISION: 1.0
LAST MODIFIED BY: SUREPC/MSK1	DATE: 14-SEP-1993	VERSION: 43	SIZE: D
DRAWING NO: 110719175		CUSTOMER: CLIFTON KC	SHEET: 4
DRAWING NO: 110719175		CUSTOMER: CLIFTON KC	SHEET: 4

CAUTION: RISK OF ELECTRIC SHOCK.
REMOTE BATTERY TERMINALS (8,9) HAVE HIGH VOLTAGE WHEN THE BATTERY CABINET IS CONNECTED TO THE UPS.

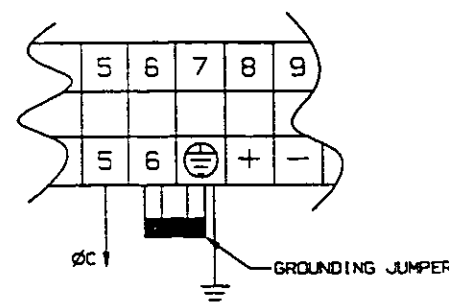


FIGURE 1

UPS CABINET TERMINAL BOARD GROUNDING JUMPER

WIRING INSTRUCTIONS:

ONLY QUALIFIED SERVICE PERSONNEL SHOULD ATTEMPT TO CONFIGURE THIS EQUIPMENT.

THE OPERATING VOLTAGE IS FACTORY SET. REFER TO SHEET 2 TO CHANGE THE OPERATING VOLTAGE.

NOTES:

- 1.0 GROUNDING
 - 1.1 AN INSULATED GROUNDING CONDUCTOR THAT IS IDENTICAL IN SIZE, INSULATION MATERIAL, AND THICKNESS TO THE GROUNDING AND UNGROUNDING BRANCH-CIRCUIT SUPPLY CONDUCTORS EXCEPT THAT IS GREEN WITH OR WITHOUT ONE OR MORE YELLOW STRIPES IS TO BE INSTALLED AS PART OF THE BRANCH CIRCUIT THAT SUPPLIES THE UNIT, AND CONNECTED TO THE TERMINAL OF THE INPUT TERMINAL BLOCK OF THE INPUT/OUTPUT CABINET.
 - 1.2 THE GROUNDING CONDUCTOR DESCRIBED ABOVE IS TO BE GROUND TO EARTH AT THE SERVICE EQUIPMENT OR, IF SUPPLIED BY A SEPARATELY DERIVED SYSTEM, AT THE SUPPLY TRANSFORMER.
 - 1.3 ANY ATTACHMENT-PLUG RECEPTACLES IN THE VICINITY OF THE UNIT OR SYSTEM ARE ALL TO BE OF A GROUNDING TYPE, AND THE GROUNDING CONDUCTORS SERVING THESE RECEPTACLES ARE TO BE CONNECTED TO EARTH GROUND AT THE SERVICE EQUIPMENT.
- 2.0 BYPASS CONFIGURATION
 - SEE DRAWING 110719046 SHEET 2, NOTE 2.
- 3.0 INPUT CONFIGURATION SWITCH
 - SEE DRAWING 110719046 SHEET 2, NOTE 3.
- 4.0 REMOTE EMERGENCY POWER OFF
 - SEE DRAWING 110719046 SHEET 2, NOTE 4.
- 5.0 NEUTRAL CONFIGURATIONS
 - 5.1 THE UPS COMES FROM THE FACTORY WITH THE OUTPUT NEUTRAL CONNECTED TO THE GROUND IN A 'TNS' CONFIGURATION. SEE FIGURE 1.
 - 5.2 IF YOU WANT TO OPERATE THE UPS IN AN 'IT' CONFIGURATION, DO THE FOLLOWING:
 - A. REMOVE THE 'GROUNDING JUMPER' FROM THE UPS TERMINAL BOARD ON THE BACK OF THE UPS CABINET (SEE FIGURE 1).
 - B. CONNECT THE UPS SYSTEM INPUT AND OUTPUT NEUTRALS TOGETHER BY A SHORTING BAR BETWEEN TERMINALS 5 AND 6 OF THE INPUT/OUTPUT CABINET CONNECTION TERMINALS (SEE SHEET 2). THE SHORTING JUMPER IS FOUND IN A BAG IN THE REAR OF THE UPS CABINET.

INPUT/OUTPUT CABINET WIRING

INPUT	OUTPUT
3Ø-400/230V	3Ø-400/230V

'IT' CONFIGURATION

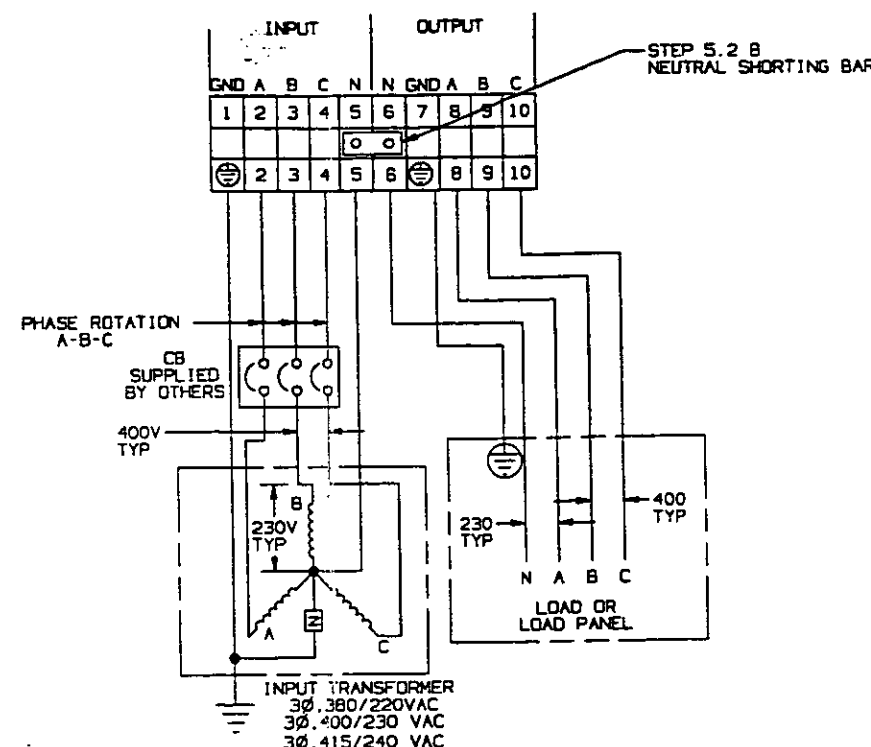


FIGURE 2

LEGEND

CB - CIRCUIT BREAKER
N - NEUTRAL
TYP - TYPICAL

INPUT/OUTPUT CABINET WIRING

INPUT	OUTPUT
3Ø-400/230V	3Ø-400/230V

'TNS' CONFIGURATION

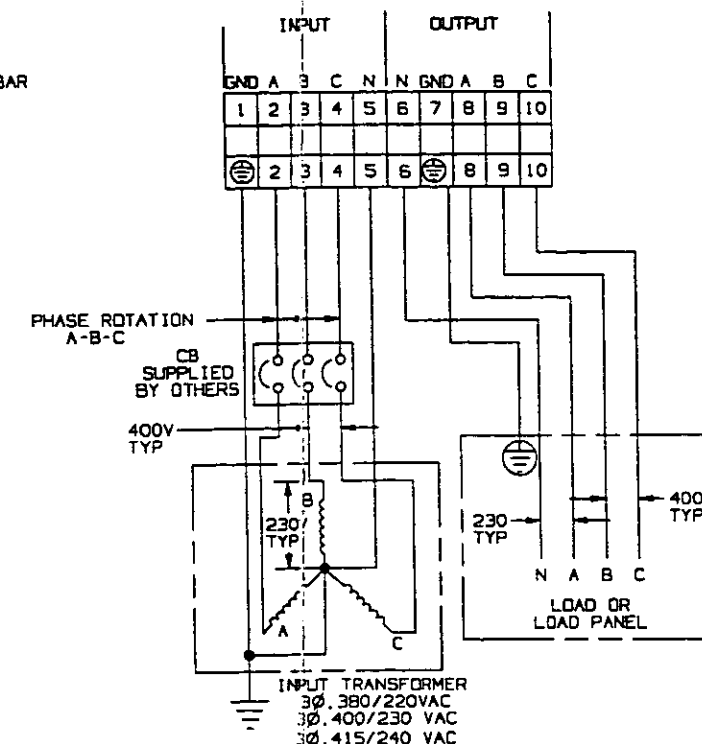


FIGURE 3

REFER TO NATIONAL AND LOCAL ELECTRICAL REGULATIONS FOR ACCEPTABLE EXTERNAL WIRING PRACTICES. TABLE 2 INDICATES INPUT/OUTPUT TERMINAL BLOCK WIRE RINGS AND REQUIRED TIGHTENING TORQUE.

TABLE 2

POWER CABLE TERMINALS ON INPUT/OUTPUT CABINET			TIGHTENING TORQUE
TERMINAL NO.	DESCRIPTION	WIRE RANGE	
1,7	GROUND	18-6AWG (0.5-10 mm ²)	10.6-12.3 lb-in (1893.16-2195.78 G/cm)
2-6, 8-10	INPUT/OUTPUT	10-4AWG (2.5-16 mm ²)	10.6-12.3 lb-in (1893.16-2195.78 G/cm)

-SAVE THESE INSTRUCTIONS-

41

DESCRIPTION: ONE LINE: INPUT/OUTPUT CABINET, BATTERY INSTALL, AND JOINING			
CREATED BY: SURECHINOKI	DATE: 14-JUL-1993	FIRST USED ON: PAPER: 1EA	SCALE: NONE
CHECKED BY:	DATE:	CATEGORY: CUSTOMER	REVISION: 02
RESPONSIBLE ENGINEER: HATSUO	SECURITY CLASS: GENERAL	REVISION: 02	DATE: 02-11-93
LAST MODIFIED BY: SURECHINOKI	DATE: 14-SEP-1993	VERSION: 1.0	SIZE: D
DRAWING NO: 110719175		CUSTOMER NO:	SHEET: 5 OF 5

CAUTION: RISK OF ELECTRIC SHOCK. DO NOT REMOVE COVERS. NO USER-SERVICEABLE PARTS INSIDE. REFER SERVICING TO TRAINED SERVICE PERSONNEL.

CAUTION: THE UPS CONTAINS ITS OWN ENERGY SOURCE (BATTERY). THE OUTPUT TERMINALS MAY HAVE VOLTAGE EVEN WHEN THE UPS IS NOT CONNECTED TO AN AC SUPPLY.

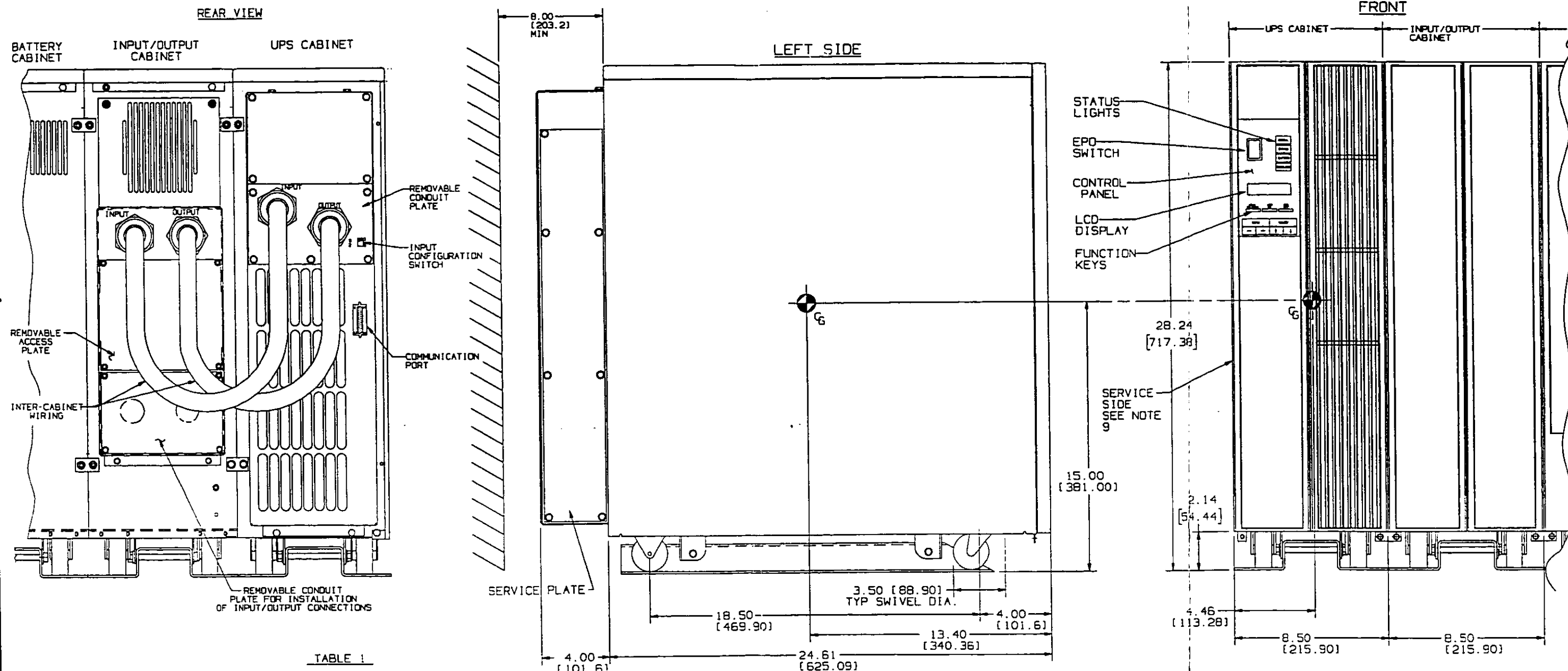


TABLE 1

EQUIPMENT WEIGHTS		MODEL 12	MODEL 15	MODEL 18
UPS CABINET		210 LB (95 KG)	210 LB (95 KG)	210 LB (95 KG)
HALF BATTERY CAB. (7AH)		165 LB (75 KG)	165 LB (75 KG)	165 LB (75 KG)
FULL BATTERY CAB. (7AH)		295 LB (134 KG)	295 LB (134 KG)	295 LB (134 KG)
FULL BATTERY CAB. (18AH)		350 LB (159 KG)	350 LB (159 KG)	350 LB (159 KG)
INPUT/OUTPUT CABINET		314 LB (142 KG)	314 LB (142 KG)	314 LB (142 KG)
HEAT DISSIPATION		5200 BTU/HR	6500 BTU/HR	7800 BTU/HR
FULL LOAD OUTPUT AT 0.8 PF		(1310 Kg-Cal/Hr)	(1537 Kg-Cal/Hr)	(1965 Kg-Cal/Hr)
FLOOR LOADING	UPS	1.73 LB/SQ. IN. (.12KG/CM ²)	1.73 LB/SQ. IN. (.12KG/CM ²)	1.73 LB/SQ. IN. (.12KG/CM ²)
	HALF BATTERY (7AH)	1.36 LB/SQ. IN. (.09KG/CM ²)	1.36 LB/SQ. IN. (.09KG/CM ²)	1.36 LB/SQ. IN. (.09KG/CM ²)
	FULL BATTERY (7AH)	2.43 LB/SQ. IN. (.17KG/CM ²)	2.43 LB/SQ. IN. (.17KG/CM ²)	2.43 LB/SQ. IN. (.17KG/CM ²)
	FULL BATTERY (18AH)	2.88 LB/SQ. IN. (.20KG/CM ²)	2.88 LB/SQ. IN. (.20KG/CM ²)	2.88 LB/SQ. IN. (.20KG/CM ²)
	INPUT/OUTPUT XFMR	2.58 LB/SQ. IN. (.18KG/CM ²)	2.58 LB/SQ. IN. (.18KG/CM ²)	2.58 LB/SQ. IN. (.18KG/CM ²)
SHIPPING CONTAINERS	WIDTH	15.5" (394MM)	15.5" (394MM)	15.5" (394MM)
	DEPTH	40.0" (1016MM)	40.0" (1016MM)	40.0" (1016MM)
	HEIGHT	34.0" (864MM)	34.0" (864MM)	34.0" (864MM)
CONTAINER WEIGHTS		40 LB (18KG)	40 LB (18KG)	40 LB (18KG)

NOTES:

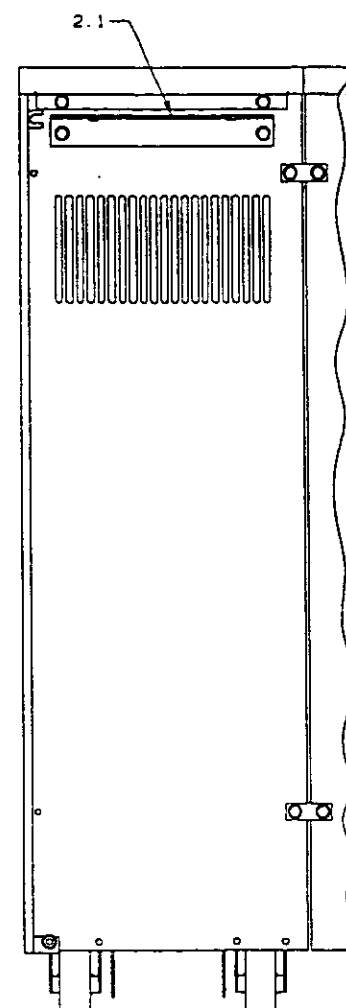
- DIMENSIONS ARE IN INCHES (MILLIMETERS).
- VENTILATION:**
UPS CABINET: FAN COOLED - INLET FRONT/OUTLET REAR.
BATTERY CABINET: NATURAL CONVECTION.
INPUT/OUTPUT CABINET: NATURAL CONVECTION.
- MAXIMUM ELEVATION FOR NORMAL OPERATION: 5000 FEET (1500 METERS). DERATING IS REQUIRED FOR HIGHER ELEVATIONS.
- DO NOT TILT THE CABINET MORE THAN 12 DEGREES (UNIT MAY TIP OVER).
- EQUIPMENT WEIGHTS ARE PROVIDED FOR TYPICAL CONFIGURATIONS. CONTACT YOUR LOCAL SALES REPRESENTATIVE IF ADDITIONAL INFORMATION IS NEEDED.
- ADDITIONAL BATTERY CABINETS MAY BE ADDED FOR EXTENDED BATTERY TIME. REFER TO DRAWING 110719062 FOR INSTALLATION INSTRUCTIONS. INSTALLATION MUST BE MADE BY QUALIFIED SERVICE PERSONNEL.
- FOR OPTIONS, CONTACT THE FACTORY OR YOUR DEALER.
- REFER TO DRAWING 110719175 BEFORE CONNECTING INPUT AND OUTPUT WIRING.
- IT IS RECOMMENDED THAT THE UNIT BE INSTALLED ALLOWING 24" MINIMUM OF SPACE ON ITS LEFT SIDE FOR ACCESS BY QUALIFIED SERVICE PERSONNEL.

-SAVE THESE INSTRUCTIONS-

42

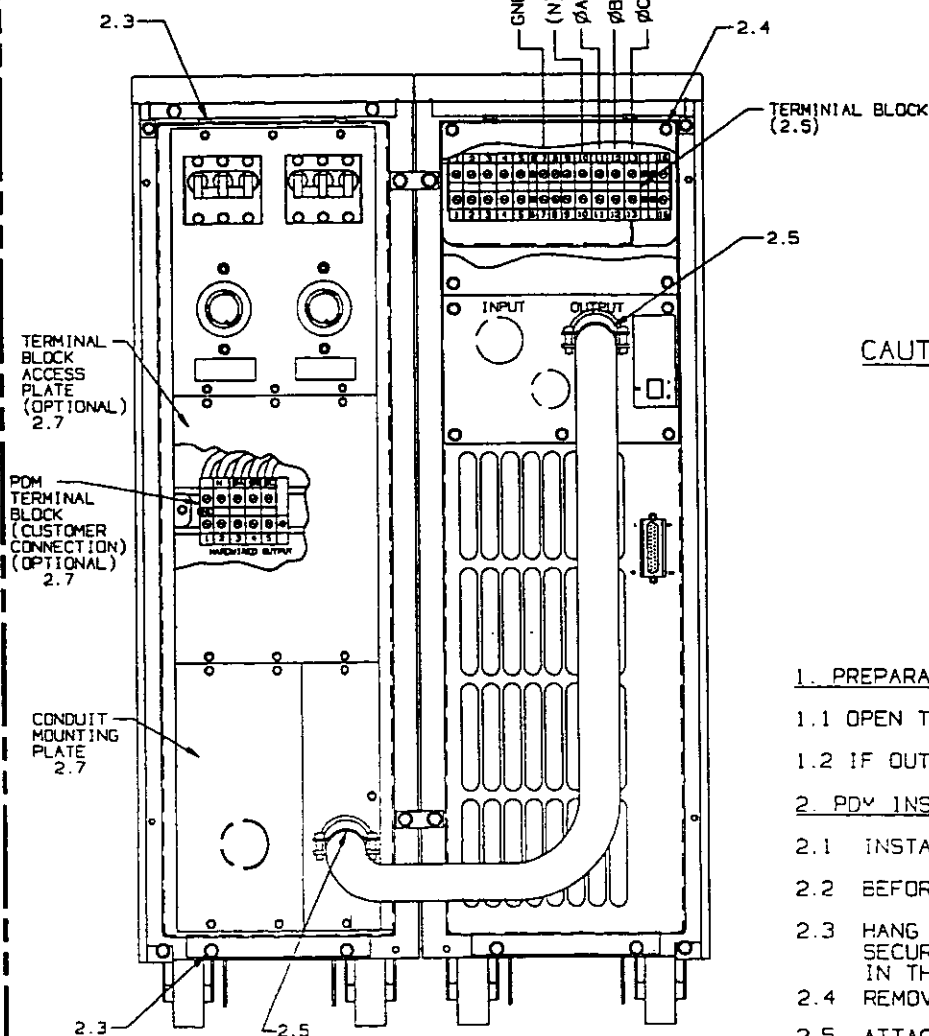
DESCRIPTION: OUTLINE AND INSTALLATION DRAWING, PMP18 INPUT/OUTPUT CABINET		DRAWING NO. 110719176	
CREATED BY: SUREPC (HKS)	DATE: 01-JUL-1993	FIRST USED ON: PMP18V	SCALE: 1/1
CHECKED BY: SUREPC (HKS)	DATE: 01-JUL-1993	CATEGORY: CUSTOMER	REVISION: 01
APPROVED BY: SUREPC (HKS)	DATE: 01-JUL-1993	SECURITY CLASS: GENERAL	REVISION: 01
LAST MODIFIED BY: SUREPC (HKS)	DATE: 14-SEP-1993	VERSION: 22	SIZE: D
CUSTOMER NO. 110719176		SHEET: 1 OF 1	

(PDM) POWER DISTRIBUTION MODULE INSTALLATION



BACK SIDE OF
BATTERY CABINET
WITHOUT PDM

FIGURE 1



BACK SIDE OF
BATTERY CABINET
WITH PDM

BACK SIDE OF
UPS CABINET

FIGURE 2

PDM IS TO BE INSTALLED BY
QUALIFIED SERVICE PERSONNEL ONLY

CAUTION:
THE UPS CONTAINS ITS OWN ENERGY SOURCE (BATTERY).
THE OUTPUT TERMINAL BLOCKS 8 & 9 MAY BE LIVE WITH 240VDC EVEN
WHEN THE UPS IS NOT CONNECTED TO AN AC SUPPLY.

CAUTION: CRITICAL LOAD IS DEENERGIZED DURING THIS
INSTALLATION PROCEDURE. SHUT YOUR LOAD DOWN
IN AN ORDERLY FASHION BEFORE PERFORMING
ANY OF THE FOLLOWING STEPS.
PDM IS NOT TO BE INSTALLED ON UNITS
WITH A 127/220V CONFIGURATION.

1. PREPARATION OF UPS UNIT FOR POWER DISTRIBUTION MODULE INSTALLATION

- 1.1 OPEN THE TOP OF THE UPS CABINET AND PLACE ALL OF THE BREAKERS (CB1,CB2,CB3) IN THE OFF POSITION.
- 1.2 IF OUTPUT IS CURRENTLY CONNECTED, DISCONNECT ALL OUTPUT CONNECTIONS FROM THEIR TERMINALS. (FIGURE 2)

2. PDM INSTALLATION INSTRUCTION

- 2.1 INSTALL THE PDM MOUNTING BRACKET USING (2) HEX HEAD SCREWS PROVIDED. (FIGURE 1)
- 2.2 BEFORE INSTALLING THE PDM, PLACE ALL CIRCUIT BREAKERS ON THE PDM IN THE OFF POSITION (DOWN).
- 2.3 HANG THE PDM MODULE ON THE PDM BRACKET ALIGNING THE MOUNTING HOLES WITH THE HOLES ON THE BRACKET. SECURE THE MODULE TO THE FRAME AT THE TOP AND AT THE BOTTOM USING (4) HEX HEAD SCREWS PROVIDED IN THE KIT.
- 2.4 REMOVE THE TERMINAL BLOCK ACCESS PLATE BY REMOVING (4) SCREWS AND RETAIN.
- 2.5 ATTACH THE STRAIN RELIEF CONNECTED TO THE END OF THE CABLE TO THE CONDUIT MOUNTING PLATE, BY REMOVING THE NUT AND PLACING IT ON THE BACK SIDE OF THE CONDUIT MOUNTING PLATE AND SECURING TIGHTLY. TO INSURE PROPER STRAIN RELIEF OF THE CABLE, DO NOT LOOSEN OR REMOVE THE STRAIN RELIEF CLAMP FROM THE CABLE DURING INSTALLATION. CONNECT WIRES FROM THE PDM TO THE UPS OUTPUT TERMINAL BLOCK AS SHOWN IN FIGURE 2. SEE LABEL ON INSIDE OF THE PDM FOR TERMINAL BLOCK TORQUE REQUIREMENTS. USE ONLY #6AWG 75°C COPPER WIRE MIN.
- 2.6 RE-ATTACH ACCESS PLATE USING THE (4) SCREWS RETAINED IN STEP 2.4.
- 2.7 IF YOU ARE USING OPTIONAL HARDWIRED PDM, REMOVE ACCESS PLATE AND CONNECT CONDUIT WIRING TO THE TERMINAL PER PHASE DIAGRAM FOR HARDWIRED OUTPUT. USE CONDUIT MOUNTING PLATE FOR CONDUIT LANDING. REPLACE ACCESS PLATE. LOCATE THE APPROPRIATE RECEPTACLES ON THE PDM PANEL IF SUPPLIED AND PLUG IN YOUR PROTECTED EQUIPMENT.
- 2.8 TURN ON (UP POSITION) THE PDM BREAKER(S).
- 2.9 TURN ON THE UPS MAIN OUTPUT BREAKER.
- 2.10 REFER TO THE OPERATORS MANUAL OPERATING INSTRUCTIONS.

PDM INSTALLATION KIT INCLUDE:

- (1) POWER DISTRIBUTION MODULE (PDM)
- (1) MOUNTING BRACKET AND HARDWARE KIT

TOOLS NEEDED FOR INSTALLATION:

- 1/4" HEX NUT DRIVER
- SMALL FLAT HEAD SCREWDRIVER
- 3/8" WRENCH

-SAVE THESE INSTRUCTIONS FOR FUTURE USE-

DESCRIPTION: 3 PHASE PDM INSTALLATION									
CREATED BY: SOREPCINSKI	DATE: 26-DEC-1991	FIRST USED ON: AST18	SCALE: 3/8"	SHEET: 1 OF 1					
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