The Future *of* Mobile Radio

MASTR® III

Battery Charger
BMLUA 162 020/1

tyco Electronics

M/A-COM

THESE SERVICE INSTRUCTIONS ARE FOR USE BY QUALIFIED PERSONNEL ONLY. TO AVOID ELECTRIC SHOCK DO NOT PERFORM ANY SERVICING OTHER THAN THAT CONTAINED IN THE OPERATING INSTRUCTIONS UNLESS YOU ARE QUALIFIED TO DO SO. REFER ALL SERVICING TO QUALIFIED SERVICE PERSONNEL.

TO PREVENT ELECTRIC SHOCK DO NOT USE THIS (POLARIZED) PLUG WITH AND EXTENSION CORD, RECPTACLE OR OTHER OUTLET UNLESS THE BLADES CAN BE FULLY INSERTED TO PREVENT BLADE EXPLSURE.

OPENING THIS UNIT DURING THE TIME OF WARRENTY VOIDS THE WARRANTY.

TO PREVENT FIRE OR ELECTRIC SHOCK HAZARD DO NOT EXPOSE THIS PRODUCT TO RAIN OR MOISTURE.

NOTICE!

Repairs to this equipment should be made only by an authorized service technician or facility designated by the supplier. Any repairs, alterations or substitution of recommended parts made by the user to this equipment not approved by the manufacturer could void the users authority to operate the equipment in addition to the manufacturer's warranty.

NOTICE!

TABLE OF CONTENTS

Page

1.0 EMERGENCY POWER OPTIONS 4
2.0 CHARGER SPECIFICATIONS 5
3.0 SYSTEM DESCRIPTION 6
4.0 CIRCUIT DESCRIPTION 10
4.1 BATTERY CHARGER 10
4.2 MAIN CHARGING CIRCUITRY 11
4.2.1 Input Filter And Rectifier 11
4.2.2 Voltage Doubler Switch 11
4.2.3 Main Converter 11
4.2.4 Main Pulse Width Modulator (PWM) 11
4.2.5 Bias Supply 12
4.2.6 PMW Power 12
4.2.7 AC Detect 12
4.2.8 Over Voltage Protection 12
4.2.9 Battery Low Detect 12
5.0 TROUBLESHOOTING 13
6.0 PARTS LISTS 15
6.1 BATTERY AND HARDWARE KITS 15
6.2 BATTERY CHARGER BMLUA 162 020 16
7.0 IC DATA 25
8.0 ASSEMBLY DIAGRAMS 29
8.1 CHARGER 29
8.2 CIRCUIT BOARD 30
8.3 CIRCUIT BOARD COMPONENT SIDE 31
8.4 CIRCUIT BOARD SOLDER SIDE 32
8.5 HARNESS 6-5500032 33
9.0 SCHEMATIC DIAGRAM 34
10.0 SYSTEM INTERCONNECTION DIAGRAM 35
11.0 APPLICATION ASSEMBLY DIAGRAM 36
12.0 FIELD INSTALLATION OF GEL CELL BATTERIES 39

FIGURES

Figure 1 – BMLUA 161 020 Charger 7
Figure 2 – Top View of Charger 8
Figure 3 – Back View of Charger 8
Figure 4 – Detail A 9

TABLES

Table 1 - Breakdown of Emergency Power Options 4
Table 2 – Connector Pins 9
Table 3 – Estimated Charge Times 10
Table 4 – Troubleshooting Procedure 13

1.0 EMERGENCY POWER OPTIONS

CH1L – AUTOMOBILE BATTERY EMERGENCY POWER (120 VAC/60 Hz VERSION): Adds a charger and power harness cabling. The automobile battery is external to the base station cabinet and is purchased separately by the customer for field installation.

CH1M – AUTOMOBILE BATTERY EMERGENCY POWER (230 VAC/50 Hz VERSION) Same as CH1L, except for international version charger.

CH1R – GEL CELL BATTERY EMERGENCY POWER (120 VAC/60 Hz VERSION) Adds a charger, power cable harnessing, and a gel cell shelf. The four 12V, 25 AH gel cell batteries are not included in this option. Each of the batteries can be ordered field installation per drop ship index item, V2401.

CH3A – GEL CELL BATTERY EMERGENCY POWER (230 VAC/50 Hz VERSION) Same as CH1R, except for international version charger.

Options CH1L, CH1M, CH1R & CH3A are emergency power backup options only. These options are activated only when the AC power is interrupted. To ensure proper operation, the option AC power cord MUST be connected to the same receptacle, or at a minimum, the same MAIN, as the station that the batteries are backing up. Also for proper charging, the charger MUST remain connected to the AC MAIN when the MAIN is active. FAILURE TO COMPLY COULD RESULT IN PERMANENT DAMAGE TO THE BATTERY.

Table 1 - Breakdown of Emergency Power Options

PART NUMBER	DESCRIPTION	CH1L	CH1M	CH1R	CH3A
BMLUA 162 020/1	10 Amp Charger, 60 Hz.	1	1	1	
BML 161 51/043	AC Power Cord, 115 VAC	1		1	
BML 161 51/044	AC Power Cord, 230 VAC		1		1
344A3696G1	Charger Kit	1	1		
344A3696G2	Charger Kit			1	1
19C852074P1	Support	1	1	1	1
19C852074P2	Support	1	1	1	1
19D9032719P1	Battery Standby Shelf			1	1
19C852193P1	Battery Cover Panel			1	1
19D903635	Interconnect Diagram	X	X	X	X
19D902845P5	Application Assembly	X	X		
19D424751P6	Application Assembly			X	X
344A4051P1	Installation Instructions			X	X

2.0 CHARGER SPECIFICATIONS

Input Voltage Range (For Normal Operation State)	121 VAC ±10% for trickle charge or full rated charge
	121 VAC ±20% for trickle charge only
	230 VAC ±10% for trickle charge or full rated charge
	230 VAC ±15% for trickle charge only
Input Voltage Range (For Emergency Power State)	<70% of nominal line voltage
Input Voltage Detection	121 VAC, -30%, <85VAC
	230 VAC, -30%, <161VAC
Input Fuse Capability	3.15 amperes, two internally mounted fuses for the primary line current
Line Voltage Surge Protection	275 VAC rated **M**etal **O**xide **V**ariactor (**M.O.V.**)
DC Output	+13.8 VDC
Trickle Charge Current	<200 milliamperes
Rated Charge Current	10 amperes
Load Current Knee	11.0 ±1.0 amperes
Short Circuit Current	4.0 amperes (minimum) to 12 amperes (maximum)
Duty Cycle	Full Charge 100% for 8 Hours
	Trickle Charge 100% Continuously
Status Line Output (Alarm Tone Signal)	Normal Operation 23.5 ±0.5 VDC with <100 millivolts ripple
	Emergency Power Impedance >1 Megohm
Out Voltage Ripple	≤250 millivolts
Current Sourcing Capability (A+ t SW A+ port in Emergency Power State)	40 amperes
Deep Discharge Cutout Voltage	10.5 VDC
Temperature Range	-30°C to +60°C
Weight	<20 lbs.

3.0 SYSTEM DESCRIPTION

Battery Charger BMLUA 162 020/1 (part of Emergency Power Options CH1L, CH1M CH1R or CH3A) is designed to interface with station power supplies 19A149978P1, Rev. B or 19A149978P2 Rev. A or later revision. To retrofit this charger with these power supplies, Field Modification Kit 344A4123G1 with Modification Instructions 344A4124P1 must be used. Under normal operating conditions (defined as having the nominal input line voltage plus a tolerance) relays K1 thru K3 are energized. The charger provides a full charge up to 10 amps out of the A+ port to the battery system. This charging current, at a constant voltage, remains until the battery system is fully charged. If the charger attempts to source more than 10 amps because (for example, when a battery has been deep discharged), the charger current foldback circuitry drops the charger voltage for a short time until the battery has been recharged enough and no longer sinks more than 10 amps. The charger then reverts to providing a constant voltage charge. The charger maintains a trickle charge indefinitely on the battery system to maintain a full charge.

Without the Emergency Power Options, the power supply 10 ohm, 50 watt bleeder resistor R1 is tied to ground through external strap P802. With the Emergency Power Options, P802 is removed, allowing K3, the SW GND (switched ground) relay, in the charger to ground the bleeder resistor through J203 to provide normal operation of the supply. The STATUS line (J201) provides a +24 VDC signal to the alarm tone circuitry indicating the system is in the normal operating state.

When the input line voltage drops below 70% of the nominal line voltage, the charger reverts to the Emergency Power state. Current, instead of being sourced from the A+ port to the battery system, is now delivered from the battery. Relay K1 de-energizes, and relay K2 remains energized. This allows up to 33 amps to flow from the battery to the charger A+ port, out of the SW A+ (SWitched A+) port and through the SW A+ port of the power supply. This current is fed through the power supply load fuses and out through the harnesses to run the base station power amplifier and receiver/system circuitry. Relay K3 also de-energizes, opening the bleeder resistor circuit. This removes the 1.2 amp load on the battery that would have an open circuit to the alarm tone circuitry indicating the system is in the Emergency Power state.

When the battery system has discharged to approximately 10.5 VDC, the charger de-energizes relay K2 to prevent a deep discharge. This is important for gel cells and especially for automobile batteries. Any deep discharge of an automobile battery will affect its capacity to store energy. Several deep discharges would result in a premature replacement of the battery.

If the charger has:

1) An overheating condition, or

2) An overvoltage condition, which would lead to an overheating condition;

Then the charger will revert to a ***"shutdown"*** mode until conditions return to normal. Under normal conditions, the SHUTDOWN line (J2-2) is at 0.1-0.2 VDC. When the charger reverts to the shutdown mode, J2-2 rises to around 2-3 VDC. The charger remains in shutdown until the condition is corrected.

SHUTDOWN is used as a monitor point only.

WARNING

Extreme care must be exercised when using an automobile battery for backup emergency power. The automobile battery must not be installed in the base station cabinet because a buildup of acidic fumes during outgassing would damage the base station circuitry. Also, there could be a dangerous buildup of hydrogen gas in the cabinet during outgassing, which could lead to an explosion. Even for an automobile battery correctly installed outside of the cabinet, there could be a dangerous concentration of hydrogen gas if the room is not properly ventilated. It may even be necessary to provide a "hood" over the battery and exhaust system to vent the gas to the outside world. Follow OSHA (or other equivalent agency) safety construction rules to determine a proper design.

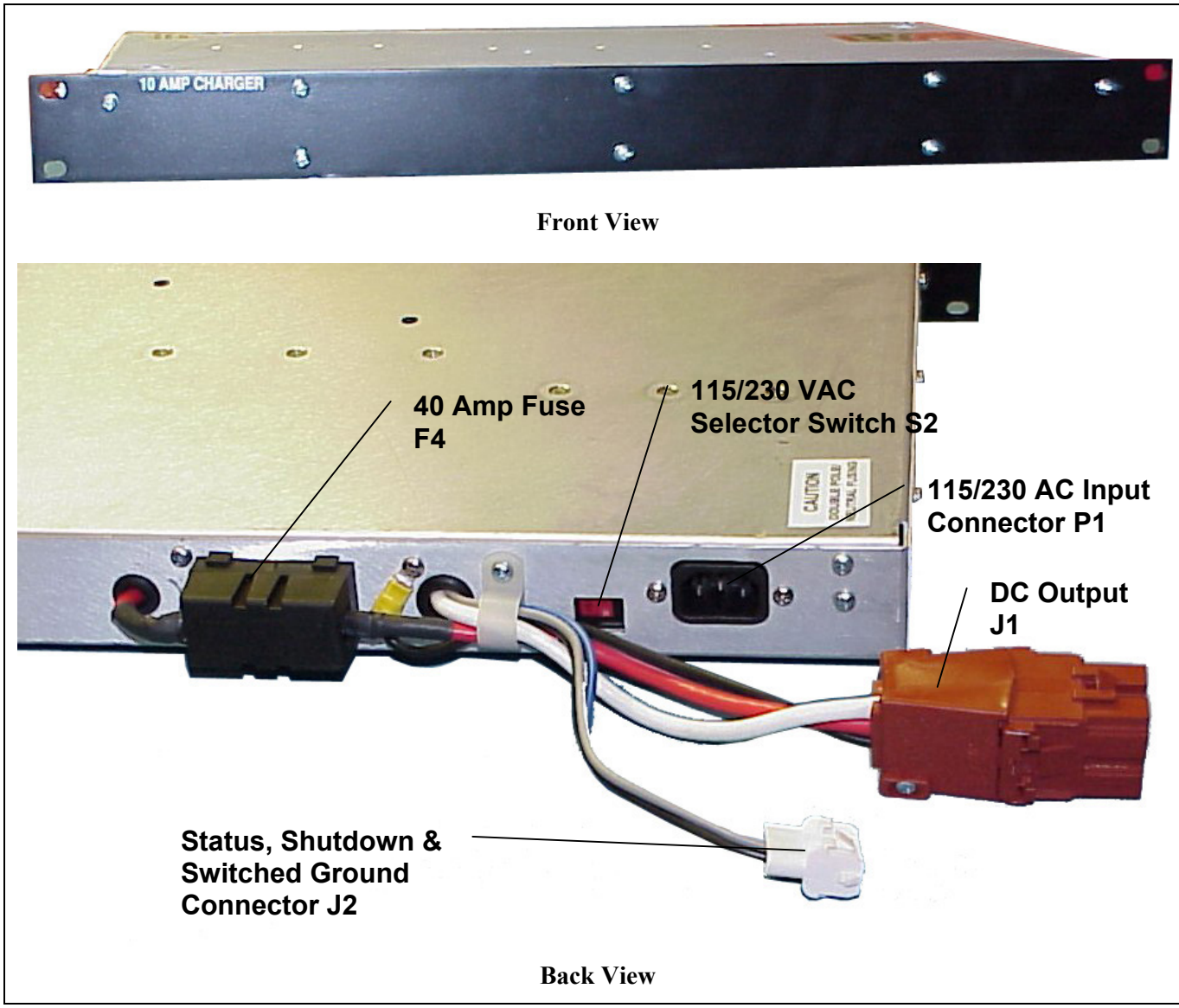


Figure 1 – BMLUA 161 020 Charger

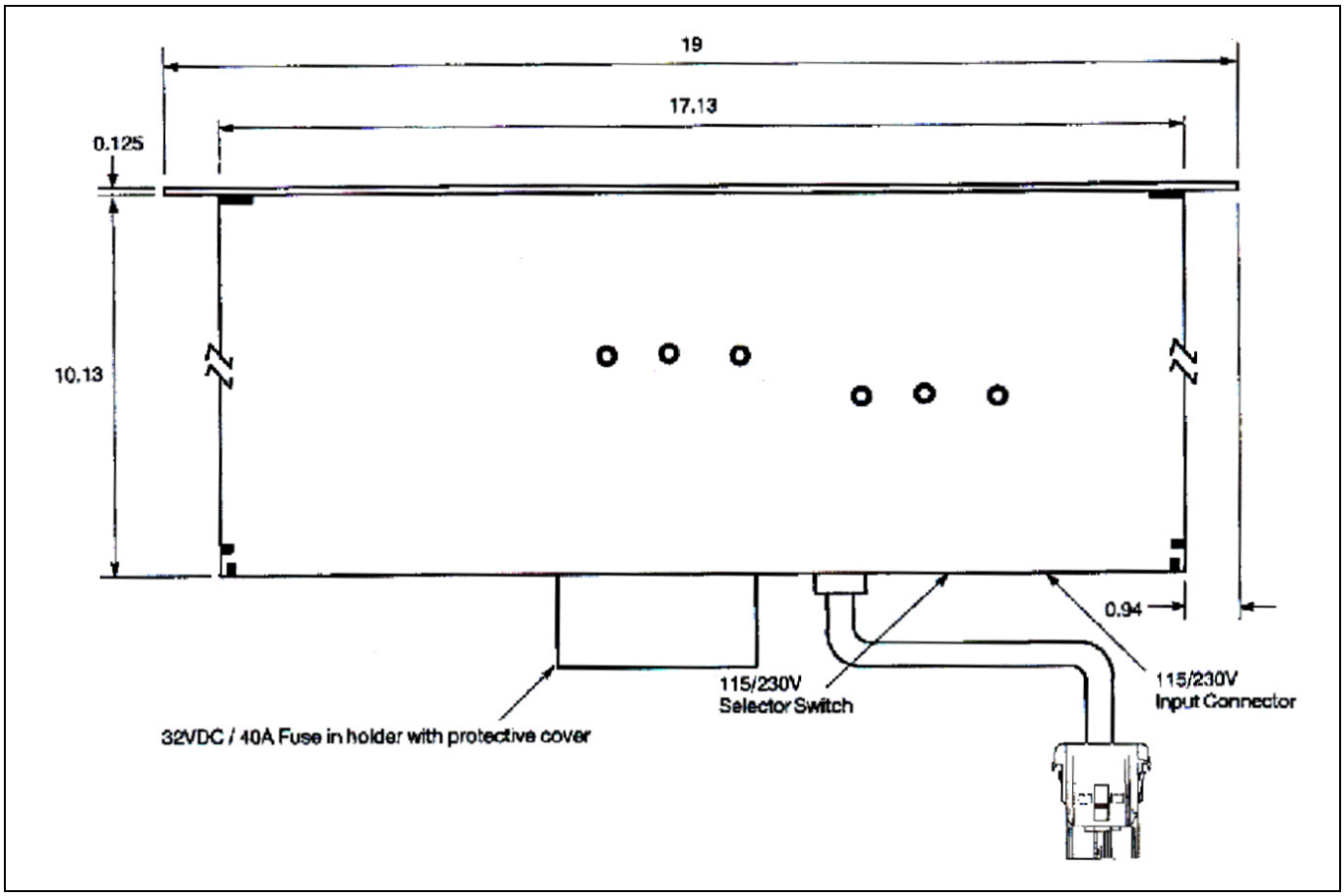


Figure 2 – Top View of Charger

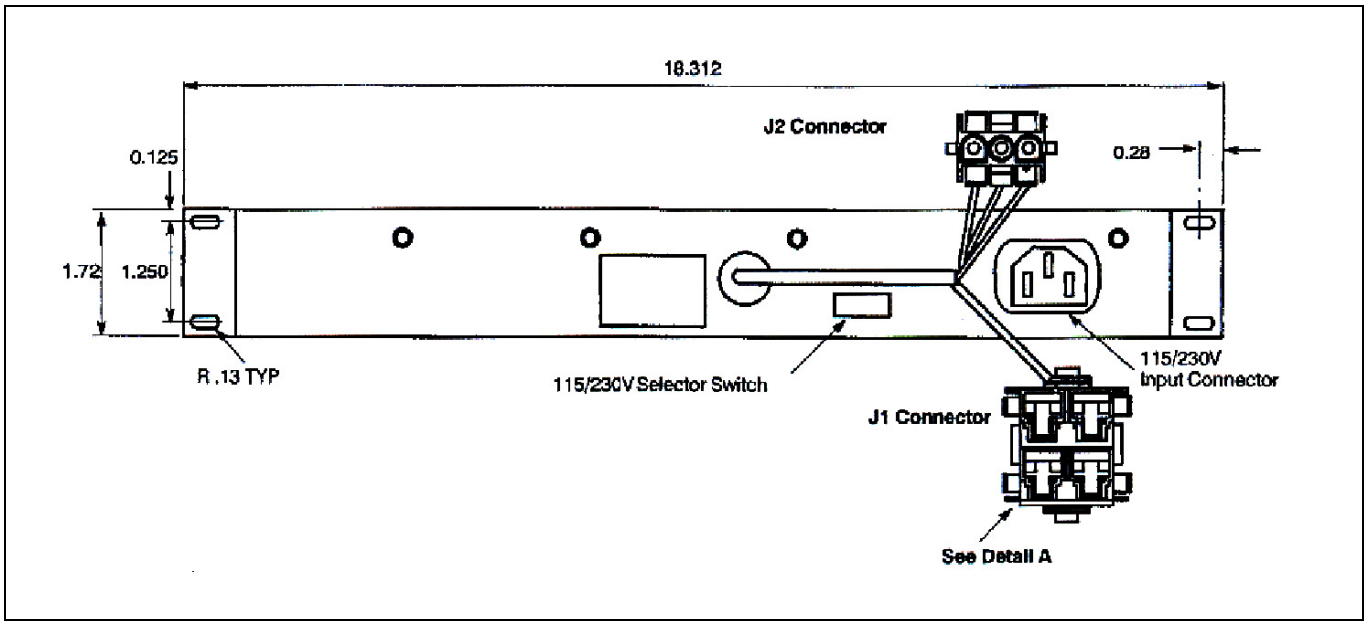


Figure 3 – Back View of Charger

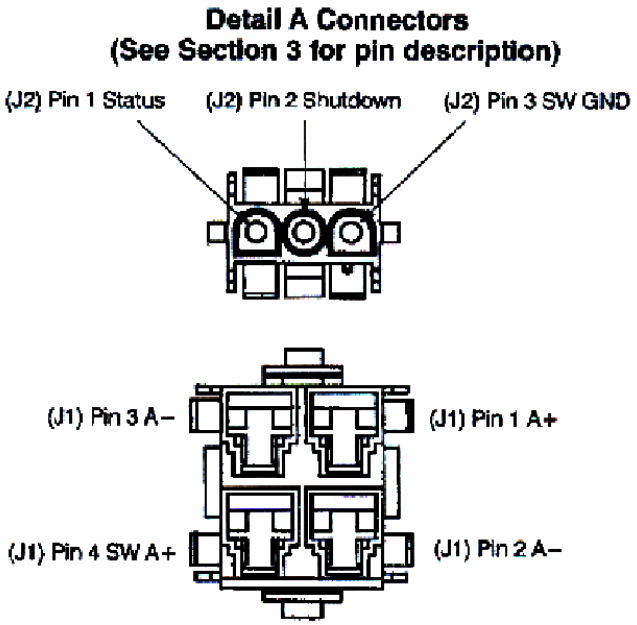


Figure 4 – Detail A

Table 2 – Connector Pins

CONNECTOR	PIN	FUNCTION & DESCRIPTION
P1 AC Input	1	Line (Line 1 Power Connection)
	2	Neutral (Neutral / Line 2 Power Connection)
	PE	GND (Safety Ground / Protective Earth)
J2 DC Output	1	Status (Emergency Power Status)
	2	Shutdown (Charger Shutdown)
	3	Sw GND (Switched Ground)
J1 DC Output	1	A+ (+12V Battery Connection)
	2	A - (Battery Return Connection)
	3	A - (Load Return Connection)
	4	SW A+ (Switched Load Connection)

4.0 CIRCUIT DESCRIPTION

4.1 BATTERY CHARGER

The BMLUA 162 020/1 battery charger is designed to provide system battery charging and relay switched, emergency power via automobile battery or gel cell battery for the MASTR II/IIe and MASTR III base stations. The backup power is from a nominal 121 VAC, 60 Hz main or a 230 VAC, 50 Hz main.

The charger monitors system line voltage for possible interruptions. During normal operation, the charger maintains full charge on the emergency power battery by providing a trickle charge current. In the event of a power source interruption, the charger sets the STATUS line to the emergency power mode.

Several general rules can be applied to estimate charge time of a lead acid battery system. There is almost a 100% conversion of electrical energy to stored chemical energy for the first 80% of battery capacity. If usable capacity is defined to be at least 80% of full charge, then the time to reach usable capacity is:

T=0.8 x AH/C,
where **T** is in hours,
AH is in amp-hours, and
C is the average charge rate in amps.

Using these estimates for a 10 amp charger, a standard 55 **A**mp-**H**our (**AH**) automobile battery and a gel cell system that uses four 25 AH batteries connected in parallel would recharge in the following times as shown in Table 3 – Estimated Charge Times.

Table 3 – Estimated Charge Times

Qty.	Type	Usable Capacity	Full Capacity
1	55 AH Automobile Battery	4.4 Hours	6.0 Hours
4	25 AH Gel Cell Batteries	8.0 Hours	11.0 Hours

Estimates of airtime can be provided for a MASTR II/MASTR III base station. Assuming the worst case of a 100% transmit duty cycle, the station airtime using a 55 AH automobile battery would be approximately one hour. A considerably longer airtime would result from a smaller transmit duty cycle.

With a four-in-parallel, 25 AH gel cell system, the station air time for a 100% transmit duty cycle would be approximately three hours, and a correspondingly longer air time for a smaller transmit duty cycle.

NOTE

With the four-in-parallel gel cell battery system, if one gel cell becomes defective before the other three, the station can run with only three gel cell in parallel *(with reduced air time)*. It is not advisable to run with only two gel cells in parallel because of excessive charge current from the charger, which would damage the gel cells. It is good practice when one gel cell battery becomes defective to replace all four gel cell batteries, because of uneven charge and discharge characteristics of new versus old gel cells. For the same reason it is also advisable not to mix different brands of gel cells.

4.2 MAIN CHARGING CIRCUITRY

The following is a description of circuit functions and is to be used in conjunction with Schematic Diagram 31-XS14600.

Hazardous voltages are present. The cover should only be removed and repairs only be attempted by qualified technicians, with approval from the manufacturer.

4.2.1 Input Filter And Rectifier

The input filter stage is designed to reduce conducted emissions. Fuses F1 and F2 only blow when a catastrophic failure has occurred. Fuse replacement should not be attempted until the failure has been repaired. Diode bridge circuit CR1 rectifies the AC input voltage into a DC voltage (1.414 X) input and stores the energy in capacitors C6-C9.

4.2.2 Voltage Doubler Switch

Voltage Doubler Switch B2 connects one line of the AC input to the center connection between capacitors C6 and C7, and C8 and C9. This results in doubling of the rectified input voltage.

Applying 230 VAC when the doubler switch is in the 115 V position will result in fuse F1, and Fuse F2 blowing and may damage other components (Transistors Q1 and Q2).

4.2.3 Main Converter

The Main converter is a half bridge AC to DC converter. **F**ield **E**ffect **T**ransistors (**FET**) Q1 and Q2 are driven by transformer T1 out of phase. Transformer T3 is the main power transformer and the output is rectified by dual diode rectifier package D1.

4.2.4 Main Pulse Width Modulator (PWM)

All control for the main converter is referenced to the secondary circuitry. Isolation is obtained across the primary – secondary boundary via T1 drive, T2 current sense and T3 main power transformer, respectively. **P**ulse **W**idth **M**odulator (**PWM**) Current Mode Controller U1 is a UC3825 and can run as fast as 1.5 MHz. Technical descriptions are available from any manufacturer of this generic component, such as: Texas Instruments Incorporated, Unitrode or On Semiconductor.

Voltage feedback is direct from the output. The soft start on U1, Pin 8 (Soft Start or SSTART) is used for both current limit and shut down control. A shutdown can be driven low by the CURRENT FEEDBACK or FAULT LINE.

Current feedback is via a peak detector circuit driven from the current sense transformer.

The fault line can be driven low by an external SHUTDOWN signal, the THERMAL SHUTDOWN switch, an **O**ver **V**oltage **P**rotection (**OVP**), the loss of BIAS (+24V) or AC input.

4.2.5 Bias Supply

The Bias Supply is a small flyback converter for providing secondary voltage at all times (+27V). It uses a Pulse Width Modulator consisting of high performance current mode controller U3, a UC3844. This controller provides a switching frequency of approximately 500 kHz as determined resistor R93 and capacitor C30. Transformer T4 provides isolating bias and all control is primary referenced.

4.2.6 PMW Power

PMW Power (+15V –B) is provided by voltage regulator U8. The +27V Bias Supply is applied to U8, Vin. The +15V is output on Vout and can be measured at TP2.

4.2.7 AC Detect

This circuit consists of transistor Q9 and optocoupler U6. By detecting the rectified DC, the AC detect drives optocoulpler U6 on when power is good. Adjustable shunt regulator D25 drives on whenever its reference pin is greater then 2.5V. When insufficient input is available, operational amplifier U2 drives the STATUS and SHUTDOWN signals low and holds the main PWM off.

4.2.8 Over Voltage Protection

The **O**ver **V**oltage **P**rotection (**OVP**) is a secondary protection intended to shut the main converter off in the event VOLTAGE FEEDBACK is lost due to a single fault failure.

4.2.9 Battery Low Detect

The BATTERY LOW DETECT circuit will function whether the AC input is available to the charger or a DC battery is connected. It detects the battery voltage and controls battery backup relay K2. If the battery drops below 10.5V, the relay will turn off, preventing a deep discharge.

5.0 TROUBLESHOOTING

Opening this battery charger voids the CONDOR warranty. It is recommended that this charger be returned to CONDOR for repairs.

Table 4 – Troubleshooting Procedure

SYMPTOM	PROCEDURE
No Charging Output Voltage	Check the Following: ❑ Proper Line Voltage ❑ Open Fuse F1 ❑ Open Fuse F2 ❑ Open Thermistor R2 ❑ Bad Relay K1 ❑ Bad IC U1 ❑ Bad IC U2 ❑ Bad IC U3
Output Voltage Too High (Greater than 14.VDC)	Check the Following: ❑ Shorted Transistor Q1 ❑ Shorted Transistor Q2 ❑ Bad Potentiometer R8 ❑ Bad IC U2
Output Voltage Too Low (Greater than 1 VDC Less than 13.6 VDC)	Check the Following: ❑ Load Too High ❑ Bad Potentiometer R8 ❑ Bad IC U3
Blown Fuse F1	Check the Following: ❑ Shorted Varistor R2 ❑ Shorted Transformer T1 ❑ Shorted Transformer T2 ❑ Shorted Transformer T3 ❑ Shorted Diode Bridge CR1 ❑ Shorted Capacitor C6 ❑ Shorted Capacitor C7 ❑ Shorted Capacitor C8 ❑ Shorted Capacitor C9 ❑ Shorted Transistor Q1 ❑ Shorted Transistor Q2

SYMPTOM	PROCEDURE
Blown Fuse F3	❑ Shorted Transistor Q1 ❑ Shorted Transistor Q2 ❑ Shorted Transformer T1 ❑ Shorted Capacitor C14
Battery Not Switching to System Backup	Check the Following: ❑ Bad Relay K1 ❑ Bad Relay K2 ❑ Open Transistor Q4 ❑ Bad IC U4 ❑ Bad IC U6 ❑ Shorted Transistor Q5
Status Error Flag not Present	Check the Following: ❑ Line Voltage To Low ❑ Open Transistor Q5 ❑ Bad IC U4 ❑ Bad IC U2 ❑ Open Diode D30
Switched Ground Not Connected	Check the Following: ❑ Line Voltage Too Low ❑ Bad Relay K3 ❑ Open Transistor Q5 ❑ Bad IC U4
Any Other Fault	Consult the Factory

6.0 PARTS LISTS

6.1 BATTERY AND HARDWARE KITS[1]

(Refer to Interconnection Diagram 19D903635)

SYMBOL	PART NUMBER	DESCRIPTION
	344A3696G1	**MASTR III AUTOMOBILE BATTERY KIT**
W1	19B801937P4	Power Cable.
W2	19B801970P1	Power Cable.
W3		
W4	19B801970P3	Power Cable.
W5	19B801970P4	Power Cable.
W6 thru W8	19B801970P5	*Not Used*
1	344A3450G1	Hardware Kit.
2 thru 4		*Not Used*
	344A3696G2	**MASTR III GEL CELL BATTERY KIT**
W1	19B801937P4	Power Cable.
W2	19B801970P1	Power Cable.
W3 thru W5		*Not Used*
W6	19B801970P5	Power Cable.
W7	19B801970P6	Power Cable.
W8	19C327801G1	Harness.
1		*Not Used*
2	344A3450G5	Hardware Kit.
3	19B802073P1	Rear Support.
4	19B802067P1	Cover.
	344A3450G1	**HARDWARE KIT**
1	7160861P33	Spring Nut.
2	19A134011P2	Screw.
3	7160861P4	Spring Nut.
4	N145P1507B6	Tapped Screw.
	344A3450G5	**HARDWARE KIT**
1	7160861P33	Spring Nut.

[1] COMPONENTS, ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES.

SYMBOL	PART NUMBER	DESCRIPTION
2	19A134011P2	Screw.
15	N403P16B6	Lock Washer.
17	N80P1600B6	Machine Screw.
18	N403P19B6	Lock Washer.
19	N402P39B6	Flat Washer.
20	N80P15012B6	Machine Screw.
21	N402P38B6	Flat Washer.

6.2 BATTERY CHARGER BMLUA 162 020[2]

NOTE

The only part stocked by M/A-COM Service Parts is the 40 Amp Fuse F4 (20-4480077), part of Harness Assembly W1 (6-5500032).

SYMBOL	PART NUMBER	DESCRIPTION
FN1	07-6010421	Chassis
FN2	19-30276-6322	Nut: Clinch s 5-32-2.
FN4	19-32016-6250	Standoff: Clinch 6-32 x 0.250".
A1	**09-SX14600**	**BATTERY CHARGER CIRCUIT BOARD**
		- - - - CAPACITORS - - - -
C1	10-32298-0003	0.470 µF, 275 VDC.
C2	10-32298-0002	0.220 µF, 275 VDC.
C3 and C4	10-30180-0222	2200 pF, 250 VDC.
C5	10-32298-0002	0.220 µF, 275 VDC.
C6 thru C9	10-31056-0008	470 µF, 200 VDC.
C10 thru C13	10-3121503	1500 µF, 25 VDC.
C14 and C15	10-3100025	2.2 µF, 250 VDC.
C16		Omit
C17		2.2 nF, SMT
C18		Omit
C19		22 µF, SMT,

[2] COMPONENTS, ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES.

SYMBOL	PART NUMBER	DESCRIPTION
C20		0.1 µF, SMT.
C21		10 nF, 50 VDC, SMD.
C22		0.1 µF, SMT.
C23		10 nF, 50 VDC.
C24		6.8 µF, SMT.
C25 and C26		0.1 µF, SMT.
C27		0.022 µF, SMT.
C28		0.1 µF, SMT.
C29		470 pF, SMT.
C30		0.0022 µF, SMT.
C31		0.1 µF, SMT.
C32	10-31782-0025	100 µF, 35 VDC.
C33	10-30182-0101	100 pF, 1000 VDC.
C34 and C35	10-31782-0025	100 µF, 35 VDC.
C36		0.0022 µF, SMT.
C37		1 nF, 100 VDC.
C38 and C38		0.1 µF, SMT.
C40		220 pF, SMT.
C41		0.0022 µF, SMT.
C42		220 pF, SMT.
C43		0.0022 µF, SMT
C44		0.1 µF, SMT.
C45		22 nF, SMT.
C46 and C47		1.0 µF, 35 VDC.
C48 thru C52		0.1 µF, SMT.
C53		22 µF, SMT.
C54		0.1 µF, SMT.
C55		
C56		10 µF, SMT.
C57		4700 pF, 250 VDC.
C58	10-32331-0012	0.470 µF ±10%, 400 VDC.

SYMBOL	PART NUMBER	DESCRIPTION
C59 and C60		4700 pF, 250 VDC.
C61		10 nF, SMT.
C62		0.1 µF, SMT.
C63 and C64	10-33125-0222	2200 pF, 1kVDC.
C65	10-33125-0221	220 pF, 1kVDC.
C66 and C67		0.1 µF, SMT.
		- - - - RECTIFIER BRIDGE - - --
CR1	12-34001-2000	1000 VDC. 8 Amps (small package).
		- - - - DIODES - - - -
D1	12-30168-0002	200 VDC. 15 Amp: sim to MUR3020.
D2 and D3		Sim to BAV70.
D4 and D5		Sim to MBR130.
D6 and D7		Sim to BAV70.
D8		Sim to MBR130.
D9		Sim to BAV70.
D10		Zener: 15VDC, SMT.
D11 and D12		Sim to MBR130.
D13		*Not Used.*
D14		19 VDC, SMT.
D15 and D16		Sim to MBR130.
D17		*Not Used.*
D18		Adjustable Precision Shunt Regulator: Sim to TL43C, SMT.
D19 and D20		Sim to BAV70.
D21 thru D24		*Not Used.*

SYMBOL	PART NUMBER	DESCRIPTION
D25		Adjustable Precision Shunt Regulator: Sim to TL43C, SMT.
D26 thru D28		Sim to MBR130.
D29 and D30		Sim to BAV70.
		- - - - VARISTORS - - - -
E1 and E2	15-31971-320	300 VAC, 80J.
E3 and E4	15-31971-200	150 VAC, 40J.
		- - - - FUSE - - - -
F1 and F2	20-32236-0315	5x20 U/I, T 3.15A, 250 V.
F3	20-30262-0020	5x20 U/I, F 2.00A, 250V.
		- - - - - HARDWARE - - - -
FN1	19-6610290	Bracket, Semiconductor.
FN2	08-6610461	Heatsink Bracket with Hardware.
FN3	19-7470059	Screw: RPH 4-40 x .38.
FN4	19-33782-0006	Insulator SiLpad 0.6” x 0.87.”
FN5	19-33782-0014	Insulator SiLpad 1.00 x 125.”
FN6	06-35131-0001	AC Recpt./Gnd Assembly, SX14600.
FN7	19-7470060	Screw: RPH 6-32 x .56.
FN8	19-7500033	Nut: Hex 6-32 x 5-16.
FN9	19-7470053	Screw: RPH 6-32 x .31.
FN10	19-30779-0090	Washer: Shoulder, 4-40 x .090.
FN11	19-32084-0002	Clamp: TO-220 Nylon.
FN12	19-6710398	Insulator: Sleeve TO-218.
FN13	19-33782-0021	Insulator: SiLpad TO-218 W/ADH.
FN14	19-7470058	Screw: RPH 6-32 x .44.
FN15	19-7470046	Screw: RPH 6-32 x .38.
FN16	19-7017017	Screw: PH 8032 x 5/8.
FN17 and FN18		*Not Used.*
FN19	19030271-0832	Nut: KEPS 8-32 Std. Pattern.
		- - - - CONNECTOR - - - -
J1	18-33564-0001	AC Power PWB Mounting.

SYMBOL	PART NUMBER	DESCRIPTION
		- - - - RELAYS - - - -
K1	20-1440030	SPDT, 12 V, 40 Amp.
K2 and K3	20-1440027	Relays
		- - - - INDUCTORS - - - -
L1	05-1101078	RFI, XS14600.
L2	05-34372-0003	Choke: Common Mode, GLD140/150's.
L3	05-1101232	Transformer: Dual Input, XS14600.
L4	05-35131-0002	Choke: Output Storage, XS14600.
		- - - - TRANSISTORS - - - -
Q1 and Q2	11-31888-0007	FET: 500V, 13 Amp. Sim to TO-247.
Q3	11-31888-0035	FET: 900V, 3.8 Amp. Sim to TO-220 (MTP4N90).
Q4		2222, SMT.
Q5	11-30315-0032	PNP: 100V, 3.0 Amps. Sim to To-220 (TIP32C).
Q6		2907A, SMT.
Q7 and Q8		2222, SMT.
Q9		2907A, SMT.
		- - - - RESISTORS - - - -
R1		*Not Used.*
R2	16-30185-0017	Thermistor NTC: 10.0 Ohms, 8.0 Amps.
R3 and R4		2.74 Ohms, SMT.
R5 and R6		10k Ohms, SMT.
R7		7.5k Ohms, SMT.
R8	16-30144-0103	Variable: 10k Ohms, 1/4w. Counterclockwise.
R9		3.01k Ohms, SMT.
R10		2.67k Ohms, SMT.
R11 and R12		10k Ohms, SMT.
R13		10 Ohms, SMT.
R14		5.11k Ohms, SMT.
R15		*Not Used.*
R16 thru R18		1k Ohms, SMT.

SYMBOL	PART NUMBER	DESCRIPTION
R19		2.21k Ohms, SMT.
R20		10k Ohms, SMT.
R21		1k Ohms, SMT.
R22		2.49k Ohms, SMT.
R23		4.75k Ohms, SMT.
R24		20.5k Ohms, SMT.
R25		3.65k Ohms, SMT.
R26		21.1k Ohms, SMT.
R27		475 Ohms, SMT.
R28 and R29		4.7 Ohms, SMT.
R30		*Not Used.*
R31 and R32		4.7 Ohms, SMT.
R33		Omit, SMT.
R34		100 Ohms, SMT.
R35 thru R40		75k Ohms, SMT.
R41 thru R46		36.5k Ohms, SMT.
R47 and R48		7.5k Ohms, SMT.
R49		4.75k Ohms, SMT.
R50		2.43k Ohms, SMT.
R51		7.68k Ohms, SMT.
R52		5.11k Ohms, SMT.
R53		243k Ohms, SMT.
R54		51.1k Ohms, SMT.
R55		1.5k Ohms, SMT.
R56		124 Ohms, SMT.
R57		1k Ohms, SMT.
R58		10k Ohms, SMT.
R59		475 Ohms, SMT.
R60		1.21k Ohms, SMT.
R61		1.2 k Ohms, SMT.
R62		10k Ohms, SMT.
R63		2.11k Ohms, SMT.
R64		1.21k Ohms, SMT.

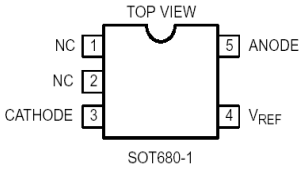
SYMBOL	PART NUMBER	DESCRIPTION
R65		1.2 k Ohms, SMT.
R66		10k Ohms, SMT.
R67		0 Ohms, SMT.
R68		1k Ohms, SMT.
R69		10k Ohms, SMT.
R70		2.11k Ohms, SMT.
R71		100 Ohms, SMT.
R72 thru R74		162k Ohms, SMT.
R75		10.7k Ohms, SMT.
R76		221 Ohms, SMT.
R77		475 Ohms, SMT.
R78		200k Ohms, SMT.
R79		365k Ohms, SMT.
R80 and R81		200k Ohms, SMT.
R82	16-30144-0103	Variable: 10k Ohms, 1/4 W. Counterclockwise.
R83 and R84		*Not Used.*
R85		221 Ohms, SMT.
R86 and R87		4.75k Ohms, SMT.
R88		221 Ohms, SMT.
R89		1.37k Ohms, SMT.
R90		124 Ohms, SMT.
R91		10k Ohms, SMT.
R92		100k Ohms, SMT.
R93		3.65k Ohms, SMT.
R94		1k Ohms, SMT.
R95		825 Ohms, SMT.
R96 thru R98		470 Ohms, SMT.
R99 thru R110		0 Ohms, SMT.
R111		*Not Used.*
R112 and R113	16-30140-0150	15 Ohms, 2 W, 5%.

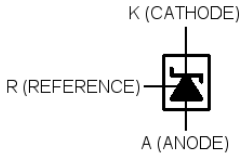
SYMBOL	PART NUMBER	DESCRIPTION
R114 and R115	16-30140-0471	470 Ohms, 2 W, 5%.
		- - - - SWITCHES - - - -
S1	20-32472-0001	Thermostat Normally Open.
S2	20-30851-0003	Slide: 115/230 V, Rt Angle (Custom).
		- - - - TEST POINTS - - - -
TP1 thru TP3	17-33523-0001	Wire Preformed Test Point (Custom).
TP4		*Not Used.*
TP5	17-33523-0001	Wire Preformed Test Point (Custom).
		- - - - TRANSFORMERS - - - -
T1	05-1150106	Drive.
T2	05-1150099	Current Sense.
T3	05-35131-0001	Power.
T4	05-1050749	Bias.
		- - - - INTEGRATED CIRCUITS - - - -
U1		High Speed PWM Controller: sim to UC3825.
U2		Dual Operational Amplifier: sim to LM358.
U3		Current Mode Controller: sim to UC2844.
U4		Quad Voltage Comparator: sim to LM2901.
U5	13-30157-0001	3-Terminal Adjustable Regulator: sim to LM317T.
U6	15-4110002	Opto-coupler: sim to 4N35.
U7		*Not Used.*
U8	13-30157-0001	3-Terminal Adjustable Regulator: sim to LM317T
		- - - - MISCELLANEOUS - - - -
	17-31256-0500	Sleeving Heatshrink Black 1/2" (For E1, 2, 3 & 4).
	17-31256-0750	Sleeving Heatshrink Black 3/4" (For C58).
	19-30251-0001	Fuse Clip 5 x 20MM Brass (For F1, 2 & 3).
	19-6770198	Terminal QC PWB Mtg Male .250 x .032 (Terminals 2, 3, 5, 6 & 7).
	22-30259-0010	Gap Mat Sheet Nomex 10 Mil (For L2).
W1	**06-5500032**	**HARNESS ASSEMBY**
FN1 (J1)	18-67707719	Connector: High Current Plug Housing 4 Ck.
FN2	18-6770736	Contact: High Current 12-8 Ga (For J1).
FN3 (J2)	18-31598-1003	Connector: Mate-N-Lok Cap 3 Ckt.
FN4	18-6770431	Contact: Mate-N-Lok Pin 20-14 Ga (For J2).
FN5	17-35203-1000	Wire: PVC 12Ga UL1015, Black.
FN6	17-34175-1000	Fuse: MIDI F 40A, 32V (For FN15).
FN7	17-5010200	Wire: PVC 8 Ga Strnd Wht.

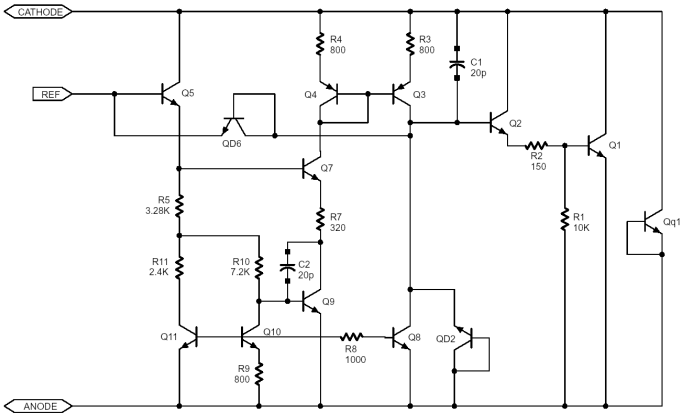
SYMBOL	PART NUMBER	DESCRIPTION
FN8	17-5010307	Wire: PVC 8 Ga Strnd Red.
FN9	17-30610-0600	Wire: PVC 16 Ga, 600V, Blue.
FN10	17-30610-0800	Wire: PVC 16 Ga, 600V, Gray.
FN11	17-30610-1000	Wire: PVC 16 Ga, 600V, Black.
FN12	19-30631-0011	Grommet; Rubber 0.38 ID .50 Mtg.
FN13	19-30631-0010	Grommet; Rubber 0.44 ID .56 Mtg.
FN14	19-5300003	Clamp: Cable, Nylon, 0.562 ID.
FN15	20-6770733	Fuse Holder With Cover.
F4	20-4480077	Fuse: MIDI, F 40 Amp, 32 Volts (For FN15).
FN16	18-5200014	Terminal: Ring #10, 8 Ga Non-Ins.
FN17	18-5200048	Terminal: QC, 0.250” 16-14 Ga, Full Ins.
FN18	18-5200065	Terminal: Ring, #8, 12-10 Ga, Ins Bar.
FN19	18-6770734	Strain Relief Backshell.
FN20	18—770735	Adapter: Strain Relief.
FN21	19-30286-0375	Screw: PNHD, 6-32 x 0.375, Phil.
FN22	17-31256-0375	Sleeving: Heatshrink, BLK, 3/8”.

7.0 IC DATA

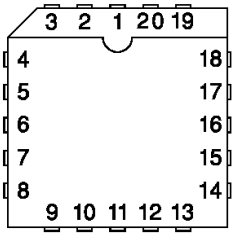
D18 & D25
Adjustable Precision Shunt Regulator
TL431C



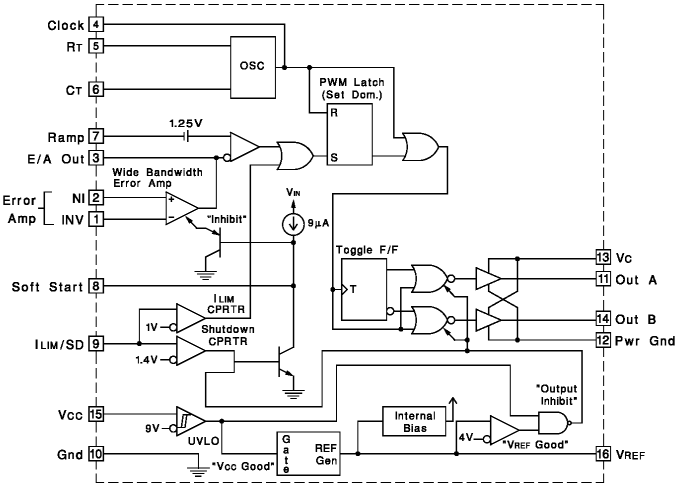




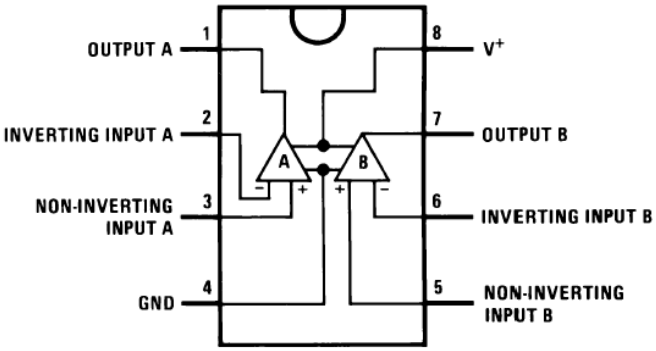
U1
High Speed PWM Controller
UC3825



PACKAGE PIN FUNCTION	
FUNCTION	PIN
N/C	1
INV	2
NI	3
E/A Out	4
Clock	5
N/C	6
R_T	7
C_T	8
Ramp	9
Soft Start	10
N/C	11
ILIM/SD	12
Gnd	13
Out A	14
Pwr Gnd	15
N/C	16
V_C	17
Out B	18
V_{CC}	19
V_{REF} 5.1V	20

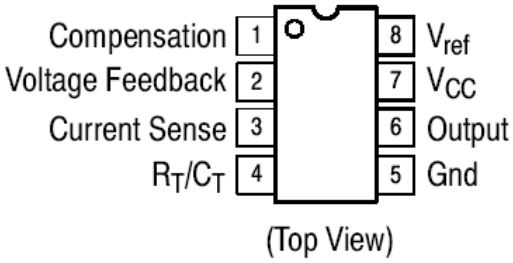


U2
Dual Operational Amplifier
LM358

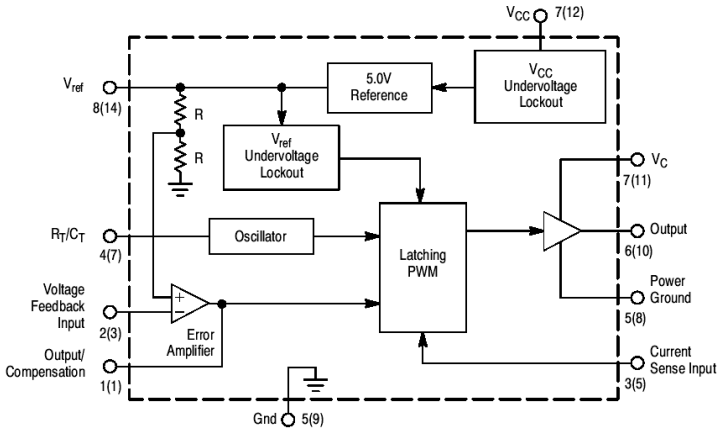


Top View

U3
Current Mode Controller
UC2844

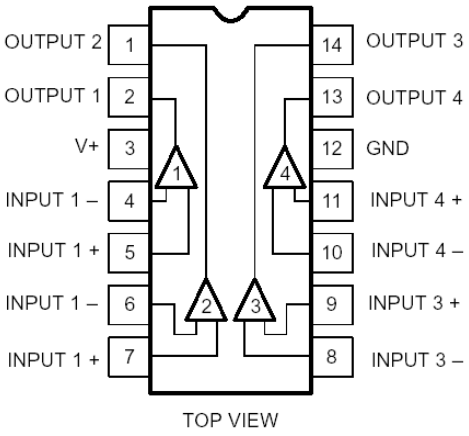


(Top View)

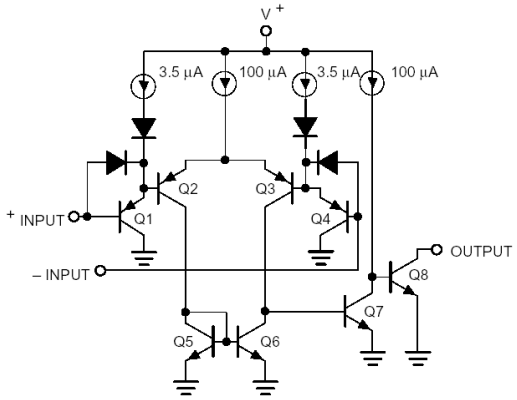


Pin numbers in parenthesis are for the D suffix SO-14 package.

U4
Quad Voltage Comparator
LM2901

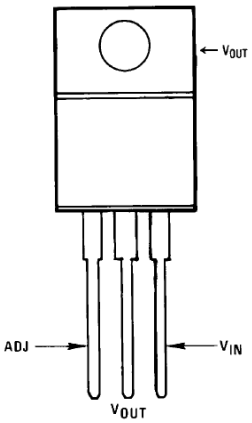


EQUIVALENT CIRCUIT



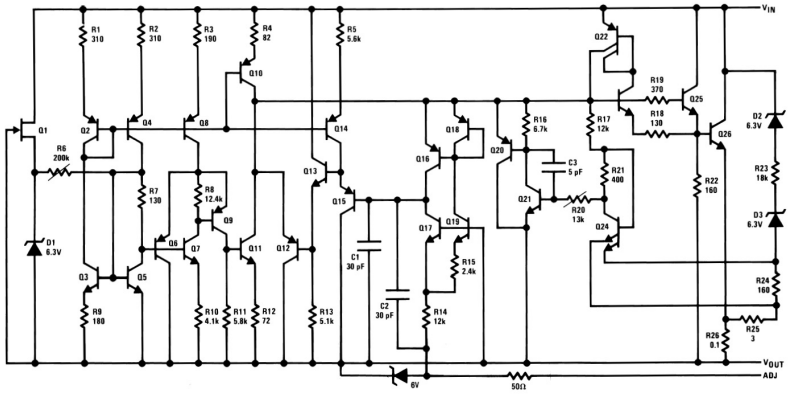
(1 Comparator Only)

U5 & U8
3-Terminal Adjustable Regulator
LM317T

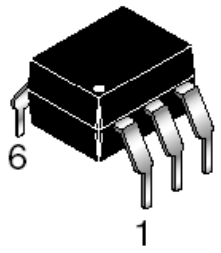


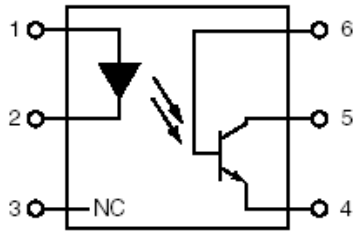
Front View

Schematic Diagram



U6
Phototransistor Optocouplers
4N35



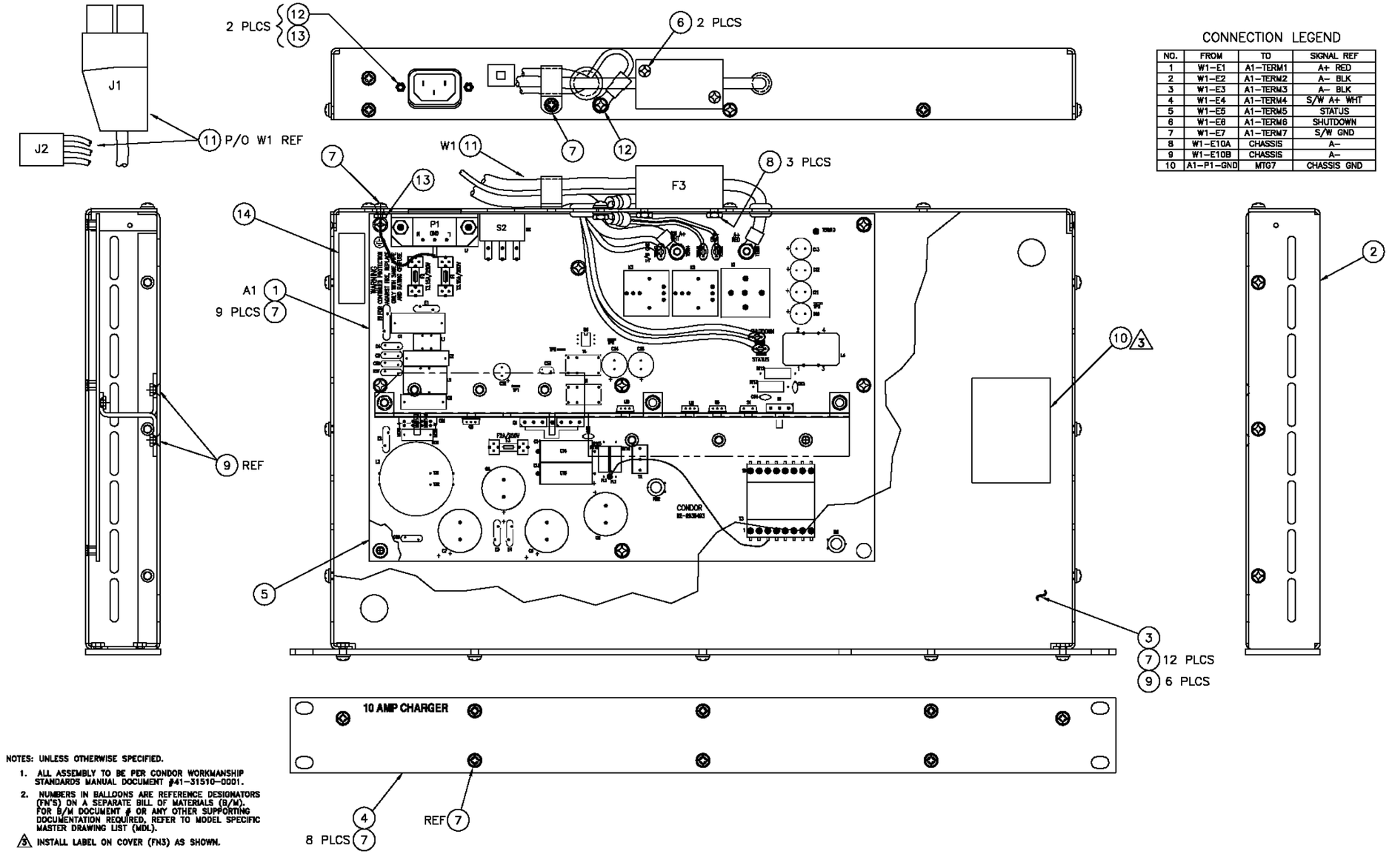


PIN 1. ANODE
2. CATHODE
3. NO CONNECTION
4. EMITTER
5. COLLECTOR
6. BASE

U7
Not Used

8.0 ASSEMBLY DIAGRAMS

8.1 CHARGER



CONNECTION LEGEND

NO.	FROM	TO	SIGNAL REF
1	W1–E1	A1–TERM1	A+ RED
2	W1–E2	A1–TERM2	A– BLK
3	W1–E3	A1–TERM3	A– BLK
4	W1–E4	A1–TERM4	S/W A+ WHT
5	W1–E5	A1–TERM5	STATUS
6	W1–E6	A1–TERM6	SHUTDOWN
7	W1–E7	A1–TERM7	S/W GND
8	W1–E10A	CHASSIS	A–
9	W1–E10B	CHASSIS	A–
10	A1–P1–GND	MTG7	CHASSIS GND

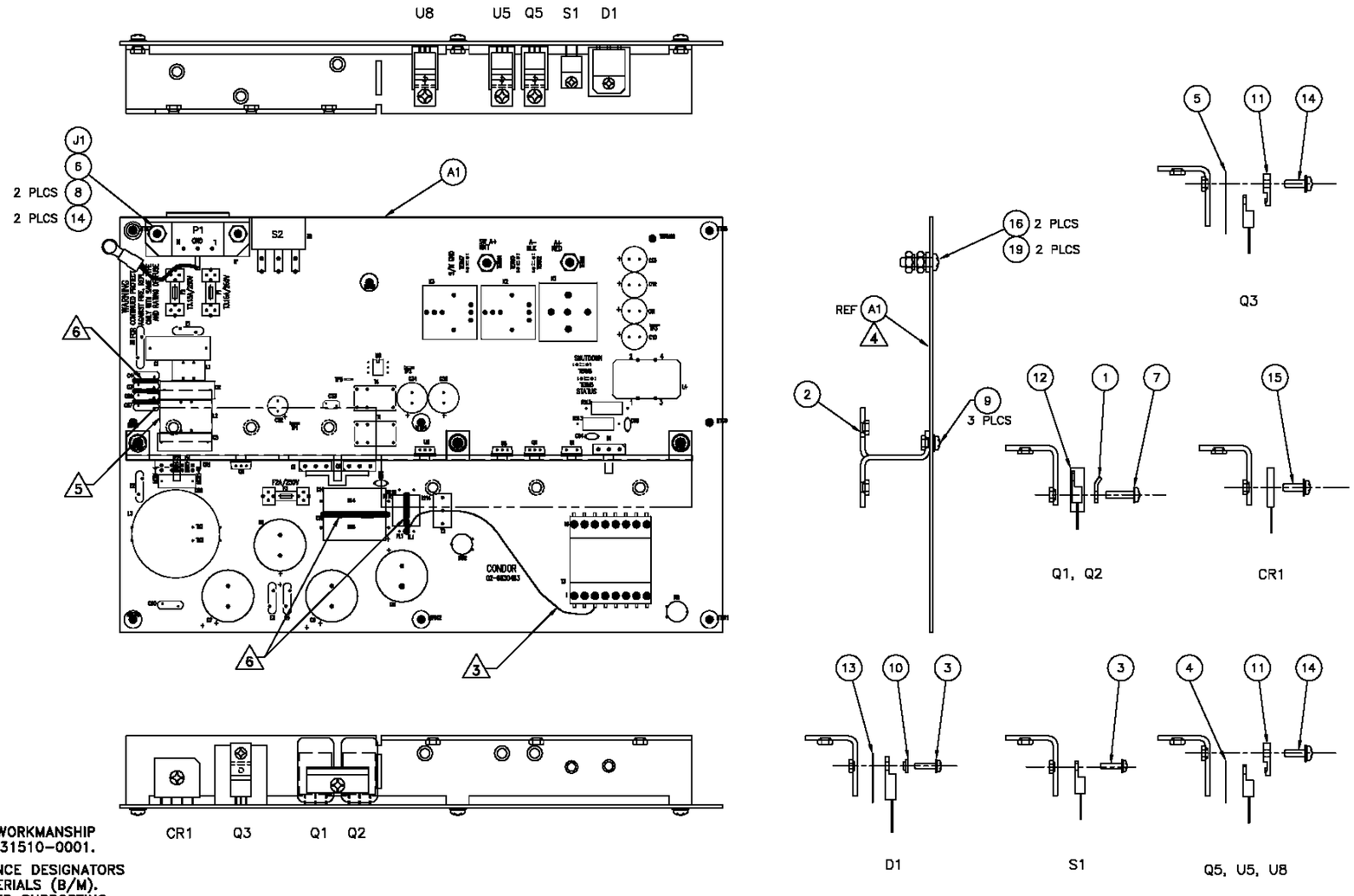
NOTES: UNLESS OTHERWISE SPECIFIED.

1. ALL ASSEMBLY TO BE PER CONDOR WORKMANSHIP STANDARDS MANUAL DOCUMENT #41–31510–0001.
2. NUMBERS IN BALLOONS ARE REFERENCE DESIGNATORS (FN'S) ON A SEPARATE BILL OF MATERIALS (B/M). FOR B/M DOCUMENT # OR ANY OTHER SUPPORTING DOCUMENTATION REQUIRED, REFER TO MODEL SPECIFIC MASTER DRAWING LIST (MDL).

△3 INSTALL LABEL ON COVER (FN3) AS SHOWN.

(1-XS14600, Sh. 1, Rev. D)

8.2 CIRCUIT BOARD



NOTES: UNLESS OTHERWISE SPECIFIED.

1. ALL ASSEMBLY TO BE PER CONDOR WORKMANSHIP STANDARDS MANUAL DOCUMENT #41-31510-0001.
2. NUMBERS IN BALLOONS ARE REFERENCE DESIGNATORS (FN'S) ON A SEPARATE BILL OF MATERIALS (B/M). FOR B/M DOCUMENT # OR ANY OTHER SUPPORTING DOCUMENTATION REQUIRED, REFER TO MODEL SPECIFIC MASTER DRAWING LIST (MDL).

△3 ROUTE T3 FLYING LEAD (FL1) THROUGH T2 AND SOLDER IN PLACE.

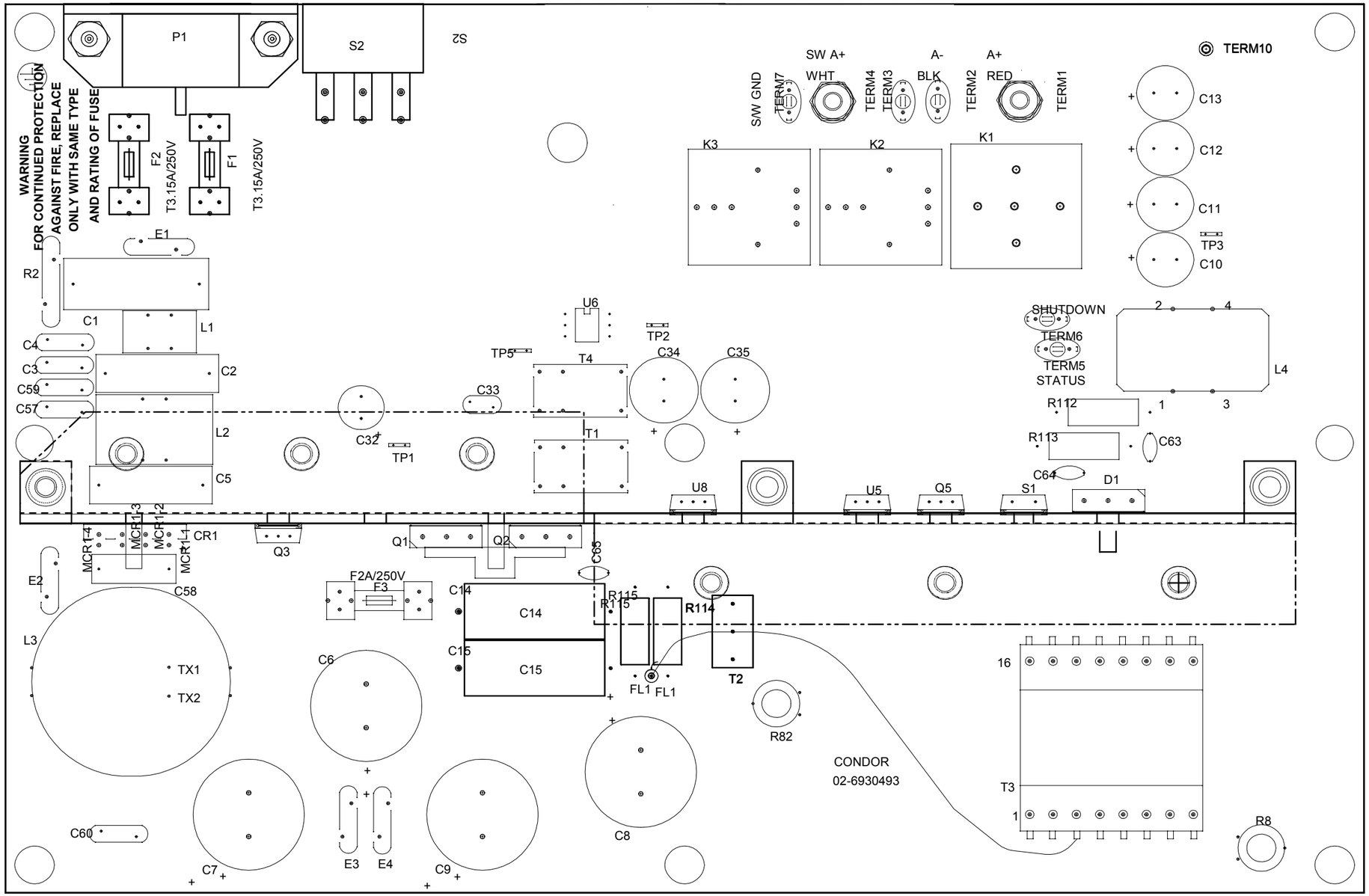
△4 SOME COMPONENTS NOT SHOWN FOR CLARITY.

△5 CUT NOMEX SHEET 1" x 1" SQUARE. RTV TO THE TOP OF L2.

△6 APPLY RTV OR EQUIV. AS INDICATED BY SHADED AREAS.

(4-XS14600, Sh. 1, Rev. C)

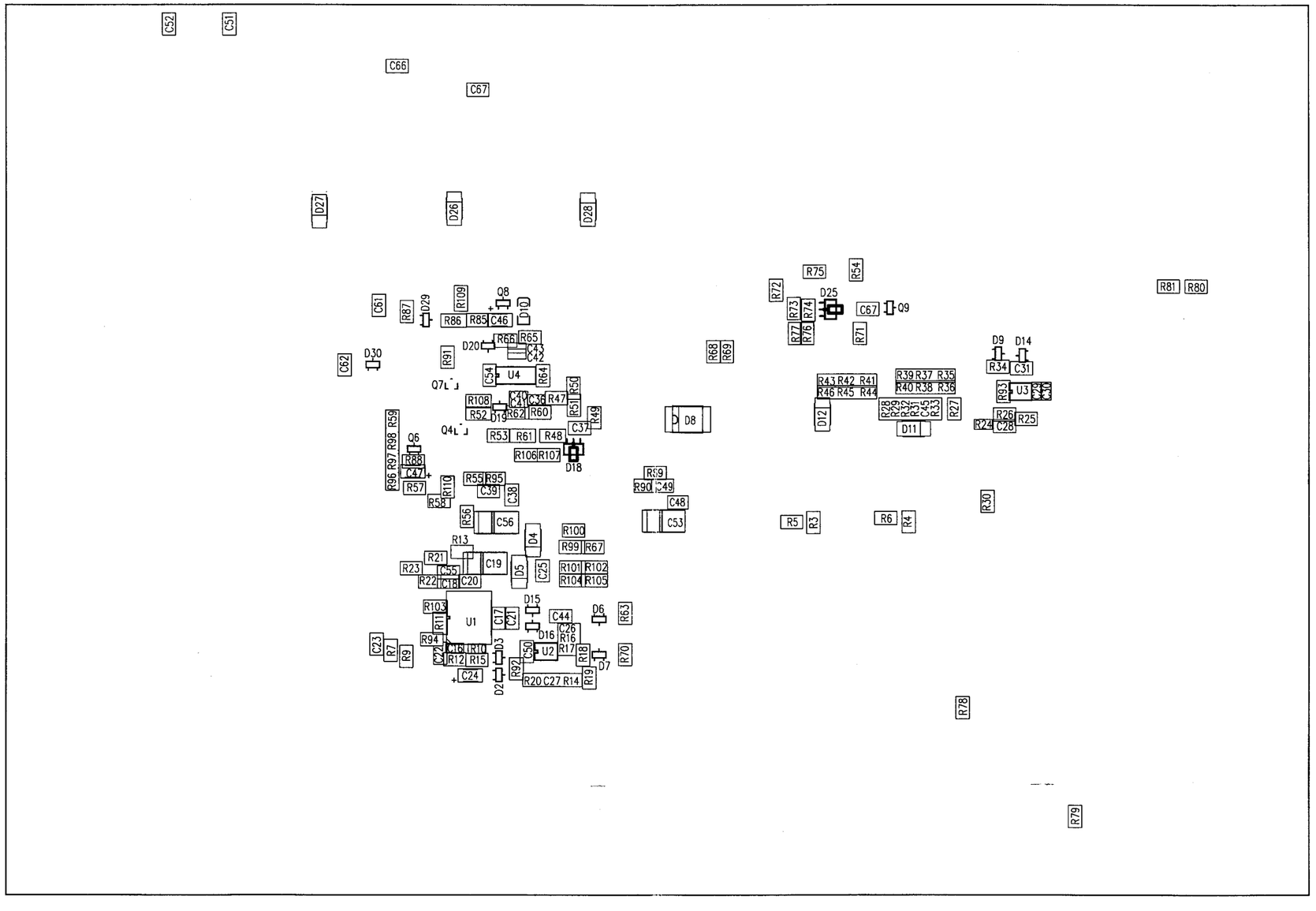
8.3 CIRCUIT BOARD COMPONENT SIDE



COMPONENT SIDE

(Made From 4-XS14600, Sh. 1, Rev. C)

8.4 CIRCUIT BOARD SOLDER SIDE

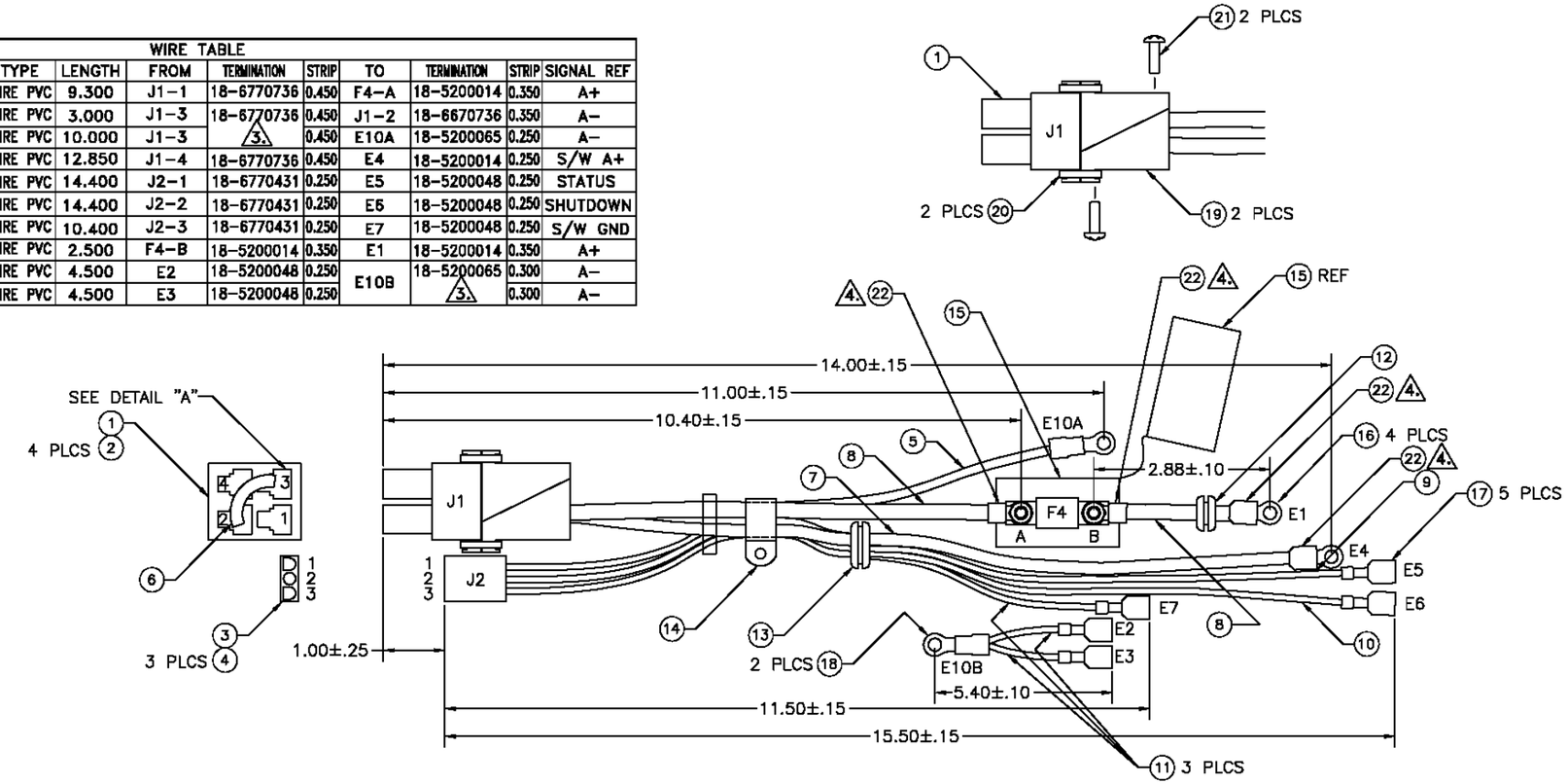


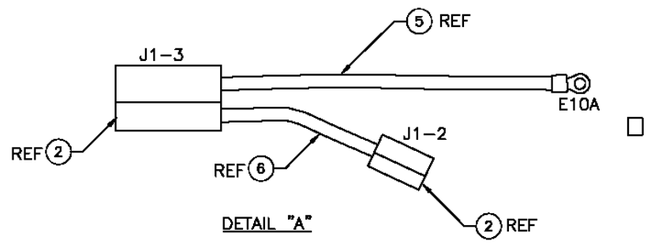
SOLDER SIDE

(9-6930493, Rev. B)

8.5 HARNESS 6-5500032

WIRE TABLE											
FN#	COLOR	AWG	TYPE	LENGTH	FROM	TERMINATION	STRIP	TO	TERMINATION	STRIP	SIGNAL REF
8	RED	8	WIRE PVC	9.300	J1-1	18-6770736	0.450	F4-A	18-5200014	0.350	A+
6	BLK	10	WIRE PVC	3.000	J1-3	18-6770736	0.450	J1-2	18-6670736	0.350	A-
5	BLK	12	WIRE PVC	10.000	J1-3	3.	0.450	E10A	18-5200065	0.250	A-
7	WHT	8	WIRE PVC	12.850	J1-4	18-6770736	0.450	E4	18-5200014	0.250	S/W A+
9	BLUE	16	WIRE PVC	14.400	J2-1	18-6770431	0.250	E5	18-5200048	0.250	STATUS
10	GRAY	16	WIRE PVC	14.400	J2-2	18-6770431	0.250	E6	18-5200048	0.250	SHUTDOWN
11	BLK	16	WIRE PVC	10.400	J2-3	18-6770431	0.250	E7	18-5200048	0.250	S/W GND
8	RED	8	WIRE PVC	2.500	F4-B	18-5200014	0.350	E1	18-5200014	0.350	A+
11	BLK	16	WIRE PVC	4.500	E2	18-5200048	0.250	E10B	18-5200065	0.300	A-
11	BLK	16	WIRE PVC	4.500	E3	18-5200048	0.250		3.	0.300	A-





NOTES: UNLESS OTHERWISE SPECIFIED.

1. ALL ASSEMBLY TO BE PER CONDOR WORKMANSHIP STANDARDS MANUAL DOCUMENT #41-31510-0001.
2. NUMBERS IN BALLOONS ARE REFERENCE DESIGNATORS (FN'S) ON A SEPARATE BILL OF MATERIALS (B/M). FOR B/M DOCUMENT # OR ANY OTHER SUPPORTING DOCUMENTATION REQUIRED, REFER TO MODEL SPECIFIC MASTER DRAWING LIST (MDL).

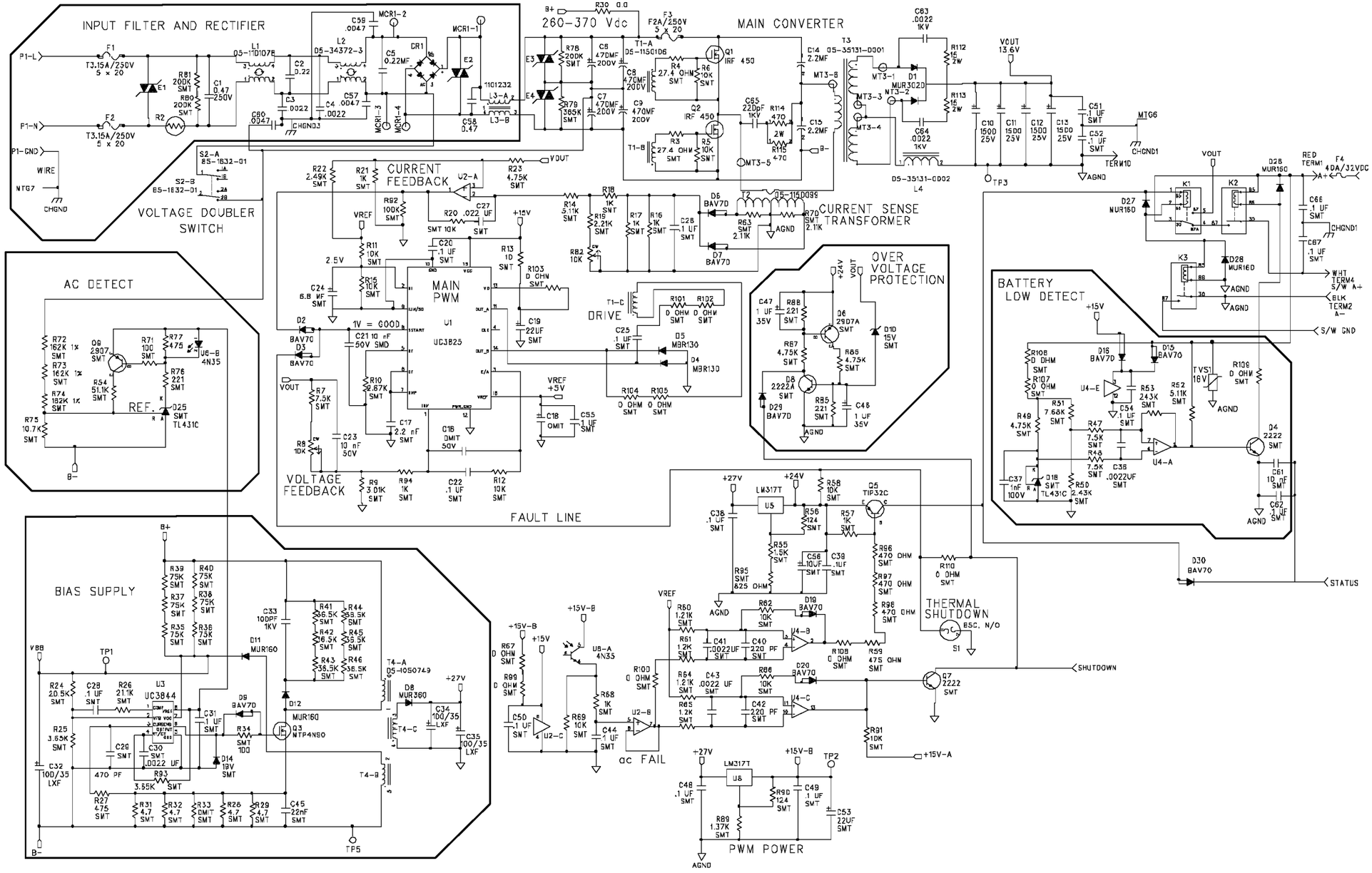
3. CRIMP TWO WIRES TO ONE TERMINAL.

4. CUT SLEEVING (FN22) APPROX. 4"

5. ATTACH TO MAIN HARNESS USING TIEWRAP, LOCATE APPROX. AS SHOWN.

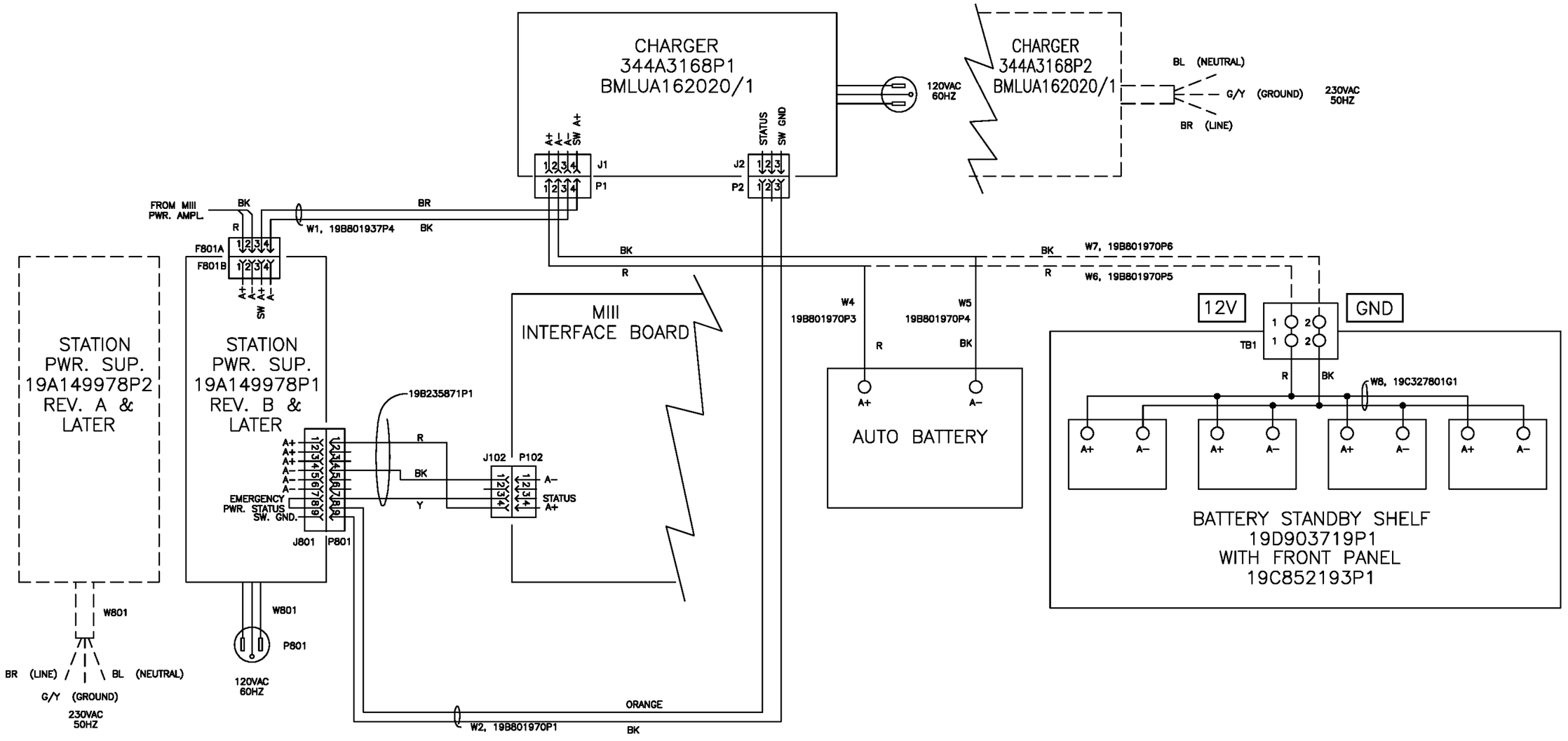
(6-5500032, Rev. C)

9.0 SCHEMATIC DIAGRAM



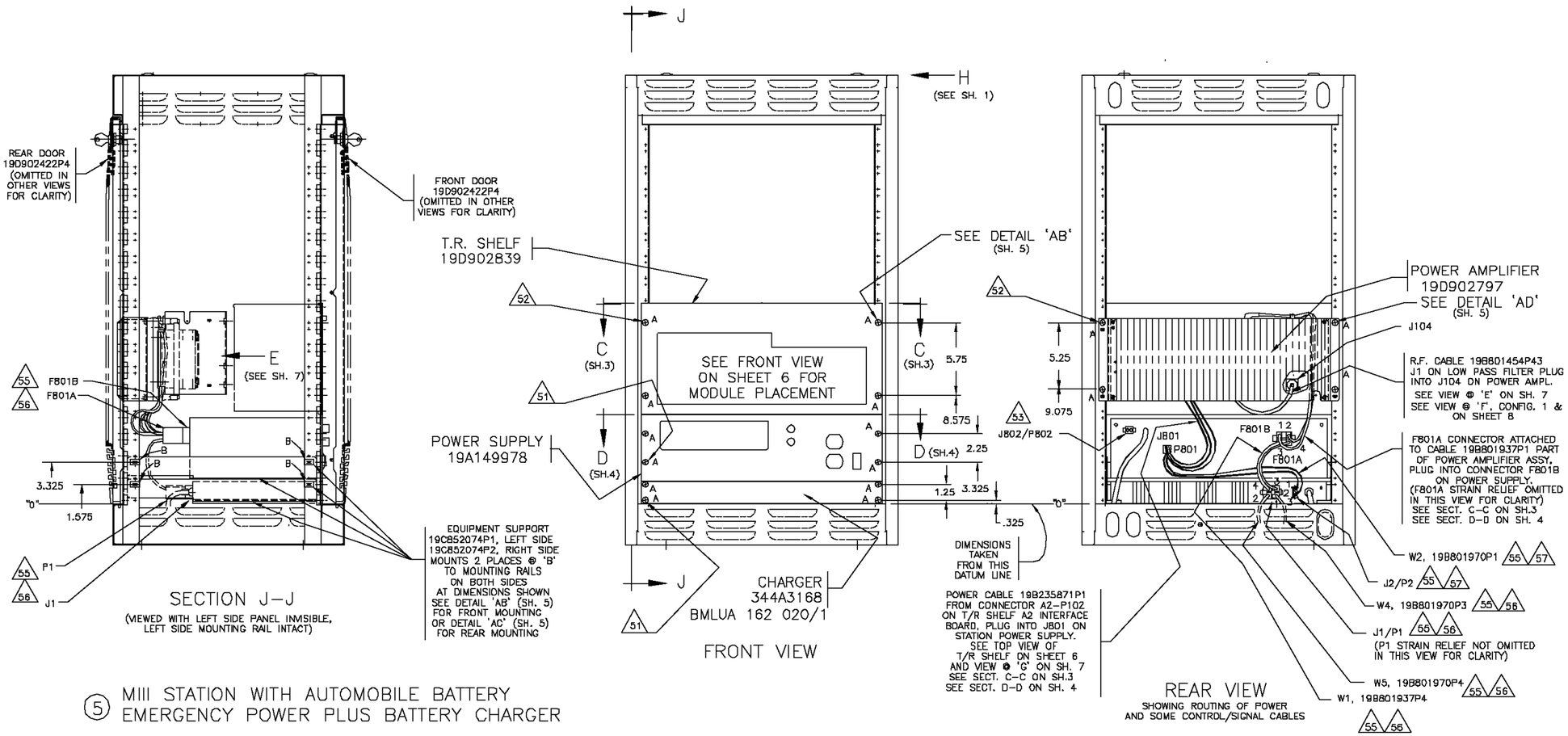
(31-XS14600, Sh.1, Rev. G)

10.0 SYSTEM INTERCONNECTION DIAGRAM



(19D903635, Sh. 3, Rev. 8)

11.0 APPLICATION ASSEMBLY DIAGRAM

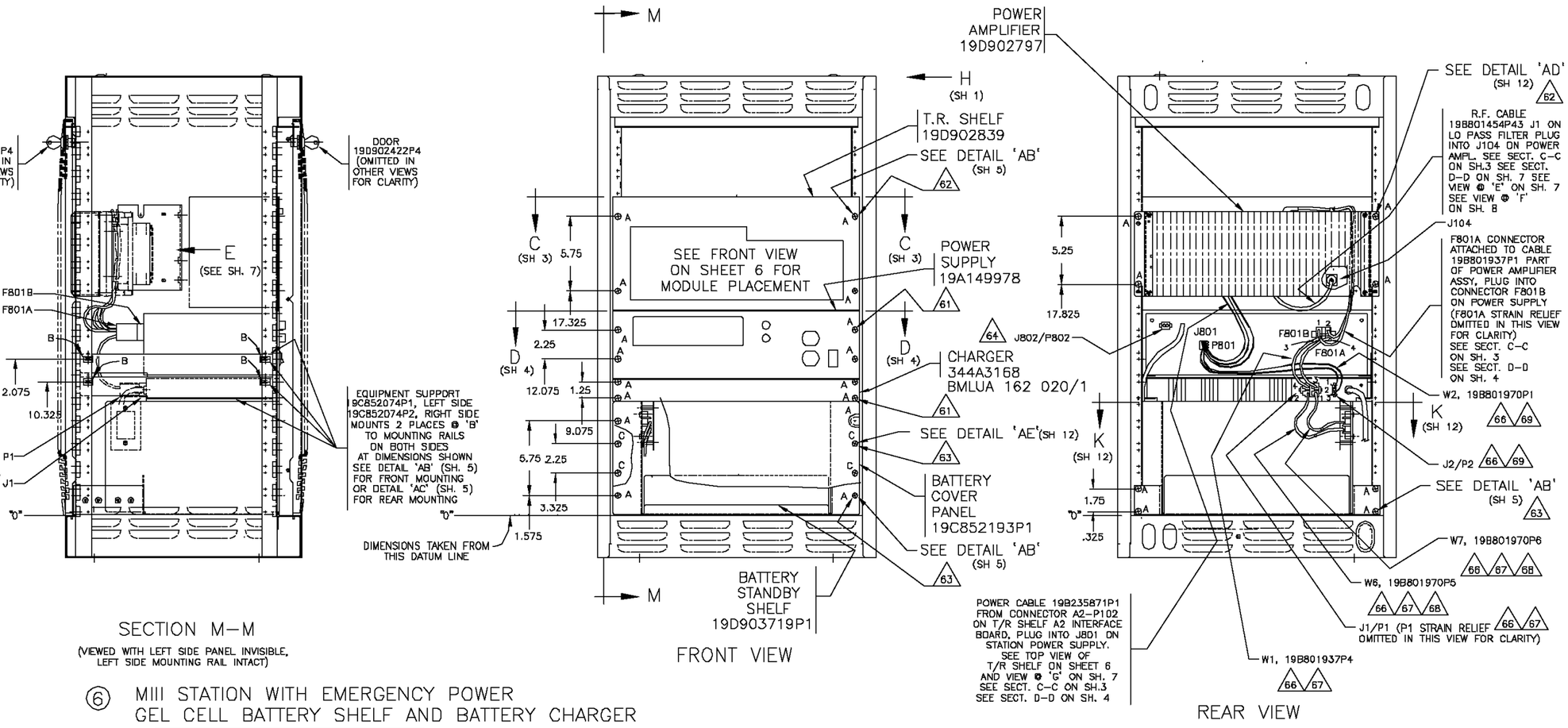


⑤ MIII STATION WITH AUTOMOBILE BATTERY EMERGENCY POWER PLUS BATTERY CHARGER

NOTES:

51. ITEMS REFERENCING THIS CALLOUT ARE CALLED FOR ON HARDWARE KIT PL344A3450G1
52. ITEMS REFERENCING THIS CALLOUT ARE CALLED FOR ON HARDWARE KIT PL344A3450G2
53. REMOVE P802 FROM J802 ON POWER SUPPLY 19A149978.
54. INSTALL CABLES AS SHOWN AND INTERCONNECT IN ACCORDANCE WITH INTERCONNECT DIAGRAM 19D903635. SEE ALSO NOTES 55, 56, & 57.
55. INTERCONNECTION OF CABLES IN NOTES 56 & 57 TO BE CONSISTENT WITH INTERCONNECT DRAWING 19D903635.
56. REMOVE FB01A OF PA LEAD ASSEMBLY 19B801937P1 FROM F801B OF POWER SUPPLY. REMOVE STRAIN RELIEFS FROM FB01A AND FROM P1 OF W1.
INSERT THE BROWN WIRE OF W1 INTO THE NUMBER 3 CAVITY OF F801A.
INSERT THE BLACK WIRE OF W1 INTO THE NUMBER 4 CAVITY OF FB01A.
INSERT THE CONTACT END OF W4 INTO THE NUMBER 1 CAVITY OF P1 OF W1.
INSERT THE CONTACT END OF W5 INTO THE NUMBER 2 CAVITY OF P1 OF W1.
REINSTALL STRAIN RELIEFS FOR P1 OF W1 AND F801A.
PLUG P1 OF W1 INTO J1 OF THE CHARGER.
PLUG FB01A INTO FB01B OF THE POWER SUPPLY.
CABLES W4 AND W5 ARE TO BE LEFT ROLLED UP AND LYING ON THE FLOOR OF THE CABINET.
57. PLUG P2 OF W2 INTO J2 ON THE CHARGER.
INSERT THE ORANGE WIRE OF W2 INTO THE NUMBER 8 CAVITY OF P801 OF CABLE ASSEMBLY 19B235871P1.
INSERT THE BLACK WIRE OF W2 INTO THE NUMBER 9 CAVITY OF P801 OF CABLE ASSEMBLY 19B235871P1.
58. FOR 13 INCH DEEP CABINET MOUNTING, USE REAR SUPPORTS 19B226160 SUPPLIED WITH HARDWARE KIT 344A3696G1. RETURN ANY UNUSED SUPPORTS TO STOCK.

(19D902845, Sh. 10, Rev. 14)



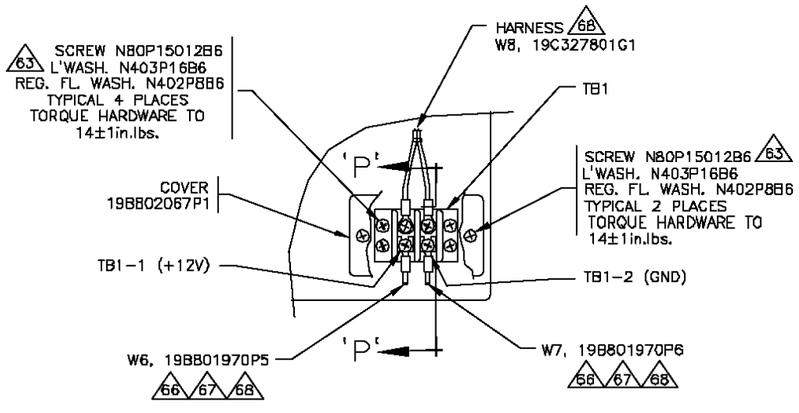
⑥ MIII STATION WITH EMERGENCY POWER GEL CELL BATTERY SHELF AND BATTERY CHARGER

FOR TRANSMIT APPLICATIONS USING THE EA101292 VERSION POWER AMPLIFIER SEE APPLICATION ASSEMBLY AA57–HRB 104 26

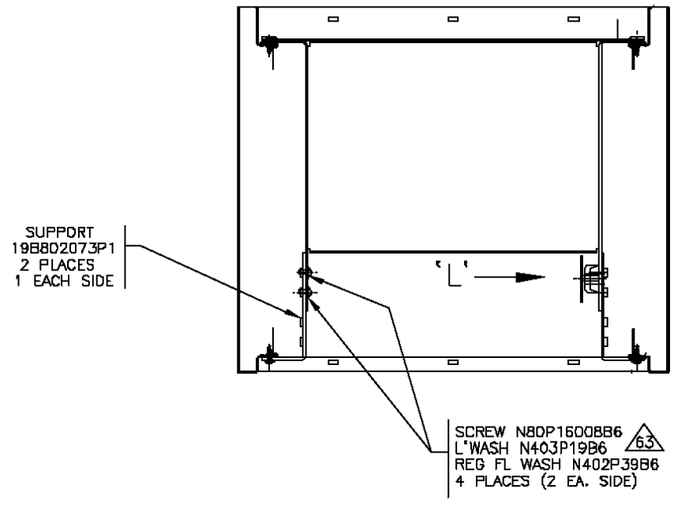
NOTES:

61. ITEMS REFERENCING THIS CALLOUT ARE CALLED FOR ON HARDWARE KIT PL344A3450G1.
62. ITEMS REFERENCING THIS CALLOUT ARE CALLED FOR ON HARDWARE KIT PL344A3450G2.
63. ITEMS REFERENCING THIS CALLOUT ARE CALLED FOR ON HARDWARE KIT PL344A3450G5.
64. REMOVE P802 FROM J802 ON POWER SUPPLY 19A149978.
65. INSTALL CABLES AS SHOWN AND INTERCONNECT IN ACCORDANCE WITH INTERCONNECT DIAGRAM 19D903635. SEE ALSO NOTES 66, 67, 68 & 69.
66. INTERCONNECTION OF CABLES IN NOTES 67, 68 & 69 TO BE CONSISTENT WITH INTERCONNECTION DRAWING 19D903635.
67. REMOVE STRAIN RELIEFS FROM F801A OF THE PA LEAD ASSEMBLY, 19B801937P1, AND FROM P1 OF W1 (19B801937P4).
INSERT THE BROWN WIRE OF W1 INTO THE NUMBER 3 CAVITY OF F801A.
INSERT THE BLACK WIRE OF W1 INTO THE NUMBER 4 CAVITY OF F801A.
INSERT THE HERMAPHRODITIC CONTACT OF W6 (19B801970P5) INTO THE NUMBER 1 CAVITY OF P1 OF W1.
INSERT THE HERMAPHRODITIC CONTACT OF W7 (19B801970P6) INTO THE NUMBER 2 CAVITY OF P1 OF W1.
REINSTALL STRAIN RELIEFS FOR P1 OF W1 AND F801A OF THE PA LEAD ASSEMBLY.
PLUG P1 OF W1 INTO J1 OF THE CHARGER.
PLUG F801A INTO F801B OF THE POWER SUPPLY.
68. CONNECT W6 TO THE "+12V " TERMINAL OF THE W8 (19C327801G1) TERMINAL BOARD. (TB1–1)
CONNECT W7 TO THE "GND " TERMINAL OF THE W8 (19C327801G1) TERMINAL BOARD. (TB1–2)
69. PLUG P2 OF W2 (19B801970P1) INTO J2 ON THE ON THE CHARGER.
INSERT THE ORANGE WIRE OF W2 INTO THE NUMBER 8 CAVITY OF P801 OF CABLE ASSEMBLY 19B235871P1.
INSERT THE BLACK WIRE OF W2 INTO THE NUMBER 9 CAVITY OF P801 OF CABLE ASSEMBLY 19B235871P1.

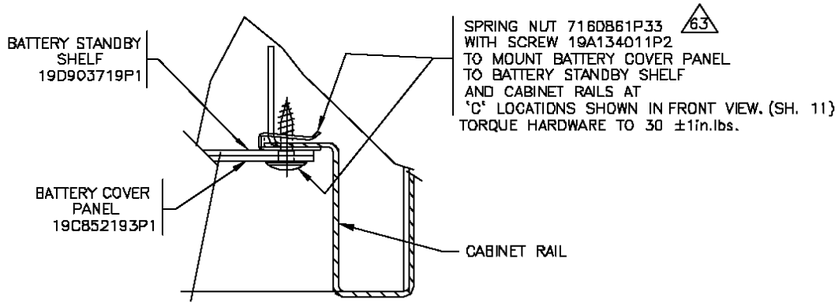
(19D902845, Sh. 11, Rev. 14)



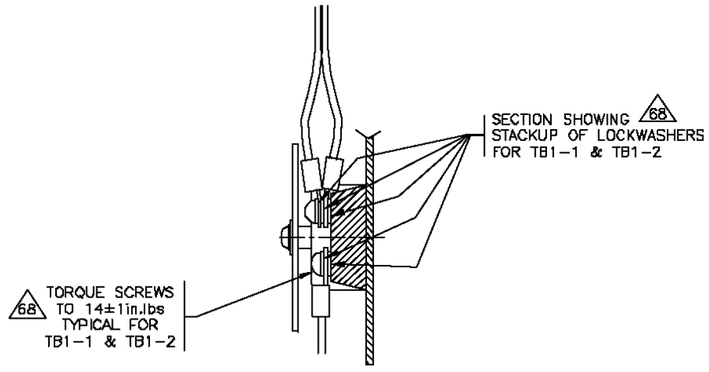
PARTIAL VIEW @ 'L'



SECTION K–K



DETAIL 'AE'
TYPICAL HARDWARE ASSEMBLY
AT LOCATIONS 'C'



SECTION P–P

(ENLARGED)

(19D902845, Sh. 12, Rev. 14)

12.0 FIELD INSTALLATION OF GEL CELL BATTERIES

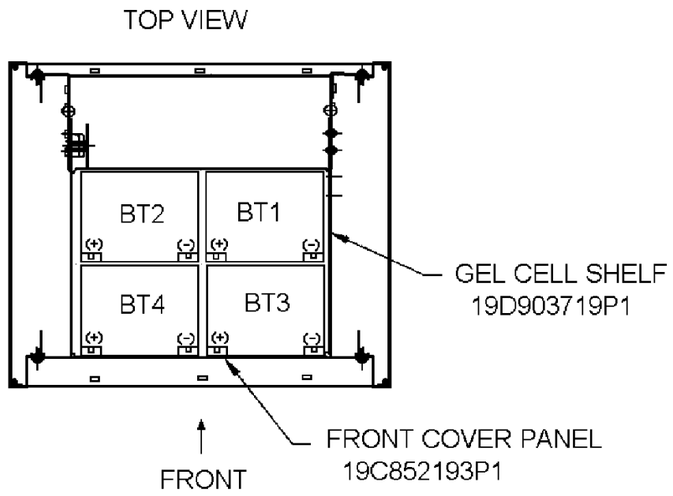


FIGURE 1

(1) FIELD INSTALLATION OF GEL CELL BATTERIES IN THE EMERGENCY POWER GEL CELL BATTERY SHELF FOR A MIII 37 in. HIGH INDOOR FIXED LAND CABINET.

1. REMOVE GEL CELL SHELF FRONT COVER PANEL 19C852193P1.
2. INSTALL BT1, BATTERY 19B209590P1, INTO GEL CELL SHELF 19D903719P1 AS SHOWN IN FIGURE 1. ATTACH A RED WIRE FROM HARNESS W8 (19C327801G1) TO THE "(+)" TERMINAL. ATTACH A BLACK WIRE FROM HARNESS W8 (19C327801G1) TO THE "(–)" TERMINAL.
3. IN ORDER, INSTALL BT2, BT3, AND BT4 PER STEP 2 INSTRUCTIONS. IT IS ADVISABLE TO POSITION THE GEL CELLS SO THAT THEY ARE NOT TOUCHING EACH OTHER OR THE GEL CELL SHELF WALLS AND ARE APPROXIMATELY 0.15" AWAY FROM EACH OTHER.
4. REINSTALL GEL CELL SHELF FRONT COVER PANEL 19C852193P1.

(344A4051, Sh. 1, Rev. 1)

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