3060-UMS

UNINTERRUPTIBLE AC POWER SOURCE

OPERATIONS MANUAL

PACIFIC
POWER SOURCE

LIMITED WARRANTY

Pacific Power Source (PPS) warrants each unit to be free from defects in material and workmanship. For the period of two (2) years from the date of shipment to the purchaser, PPS will either repair or replace, at its sole discretion, any unit returned to its factory in Huntington Beach, California. This warranty does not cover batteries. It does not cover damage arising from mis-use of the unit or attempted field modifications or repairs. This warranty specifically excludes damage to other equipment connected to the unit.

Upon notice from the purchaser within thirty (30) days of shipment of units found to be defective in material or workmanship, PPS will pay all shipping charges for the repair or replacement. If notice is received more than thirty (30) days from shipment, all shipping charges shall be paid by the purchaser. Units returned on debit memos will not be accepted and will be returned without repair.

This warranty is exclusive of all other warranties, express or implied.

3060-UMS

UNINTERRUPTIBLE AC POWER SOURCE
INSTALLATION AND OPERATION MANUAL

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SECTION 1

GENERAL

1 SCOPE

1.1 MANUAL DESCRIPTION

This manual is written to provide the information required to use the 3060-UMS Uninterruptible Power Source effectively. This manual is an Operations Manual. Installation, operation and maintenance are principal subjects of this manual.

1.1.1 USING THIS MANUAL

This manual primarily covers installation and operation. It is very important that the user reads sections 3 and 4 prior to installing this equipment. A thorough understanding of these two sections is required to operate this equipment properly.

If questions arise while reading this manual, the user is encouraged to call the Pacific Power Source Corporation. Pacific maintains a toll-free number which is 1-800-854-2433 (1-800-472-8465 inside California), FAX 1-714-891-1928.

Section 5 discusses maintenance. This section needs to be read only when such activities are required to be performed.

SECTION 1 GENERAL

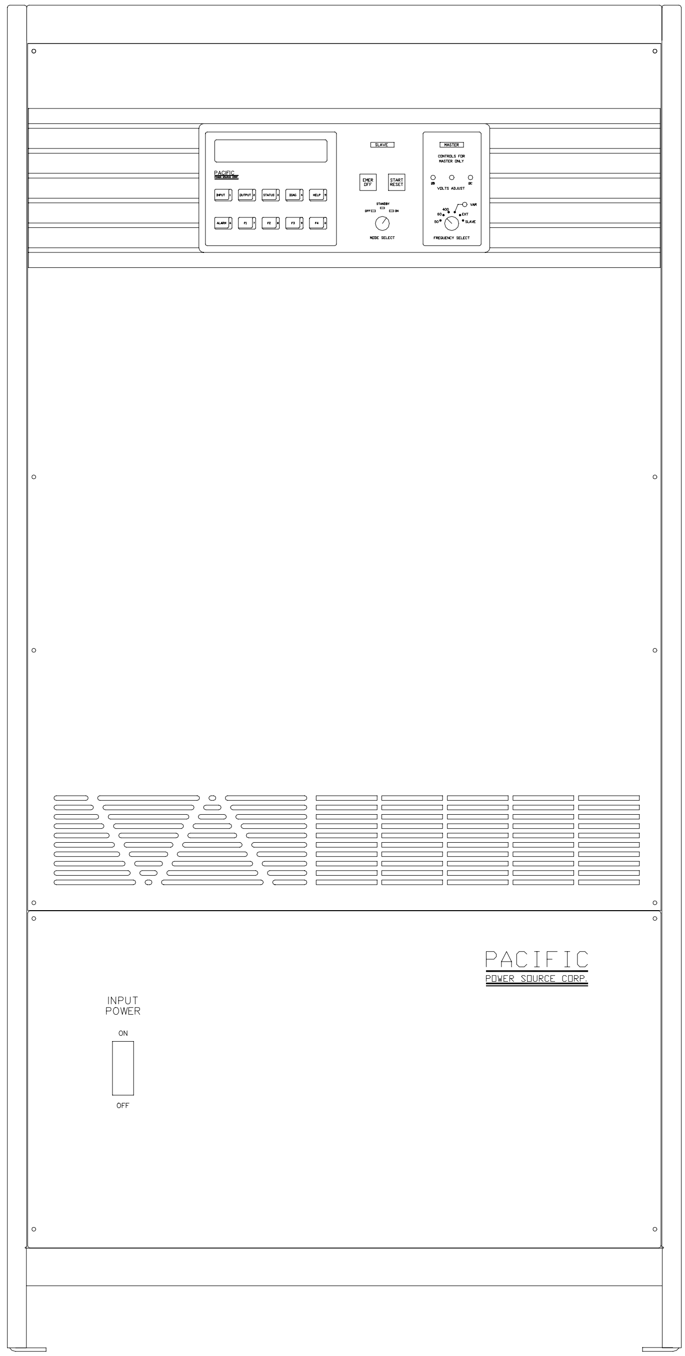

FIGURE 1.1 3060-UMS

1.2 SAFETY NOTICES

The 3060-UMS is capable of transferring very large amounts of electrical energy very quickly. This basic quality is fundamental to a high-performance power source. The batteries are connected in series to produce ± 200VDC at several hundred amps. The warnings and cautions listed below should be observed at all times.

Warnings are conditions which are hazardous to user personnel. All warnings throughout this manual will be formatted as shown below. A condition which is hazardous to both personnel and equipment will be issued as a warning.

Caution statements indicate a dangerous situation which may damage the equipment but is not a threat to life or limb. Cautions will assume the format shown on the following page. All cautions should be rigorously observed.

*** * * * * * * WARNING * * * * * * ***

* THIS EQUIPMENT CONTAINS HIGH ENERGY, LOW IMPEDANCE CIRCUITS !! LETHAL POTENTIALS ARE CONTAINED WITHIN THE CABINET.

* CARE MUST BE EXERCISED WHEN SERVICING THIS EQUIPMENT IN ORDER TO PREVENT SERIOUS OPERATOR INJURY OR EQUIPMENT DAMAGE.

* OBSERVE THE FOLLOWING WHEN SERVICE AND MAINTENANCE ARE REQUIRED:

1) REMOVE ALL JEWELRY FROM ARMS AND NECK WHEN SERVICING THIS EQUIPMENT. THIS PREVENTS THE POSSIBILITY OF SHORTING THROUGH THE JEWELRY AND CAUSING BURNS TO THE OPERATOR.

2) **WEAR SAFETY GLASSES** WHEN SERVICING THIS EQUIPMENT TO PREVENT EYE INJURY DUE TO FLYING PARTICLES CAUSED BY ACCIDENTAL SHORT CIRCUIT CONDITIONS.

*** * * * * * * WARNING * * * * * * ***

1.2 SAFETY NOTICES (Cont)

*** * * * * * * WARNING * * * * * * ***

* 3) DO NOT REMOVE ANY PANEL OR COVER WITHOUT FIRST REMOVING THE INPUT SERVICE BY OPENING ALL CIRCUIT BREAKERS.

4) SERVICE OTHER THAN EXTERNAL CLEANING SHOULD BE REFERRED TO PERSONNEL AUTHORIZED BY THE FACTORY TO SERVICE THIS EQUIPMENT.

*** * * * * * * WARNING * * * * * * ***

\- - - - - - - CAUTION - - - - - - -

\- READ SECTIONS 3 AND 4 OF THIS MANUAL BEFORE INSTALLING OR OPERATING THIS EQUIPMENT.

\- - - - - - - CAUTION - - - - - - -

1.3 GENERAL PRODUCT DESCRIPTION

Pacific UMS Series of equipment is a family of Uninterruptible AC Power Sources covering the power range 62.5 to 625 kVA (50 - 500 kW), at power frequencies of 50 - 400 Hz. The basic 62.5 kVA / 50 kW unit is designated as the model 3060-UMS. Up to 10 units are paralleled to provide 625 kVA / 500 kW.

The 3060-UMS functions as a double conversion Power Source. Input AC Power is rectified to DC by a special power supply that provides low input current distortion and charges the batteries. The DC is then converted back to AC by a high frequency pulse-width modulated switcher, under the control of a highly stable digital oscillator. Batteries provide power if the input line fails.

The 3060-UMS unit is designed to provide high quality output power. Output regulation and total harmonic distortion are of the order of 1% at 50 or 60Hz and 2% at 400Hz. Response time to a 100% step load change is 300 microseconds. The machine is therefore capable of delivering very high pulse current loads.

The fast response time and excellent regulation of the 3060-UMS is extremely important in applications where mixed or switched loads may cause power interference and load "Cross talk".

3060-UMS equipment is designed for long term, continuous operation in a sheltered (no rain) environment. The equipment is efficient circulates little cooling air and is relatively tolerant of high dust environments.

Cabinet operation is controlled by simple, highly reliable digital logic. A microprocessor provides internal diagnostics and communicates with the operator via a 160 character Liquid Crystal Display.

The 3060-UMS is easy to install and even easier to operate. Turn-on, start up, shutdown and other operations are guided by the front panel communications center. The equipment is fail-safe and provides for both local and remote status information.

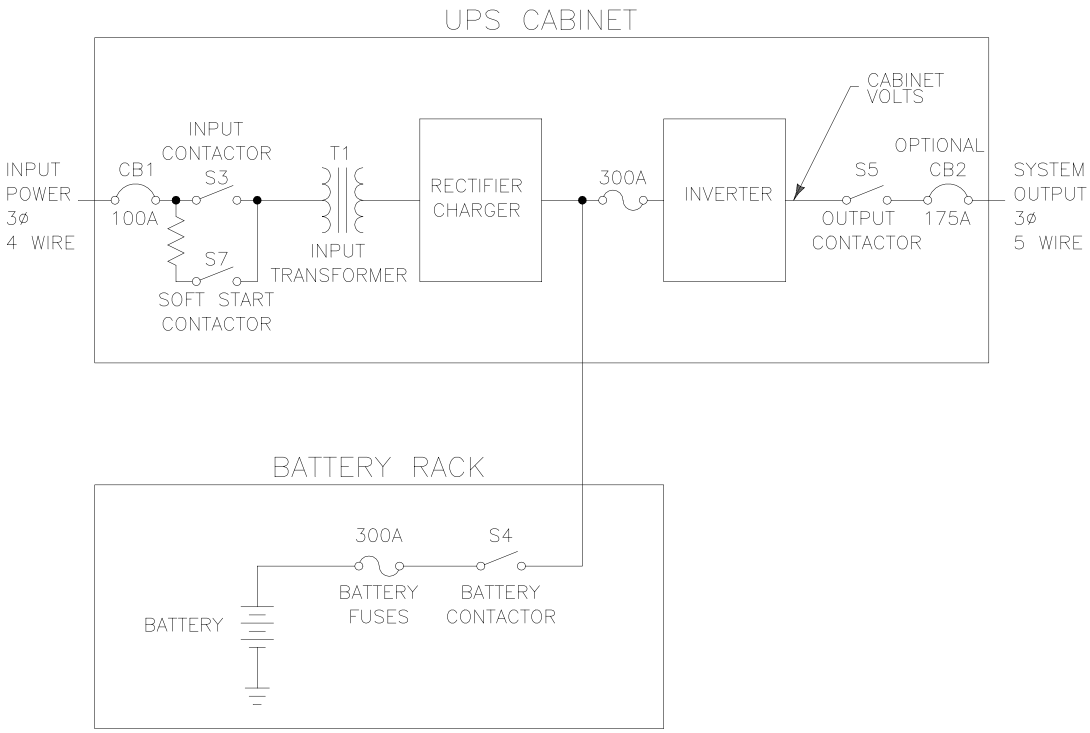

FIGURE 1.3 UPS FUNCTIONAL BLOCK DIAGRAM

1.4 MAJOR COMPONENT DESCRIPTION

The paragraphs below provide descriptions of major components used in the 3060-UMS.

1.4.1 UNINTERRUPTIBLE POWER SOURCE (UPS)

All components within the UPS Cabinet and separate battery cabinet which function as a system to provide continuous, conditioned AC power to the load.

1.4.2 CABINET

An enclosure that contains the rectifier, charger, inverter, and controls required to provide the specified AC power to the load.

1.4.3 BATTERY CABINET

A cabinet that contains maintenance-free sealed batteries sufficient to maintain UPS output in accordance with the specifications.

The Battery Cabinet contains a battery disconnect contactor and fuses. The contactor is mounted in the battery cabinet and when open, allows no battery voltage to be present in the UPS cabinet.

SECTION 1 GENERAL

1.4.4 RECTIFIER/CHARGER

The UPS component that contains the equipment and controls necessary to convert the input AC power to regulated DC power for the inverter and to charge the batteries.

The rectifier/charger unit is a solid-state device designed to provide direct current to the inverter unit and charge the batteries.

A 12 pulse input rectifier is used. This reduces current distortion into the input AC line to no more than 8%. The rectifier also improves the input power factor so that it remains above 0.75 lagging at full load.

A dry type power transformer is used for the rectifier/charger unit. The transformer's hottest spot winding temperature is monitored by the Diagnostic System to ensure that the transformer temperature does not exceed design limits.

The rectifier/charger unit provides a soft start-up feature whereby when the AC power is first applied, the total initial power drawn at the input terminals will not exceed 100% of rated input power. If the output power is in excess of 100% then the input power may increase over 100%.

Nominal float voltage is 204 VDC. Voltage will increase to 212 VDC during recharge of the batteries. Voltage will decrease to 175 VDC during a battery test.

DC overvoltage protection is provided so that if the DC Bus voltage rises above the 240 VDC, the UPS will shut down automatically.

DC undervoltage protection is provided so that if the DC Bus voltage drops below 160 VDC, the UPS will shut down automatically and prevent battery damage from over-discharging.

1.4.5 INVERTER

The inverter unit is a solid-state device that derives its power from the output of the rectifier/charger or batteries to provide the rated AC output within specified limits. A high frequency pulse-width modulated switcher.

The output frequency of the inverter is controlled by a digital oscillator with fixed frequencies of 50, 60 and 400 Hz. The oscillator is adjustable over the range of 47 to 500Hz in the VAR position.

In the fixed frequency positions, the oscillator is also designed to hold the inverter output frequency to ±0.01% for both steady state and transient conditions. Drift will not exceed ±0.01% during a 24-hour period. Total frequency deviation, including short time fluctuations and drift, is limited to ±0.01% from the specified frequency.

The inverter is capable of supporting transient overloads up to 150%, or any load within its rating, without reducing the output voltage. Overloads will cause the machine to overheat and shutdown. Loads greater than 150% may cause a reduction of the output voltage.

The inverter will current limit at 150% of rated current. The inverter is capable of supplying at least 210% of rated RMS current for short circuit conditions. If the short circuit is sustained, the inverter will shut down and disconnect automatically from the output in approx. 20 seconds.

Each inverter output phase is independently regulated to ±0.5%, with Automatic Gain Control enabled, such that unbalanced loading will not cause the output voltage to go outside the specified voltage unbalance.

A four pole inductor capacitor low pass filter, is incorporated in the inverter unit. The filter reduces the inverter output sine wave voltage harmonics to less than 1% total and single harmonics to less than 0.5% for linear loads at 50-60Hz.

Insulated Gate Bipolar Transistors in the inverter unit are fused with fast acting fuses, so that loss of any one transistor will not cause cascading failures.

1.4.6 UTILITY INVERTER

The UPS component that contains the equipment and controls necessary to convert DC power from the rectifier or batteries to 110 VAC, 60 Hz required by the UPS such as fans and contactors. A high frequency pulse-width modulated switcher.

1.4.7 SYSTEM

A system may be from one to ten cabinets in parallel. Cabinets may be paralleled together for higher power systems. Each 3060-UMS is capable of operating as either a SLAVE or MASTER in multi-cabinet paralleled system. The Mean Time Between Failure of a single cabinet 3060-UMS is quite high (approx. 5 years). Parallel system architecture is such that a failed slave unit automatically drops off-line.

A failed MASTER turns the entire system off. In this event an operator can select any other paralleled unit as the MASTER from a front panel control and restore system operation.

1.4.8 LOW VOLTAGE POWER SUPPLY (LVPS)

A ±18 VDC power supply to power all low voltage circuits.

1.5 ON-LINE BATTERY TEST

The UPS is provided with an "On-Line" battery test capability that tests the UPS battery and battery connections under actual operating load. Initiation of battery test will not disturb the UPS output in case of a failed battery or battery connection. Refer to section 5, Maintenance for a full description of the battery test feature.

1.6 GROUNDING

The input power is fully isolated from the output power with exception of three, 1 megohm voltage sense resistors. The chassis of the UPS Cabinet must be tied to ground. Output neutral is tied to chassis. Battery neutral is tied to chassis.

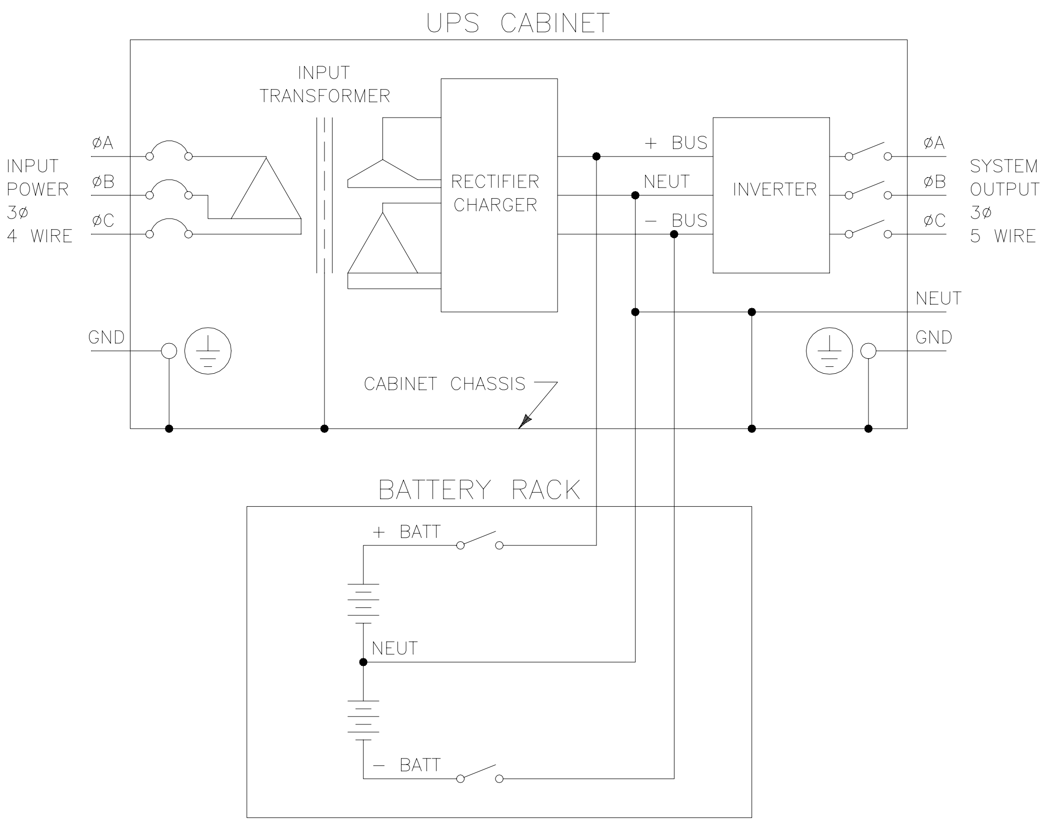

FIGURE 1.6 GROUNDING

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SECTION 2

SPECIFICATIONS

2 SPECIFICATIONS

This section states the electrical and mechanical specifications for one 3060-UMS Uninterruptible AC Power Source. For paralleled systems the output amps and power will increase by the number of cabinets on line.

2.1 ELECTRICAL SPECIFICATIONS

2.1.1 INPUT POWER

Voltage Range	480, 380, 240 or 208 VAC_{L-L} ±15%. Normally configured for 480 VAC_{L-L}.
Frequency Range	47-63 Hz.
Power	55 kW nominal, 60 kW when charging batteries.
Volt-Amps	68 kVA, nominal, 74 kVA when charging batteries.

Input Volts	Amps	Taps Available
480	100	Nom, -7%, -10%
380	125	Nom, +5%, +10%, -4%, -8%, -17%
240	200	Nom, -13%
208	250	Nom, +15%, -9%

SECTION 2 SPECIFICATIONS

2.1.1 INPUT POWER (cont)

Turn-on Surge	100% of normal full load input inrush current, maximum.
Power Factor	0.8 lagging at full load.
Current Distortion	8% THD maximum.
Input Controls	Input contactors provide input ON-OFF controls. In addition, an input circuit breaker is provided that disconnects all input power from the cabinet.
Protection	Meets National Electrical Code Protection requirements for single phase protection, and reversed phase rotation protection.
Transients	Meets Institute of Electrical and Electronics Engineers 587 requirements at 4000 volts peak. Up to 150% line voltage for 1/2 cycle.
Phase Rotation	Unit will operate with any input phase rotation. There are no input phase rotation sensitive devices.
Isolation	An input transformer with an electrostatic shield provides isolation between the input and output of the system.
Balance	All three input phases are equally loaded regardless of output phase load unbalance.

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SECTION 2 SPECIFICATIONS

2.1.2 BATTERY POWER

Type	12 volt, Sealed, non-venting lead acid.
Quantity	Two series strings of 15 batteries each for a total of 30 batteries.
Capacity	120 AH.
Weight	82 pounds each.
Charge current	14 amps max.
Charge voltage	A two step charge voltage is used for faster recharging. Initially 2.36 V.P.C. or 212 volts per bus. Float voltage is 2.27 V.P.C. or 204 volts per bus.
Charge time	6 hours for a full load discharge cycle.
Discharge voltage	1.78 V.P.C. or 160 volts per bus.
Discharge current	150-160 amps D.C., at full load.
Protection	Fuses (300A) located in the battery cabinet. Breaker (225A) located in battery cabinet.
Control	Contactor located in the battery cabinet. Contactor opens when low voltage or over voltage limits are exceeded.

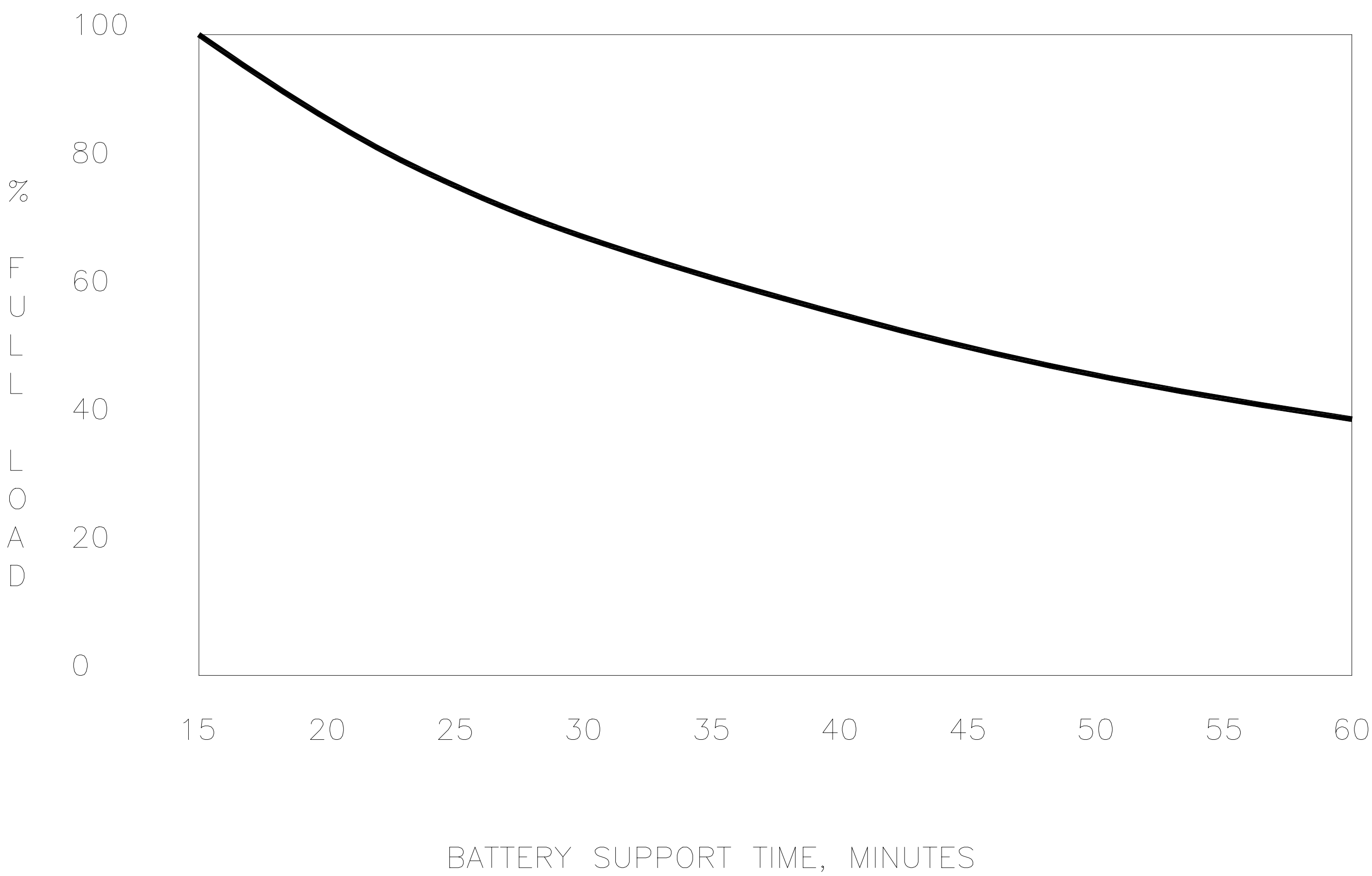

FIGURE 2.1.2 BATTERY SUPPORT TIME

SECTION 2 SPECIFICATIONS

2.1.3 OUTPUT POWER

Power	50 kW.
Volt-Amps	62.5 kVA.
Voltage	120/208 3φ WYE May be loaded WYE or DELTA. 0-132 VAC_{L-N} Adjustment Range. Other voltages available as options. Output adjustable by front panel controls.
Voltage Regulation 0-100% Load Step	±1% of output voltage regardless of load unbalance, with AGC enabled.
Transient Voltage Regulation and Recovery.	Recovers to 3% regulation band in: a) 200 microseconds for a 50% load step. b) 400 microseconds for a 100% load step.
Harmonic Voltage Content for Linear Loads	Maximum 1% RMS total, maximum 0.5% any single harmonic for linear loads 50-60Hz, 2% RMS total for 400Hz. Paralleled Systems may be higher.
Current	175 amps per phase.
Inverter Fault Clearing Current	Greater than 200% of full load.
Pulse Current	Greater than 200% per phase of pulse current for driving non-linear loads.

2.1.3 OUTPUT POWER (cont)

Frequency Range	Selectable, crystal based frequencies at 50, 60, 400 Hz. A variable frequency oscillator is included, covering the range 47-500 Hz. In addition, provision is made for an External Oscillator input.
Frequency Accuracy and Stability	±0.01% for fixed frequencies.
Power Factor	No Restrictions.
Overload	150% 30 sec. 125% 10 min. 110% 1 hour.

For a paralleled cabinet system multiply the above ratings by the number of cabinets on line in the system.

SECTION 2 SPECIFICATIONS

2.2 MECHANICAL SPECIFICATIONS

2.2.1 3060-UMS

Weight	1200 LBS
Height	72"
Width	36"
Depth	30"
Air Flow	1200 CFM bottom intake, top exhaust
Noise level	65dbA at 3 feet
Installation Clearance	36" at front of cabinet for service, 12" top, 0" side and rear
Ambient Temperature	Operating 0 to 40°C Storage -10 to +70°C
Relative Humidity	0 to 95% non-condensing
Elevation	Operating 6500 Ft. Derate to 70% at 11,500 Ft. Storage 40,000 Ft.
Heat Dissipation at 50 kW, 62.5 kVA load.	20 kBTU/HR

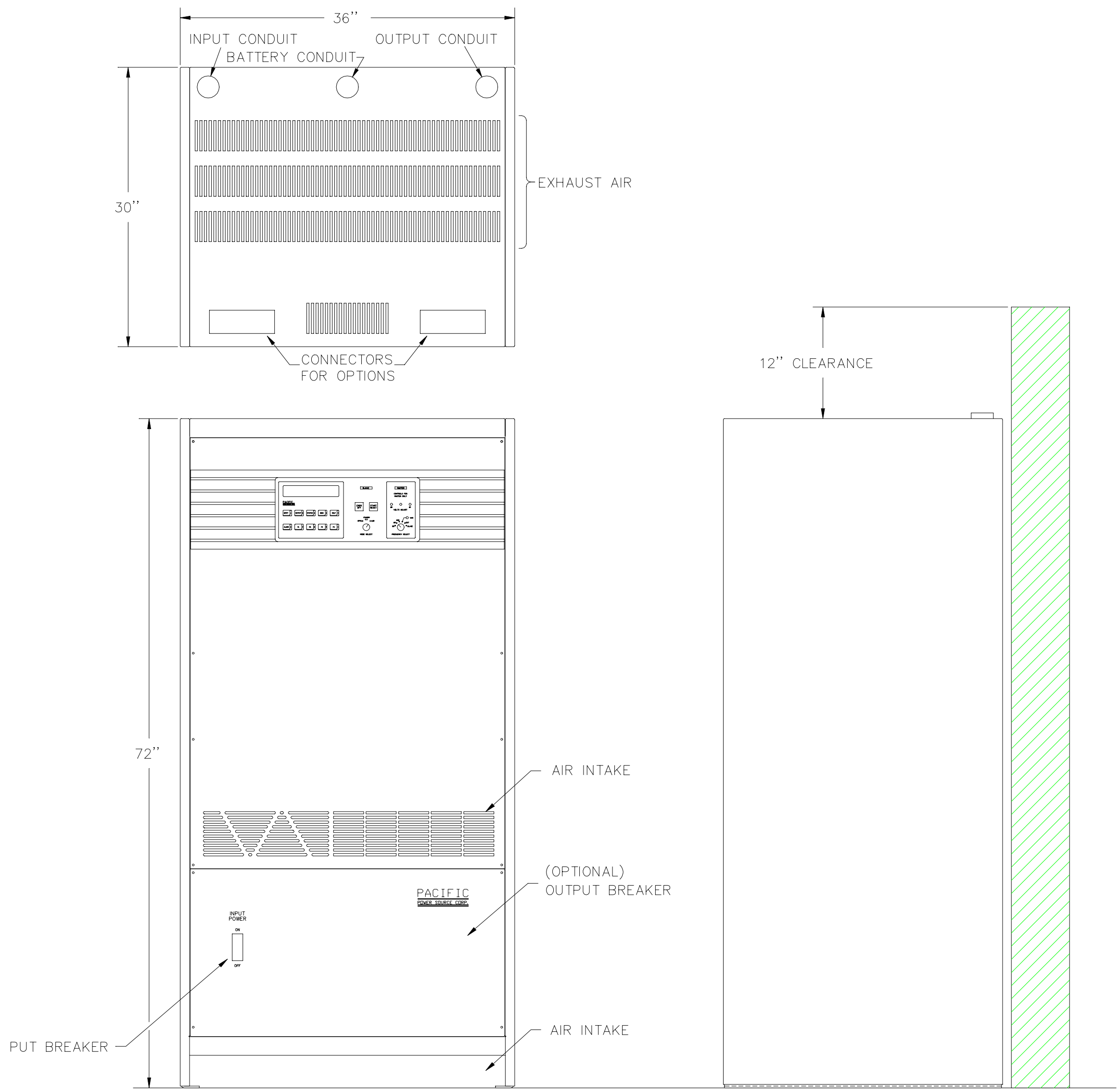

FIGURE 2.2.1 3060-UMS OUTLINE DRAWING

2.2.2 BATTERY CABINET

Weight	2800 LBS including batteries.
Height	60"
Width	40"
Depth	35.5"
Installation Clearance	36" at front of cabinet for service, 0" top and sides, 12" rear.
Ambient Temperature	20 to 30◦C.
Relative Humidity	0 to 95% non-condensing
Elevation	0 - 6500 Ft.

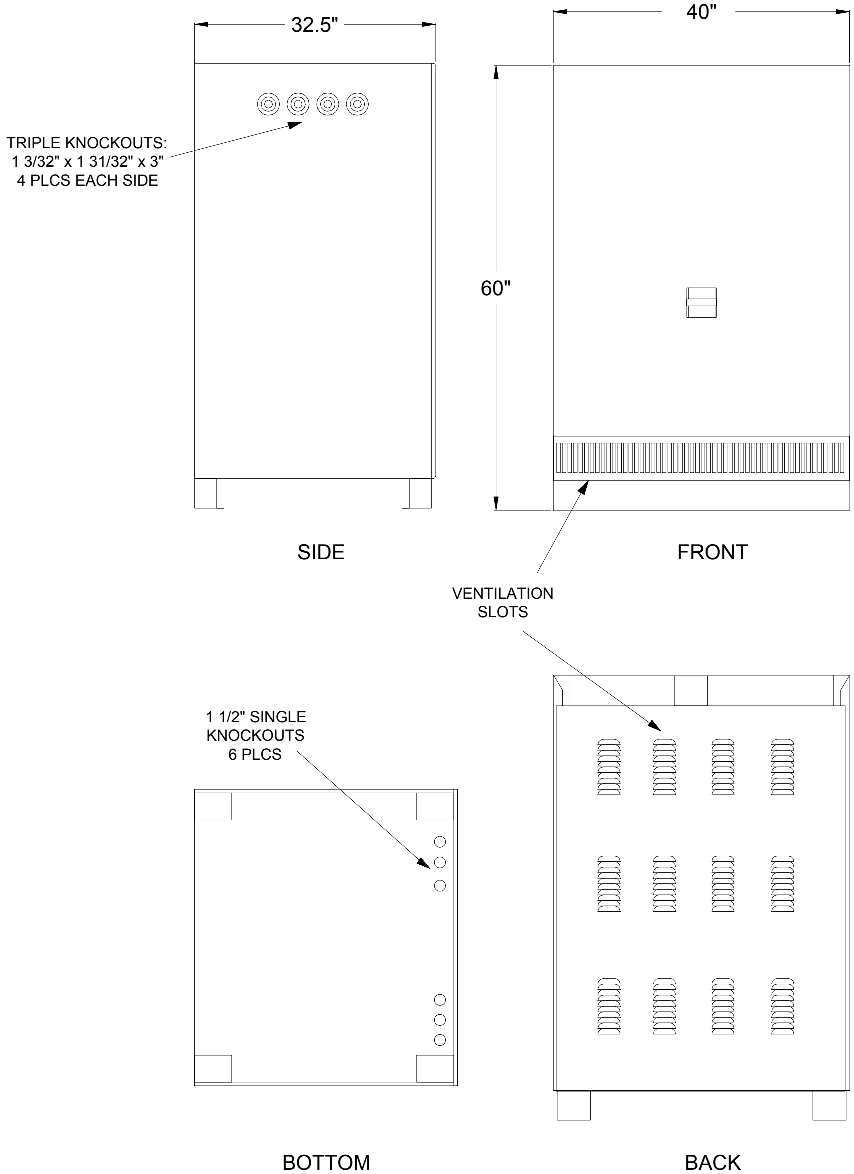

FIGURE 2.2.2 BATTERY CABINET OUTLINE DRAWING

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SECTION 3

INSTALLATION

3 INSTALLATION

This section describes the installation of a 3060-UMS Uninterruptible AC Power Source. The information required to properly install UPS equipment is provided in this section. A thorough understanding of this material is mandatory.

Should a question arise regarding the installation of this equipment, the user is encouraged to call Pacific Power Source, toll free, at 1-800-854-2433 (1-800-472-8465 inside Ca.).

The installation of the UPS consists of the following steps:

1) Planning the job.
   (Refer to paragraph 3.1)

2) Uncrating and Moving the system.
   (Refer to paragraph 3.2)

3) Changing Input Voltage, if required.
   (Refer to paragraph 3.3)

4) Setting the UMS cabinet and battery cabinet into place.
   (Refer to paragraph 3.4)

5) Making Input Connections.
   (Refer to paragraph 3.5)

6) Making Output Connections.
   (Refer to paragraph 3.6)

7) Installing Batteries.
   (Refer to paragraph 3.7)

8) Multiple Cabinet Paralleled Systems.
   (Refer to paragraph 3.8)

9) RSP IV Installation.
   (Refer to paragraph 3.9)

10) Inspecting the Installation.
    (Refer to paragraph 3.10)

SECTION 3 INSTALLATION

3.1 PLANNING THE JOB

The main objective in planning the job is to determine the hardware required to install the UPS. Proper consideration of the items below will allow the installation to proceed in an orderly manner.

The first step in planning the job is to determine the size of power source required to service the load. In normal situations the load should not exceed 80% of the power source's full load ratings. This margin allows the user to add future loads to the Power Source without sacrificing surge and overload capabilities.

After a particular model has been selected, location of the Power Source, input and output wiring and environmental conditions must be considered. Section 3.1, Environmental Survey Checklist, is provided to verify environmental conditions.

The UMS cabinet should be placed as close as possible to the battery cabinet and load to minimize output wiring lengths. This is done to reduce distribution losses between the load and power source. Shorter output wiring will provide higher quality power to the load. If there is a choice between shorter power source input or output wiring, choose shorter output wiring. Final equipment location must maintain the minimum physical clearances as shown in Figures 2.2.1 and 2.2.2 Outline Drawings.

CHECK AT RIGHT WHEN CONFIRMED

1. Ambient temperature between 20-30 degrees Centigrade. Temperatures over the range 0-40 degrees are allowed with a decrease in battery life and capacity. _____

2. Cooling and air exchange rates adequate to support the heat load. _____

3. A minimum of 12" above the Cabinet for exhaust. _____

4. Unrestricted air intake at the lower front of the Cabinet. (Exception: Forced air intake from raised floor installations requires sealing off of the lower front area. Consult factory.) _____

5. A minimum of 36" in front of the UPS Cabinet, and 36" in front of and to one side of the battery cabinet for service. _____

6. Altitude of installation does not exceed 6500 feet. Altitudes in excess of 6500 feet require the derating of maximum operating levels. _____

7. Relative humidity does not exceed 95% non-condensing. It is suggested that equipment not be located directly under cooling equipment due to the danger of condensing vapor. _____

8. Utility input voltage is the same as the input voltage rating on the nameplate at the rear of the machine. _____

FIGURE 3.1 ENVIRONMENTAL SURVEY CHECKLIST

SECTION 3 INSTALLATION

3.2 MOVING, UNCRATING, AND INSPECTION

Unless specified otherwise, all Pacific 3060-UMS UPS systems will be shipped in three separate wooden crates. Crate Number 1 contains the UPS Cabinet, with a crated weight between 1200-1300 lbs. depending upon the model selected. Crate Number 2 contains the Battery Cabinet with batteries. Crated weight will be between 2500 and 3000 lbs. again dependent upon selected models. Crate number 1 can be seen in figure 3.2, Crating and Moving Outline drawing. The weight will be marked on all sides for safe handling. All crates are constructed of wood and designed to be moved with a forklift or hand truck of adequate capacity.

Upon receiving the equipment, remove the packing list. Separate and remove the top then the sides of the crate setting these aside for the moment. Inspect all equipment for signs of damage in shipping. If any damage has occurred, contact the shipper and the Pacific factory for instructions. If the cabinet is to be returned, it must be shipped back in the original crate.

If no signs of damage are evident, the equipment may be removed from the pallet. A forklift is <u>Required</u> to lift the UPS cabinet off the pallet. Do not attempt to "rock" or slide it as damage may occur.

\- - - - - - - CAUTION - - - - - - -

\- TO AVOID DAMAGE TO THE EQUIPMENT, LIFTING FORKS MUST EXTEND COMPLETELY THROUGH THE LIFTING CHANNEL UNDER THE CABINET AS SHOWN IN FIGURE 3.2, CRATING AND MOVING OUTLINE DRAWING.

\- - - - - - - CAUTION - - - - - - -

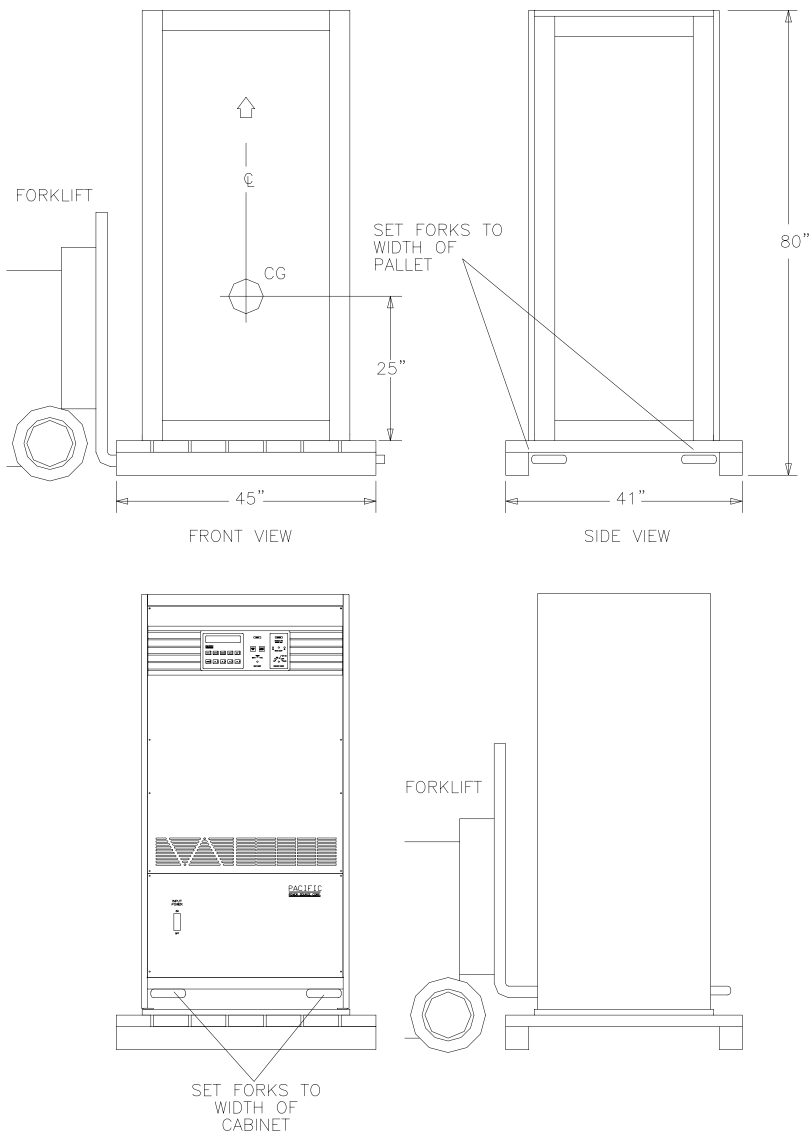

FIGURE 3.2 CRATING AND MOVING OUTLINE DRAWING

SECTION 3 INSTALLATION

3.3 CHANGING INPUT VOLTAGE

This paragraph states the procedure to be used when changing input voltage. All voltages are line to line.

Configure the machine for the correct input voltage prior to installing.

To change input voltage, the input circuit breaker and fuses must be changed. The input transformer, T1, and LVPS transformer, T2, must be reconnected to the correct taps. See figure 3.3.1 through figure 3.3.4.

Each mainframe, dependent upon model number, will require the following Input Circuit Breaker and Fuses:

Input Volts	CB1	F1, F2, F3
480	100 A (P/N 716049)	1 A (P/N 712043)
380	125 A (P/N 716056)	1½ A (P/N 712045)
240	200 A (P/N 716057)	2 A (P/N 712044)
208	225 A (P/N 716032)	2 A (P/N 712044)

If a non-standard input is required the machine may be configured for any of the following:

INPUT VOLTAGE		INPUT TAPS	CONNECT TAPS	Fig.
480	480	1,8	4-5	3.3.1
480-7%	448	1,8	3-5	
480-10%	430	1,8	4-6	
380+10%	416	1,7	3-5	
380+5%	398	1,8	3-6	
380	380	2,8	4-6	3.3.2
380-4%	366	1,7	3-6	
380-8%	348	2,7	4-6	
380-17%	316	2,7	3-6	
240	240	1,8	1-5,4-8	3.3.3
240-13%	208	1,7	1-5,3-7	
208+15%	240	1,8	1-5,4-8	
208	208	1,7	1-5,3-7	3.3.4
208-9%	190	2,8	2-6,4-8	

3.3 CHANGING INPUT VOLTAGE (cont)

* * * * * * * **WARNING** * * * * * * *

* OPENING INPUT CONTACTOR DOES **NOT** REMOVE INPUT VOLTAGE FROM INPUT TRANSFORMER. OPEN THE INPUT CIRCUIT BREAKER.

* * * * * * * **WARNING** * * * * * * *

STEP 1:
Verify no input or battery power is connected.
Open Input Circuit Breaker.

STEP 2:
Remove front covers.
Remove subpanels.
Remove rear panel.

STEP 3:
Remove old CB1, the input circuit breaker.
Install new CB1 with correct amperage for new input voltage.

STEP 4:
Remove old F1, F2 and F3, the input fuses.
Install new fuses with correct amperage for new input voltage.

STEP 5:
Rewire T1 **AND** T2 as per figure 3.3.1 or 3.3.2 or 3.3.3 or 3.3.4 as required.

- - - - - - - CAUTION - - - - - - -

- DAMAGE TO THE EQUIPMENT MAY RESULT IF INCORRECTLY WIRED. VERIFY CONNECTIONS ARE MADE TO PROPER TAPS.

- - - - - - - CAUTION - - - - - - -

STEP 6:
Reinstall front covers.
Reinstall subpanels.
Reinstall rear panel.

STEP 7:
Go to section 4.3.1 for first time operation.

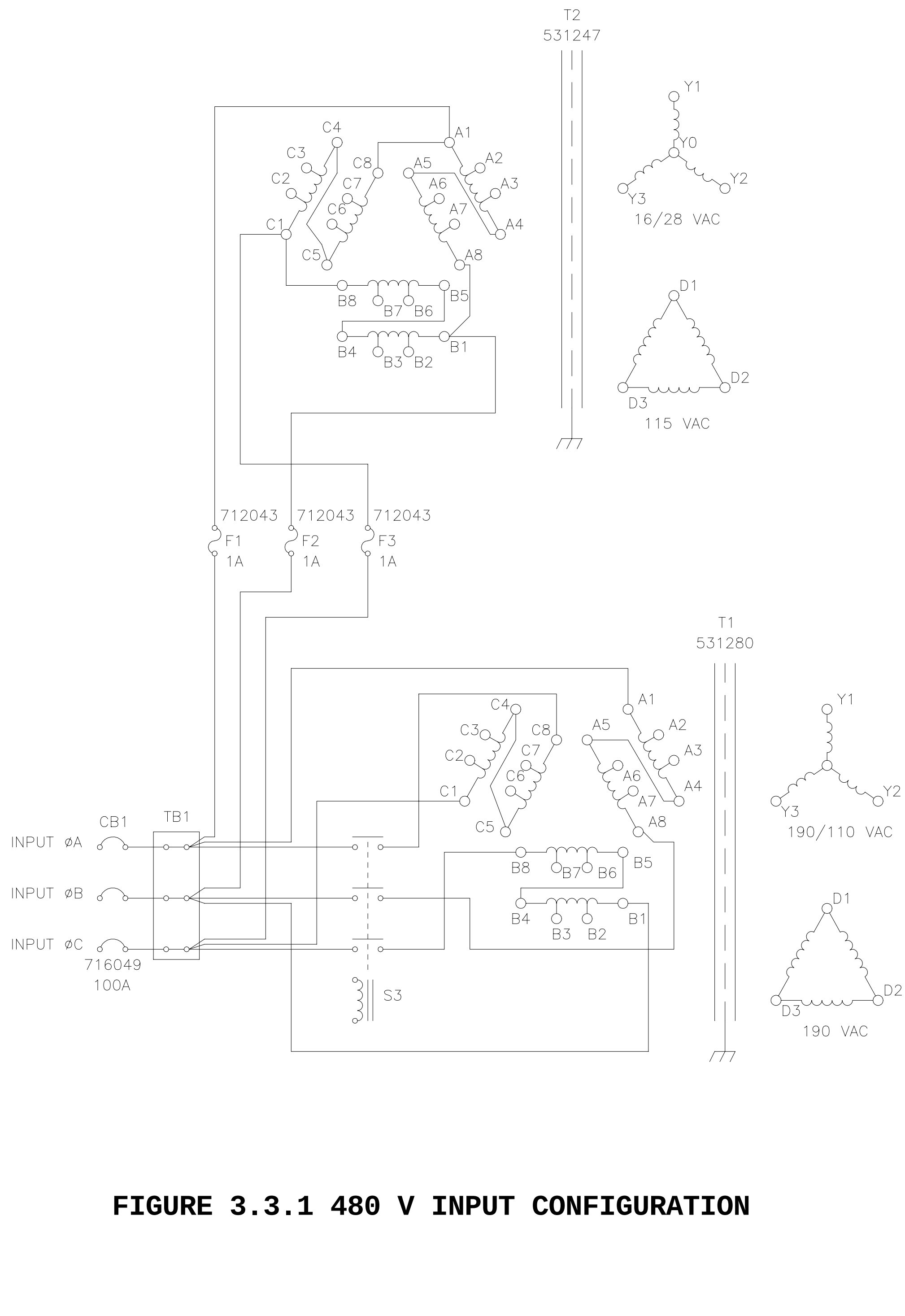

FIGURE 3.3.1 480 V INPUT CONFIGURATION

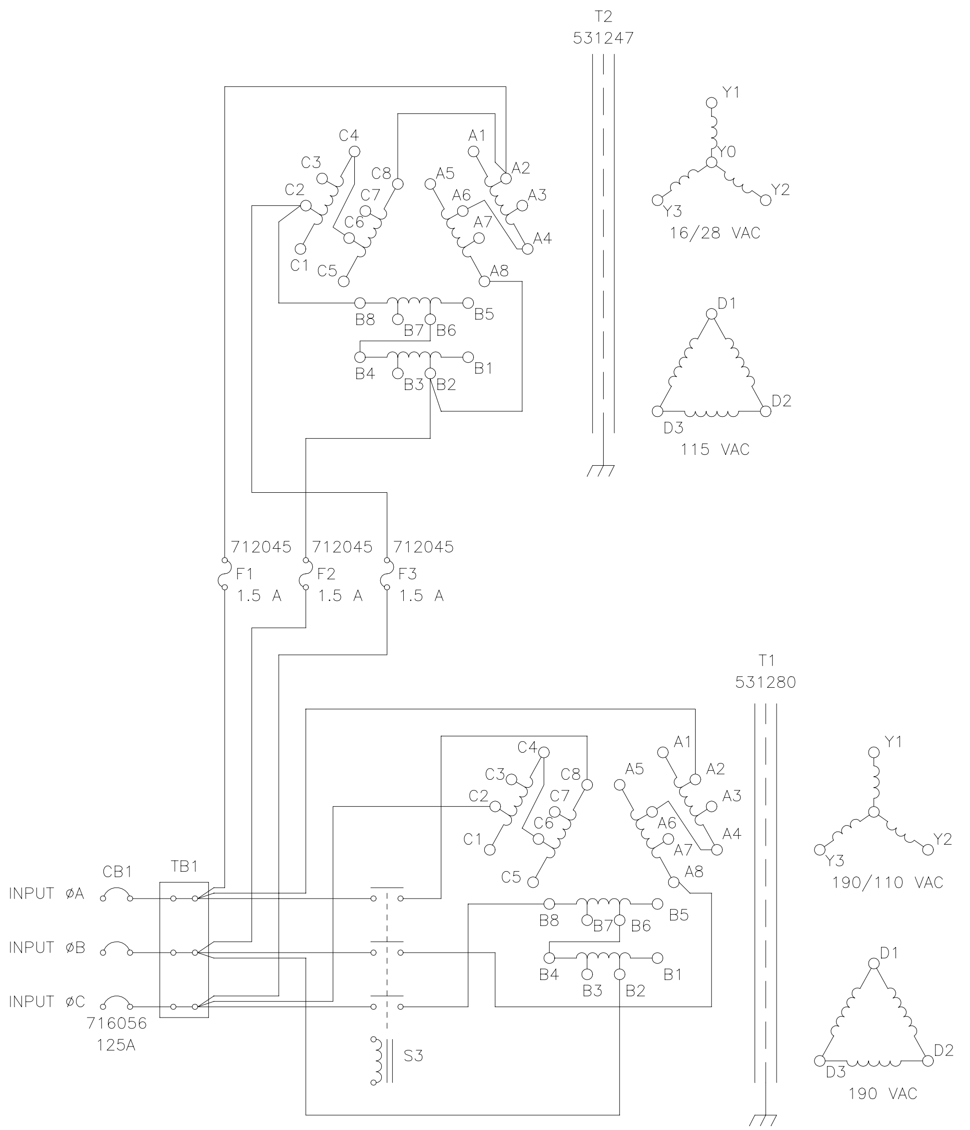

FIGURE 3.3.2 380 V INPUT CONFIGURATION

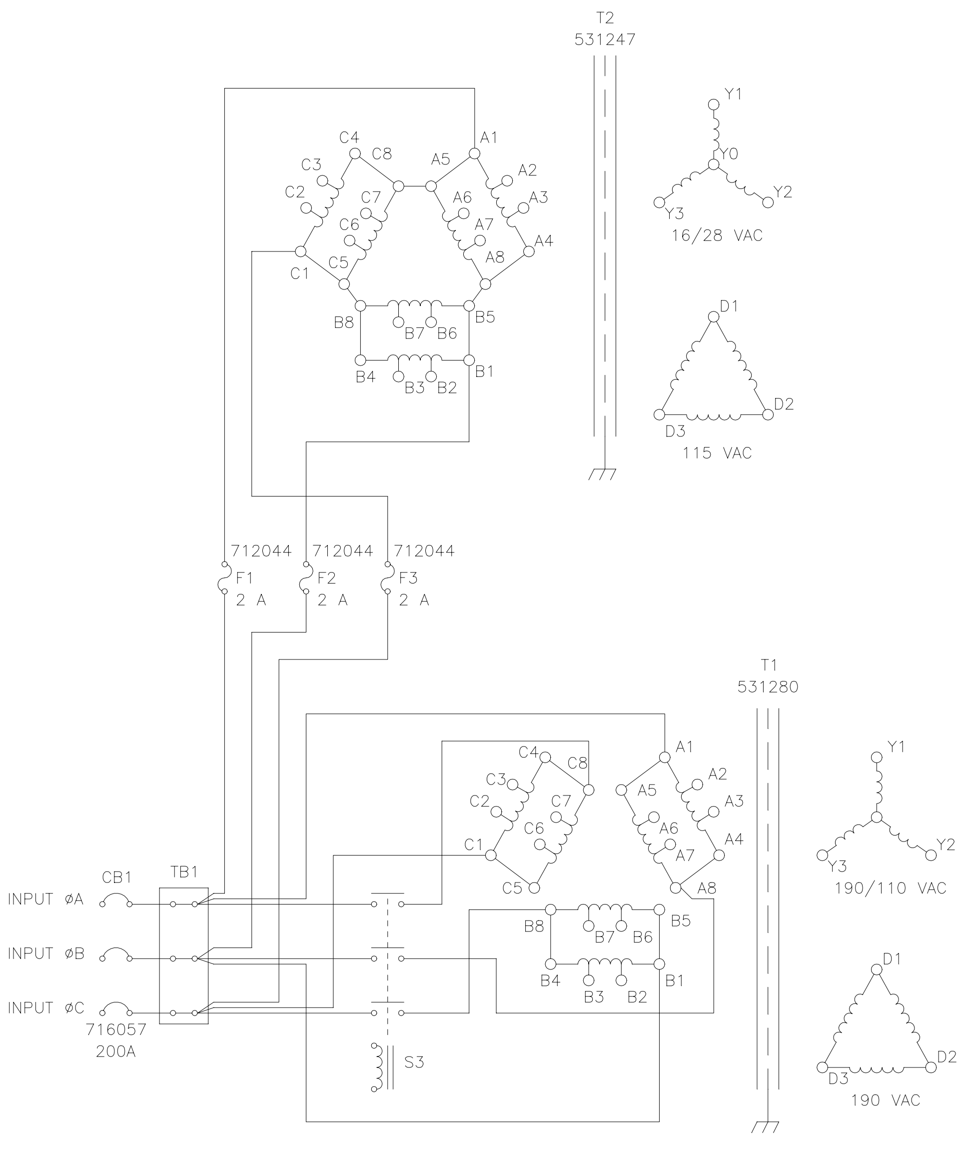

FIGURE 3.3.3 240 V INPUT CONFIGURATION

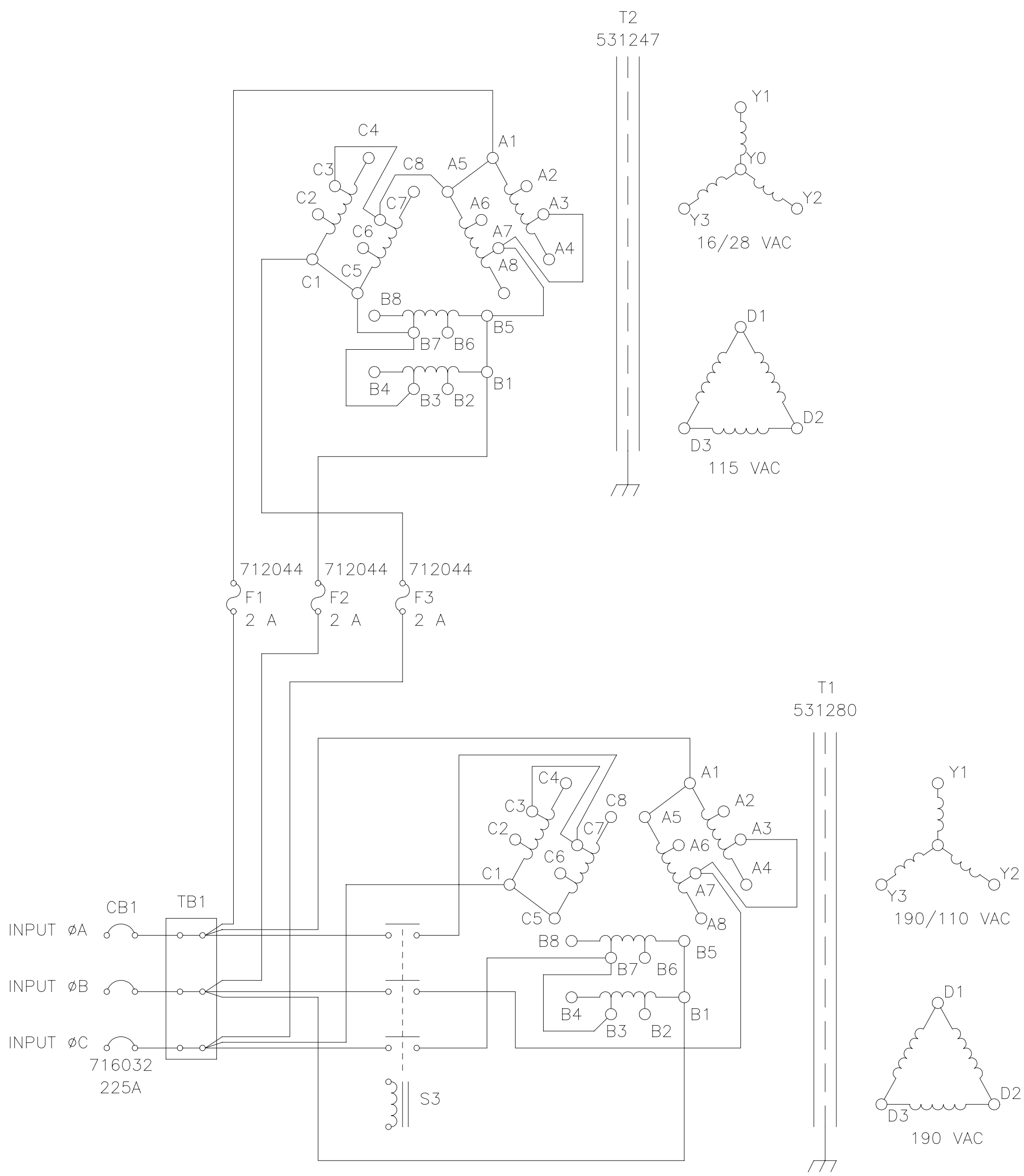

FIGURE 3.3.4 208 V INPUT CONFIGURATION

3.4 SETTING THE CABINET INTO PLACE

Depending on the site, it may be advisable to rough-in the input and output wiring prior to moving the UPS into place. This is best evaluated by the installation team and they should proceed appropriately. Observe clearances as shown in Figures 2.2.1 and 2.2.2.

When installing the UPS, the battery cabinet should be installed at this time. Refer to paragraph 3.7 for battery cabinet installation.

The weight of the battery cabinet may approach 2800 lbs. dependent upon the batteries selected. In this state, it is recommended that the battery cabinet be moved using a forklift or other heavy duty lifting equipment.

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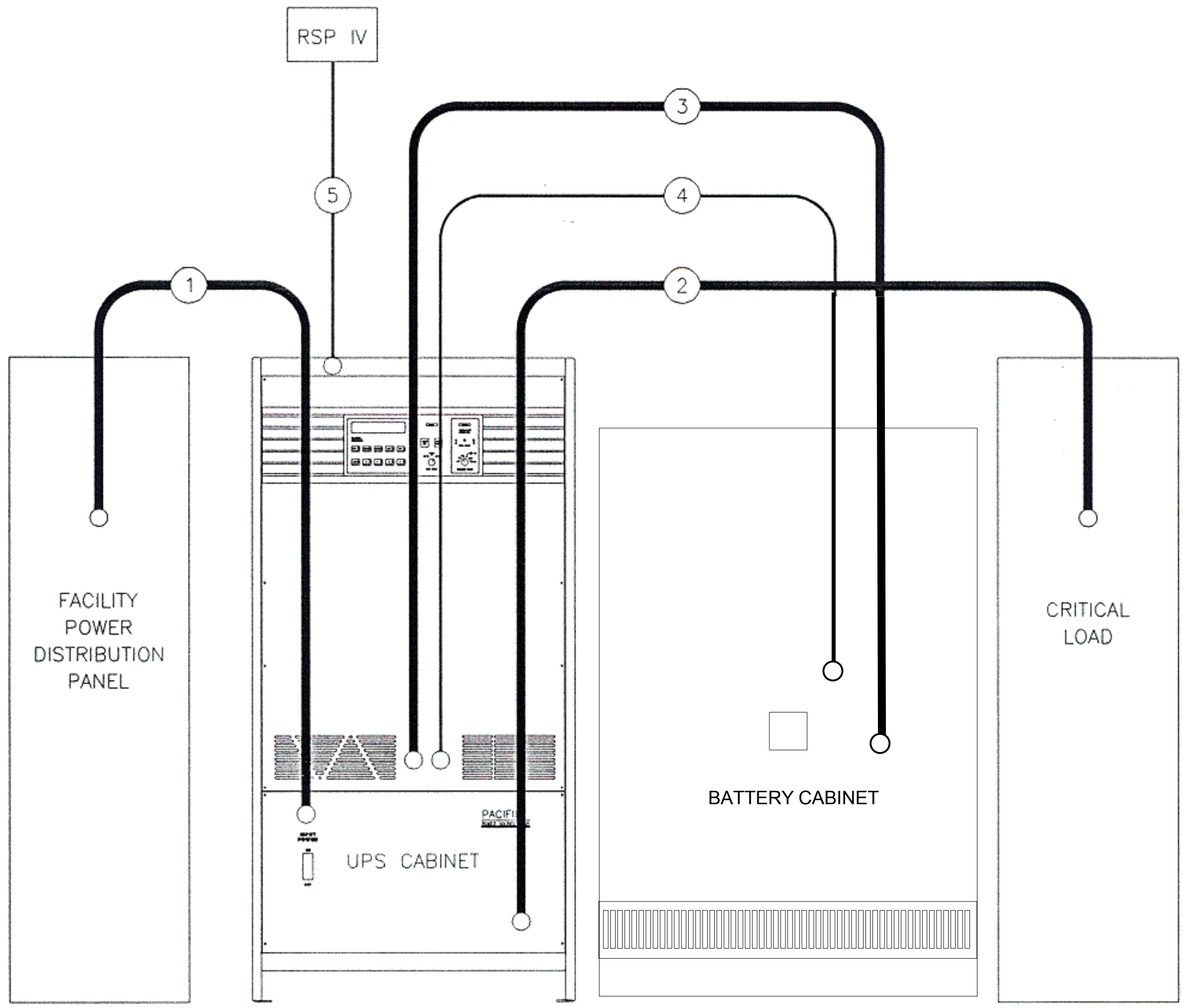

FIGURE 3.4A SYSTEM INTERCONNECT WIRING

WIRE LIST

CABLE ROUTE	FUNCTION	FROM		TO		NOTES
			TERMINATION		TERMINATION	
1	INPUT POWER	FACILITY INPUT POWER PHASES A, B, C GROUND	USER DEFINED	UPS CABINET CB1 PHASES A, B, C GROUND	PRESSURE CONTACT	1,5,6
2	OUTPUT POWER	UPS CABINET S5 PHASES A, B, C NEUTRAL GROUND	PRESSURE CONTACT	CRITICAL LOAD PHASES A, B, C NEUTRAL GROUND	USER DEFINED	2,5,7
3	BATTERY POWER	BATTERY RACK S4-4 (+) TB5-2, NEUT S4-6 (-)	PRESSURE CONTACT	UPS CABINET TB3-1 (+) TB3-3, NEUT TB3-5 (-)	PRESSURE CONTACT	3,5,7
4	BATTERY CONTROL	UPS CABINET TB4-1, S4 DRIVE TB4-3, NEUT	PRESSURE CONTACT	BATTERY RACK S4-A, S4 DRIVE S4-B, NEUT	PRESSURE CONTACT	3
5	REMOTE STATUS PANEL	UPS CABINET P9-15, + 12 VDC P9-7, − 12 VDC P9-5, $\overline{IAC}$ P9-6, $\overline{OAC}$ P9-11, $\overline{BOP}$ P9-12, $\overline{BLC}$	DA-15P CONNECTOR	RSP IV TB1-1, + 12 VDC TB1-2, − 12 VDC TB1-3, $\overline{IAC}$ TB1-4, $\overline{OAC}$ TB1-5, $\overline{BOP}$ TB1-6, $\overline{BLC}$	PRESSURE CONTACT	4

NOTES: UNLESS OTHERWISE SPECIFIED
1 REFER TO FIGURE 3.5.
2 REFER TO FIGURE 3.6.
3 REFER TO FIGURES 3.7.2 AND 3.7.3.
4 REFER TO FIGURE 3.9.
5 REQUIRED TO BE IN SEPARATE ELECTRICAL CONDUIT RUNS.
6 TIGHTEN TO 55 INCH/POUNDS.
7 TIGHTEN TO 150 INCH/POUNDS.

FIGURE 3.4B SYSTEM INTERCONNECT WIRING

3.5 CONNECTING THE INPUT SERVICE

This paragraph states the procedure to be used when connecting the input service. Certain requirements relating to safety are also stated and should be followed rigorously.

480 Delta, 50-60 Hz, 100 Amp. 3φ input service is standard for the 3060-UMS. Check the name plate on the rear of the machine for input voltage. If a different input voltage is required, the machine must be reconfigured. See section 3.3. The 3060-UMS is not sensitive to input phase sequence.

Each mainframe, dependent upon model number, will draw the following load currents:

Input Volts	Amps	Taps Available
480	100	Nom, -7%, -10%
380	125	Nom, +5%, +10%, -4%, -8%, -17%
240	200	Nom, -13%
208	250	Nom, +15%, -9%

Input connections to the 3060-UMS AC Power Source are made at the Circuit Breaker labeled "INPUT POWER." Refer to figure 3.5 for location and orientation of terminals.

The input terminals are compression type. It is very important that the connections are clean and properly tightened. Torque input connector set screws to 55 in/lbs.

* * * * * * * **WARNING** * * * * * * *

LETHAL VOLTAGES PRESENT AT INPUT OF MACHINE REFER CONNECTION TO A QUALIFIED ELECTRICIAN.

* * * * * * * **WARNING** * * * * * * *

- - - - - - - CAUTION - - - - - - -

- IT IS THE USER'S RESPONSIBILITY TO MEET ALL APPLICABLE LOCAL AND NATIONAL CODE REQUIREMENTS WHEN INSTALLING THIS EQUIPMENT.

\- - - - - - - CAUTION - - - - - - -

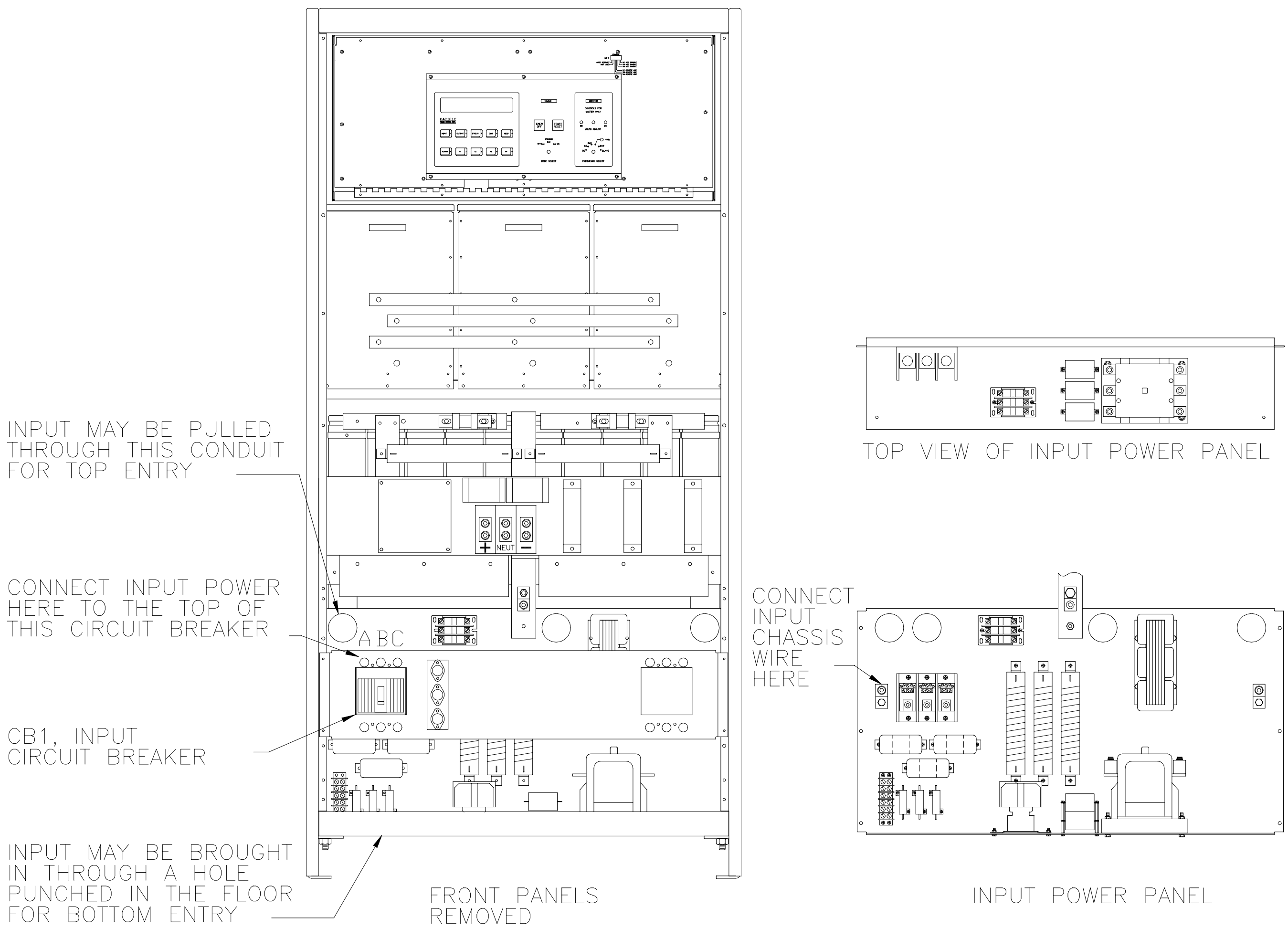

FIGURE 3.5 INPUT TERMINAL DETAIL

3.6 CONNECTING THE OUTPUT SERVICE

This paragraph states the procedure to be used when connecting the output service. Certain requirements relating to safety are also stated and should be followed rigorously.

The standard output form of the 3060-UMS is 120/208Y, 50, 60, 400 Hz or Variable frequency. Phase sequence of the output is ABC. Maximum continuous output current is 175A. 370A is available into a short.

Note that there is no output circuit breaker provided within the Cabinet. If a circuit breaker is desired on the output distribution system, it is available as an option, or may be mounted external to the cabinet and is provided by the user.

* * * * * * * **WARNING** * * * * * * *

LETHAL VOLTAGES PRESENT AT OUTPUT OF MACHINE REFER CONNECTION TO A QUALIFIED ELECTRICIAN.

* * * * * * * **WARNING** * * * * * * *

Output connections from the 3060-UMS AC Power Source are made at the output contactor labeled "OUTPUT POWER". Refer to figure 3.6 for location and orientation of terminals.

The output terminals are compression type. It is very important that the connections are clean and properly tightened. Torque output contactor hex screws to 150 in/lbs.

- - - - - - - CAUTION - - - - - - -

- IT IS THE USER'S RESPONSIBILITY TO MEET ALL APPLICABLE LOCAL AND NATIONAL CODE REQUIREMENTS WHEN INSTALLING THIS EQUIPMENT.

- - - - - - - CAUTION - - - - - - -

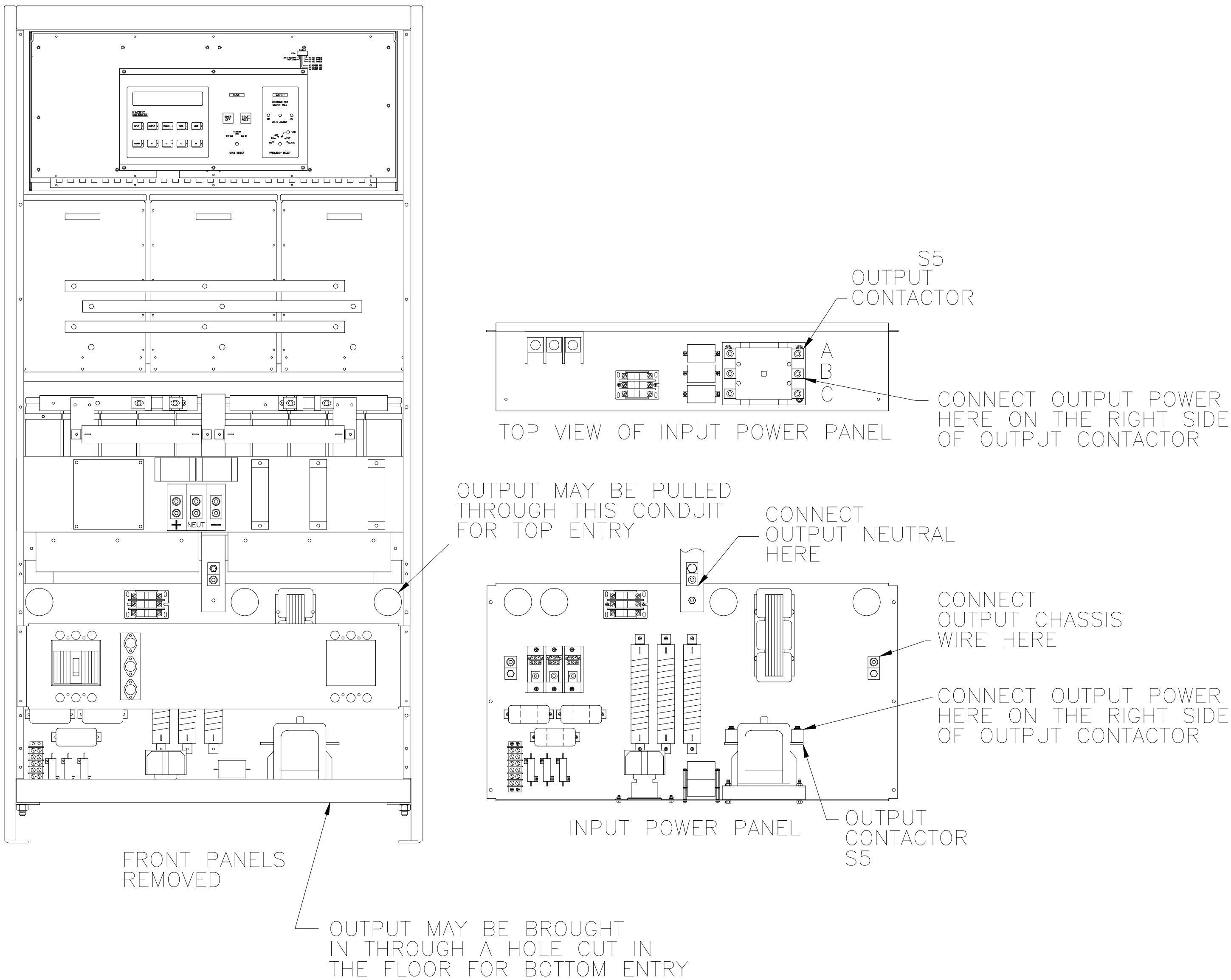

FIGURE 3.6 OUTPUT TERMINAL DETAIL

3.7 BATTERY INSTALLATION

This paragraph describes the procedure to be used to install the battery cabinet assembly.

Paragraph 3.7.1 deals with installing the battery cabinet assembly.

Paragraph 3.7.2 discusses electrical connections from the battery cabinet to the UPS cabinet.

Paragraph 3.7.3 deals electrical connections between batteries and to fuses in the battery cabinet.

*** * * * * * * WARNING * * * * * * ***

* WHEN FOUR OR MORE BATTERIES ARE CONNECTED IN SERIES, LETHAL POTENTIALS EXIST.

* WEAR SAFETY GLASSES WHEN MAKING CONNECTIONS TO BATTERIES.

* BATTERIES ARE CAPABLE OF DELIVERING EXTREMELY HIGH CURRENTS IF SHORTED.

* BATTERIES MAY EXPLODE IF SHORTED.

* USE EXTREME CARE TO PREVENT ACCIDENTAL SHORTING OF TOOLS ACROSS BATTERIES.

* REMOVE ALL WATCHES, RINGS, AND OTHER JEWELRY BEFORE SERVICING THE BATTERIES.

*** * * * * * * WARNING * * * * * * ***

\- - - - - - - CAUTION - - - - - - -

\- CAREFULLY READ AND UNDERSTAND THIS PROCEDURE PRIOR TO WORKING ON THIS EQUIPMENT.

\- SEVERE EQUIPMENT DAMAGE MAY OCCUR IF INCORRECTLY CONNECTED.

\- - - - - - - CAUTION - - - - - - -

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3.7.1 BATTERY CABINET INSTALLATION

This subsection describes the procedure to be used to set the battery cabinet into place.

Figure 3.7.1 shows battery cabinet service clearances. The design of the cabinet allows it to be mounted with zero rear clearance. 36 inch front and 12 inch rear clearance should be maintained to allow for battery service and allow access to the battery contactor and fuses.

The cabinet weighs approximately 2800 lbs. with batteries installed.

Attention must be given to floor loading relative to the strength of the floor when placing this assembly.

Place the battery cabinet near the side or rear of the UPS Cabinet as required.

\- - - - - - - CAUTION - - - - - - -

\- IT IS THE USER'S RESPONSIBILITY TO MEET ALL APPLICABLE LOCAL AND NATIONAL CODE REQUIREMENTS WHEN INSTALLING THIS EQUIPMENT.

\- - - - - - - CAUTION - - - - - - -

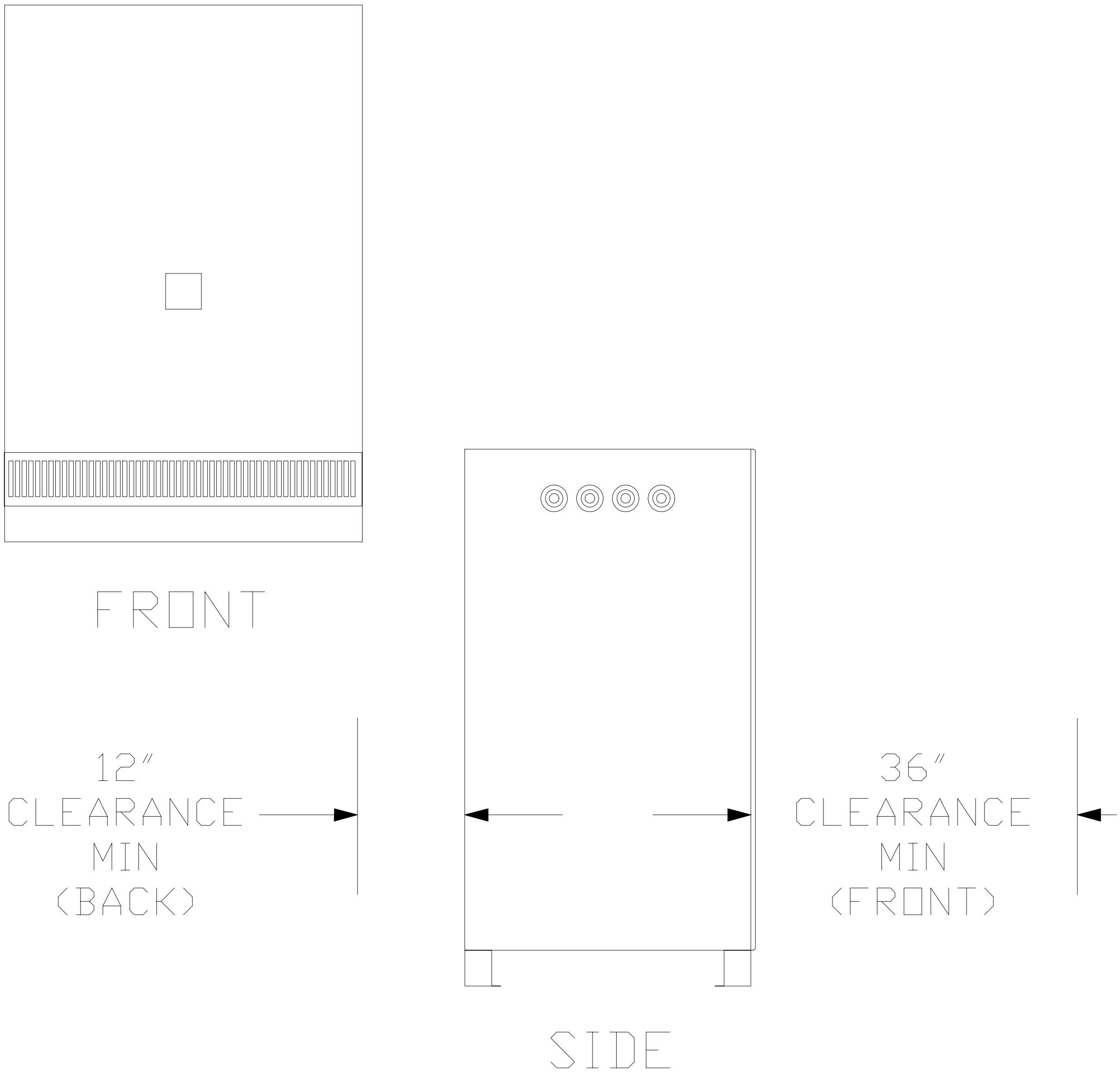

FIGURE 3.7.1 BATTERY CABINET SERVICE CLEARANCES

3.7.2 UPS CABINET TO BATTERY CABINET CONNECTIONS

This subsection discusses the requirements for the wiring between the battery cabinet and UPS Cabinet.

After the battery cabinet is set in place, wiring between the battery cabinet and the UPS cabinet is installed. The batteries are already installed in the cabinet at this time.

Remove any input power from the UPS Cabinet.

Power wiring between the UPS Cabinet and the battery cabinet cabinet should be 1/0 copper. The terminals which connect these wires are the compression types. Refer to figures 3.7.2 and 3.7.3. It is mandatory that these connections are clean and tightened properly. Be sure to observe polarity, positive to positive, negative to negative and neutral to neutral. The hex screw of these terminals must be torqued to 150 inch/lbs.

The battery contactor coil wires from the battery cabinet to the UPS Cabinet should be a minimum of 18 AWG. Single conductors or jacketed cable is acceptable. Connections are made via a 2 terminal barrier strip as shown in figure 3.7.2 directly to the battery contactor coil as shown in figure 3.7.3. The battery contactor coil wires may be interchanged.

\- - - - - - - CAUTION - - - - - - -

\- IT IS THE USER'S RESPONSIBILITY TO MEET ALL APPLICABLE LOCAL AND NATIONAL CODE REQUIREMENTS WHEN INSTALLING THIS EQUIPMENT.

\- - - - - - - CAUTION - - - - - - -

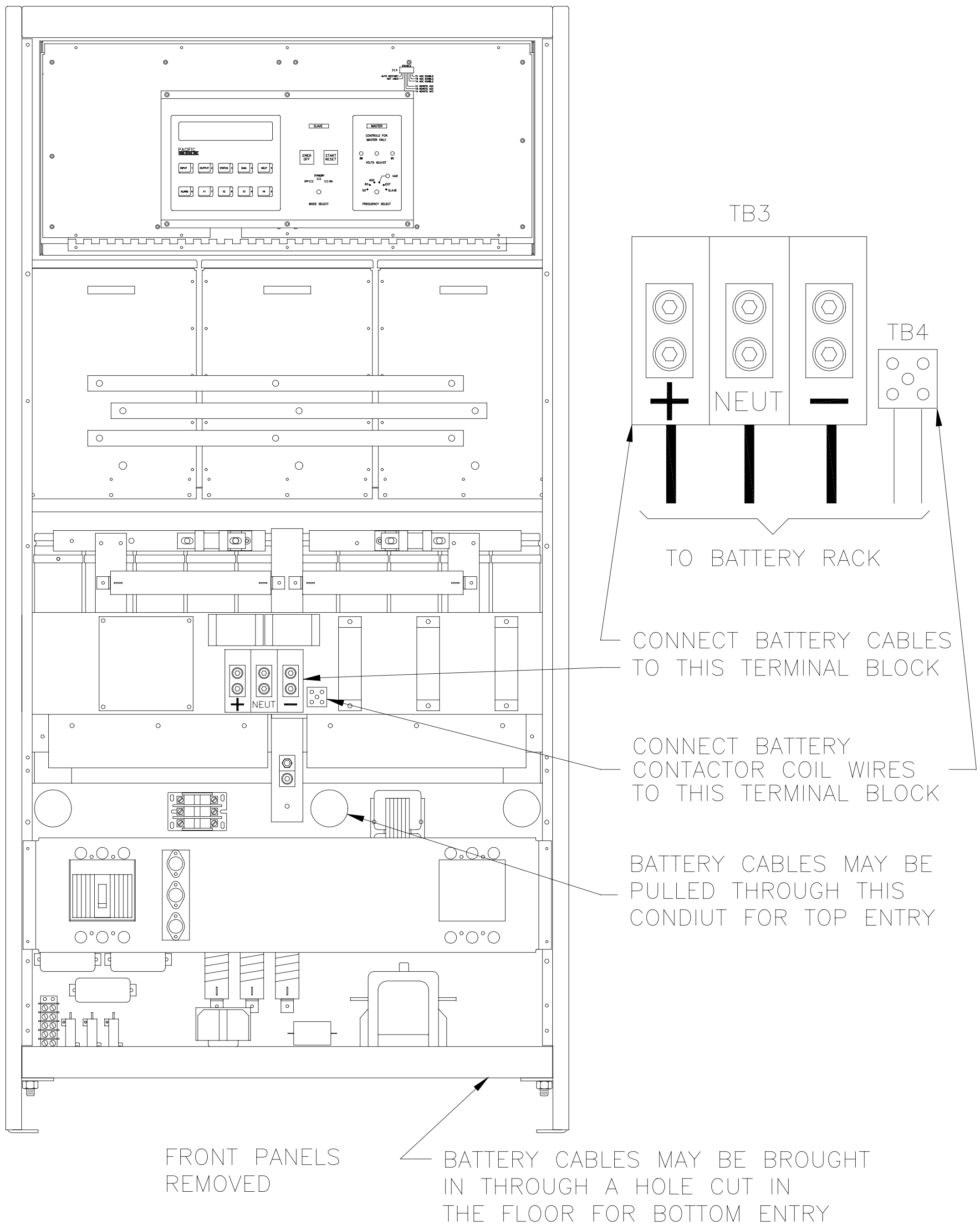

FIGURE 3.7.2 UPS CABINET BATTERY TERMINAL DETAIL

3.7.3 BATTERY ORIENTATION AND WIRING

The batteries are pre-wired at the factory. This section is for information purposes only.

*** * * * * * * WARNING * * * * * * ***

* WHEN FOUR OR MORE BATTERIES ARE CONNECTED IN SERIES, LETHAL POTENTIALS EXIST.

* WEAR SAFETY GLASSES WHEN MAKING CONNECTIONS TO BATTERIES.

* BATTERIES ARE CAPABLE OF DELIVERING EXTREMELY HIGH CURRENTS IF SHORTED.

* BATTERIES MAY EXPLODE IF SHORTED.

* USE EXTREME CARE TO PREVENT ACCIDENTAL SHORTING OF TOOLS ACROSS BATTERIES.

* REMOVE ALL WATCHES, RINGS, AND OTHER JEWELRY BEFORE SERVICING THE BATTERIES.

*** * * * * * * WARNING * * * * * * ***

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3.7.3 BATTERY ORIENTATION AND WIRING (cont)

Inside the battery cabinet there are ten (10) batteries on each shelf. (See figure 3.7.3.) Be sure to note the polarity of the batteries, negative forward and positive back when doing maintenance or replacing batteries.

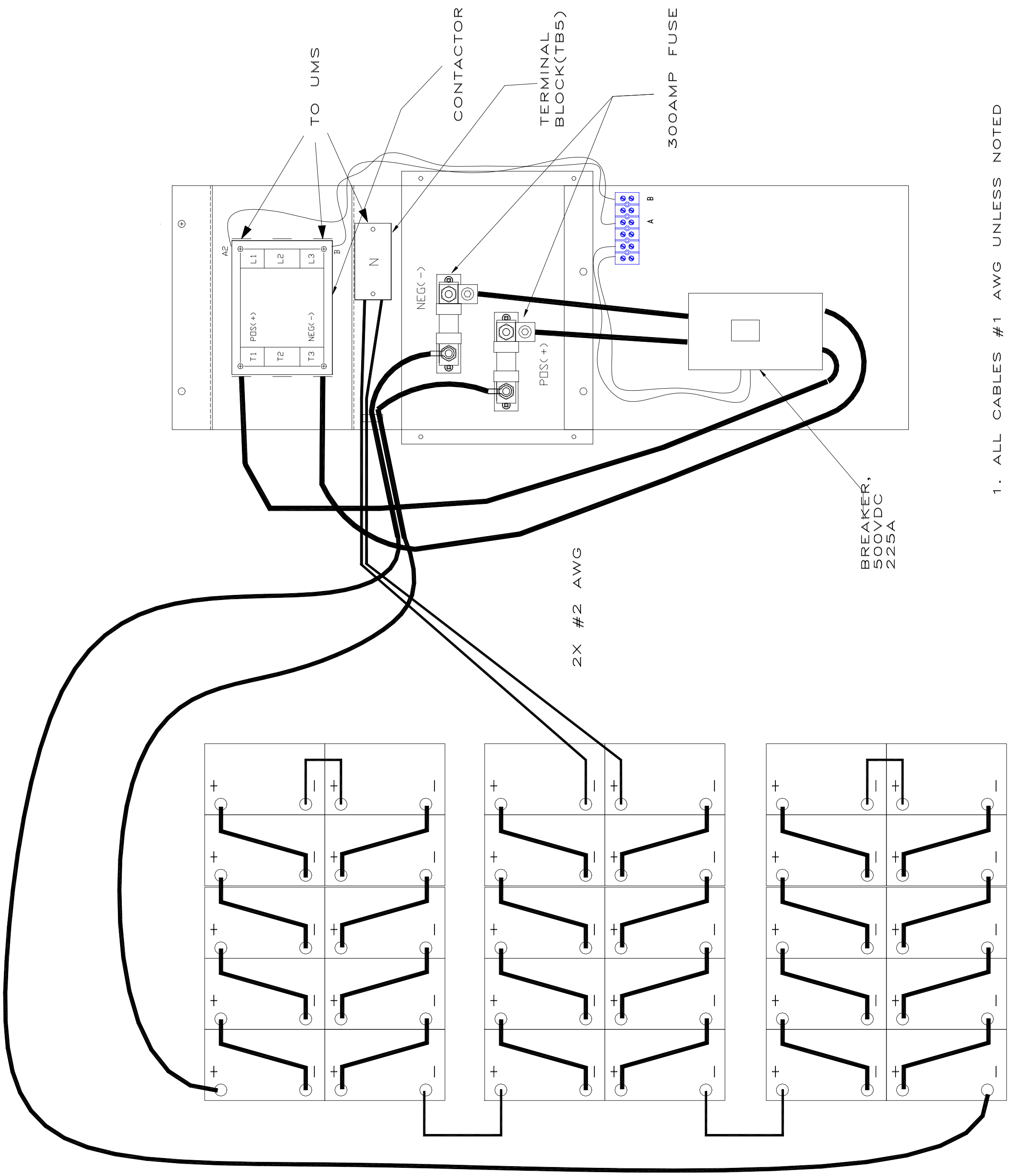
The short jumper cables, from battery to battery, are installed using 120 inch/pounds torque on the connections.

A cable from the top shelf is connected from the positive battery terminal to the positive fuse block. The cable from the bottom shelf negative battery terminal is connected to the negative fuse block.

The cables connected to the neutral terminal block (TB5) are connected to battery #15 (-) and battery #16 (+) terminals on the middle shelf.

A jumper cable is connected from the top shelf to middle shelf. A second jumper is connected from the middle shelf to the shelf.

FIGURE 3.7.3 BATTERY ORIENTATION AND WIRING



3.8 MULTIPLE CABINET SYSTEM

This paragraph states the procedure to be used when connecting the two or more cabinets in parallel to make a Multiple Cabinet System.

Proceed with installation of each cabinet as single cabinet power sources. Place each cabinet next to each other. No side clearance is necessary. Connect the input wiring to each cabinet. See figure 3.8.1 for a Multiple Cabinet System Outline.

A paralleling cable PN (126088) is required between each cabinet of the paralleled system. Connect one cable from Cabinet #1-P2 to Cabinet #2-P1. Connect another cable from Cabinet #2-P2 to Cabinet #3-P1. Connect as many paralleling cables (up to nine for a ten cabinet system) as needed. This paralleling cable contains all of the control signals necessary to operate the Multiple Cabinet System.

All five output wires (Chassis, Neutral, Phase A, Phase B and Phase C) from each cabinet need to be paralleled. For three or more cabinets in parallel an Output Load Center is recommended. Each output wire from each Cabinet to the Output Load Center **MUST BE THE SAME LENGTH AND AWG.** Refer to figure 3.8.2 for Multiple Cabinet System Wiring.

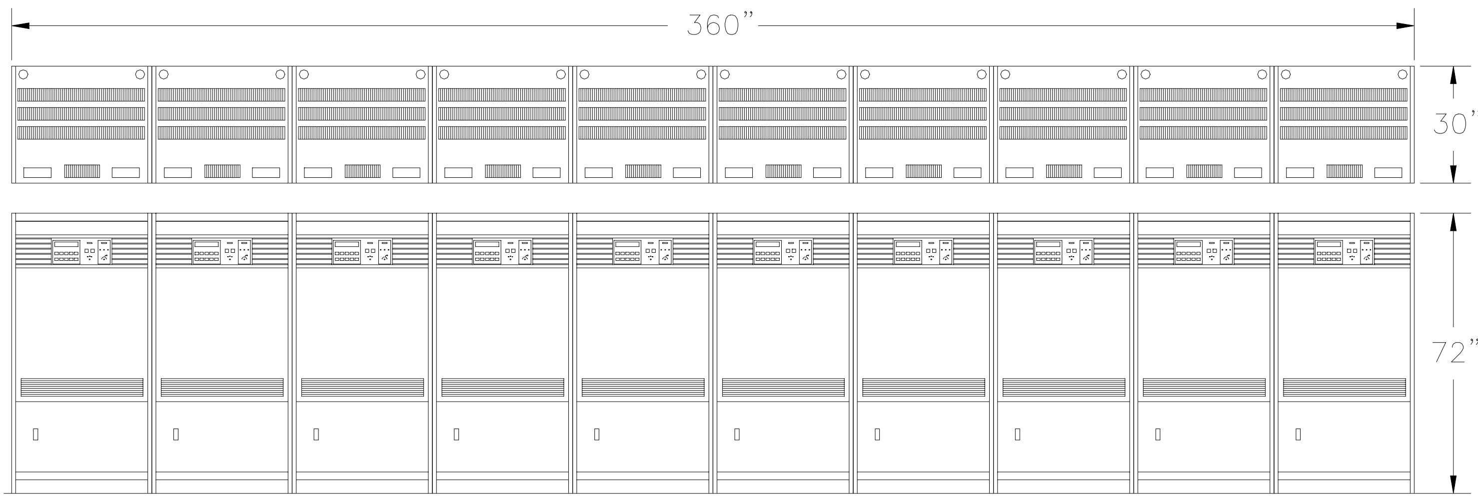


FIGURE 3.8.1 MULTIPLE CABINET SYSTEM OUTLINE

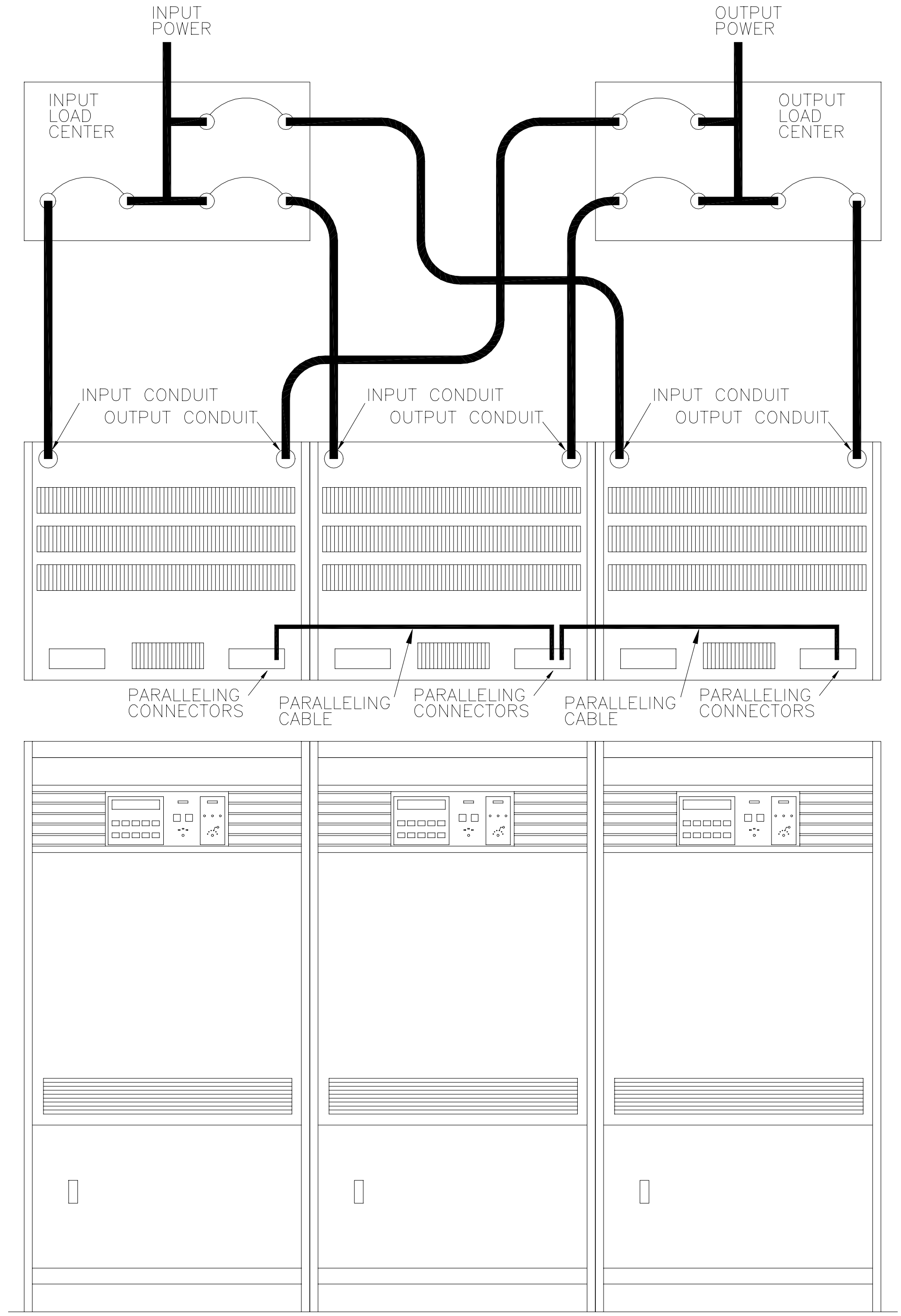


FIGURE 3.8.2 MULTIPLE CABINET SYSTEM ONE-LINE DIAGRAM

3.9 RSP IV INSTALLATION

This paragraph states the procedure to be used when connecting the RSP IV.

The RSP IV connects to the 3060-UMS via J9 which is a DA15S connector on top of the machine. A DA15P is supplied for mating to this connector.

Connect the RSP IV to the 3060-UMS as shown in figure 3.9. The RSP IV may be mounted up to 1000 feet away from the 3060-UMS when using 18 AWG wire.

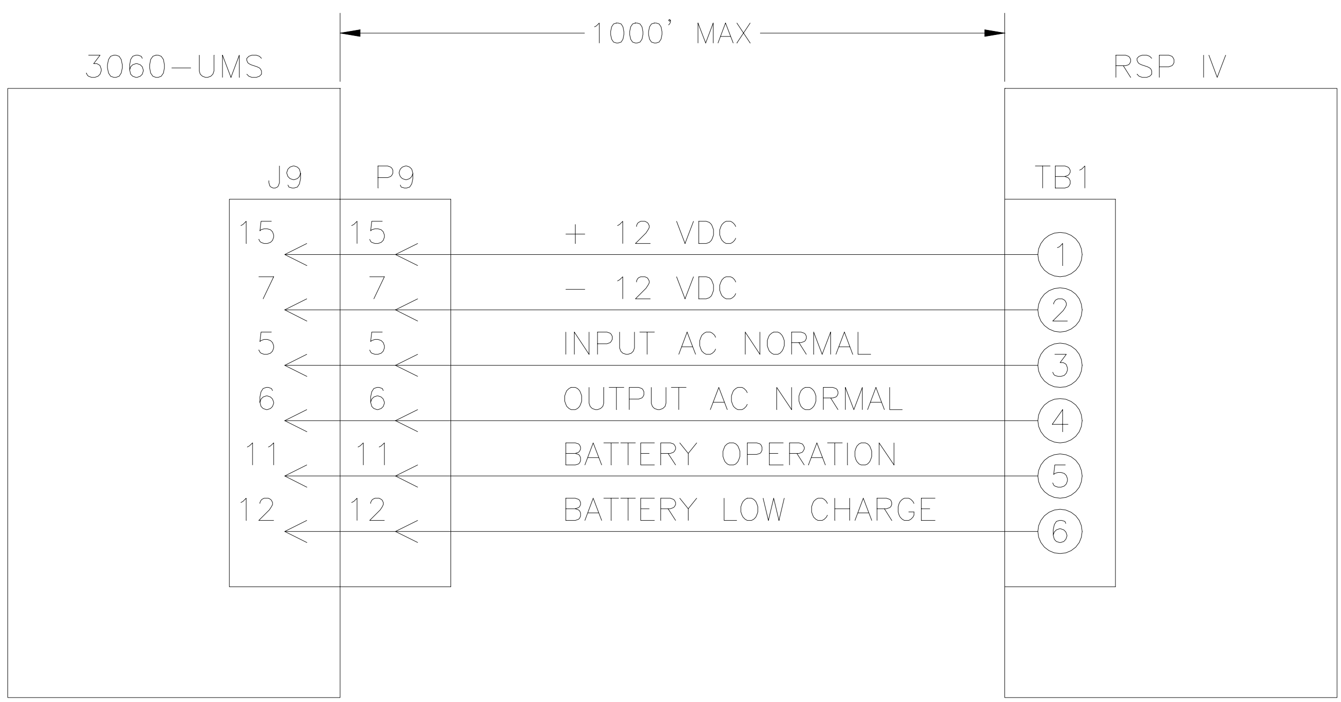


FIGURE 3.9 RSP IV CONNECTIONS

3.10 ELECTRICAL SURVEY

This paragraph provides a comprehensive checklist to be performed prior to first time power-up of the 3060-UMS Power Source.

All work must be performed in accordance with applicable local, state, and national electrical codes. In the event of conflict between this document and the aforementioned codes, the codes shall take precedence over this document. It is requested that in the event of conflict, the factory be notified by calling (714) 898-2691.

*** * * * * * * WARNING * * * * * * ***

* WHEN FOUR OR MORE BATTERIES ARE CONNECTED IN SERIES, LETHAL POTENTIALS EXIST.

* WEAR SAFETY GLASSES WHEN MAKING CONNECTIONS TO BATTERIES.

* BATTERIES ARE CAPABLE OF DELIVERING EXTREMELY HIGH CURRENTS IF SHORTED.

* BATTERIES MAY EXPLODE IF SHORTED.

* USE EXTREME CARE TO PREVENT ACCIDENTAL SHORTING OF TOOLS ACROSS BATTERIES.

* REMOVE ALL WATCHES, RINGS, AND OTHER JEWELRY BEFORE SERVICING THE BATTERIES.

*** * * * * * * WARNING * * * * * * ***

CHECK AT RIGHT WHEN CONFIRMED

1. In the Battery Cabinet, measure the voltage from the neutral terminal block to the positive fuse. Verify the voltage is between +200 and +215 VDC. If the voltage is much less than +200 VDC a battery may be installed backward or mis-wired. If the voltage is more than +215 VDC too many batteries may be connected in series. _____

2. In the Battery Cabinet, measure the voltage from the neutral terminal block to the negative fuse. Verify the voltage is between -200 and -215 VDC. If the voltage is much less than -200 VDC a battery may be installed backward or mis-wired. If the voltage is more than -215 VDC too many batteries may be connected in series. _____

3. Check input service, voltage and frequency, with the service listed on the Cabinet Identification Plate on the upper rear of the cabinet. _____

4. Check input service ratings. Circuit breakers and wiring should be sized in accordance with currents listed in Section 3.5. _____

5. Safety wiring should be sized in accordance with currents listed in Section 3.5. Ground for the Cabinet shall be connected to the Cabinet from the building ground. _____

6. All power input and output wiring shall be run in individual conduits. All control wiring shall be contained in separate conduit runs. _____

7. Only one neutral point is to be used by the cabinet. Input neutral is not connected and is not required. Output neutral shall be connected at the output neutral terminal. Refer to Figure 3.6. _____

8. Verify that all pressure terminations are tightened per specifications listed in Section 3.5 and 3.6. _____

FIGURE 3.10 ELECTRICAL SURVEY CHECKLIST

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SECTION 4

OPERATION

4 OPERATION

This section provides the information required to operate the 3060-UMS Uninterruptible AC Power Source.

4.1 INSPECTION OF INSTALLATION

Inspection of the installation is a very important step in the operation of the 3060-UMS Uninterruptible AC Power Source. This is done as a safety measure to prevent injury to personnel or damage to equipment. Anytime the cabinet is first turned on, the wiring and distribution system should be checked. Input, battery and output wiring should be examined carefully.

Solid-state power sources are capable of delivering tremendous amounts of energy. This is by design and the primary mission of the power source. Make sure that the loads attached match the output voltage and frequency of the Power Source.

First time operation requires a more in depth inspection than would otherwise be indicated. Specific items to check on first time turn on are:

1. Proper input voltage brought into the Power Source.

2. Proper battery voltages and connections properly tightened.

3. Input connections properly tightened. No nicked or damaged wires, etc.

4. Output connections made properly. Also, are loads attached of the proper voltage and frequency rating.

The operator should refer to section 3.0, Installation, if there is any doubt regarding the above statements.

4.2 INSTALLATION RECORD

During first time operation, the Power Source Installation Record, Table 4.2, should be completed. This information will record initial operating parameters as well as providing the beginning of the maintenance and service record.

Model, Serial and Modification Numbers may be found on a name plate at the upper rear of the cabinet. Refer to section 4.5 to set and record Set-Up Switch Positions.

After installation of the Power Source, and if commissioning service has been contracted, contact the PACIFIC factory for check-out and initial turn-on. Two weeks should be allowed in scheduling personnel, with a maximum of two days normally required on site. The first half of the Installation Record should be completed prior to the arrival of factory personnel. The second half will be recorded by factory personnel during the commissioning field service.

If a factory visit has not been contracted, the following record should be completed by properly trained personnel only.

TABLE 4.2 INSTALLATION RECORD

1.0 Cabinet and Site Information

Model Number ___________

Serial Number ___________

Modification Numbers ______________________________

Customer Name ______________________________

____

Technical Contact _____________ _____________
Name Title

Phone Number __________________ Ext. _____

Site Address ______________________________

____

Test Technician ______________________________

Date ___/___/___

Comments on Installation ______________________________

____

____

____

____

____

TABLE 4.2 INSTALLATION RECORD (cont.)

2.0 Technical Record

Parameter	Phase A	Phase B	Phase C
Input Voltage (L-L)	________	________	________
Input Current	________	________	________
Output Voltage (L-N)	________	________	________
Output Current	________	________	________
Output kVA	________	________	________
Percent Load	________	________	________
Output Frequency	________		

Set-Up Switch Positions

Switch Position Number

Dip Switch	1	2	3	4	5	6	7	8
Control PCB S14	____	____	____	____	____	____	____	____
Display PCB S41	____	____	____	____	____	____	____	____
Display PCB S42	____	____	____	____	____	____	____	____

SECTION 4 OPERATION

4.3 OPERATING PROCEDURES

This paragraph describes Power Source modes of operation and the various operating procedures to be used in operating the 3060-UMS Power Source.

* * * * * * * **WARNING** * * * * * * *

BEFORE APPLYING POWER OF ANY KIND TO THE POWER SOURCE, READ SECTION 4 OF THIS MANUAL AND DO NOT PROCEED UNTIL ITS CONTENTS ARE FULLY UNDERSTOOD.

* * * * * * * **WARNING** * * * * * * *

This section is divided into four sub-paragraphs:

1. <u>First Time Turn-On Procedure</u>
   To be performed at initial turn-on or when service has been performed.

2. <u>Normal Shut-Down Procedure</u>
   To be performed when Power Source power is secured for load maintenance.

3. <u>Emergency Shutdown Procedure</u>
   Action taken to secure Power Source output power in emergency situations.

4. <u>Power Source Modes of Operation</u>
   Provides definition of Power Source operational states.

Operation of the 3060-UMS Power Source has been designed to be simple and straightforward. This is done for several reasons the primary reason being safety. The addition of an Emergency Off Switch allows for quick action in the case of an emergency.

It cannot be stressed too many times that Solid-State Power Sources are capable of delivering tremendous amounts of energy. Things happen quickly when something goes wrong. However, good habits and a methodical approach, when operating this equipment will, avoid most hazards.

4.3.1 FIRST TIME OPERATION

This procedure is to be used to turn on a one Cabinet Power Source for the first time, or when service has been performed.

Proceed as follows:

STEP 1:

Verify the AUTO RE-START option has been disabled by switching S14-1 OFF (refer to Section 4.5.2, figure 4.5.2.) Rotate the MODE SELECT switch to the OFF position.

STEP 2:

Inspect the installation. Verify that the wiring is correct (refer to Section 3.0, figure 3.5, figure 3.6, figure 3.7.2 and figure 3.7.3.) If this is first time turn-up operation, complete Table 4.2, (Installation Record) as operation proceeds.

STEP 3:

Open main breakers of output distribution system. No load should be connected to cabinet at this point.

STEP 4:

Close input power circuit breaker. The OFF lamp on the Power Source Mode Select switch should illuminate.

If this lamp does not light the EMER OFF lamp should be on. Check the input power by pressing the INPUT then f1 keys on the front panel. ABNORMAL will be displayed if the input power is not within limits or NORMAL if input power is within limits. If the input is NORMAL, press the DIAG then f1 keys to determine the cause of the EMERGENCY OFF. Correct the fault, if any, and proceed.

Press START/RESET. The EMER OFF indicator should go out.

4.3.1 FIRST TIME OPERATION (cont.)

STEP 5:

Place the cabinet in the STANDBY state by rotating the Mode Select Switch to STANDBY and pressing the START/RESET button. The STANDBY lamp will illuminate. The high voltage power supplies are now energized, the batteries are charging and the inverters are producing voltage. The output contactor is open. Cabinet output voltages and frequency may be checked by pressing the OUTPUT then f1 keys on the front panel.

STEP 6:

If inverter voltage is not at desired levels, it may be changed by adjusting the VOLTS ADJUST controls on the front panel. The center VOLTS ADJUST control adjusts all three outputs simultaneously. φB and φC are trim adjustments.

Frequency may be changed by using the FREQUENCY SELECT switch. 50, 60, and 400Hz are fixed crystal stabilized frequencies. The VAR position is variable from 47 to 500Hz. The EXT position allows external oscillator input on connector J6. The SLAVE position makes this cabinet a slave.

STEP 7:

Place the cabinet in the ON State by rotating the Mode Select Switch to ON. The internal output contactor is now closed, and the cabinet is ready to deliver load power. Cabinet output voltages may be checked by pressing the OUTPUT then f2 keys on the front panel.

STEP 8:

Close main breakers of the output distribution system. Monitor output voltages. The output voltage should not change as load is applied.

4.3.2 PARALLEL CABINET OPERATION

This procedure is to be used to turn on the Paralleled Cabinet System for the first time, or when service has been performed on a cabinet.

Proceed as follows:

STEP 1:
Inspect the installation. Verify that the wiring is correct (refer to Section 3.8, figure 3.8.2). Open all Circuit Breakers in the Output Load Center.

STEP 2:
Rotate the MODE SELECT switch to the OFF position for each Cabinet in the System. Rotate the FREQUENCY SELECT switch to the SLAVE position for each Cabinet in the system. This should cause an EMER OFF in ALL Cabinets.

STEP 3:
Select **ONE** Cabinet to be MASTER. Operate the **ONE** MASTER Cabinet as a Single Cabinet Power Source as described in section 4.3.1.

STEP 4:
Verify operation of each Cabinet individually as described in steps 2 and 3 above.

STEP 5:
Rotate the MODE SELECT switch to OFF for all Cabinets. Select **ONE** Cabinet, in the middle of the System, to be MASTER. Select all other Cabinets to be slaves. Disconnect any load from the output of the system. Close all of the Circuit Breakers at the Output Load Center. Press OUTPUT then f1 keys on all Cabinets in the system to monitor each Cabinet's output voltages and currents.

4.3.2 PARALLEL CABINET OPERATION (cont)

STEP 6:

On the MASTER, turn the Volts Adjust down to 0 VAC. Rotate the MODE SELECT to ON and press START/RESET. Select **one and only one** SLAVE. Rotate it's MODE SELECT to ON, and press START/RESET. Verify the MASTER and SLAVE output currents are less than 10 amps.

STEP 7:

On the MASTER, turn the Volts Adjust up to 120 VAC. Verify the MASTER and SLAVE output currents are less than 10 amps. If output currents are large, check for mis-wires.

STEP 8:

Verify operation of each SLAVE individually as described in steps 6 and 7 above.

STEP 9:

Turn ON all Cabinets in the system. On the MASTER, rotate the MODE SELECT switch to standby and verify all cabinets go to STANDBY. On the MASTER, press EMER OFF and observe all Cabinet goes to EMER OFF.

STEP 10:

Connect the load. Bring up the MASTER, then all Cabinets to the STANDBY state. Leave the MASTER in the STANDBY state. Rotate the MODE SELECT switch to ON for all the SLAVES. Rotate the MASTER MODE SELECT to ON. Verify all Cabinet output currents are ± 10% of each other. The system is now fully operational.

4.3.3 NORMAL SHUTDOWN PROCEDURE

This procedure describes how to place the Power Source into the normal Off state. One of two conditions may be desired when turning off the Power Source:

1. Secure power from the Power Source. Turn off high voltage power supplies, inverters and output to the load. Control circuits shall remain active.

2. Secure all power; no power applied to either the Power Source or the Load.

To secure power from the Power Source proceed as follows:

STEP 1:
Turn off all loads and open output circuit breaker if provided.

STEP 2:
Rotate the Mode Select Switch to the OFF position. Verify that the OFF lamp is lit. Verify that the STANDBY and ON lamps are extinguished.

To secure all power to and from the Power Source proceed as follows:

STEP 1:
Turn off all loads and open output circuit breaker if provided.

STEP 2:
Rotate the Mode Select Switch to the OFF position.

STEP 3:
Open the input power circuit breaker. This removes all power to and from the cabinet.

4.3.4 EMERGENCY SHUTDOWN PROCEDURE

Emergency shutdown is accomplished by depressing the EMER OFF Switch at any time.

The principle function of the Emergency Off state is to open the input and output contactors in the event of internal Power Source failure.

A secondary purpose is to protect against overheating of the inverter or input transformer in the event of excessive load current for extended time (an unlikely occurrence due to conservative thermal design.)

A third function is to give the operator a quick "Turn Off" means in the event of an emergency - since pressing EMER OFF is slightly faster than rotating the Mode Select Switch to Off.

The Emergency Off state can only be removed by rotating the Mode Select Switch to Off and pressing START/RESET. The EMER OFF lamp will extinguish and the cabinet will be in a normal Off state.

4.3.5 MODES OF OPERATION

There are six possible modes of operation:

1. Off State
2. Stand By State
3. On State
4. Emergency Off State
5. Slave State
6. Auto Re-Start

These states are achieved as described below:

OFF STATE

The OFF state is achieved by rotating the Mode Select Switch to Off. If the EMER OFF switch is illuminated, pressing START/RESET is also required to change the state from EMER OFF to normal OFF.

OFF causes the machine to be dead except for the low voltage power supply. OFF shall be achieved if the following are true:

A) The EMER OFF lamp is off.

B) The OFF lamp is on.

C) The STANDBY lamp is off.

D) The ON lamp is off.

4.3.5 MODES OF OPERATION (cont)

STANDBY STATE

STANDBY is when the input and/or battery contactor is closed and the machine is ready to deliver power to a load but the output contactor is open. The batteries are charging if input power is ok. The STANDBY lamp is on. Observe the following start sequence to achieve STANDBY:

A) The EMER OFF lamp is off.

B) The OFF lamp is on.

C) The MODE SELECT switch is rotated to STANDBY.

D) The START/RESET button is pushed.

E) The slow turn on contactor closes.

F) The main input contactor closes.

G) The ±200 VDC supplies charge, the battery contactor closes the modulator is enabled. The machine is now in STANDBY mode.

ON STATE

ON is when the output contactor is closed and the machine is ready to deliver power to a load. The ON lamp is on. Observe the following sequence to achieve ON:

A) The STANDBY lamp is on.

B) The MODE SELECT switch is rotated to ON. The machine is now in ON mode.

OR

A) The EMER OFF lamp is off.

B) The MODE SELECT switch is in the ON position and the START/RESET switch is pressed. The machine shall go to STANDBY mode and then to ON mode.

4.3.5 MODES OF OPERATION (cont)

EMER OFF STATE

EMER OFF causes the machine to be dead except for the low voltage power supply. The EMER OFF push button shall be lit. The following shall cause an EMER OFF:

A) EMER OFF BUTTON, the EMER OFF push button has been pressed.

B) MASTER EMERGENCY OFF, The Master Cabinet is in an EMERGENCY OFF STATE and this machine is a SLAVE.

C) LVPS FAULT, one of the low voltage power supplies has failed.

D) Bus VOLTAGE GREATER THAN 240 VDC, one of the high voltage power supplies has exceeded 240 VDC.

E) INVERTER FAULT, one of the inverters has failed.

F) INVERTER OVERTEMP, one of the inverters has exceeded 85° C.

G) TRANSFORMER OVERTEMP, the large input transformer has exceeded 200° C.

H) SUSTAINED OVERLOAD, the power source has been in current limit for a long time. The time to shutdown will vary with type of load.

I) EXTERNAL EMERGENCY OFF, external contacts have shorted connector P1-18 to P1-19 together and has caused an emergency off.

4.3.5 MODES OF OPERATION (cont)

SLAVE STATE

SLAVE causes the machine to act as a slave in a multi cabinet system. The machine is a SLAVE if the FREQUENCY SELECT switch is rotated to SLAVE, and a MASTER if in any other position. The SLAVE lamp and either EMER OFF, OFF, STANDBY or ON lamps shall be lit. The control mode shall be determined by the following table:

	MASTER MODE		
	OFF	STANDBY	ON
SLAVE MODE			
OFF	OFF	OFF	OFF
STANDBY	OFF	STANDBY	STANDBY
ON	OFF	STANDBY	ON

CONTROL MODE

AUTO RE-START

If AUTO RE-START is enabled, the Power Source shall start **AUTOMATICALLY** when input power is applied. The Power Source shall attain the mode as selected by the MODE SELECT switch if all internal diagnostics check out ok.

4.4 DESCRIPTION OF CONTROLS AND INDICATORS

The controls and indicators for the 3060-UMS are located on the front panel of the Power Source cabinet.

As shown in figure 4.4 the Front Panel is divided into 3 basic regions:

1 LCD and Interrogation Section.
Used to solicit Power Source parametric values.
(Refer to paragraph 4.4.1)

2. Mode Select, Emer Off, and Start/Reset switches.
(Refer to paragraph 4.4.2)
Used to control the operational state of the Power Source.

3 Frequency Select and Volts Adjust.
(Refer to paragraph 4.4.3)
Used to control the Internal Oscillator and select Master or Slave operation in Parallel Systems.

This section is divided into the referenced subparagraphs which discuss each of the above in detail.

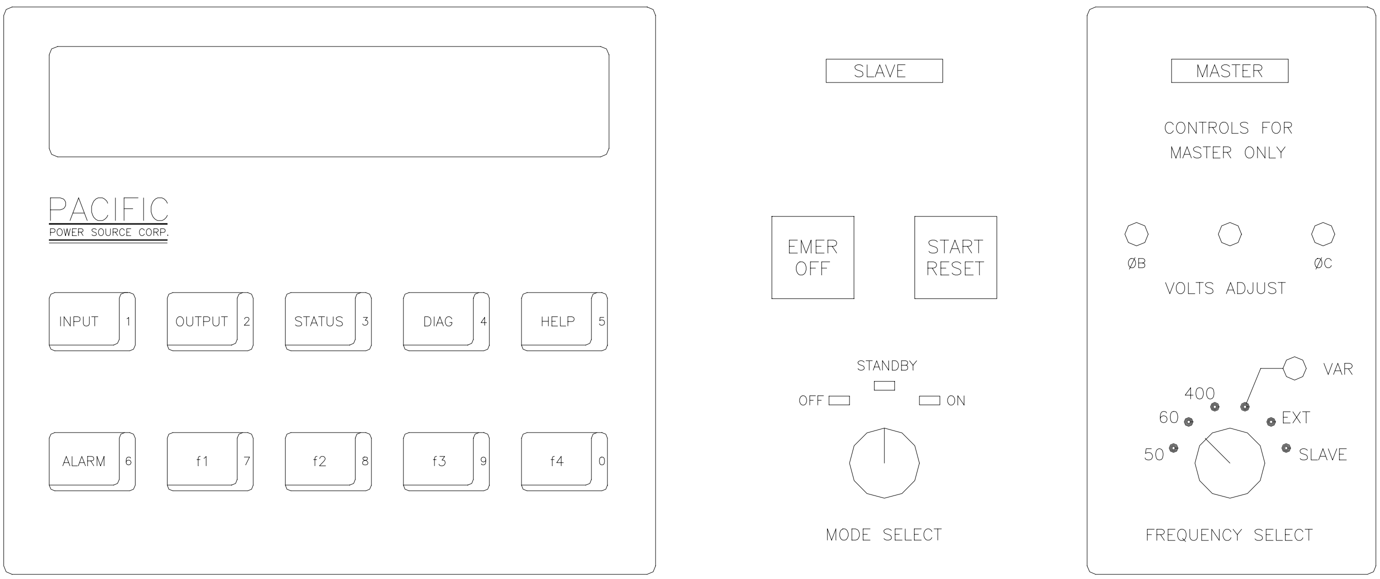

FIGURE 4.4 3060-UMS FRONT PANEL

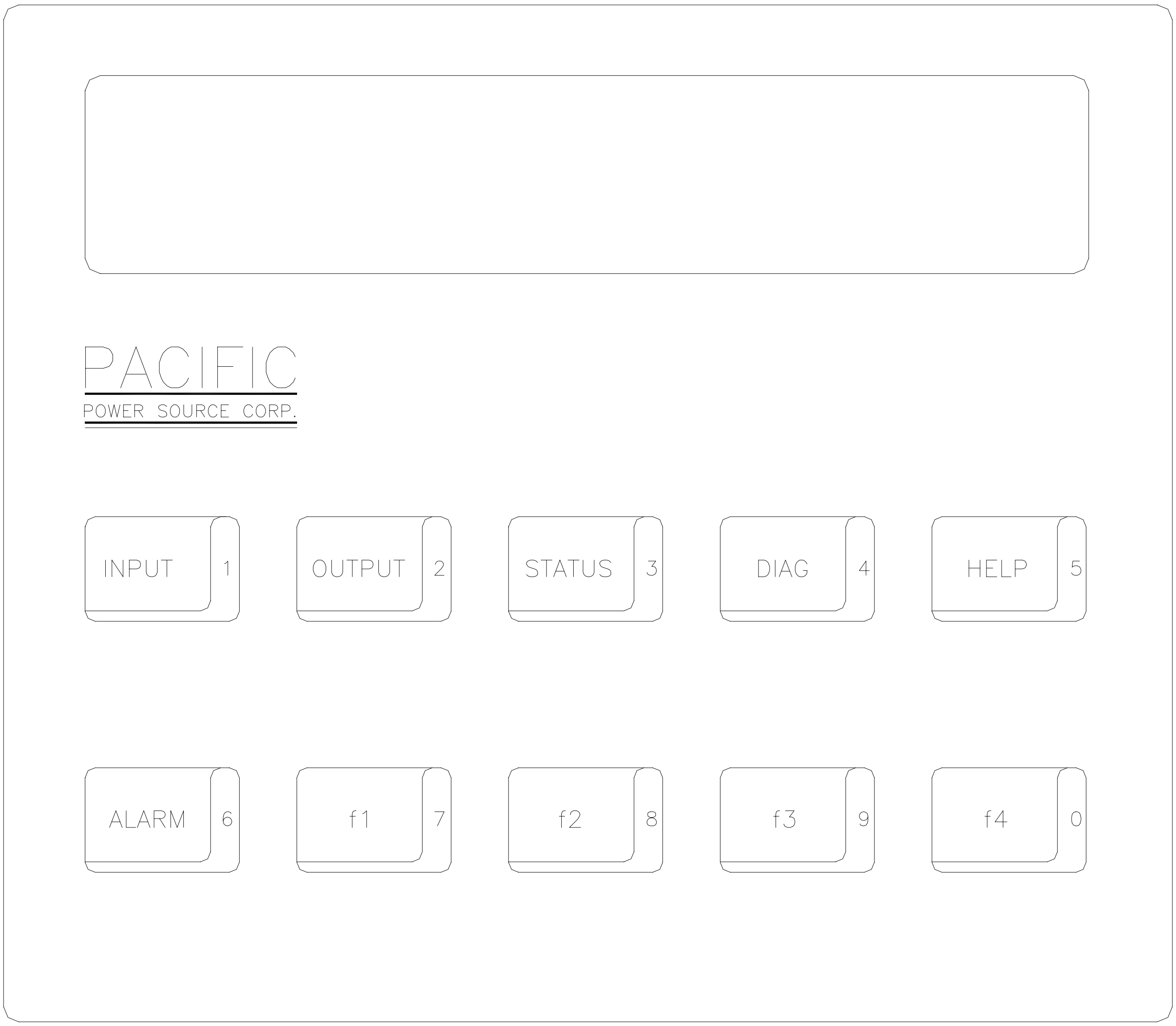

FIGURE 4.4.1 LCD AND INTERROGATION SWITCHES

4.4.1 LCD AND INTERROGATION SWITCHES

This paragraph provides a detailed description of each Power Source message, how it is obtained, and it's meaning.

A four line, 160 character Liquid Crystal display provides the communication interface between the Power Source and the operator.

4.4.1.1 INPUT KEY

The INPUT Key is used to display the current status of all Power Source input power and battery parameters. It may be pressed at any time power is applied to the cabinet.

When the INPUT then f1 Keys are pressed, message I1 will be displayed. NORMAL indicates Input Power is acceptable and ABNORMAL indicates Input Power is not acceptable. FREQ displays Input Frequency. V displays Input Volts Phase to Neutral and Phase to Phase. A displays Input Amps for each phase. kW displays Input Kilowatts for each phase and kVA displays Input Kilo-Volt-Amps for each phase.

```
I1: INPUT  V  XXX/XXX  XXX/XXX  XXX/XXX
ABNORMAL   A      XXX      XXX      XXX
           kW    XX.X     XX.X     XX.X
FREQ=XXX.X kVA   XX.X     XX.X     XX.X
```

When the INPUT then f2 Keys are pressed, message I2 will be displayed. LVPS is internal Low Voltage Power Supply voltages. Bus/BATT is the ±200 VDC voltages which is directly connected to the batteries when the unit is in standby or on. BATT is ± battery current and power.
+ indicates batteries are charging and - indicates batteries are discharging.

```
I2: INPUT     Bus/BATT        BATT
 LVPS         +XXX VDC       ±XXX ADC
+XX.X VDC     -XXX VDC       ±XXX ADC
-XX.X VDC                    ±XX.X KW
```

If an INPUT display is already active, it is not necessary to press the INPUT key each time to view another message. Simply pressing another f1-f2 key shall display the corresponding message.

4.4.1.2 OUTPUT KEY

The OUTPUT Key is used to display the current status of all Power Source output power parameters. It may be pressed at any time power is applied to the cabinet.

When the OUTPUT then f1 keys are depressed, message O1 will be displayed showing Single Cabinet Efficiency and output Frequency. Single Cabinet output volts (Phase to Neutral and Phase to Phase,) Amps, kW and kVA information is displayed for each phase.

```
O1: CABINET V XXX/XXX  XXX/XXX  XXX/XXX
    OUTPUT  A     XXX      XXX      XXX
EFF=XX%    kW    XX.X     XX.X     XX.X
FREQ=XXX.X kVA   XX.X     XX.X     XX.X
```

$$\text{Efficiency} = \frac{\text{kW OUT} + \text{kW Batt Charge}}{\text{kW IN} + \text{kW Batt discharge}}$$

When the OUTPUT then f2 keys are depressed, message O2 will be displayed showing Single Cabinet output Frequency. Single Cabinet output volts (Phase to Neutral and Phase to Phase,) %I-PEAK (percentage of maximum peak amps,) %kVA (percentage of maximum kVA,) and %kW (percentage of maximum kW) information are displayed for each phase.

```
O2: CABINET V XXX/XXX  XXX/XXX  XXX/XXX
    OUTPUT  %I-PEAK       XXX  XXX  XXX
            %kVA          XXX  XXX  XXX
FREQ=XXX.X  %kW           XXX  XXX  XXX
```

When the OUTPUT then f3 keys are depressed, message O3 will be displayed showing Multiple Cabinet System output Frequency. Multiple Cabinet output volts (Phase to Neutral and Phase to Phase,) Amps, kW and kVA information is displayed for each phase.

```
O3: SYSTEM  V XXX/XXX  XXX/XXX  XXX/XXX
    SUMMARY A    XXXX     XXXX     XXXX
    OUTPUT  kW    XXX      XXX      XXX
FREQ=XXX.X  kVA   XXX      XXX      XXX
```

4.4.1.2 OUTPUT KEY (cont)

When the OUTPUT then f4 keys are depressed, message O4 will be displayed showing Remotely Sense signals from the Remote Metering connector J8. Remote Sense frequency, output volts (Phase to Neutral and Phase to Phase,) Amps, kW and kVA information are displayed for each phase.

```
O4: REMOTE  V XXX/XXX  XXX/XXX  XXX/XXX
    OUTPUT  A    XXXX     XXXX     XXXX
           kW     XXX      XXX      XXX
FREQ=XXX.X kVA    XXX      XXX      XXX
```

If an OUTPUT display is already active, it is not necessary to press the OUTPUT key each time to view another message. Simply pressing another f1-f4 key shall display the corresponding message.

4.4.1.3 STATUS KEY

The STATUS key is used to display the operating status of the Power Source. This key may be pressed at any time power is applied to the cabinet. Based on internal sense circuits one of six basic messages may be displayed. Section 6.2.1 is a list of control term definitions.

S1 Displayed when the Power Source is in an Emergency Off state. The EMER OFF lamp shall be lit.

```
S1: CAB EMER OFF - WARNING - NO OUTPUT
                   PRESS DIAG KEY
```

S2 Displayed when the Power Source is in the Normal Off state. The OFF lamp shall be lit.

```
S2: CAB IS OFF - WARNING - NO OUTPUT
```

S3 Displayed when the Power Source is in the Standby state. The STANDBY lamp shall be lit.

```
S3: CAB IS STBY - WARNING - NO OUTPUT
                  READY FOR OPERATION
```

4.4.1.3 STATUS KEY (cont)

S4 Displayed when the Power Source is in the Normal ON state. The ON lamp shall be lit. Output Frequency and %LOAD (the highest of any percent load as described in the Output O2 message) is displayed. Single Cabinet output volts (Phase to Neutral and Phase to Phase,) Amps information is displayed for each phase.

```
S4: CAB IS ON - OPERATION NORMAL
           V  XXX/XXX  XXX/XXX  XXX/XXX
           A      XXX      XXX      XXX
FREQ=XXX.X %LOAD  XXX
```

S5 Displayed when the Power Source is OVERLOADED. The Power Source is Overloaded when %LOAD is greater than 100%. The ON lamp shall be lit. Output Frequency and %LOAD (the highest of any percent load as described in the Output O2 message) is displayed. Single Cabinet output volts (Phase to Neutral and Phase to Phase,) Amps information is displayed for each phase.

```
S5: CAB IS ON - WARNING - OVERLOAD
      V  XXX/XXX  XXX/XXX  XXX/XXX
      A      XXX      XXX      XXX
FREQ=XXX.X %LOAD  XXX
```

S6 Displayed when the Power Source is in an Emergency Off state caused by an OVERTEMP condition. The EMER OFF lamp shall be lit.

```
S6: CAB IS EMER OFF - WARNING - OVERTEMP
           V  XXX/XXX  XXX/XXX  XXX/XXX
           A      XXX      XXX      XXX
FREQ=XXX.X %LOAD  XXX
```

S7 Displayed when the Power Source is in an Alarm condition caused by an OUTPUT UNDER VOLTAGE.

```
S7: CAB IS ON - WARNING UNDER VOLTAGE
           V  XXX/XXX  XXX/XXX  XXX/XXX
           A      XXX      XXX      XXX
FREQ=XXX.X %LOAD  XXX
```

4.4.1.3 STATUS KEY (cont)

S8 Displayed when the Power Source is in an Alarm condition caused by an OUTPUT OVER VOLTAGE.

```
S8: CAB IS ON - WARNING OVER VOLTAGE
           V  XXX/XXX  XXX/XXX  XXX/XXX
           A      XXX      XXX      XXX
FREQ=XXX.X %LOAD  XXX
```

S9 Displayed when the Power Source is in an Alarm condition caused by an OUTPUT UNDER FREQUENCY.

```
S9: CAB IS ON - WARNING UNDER FREQUENCY
           V  XXX/XXX  XXX/XXX  XXX/XXX
           A      XXX      XXX      XXX
FREQ=XXX.X %LOAD  XXX
```

S10 Displayed when the Power Source is in an Alarm condition caused by an OUTPUT OVER FREQUENCY.

```
S10: CAB IS ON - WARNING OVER FREQUENCY
           V  XXX/XXX  XXX/XXX  XXX/XXX
           A      XXX      XXX      XXX
FREQ=XXX.X %LOAD  XXX
```

S11 Displayed when the Power Source is in an Alarm condition caused by loss of input power.

```
S10: CAB IS ON - WARNING
                 INPUT POWER HAS FAILED
                 LOAD ON BATTERY
                 BATT TIME = XX MIN
```

S12 Displayed when the Power Source is in an Alarm condition caused by loss of input power and shutdown is imminent.

```
S10: CAB IS ON - WARNING
                 LOAD ON BATTERY
                 SHUTDOWN IMMINENT
                 BATT TIME = XX MIN
```

4.4.1.4 DIAGNOSTIC KEY

The Diagnostic (DIAG) key is dual purpose. First, by saving the cause of the Emergency Off state, an audit trail is provided for trouble shooting purposes. Second, technical operating parameters are displayed and recorded for determining Power Source operational status.

When the DIAG then f1 keys are depressed the cause of the Emergency Off state is displayed.

```
D1: DIAGNOSTIC    NO EMERGENCY OFF
```

or

```
D1: DIAGNOSTIC    EMERGENCY OFF CAUSED BY
                  MASTER EMERGENCY OFF
                  SUSTAINED OVERLOAD
                  INVERTER FAULT
                  EMER OFF BUTTON
                  TRANSFORMER OVERTEMP
                  INVERTER OVERTEMP
                  LVPS FAULT
                  Bus VOLTAGE > 240 VDC
                  EXTERNAL EMERGENCY OFF
                  NO MASTER ON LINE
```

When the DIAG then f2 keys are pressed the input transformer temperature in degrees C and inverter temperature status (OK/Not OK) are displayed.

```
D2: DIAGNOSTIC    TEMPERATURE DATA
                  XFMR: XXX DEG C
                  INV:  OK
```

4.4.1.4 DIAGNOSTIC KEY (cont)

When the DIAG then f3 keys are pressed the results of the **last** battery test are displayed. BATT XXX % is the percentage of current delivered by the batteries as compared to calculated current. OK is displayed if the percentage is > 75%. V and A are battery volts and amps.

```
D3: DIAGNOSTIC     +BATT XXX %     +XXXV
LAST BATTERY        NOT OK          XXXA
TEST. PRESS f3     -BATT XXX %     -XXXV
FOR NEW TEST.       NOT OK          XXXA
```

If the f3 key is pressed again, and the output contactor is open, the following message is displayed:

```
D5: DIAGNOSTIC          OUTPUT IS OFF AND
    BATTERY             THERE IN NO LOAD.
    TEST                TEST NOT POSSIBLE
```

If the f3 key is pressed again, and the output contactor is closed, the following message is displayed:

```
D6: DIAGNOSTIC          PRESS f2 AND f4
    BATTERY             TOGETHER
    TEST                WITHIN 5 SECONDS
                        TO INITIATE
```

If f2 and f4 are not pressed within 5 seconds the D3 message is displayed. If f2 and f4 are pressed within 5 seconds a new battery test starts. This test will last for 60 seconds. At the end of the test the results will be displayed. To abort the test early, press the diag key and old test results will be displayed.

```
D7: DIAGNOSTIC    TEST IN PROCESS  +XXXV
    BATTERY       PRESS DIAG KEY    XXXA
    TEST          TO ABORT TEST    -XXXV
                  XX SECONDS REMAIN XXXA
```

At the conclusion of the test the D3 message comes up automatically.

4.4.1.4 DIAGNOSTIC KEY (cont)

When the DIAG then f4 keys are pressed the digital inputs to the Display PCB are displayed.

```
D4:  PORT # 2 PORT # 3 PORT # 4 PORT # 5
PWR  XXXXXXXX XXXXXXXX XXXXXXXX XXXXXXXX
EMER XXXXXXXX XXXXXXXX XXXXXXXX XXXXXXXX
NOW  XXXXXXXX XXXXXXXX XXXXXXXX XXXXXXXX
```

This display shows the status of all of the 32 digital inputs to the Display PCB at the last PWR down (when the + 18 VDC fell below 12.3VDC,) the last EMER off (when Q6 went hi) and NOW (present real time.)

BIT	PORT # 2	PORT # 3
7	KYBD f3	ML
6	KYBD f4	INV OVERTEMP
5	MASTER EMER OFF	EMER OFF SW
4	XFMR OVERTEMP	SUSTAINED O/L
3	LVPS FAULT	INPUT LINE FAULT
2	LS	Q6
1	C0	VDC > 240
0	LM	EXT EMER OFF

BIT	PORT # 4	PORT # 5
7	VDC > 160	SPARE
6	INV FAULT	MOD ENABLE
5	S3 CLOSE COMM	SPARE
4	S4 CLOSE COMM	SPARE
3	S5 CLOSE COMM	INV TEST OK
2	S7 CLOSE COMM	SPARE
1	C2	INV O/L
0	POLARITY	SPARE

If a DIAGNOSTIC display is already active, it is not necessary to press the DIAG key each time to view another message. Simply pressing another f1-f4 key shall display the corresponding message.

4.4.1.5 HELP KEY

The HELP key is provided to direct the operator with the proper course of action to turn on and operate the machine. Six different help messages are available for display. If the HELP key is pressed the first applicable message, H1 through H6, is displayed.

H1 Displayed when the Input Voltage is not within acceptable range.

H1: INPUT SERVICE IS NOT CORRECT.
CHECK ALL THREE INPUT PHASES
FOR PROPER VOLTAGE.

H2 Displayed when the cabinet is in an Emergency Off State. Instructs the user to press the DIAG then f1 keys to determine the cause of the FAULT. Instructs the user to press the START/RESET to clear the FAULT. Instructs the user that service is required if the fault cannot be cleared.

H2: CABINET IS IN EMERGENCY OFF STATE.
PRESS DIAG KEY TO DETERMINE FAULT.
TO CLEAR FAULT PRESS START/RESET.
IF FAULT REMAINS, SERVICE IS REQUIRED.

H3 Displayed when the cabinet is in a Normal Off State. Instructs the user how to place the cabinet in the Standby state by rotating the MODE SELECT switch to the STANDBY position and pressing the START/RESET button. This will charge up the internal high voltage dc power supplies and start the inverter operating.

H3: SYSTEM IS IN NORMAL OFF STATE.
TO PLACE IN STANDBY, ROTATE THE
MODE SELECT SWITCH TO STANDBY AND
PRESS START/RESET.

4.4.1.5 HELP KEY (cont)

H4 Displayed when the cabinet is in the Standby State. The cabinet is ready to deliver output power but the output contactor is open. Instructs the user to rotate the MODE SELECT switch to the ON position to turn on the output contactor.

H4: SYSTEM IS IN STANDBY STATE.
TO TURN ON THE OUTPUT, ROTATE
THE MODE SELECT SWITCH TO ON.

H5 Displayed when the cabinet is in the On State. The cabinet's output terminals are energized. The output contactor is closed. Instructs the user to press a button to read metering information.

H5: SYSTEM IS IN ON STATE.
TO READ METERING INFORMATION
PRESS THE ASSOCIATED BUTTON.

H6 Displayed when the cabinet is in the Alarm State. Instructs the user to press the STATUS button to determine the cause of the alarm. Instructs the user to press the ALARM button to silence the audible alarm.

H6: SYSTEM IS IN ALARM STATE.
PRESS STATUS TO DETERMINE CAUSE
OF ALARM. PRESS ALARM TO SILENCE.

4.4.1.6 ALARM KEY

Whenever ALARM is pressed message A1 appears. It remains displayed until some other button is pressed. Pressing ALARM momentarily there after has no effect. Pressing <u>and holding</u> ALARM for 2+ seconds shall cause the ALARM buzzer to change state between ENABLED and DISABLED (display text changes accordingly).

```
A1: ALARM DISABLED- PRESS     f1> OV XXX
AND HOLD ALARM TO ENABLE.     f2> UV XXX
USE f1 f2 f3 f4 BUTTONS       f3> OF XXX
TO CHANGE LIMITS              f4> UF XXX
```

Whenever message A1 is displayed, limits are subject to change by use of f1 through f4 buttons.

First press and hold of f1 causes OV to increase at about 5 volts per second. Second press and hold causes OV to decrease at about 5 volts per second. Similarly for f2, f3 and f4.

If ALARM is ENABLED and any voltage, frequency, temperature or percent load parameters exceeds its limits the ALARM BUZZER shall sound. When parameter returns to limits buzzer shall extinguish.

When RAM is cleared, ALARM system shall be DISABLED and limits shall be :

```
OV 132
UV 108
OF 440
UF  47
```

This feature monitors output terminals. The alarm shall sound if enabled and the output contactor is open.

4.4.1.7 SPECIAL KEY COMBINATIONS

INPUT/STATUS/HELP: Pressed simultaneously shall cause a software reset of the display CPU.

OUTPUT/DIAG/ALARM: Pressed simultaneously shall clear the RAM.

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4.4.2 MODE SELECT, EMERGENCY OFF, AND ON-RESET SWITCHES

As the name implies, these switches control the operational mode of the Power Source. The operator must be fully familiar with these switches and their function prior to operating the Power Source.

4.4.2.1 MODE SELECT SWITCH

During normal operation of the 3060-UMS, control of the cabinet is through the MODE SELECT switch. The design of the switch is such that only one Mode Position can occur at any time. The three available switch positions are defined as follows:

OFF The cabinet is shut off. No power is supplied to the load. A red LED next to the OFF position is lighted when there is no power applied to the output and diagnostic checks are OK.

STANDBY The cabinet is in the Standby State. The internal high voltage power supplies are energized and the batteries are on line. The inverter is operating. The cabinet is ready to deliver output power but the output contactor is open. A red LED next to the STANDBY position is lighted.

ON The output terminals are energized. The output contactor is closed and supplying power to the load. A red LED next to the ON position is lighted.

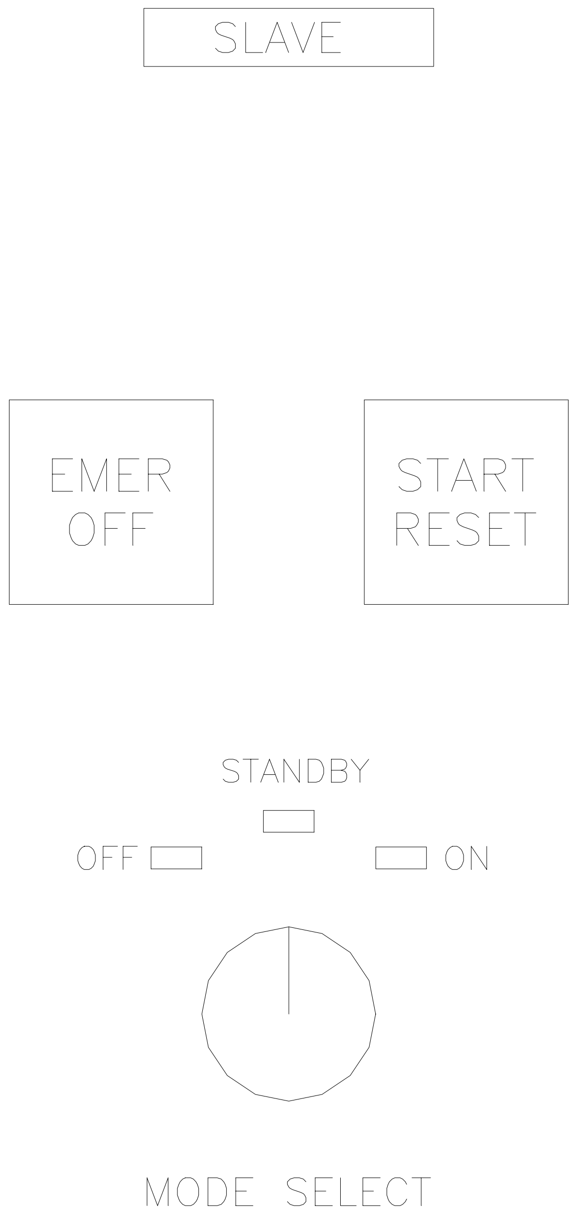

FIGURE 4.4.2 MODE SELECT, EMER OFF, AND START/RESET

4.4.2.2 EMERGENCY OFF AND START/RESET SWITCHES

During normal operation of the Power Source, return to the OFF state is accomplished through the use of the Mode Select Switch. In the event of an emergency, the EMER OFF button may be used to cause an immediate shutdown of the UPS. Pushing the START/RESET switch is required before the cabinet can be brought back on line.

Two off lamps are used to indicate the Off states. The Emergency Off state is indicated by a lamp that illuminates the EMER OFF push button. A lamp next to the OFF text on the Mode Select switch indicates that the cabinet is in the Normal Off State. The Normal Off state lamp is inhibited from being ON when an EMERGENCY OFF condition exists.

When power is first applied during turn-on, the cabinet is automatically set to the Off state. If AUTO-RESTART is enabled the cabinet will attain the mode as selected by the MODE SELECT switch. If the cabinet is in the Emergency Off state the operator must press START/RESET to reset the cabinet and obtain the mode as selected by the MODE SELECT switch.

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4.4.3 FREQUENCY SELECT SWITCH AND VOLTS ADJUST

These switches also control the operation of the Power Source. The operator must be fully familiar with these switches and their function prior to operating the Power Source.

4.4.3.1 FREQUENCY SELECT SWITCH

The primary of the Frequency Select Switch is to control the internal Oscillator. It also is used to determine whether the cabinet is a MASTER or SLAVE.

50, 60 and 400 These are fixed, crystal controlled frequencies for the internal oscillator.

VAR This is a 47 to 500 Hz variable frequency control for the internal oscillator.

EXT This selects an external oscillator input for the Power Source.

SLAVE In this position this cabinet is a SLAVE to another master in a Multiple Cabinet System. One and only one cabinet may be MASTER in a Multiple Cabinet System. The MASTER Frequency shall control the entire Multiple Cabinet System.

4.4.3.1 VOLTAGE ADJUST CONTROLS

The Voltage Adjust Controls control the internal Oscillator output voltage. The center control is for all three output phases. φB and φC are for Phase B and Phase C trim adjustments only. These controls only work if the cabinet is a master and the internal oscillator is selected.

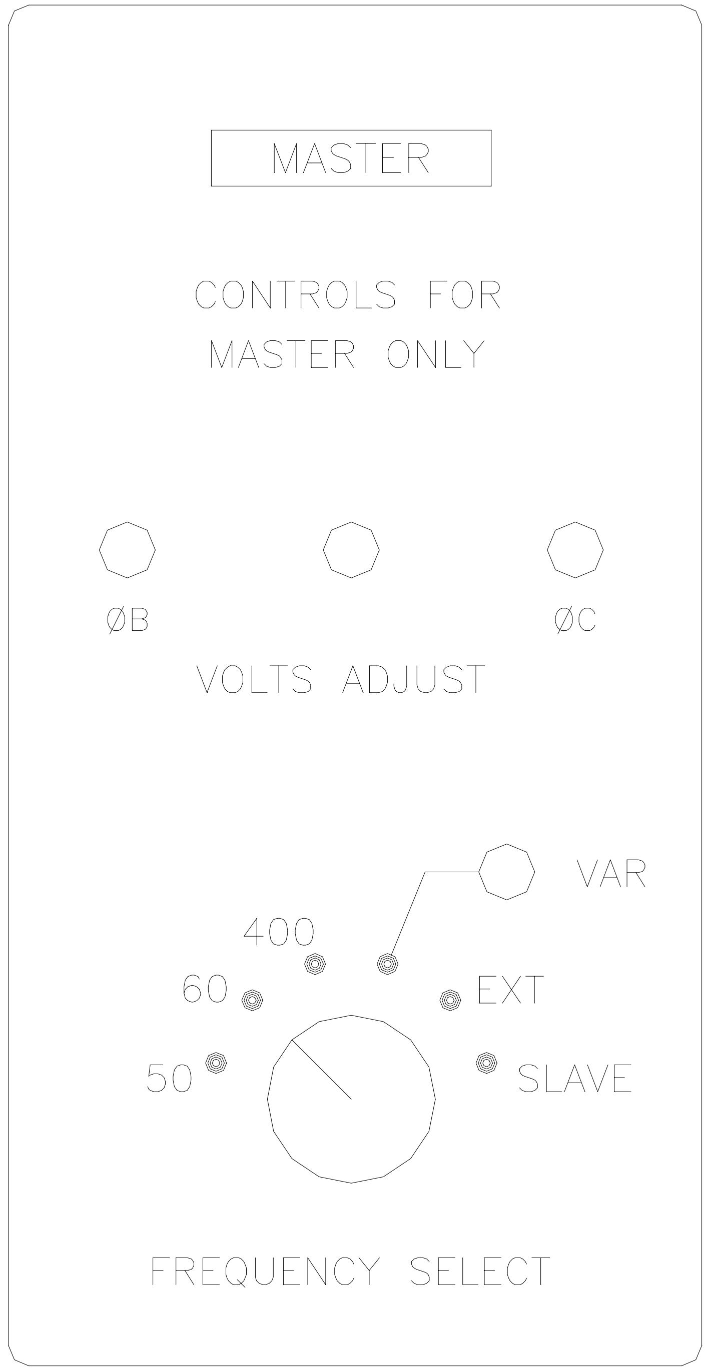

FIGURE 4.4.3 FREQUENCY SELECT AND VOLTS ADJUST

4.5 SETUP SWITCHES

This paragraph describes the PC mounted dip switches contained within the 3060-UMS AC Power Source, their purpose and location.

Every effort has been made to simplify the Power Source design and it's maintenance. To this end, many common components are used throughout the product family. To maintain commonality within the product family, logic switches are used to convey certain operating characteristics to the cabinet. These switches are summarized as follows:

1. Display PCB, Paragraph 4.5.1

   S41 Machine ID and Baud Rate
   S42 For testing and future use.

2. Control PCB, Paragraph 4.5.2

   S14 Auto restart and AGC control.

Refer to Figure 4.5, Cabinet Assembly Drawing, for PC Board location.

\- - - - - - - CAUTION - - - - - - -

\- All Cabinet Switches are FACTORY PRESET. Changing any switch position, without properly identifying its location and purpose, may cause serious equipment damage.

\- - - - - - - CAUTION - - - - - - -

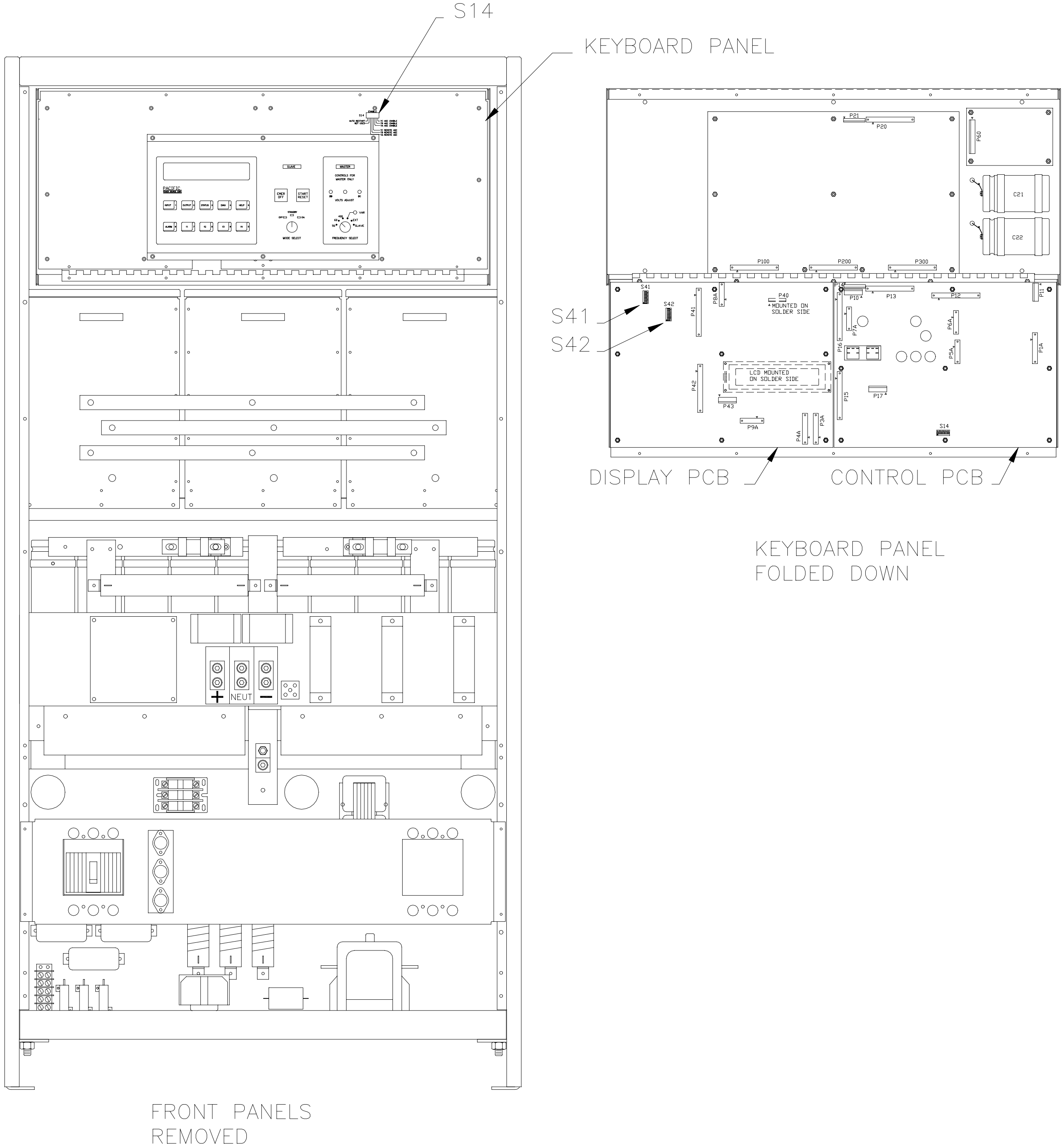

FIGURE 4.5 CABINET ASSEMBLY

4.5.1 DISPLAY PCB

Refer to figure 4.5.1, Display PCB, part number 126572. Two switches are located on this assembly. Switch S42 is for testing and future use. Switch S41 provides the following configuration information to the Power Source:

S41-1	S41-2	Machine Size
OFF	OFF	62.5kVA
OFF	ON	Undefined
ON	OFF	Undefined
ON	ON	Undefined

S41-3	Machine Type
OFF	NON UPS
ON	UPS

S41-4	Undefined

S41-5	S41-6	Serial Port "A" Baud Rate
OFF	OFF	300
OFF	ON	1200
ON	OFF	2400
ON	ON	9600

S41-7	S41-8	Serial Port "B" Baud Rate
OFF	OFF	300
OFF	ON	1200
ON	OFF	2400
ON	ON	9600

Normal Shipping Configuration is as follows:

S41-1OFF	62.5kVA Machine
S41-2OFF	62.5kVA Machine
S41-3ON	UPS
S41-4OFF	Undefined
S41-5OFF	1200 Baud Serial Port A
S41-6ON	1200 Baud Serial Port A
S41-7OFF	1200 Baud Serial Port B
S41-8ON	1200 Baud Serial Port B
S42-ALL	OFF Undefined

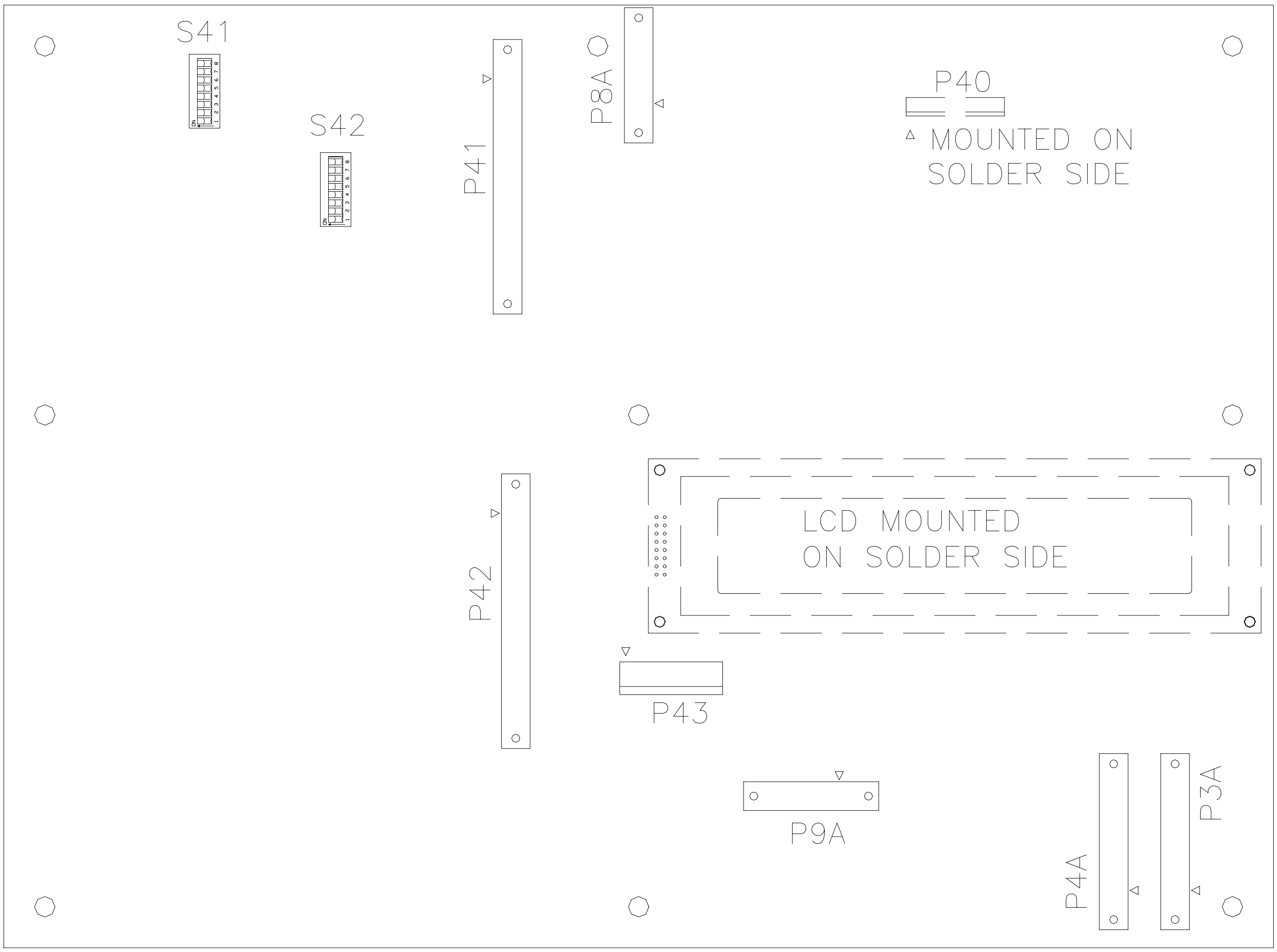

FIGURE 4.5.1 DISPLAY PCB, PART NUMBER 126572

4.5.2 CONTROL PCB

Refer to figure 4.5.2, Control PCB, part number 126572. One switch is located on this assembly. Switch S14 provides for enabling of the auto restart option and local or remote AGC (automatic gain control.)

Switch S14 assignments are as follows:

S14-1	Auto Restart
OFF	OFF
ON	ON

S14-2 Undefined

S14-3	Phase A AGC
OFF	LOCAL
ON	REMOTE

S14-4	Phase B AGC
OFF	LOCAL
ON	REMOTE

S14-5	Phase C AGC
OFF	LOCAL
ON	REMOTE

S14-6	Phase A AGC
OFF	DISABLED
ON	ENABLED

S14-7	Phase B AGC
OFF	DISABLED
ON	ENABLED

S14-8	Phase C AGC
OFF	DISABLED
ON	ENABLED

Normal Shipping Configuration is as follows:

S14-1	OFF	Auto Restart Disabled
S14-2	OFF	Undefined
S14-3	OFF	Phase A Local AGC
S14-4	OFF	Phase B Local AGC
S14-5	OFF	Phase C Local AGC
S14-6	ON	Phase A AGC Enabled
S14-7	ON	Phase B AGC Enabled
S14-8	ON	Phase C AGC Enabled

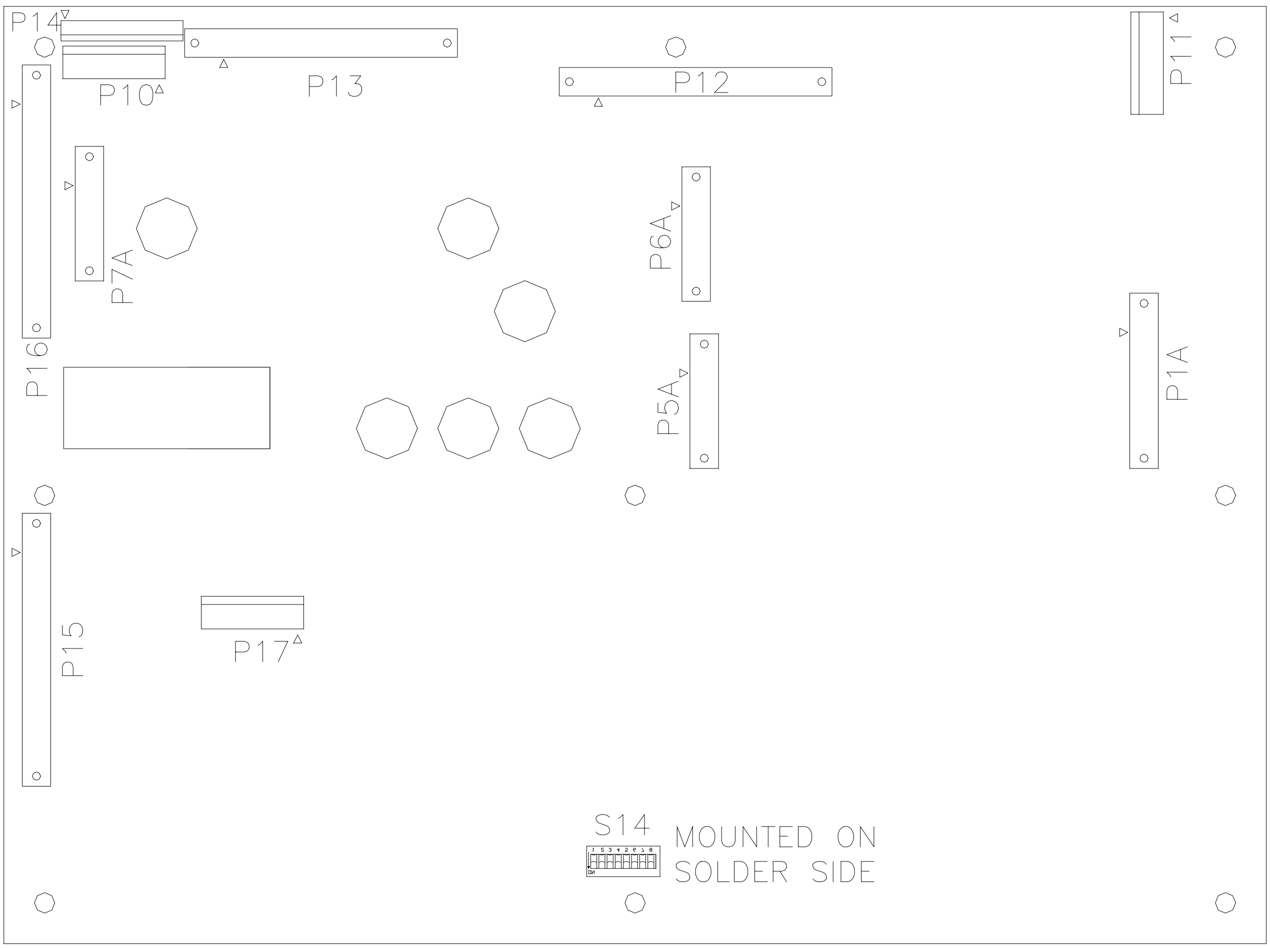

FIGURE 4.5.2 CONTROL PCB, PART NUMBER 126570

4.6 FEATURE CONNECTORS

This paragraph describes the Feature Connectors contained within the 3060-UMS AC Power Source, their purpose, location, and pin numbers. The use of these connectors is optional. Refer to figure 4.6 for location of these connectors.

4.6.1 P1, P2 PARALLELING

These are used for Paralleling cabinets in multiple cabinet systems. They are DB25P type. Pin numbers are as follows:

1	φA Error Signal
2	φB Error Signal
3	φC Error Signal
4	Common Error Signal
5	Triangle Wave Sync
6	Master on line
7	Remote mode 0
8	Remote mode 2
9	Remote Emer Off
10	Remote Start
11	φA System Amps
12	φB System Amps
13	φC System Amps
14-17	Gnd
18	+12VDC
19	Ext Emer Off
20-22	No Connection
23-25	Gnd

Pins 18 and 19 may be wired to an External Emergency Off switch. This switch must have normally open isolated contacts. Closure of these contacts will cause an emergency off.

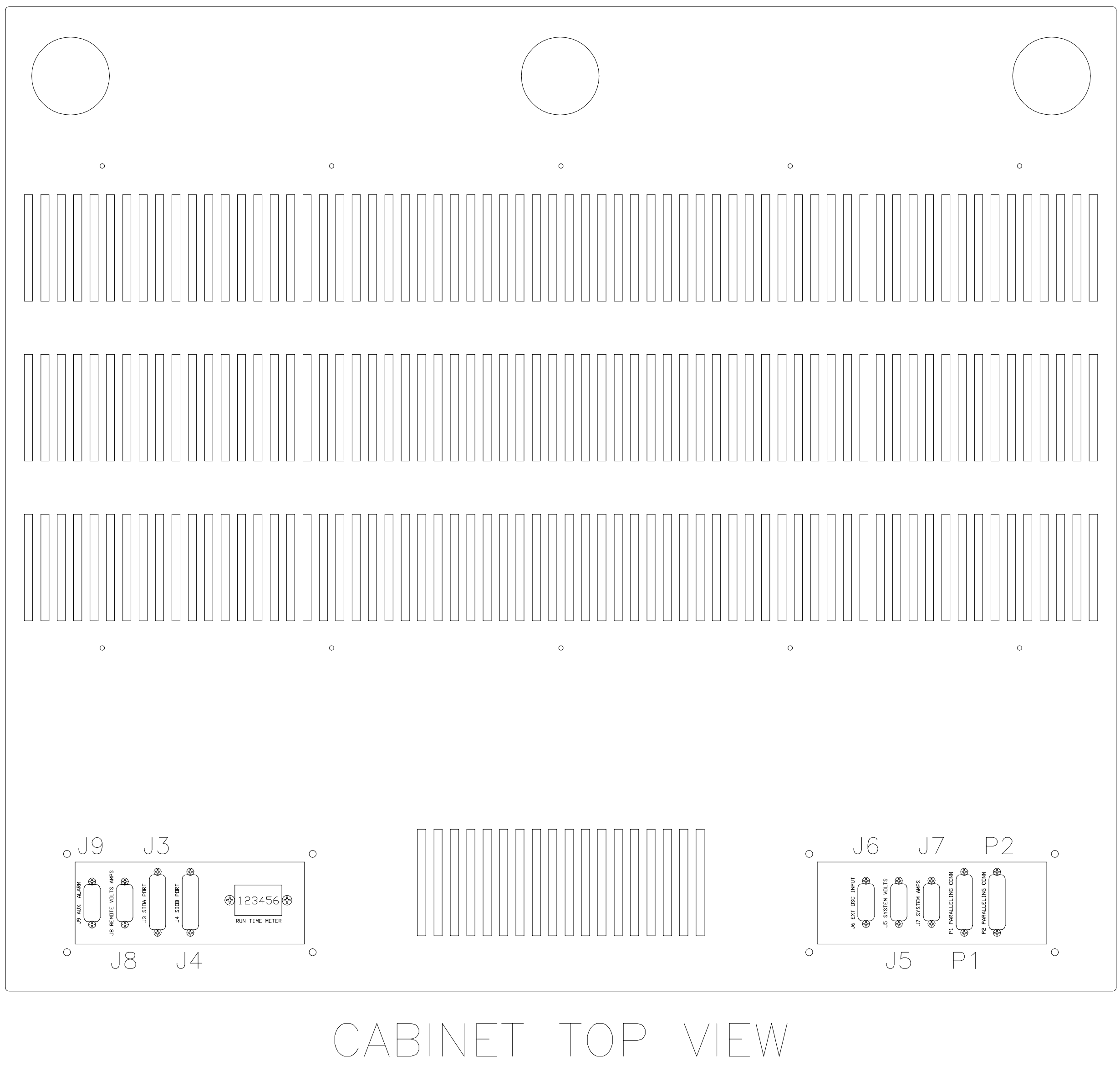

FIGURE 4.6 FEATURE CONNECTOR DETAIL

4.6.2 J3 AND J4 SERIAL I/O

This paragraph describes the Serial Ports available on the 3060-UMS Power Source.

The 3060-UMS Power Source is provided with Dual Serial Communication Ports designated COM A and COM B. These output are RS-232-C Ports with bi-directional logic. Power Source status is stored in an internal register and transmitted through these ports when interrogated.

PHYSICAL CONFIGURATION

Refer to Figure 4.6. J3, or COM A, is a female, DB-25 socket. This socket is a Data Communications Equipment (DCE) Port configured to be interfaced with a Data Terminal Equipment (DTE) device such as a "dumb" terminal, or PC set up as a DTE.

J4, or COM B, is a DTE port configured to be interfaced with a DCE device such as a modem. A female, DB-25 socket is also provided for this port.

BAUD RATE

The Baud Rates for data transmission are 300, 1200, 2400 or 9600 as selected by switch S41 on the Display PCB Assembly. (Refer to Figure 4.5.1.)

COMMUNICATION DATA FORMAT

Data is transferred as an 8 bit word with 1 Start, 1 Stop, and no Parity bit.

4.6.2 J3 AND J4 SERIAL I/O (cont)

DATA TRANSMISSION

Serial Port design is such that no "Handshaking" is required in hardware or software. Due to this fact, data transmitted to the 3060-UMS must be limited to 5 characters per second. Data bursts are sent from the 3060-UMS in approximately 200ms increments.

Refer to Table 4.6.2. Hardware handshaking signals, (i.e. TXDA, CTSA, DCDA, etc) are provided for operator convenience. The 3060-UMS requires only 3 lines: Receive, Transmit and Ground.

PORT	PIN	MNEMONIC	DESCRIPTION
COM A	2	RXDA	RECEIVE DATA PORT A
	3	TXDA	TRANSMIT DATA PORT A
	4	CTSA	CLEAR TO SEND PORT A
	20	DCDA	DATA CARRIER DETECT PORT A
	8	DSRA	DATA SET READY PORT A
	5	RTSA	REQUEST TO SEND PORT A
	7	GRD	GROUND PORT A
COM B	4	RTSB	REQUEST TO SEND PORT B
	20	DTRB	DATA TERMINAL READY PORT B
	2	TXDB	TRANSMIT DATA PORT B
	3	RXDB	RECEIVE DATA PORT B
	8	DCDB	DATA CARRIER DETECT PORT B
	5	CTSB	CLEAR TO SEND PORT B
	7	GRD	GROUND

TABLE 4.6.2 SERIAL I/O CONNECTIONS

4.6.2 J3 AND J4 SERIAL I/O (cont)

With the serial port, it is possible to obtain all Front Panel Display information described in section 4.4.1.

This paragraph provides the syntax and a brief description of all 3060-UMS recognized commands. Section 4.4.1 should be reviewed for detailed descriptions of returned messages.

Command	Command Type	Information Type
I1 <RET>	Input Screen #1	VLN, VLL, Amps, kW, kVA, Frequency, Input NORMAL OR ABNORMAL.
I2 <RET>	Input Screen #2	LVPS, Bus/BATT voltages, Battery amps and kW.
O1 <RET>	Output Screen #1	CABINET VLN, VLL, Amps, kW, kVA, Frequency, Efficiency.
O2 <RET>	Output Screen #2	CABINET VLN, VLL, %Peak Current, %kVA, %kW, Frequency.
O3 <RET>	Output Screen #3	SYSTEM VLN, VLL, Amps, kW, kVA, Frequency.
O4 <RET>	Output Screen #3	REMOTE VLN, VLL, Amps, kW, kVA, Frequency.
S <RET>	Status Screen	Varies

4.6.2 J3 AND J4 SERIAL I/O (cont)

Command	Command Type	Information Type
D1 <RET>	Diag. Screen #1	Cause of Emergency Off.
D2 <RET>	Diag. Screen #2	Temperature Data
D3 <RET>	Diag. Screen #3	DIAGNOSTIC BATTERY TEST, display D3 prompts you for display D5. % starts the battery test from display D5. <Same as pressing f2 and f4 keys> X cancels the battery test. <Same as pressing DIAG key>
D4 <RET>	Diag. Screen #4	Binary Ports 2-5
H <RET>	Help Screen	Varies
ST <RET>	Reset Display CPU	<Same as pressing Input Status and Help keys>
Q <RET>	Alarm Silence	<Same as Alarm Key>
R <RET>	Continuously Repeat Last Command. Use <SPACE BAR> <RET> to stop.	

4.6.3 J6 EXTERNAL OSCILLATOR

This is an External Oscillator Input. This connector is a DA15S type. If the Frequency Select Switch is rotated to the EXT position and the cabinet is ON, inputs applied to J6 are amplified 25 times at the output terminals.

Example: 4.80 VAC, 60 Hz input at J6 equals
120 VAC, 60 Hz at the output contactor.

Pin Numbers are as follows:

7	Ext Phase A Oscillator Input
15	Ext Phase B Oscillator Input
8	Ext Phase C Oscillator Input
10	Gnd

4.6.4 J5 AND J7 SYSTEM METERING OUTPUTS

J5 is a System Volts output signal connector. System Volts are divided down by 25 to 1 and sent to this connector. This connector is a DA15S type.

Example: 120 VAC, 60 Hz at the output contactor equals
4.80 VAC, 60 Hz at J5.

Pin Numbers are as follows:

1	Phase A System Volts Output
11	Phase B System Volts Output
8	Phase C System Volts Output
2,7,12	Gnd

J7 is a System Amps output signal connector. System Amps are divided down by 400 to 1 and sent to this connector. This connector is a DA15S type.

Example: 400 AAC, 60 Hz total system output equals
1.00 VAC, 60 Hz at J7.

Pin Numbers are as follows:

2	Phase A System Amps Output
7	Phase B System Amps Output
11	Phase C System Amps Output
1,8,12	Gnd

4.6.5 J8 REMOTE METERING INPUTS

J8 is a Remote Metering Input signal connector. Remote Volts are divided down by 100 to 1 and sent to this connector. Remote Amps are divided down by 400 to 1 and sent to this connector. This connector is a DA15S type.

Example: 120 VAC, 60 Hz at the remote location equals 1.20 VAC, 60 Hz at J8.

Example: 400 AAC, 60 Hz at the remote location equals 1.00 VAC, 60 Hz at J8.

Pin Numbers are as follows:

1	Phase A Remote Volts Input
2	Phase B Remote Volts Input
3	Phase C Remote Volts Input
4	Phase A Remote Amps Input
5	Phase B Remote Amps Input
6	Phase C Remote Amps Input
7	Neut Remote Amps Input
8	Gnd

4.6.6 J9 AUXILIARY ALARM AND RSP IV OUTPUTS

This connector alerts the user to conditions that cause alarm status in the cabinet and/or drives the Remote Status Panel (RSP IV.) Some of these are digital 0 to +5 VDC outputs designed to operate small relays which the user may utilize to operate remote lights and buzzers. The signals which drive the RSP IV are open collector outputs tied to -12 VDC. The RSP IV operates off of +12 VDC and -12 VDC. This connector is a DA15S type.

Pin Number	Description	True	False
1	Overload	+5	0
2	Over or Under Voltage or Frequency	+5	0
3	Audible Alarm at Cabinet	+5	0
4	Diagnostic Battery Test	0	+5
5	Input AC Normal	-12	--
6	Output AC Normal	-12	--
7	-12 VDC		
8	Gnd		
9	Overtemp	+5	0
10	Spare	+5	0
11	Battery Operation	-12	--
12	Battery Low Charge	-12	--
13	No connection		
14	No connection		
15	+12 VDC		

Refer to section 4.4.1.6 for information on setting ALARM parameter limits. Disabling ALARM at the cabinet will be reflected here as no output on pin 3 during an ALARM condition.

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SECTION 5

MAINTENANCE

5 MAINTENANCE

The 3060-UMS has been designed so that maintenance is kept to an absolute minimum. This section describes the maintenance requirements of this equipment. Paragraph 5.1 describes the maintenance required by the Power Source. Paragraph 5.1 describes the maintenance required by the batteries.

5.1 POWER SOURCE MAINTENANCE SCHEDULE

Routine maintenance of the Power Source consists of the steps below. Pacific recommends the use of a maintenance checklist of the form shown in Table 5.1. This helps to guarantee regular performance of maintenance. Additionally, equipment history is created. This is sometimes helpful when servicing the equipment, particularly when attempting to solve an application type problem. The following procedure is recommended to be performed at 3 month intervals.

MAINTENANCE PROCEDURE (Refer to Table 5.1)

STEP 1:
Record cabinet input data by pressing the INPUT then f1 and f2 keys on the front panel display.

STEP 2:
Record cabinet output data by pressing the OUTPUT then f1 and f2 keys on the front panel display.

STEP 3:
Record the current Status message by pressing the STATUS key on the front panel display.

STEP 4:
Record Diagnostic messages by pressing the DIAGNOSTIC then f2 and f4 keys on the front panel display.

STEP 5:
Inspect the cabinet carefully. Listen for noisy fan bearings, etc. Clean the Inverter Air Filters and the outside of the machine. Make comments as appropriate.

STEP 5:
Go to section 5.2 Battery Maintenance and testing.

TABLE 5.1 3060-UMS MAINTENANCE LOG

EQUIPMENT MODEL NO. ____________________

EQUIPMENT SERIAL NO. ____________________

DATE: ____/____/____

TECHNICIAN: ____________________________

INPUT DATA

I1: INPUT	V	____/____	____/____	____/____
___NORMAL	A	_________	_________	_________
	kW	_________	_________	_________
FREQ=_________	kVA	_________	_________	_________

I2: INPUT	Bus/BATT	BATT
LVPS	+_____VDC	______ADC
+_____VDC	+_____VDC	______ADC
-_____VDC		_______kW

TABLE 5.1 3060-UMS MAINTENANCE LOG (cont)

OUTPUT DATA

O1: CABINET	V	____/____	____/____	____/____
OUTPUT	A	__________	__________	__________
EFF=____%	kW	__________	__________	__________
FREQ=______	kVA	__________	__________	__________
O2: CABINET	V	____/____	____/____	____/____
OUTPUT	%I-PEAK	________	________	________
	%kVA	________	________	________
FREQ=_____%	kW	________	________	________
O3: SYSTEM	V	____/____	____/____	____/____
SUMMARY	A	__________	__________	__________
OUTPUT	kW	__________	__________	__________
FREQ=______	kVA	__________	__________	__________
O4: REMOTE	V	____/____	____/____	____/____
OUTPUT	A	__________	__________	__________
	kW	__________	__________	__________
FREQ=______	kVA	__________	__________	__________

TABLE 5.1 3060-UMS MAINTENANCE LOG (cont)

STATUS INFORMATION

S__: CAB ____

____

____

____

DIAGNOSTIC INFORMATION

D2: DIAGNOSTIC TEMPERATURE DATA

XFMR: _____ DEG C

INV: _____

D4:	Port # 2	Port # 3	Port # 4	Port # 5
PWR	________	________	________	________
EMER	________	________	________	________
NOW	________	________	________	________

COMMENTS/APPEARANCE

____

____

____

____

5.2 BATTERY MAINTENANCE AND TESTING

The UPS battery maintenance requirements are as stated below. The procedure should be performed at 3 month intervals. This test works best at high loads and becomes more inaccurate at light loads. The primary reason for this test is to monitor the batteries and to be able to detect and replace a weak battery. This will help to avoid UPS failure due to a completely failed battery.

In the case of the UPS, the maintenance log is extremely valuable since it provides data relative to battery life. This enables the user to detect batteries which require replacement as early as possible.

The procedure is as follows:

STEP 1:
If scheduled, perform routine maintenance as outlined in paragraph 5.1.

STEP 2:
Verify that the batteries are fully charged before performing a test. Press the INPUT then f2 keys on the front panel display. Both BATT amps must be 2 ADC or less but not negative.

STEP 3:
Record the last battery test information by pressing the DIAG then f3 keys on the front panel display.

STEP 4:
Press f3 key again then (f2 and f4 keys together within 5 seconds) to perform a new battery test. The battery test is now in progress. The system will count down from 60 seconds while displaying the positive and negative battery current and voltages. This test exercises the batteries without the danger of the UPS going down even if a bad battery or connection exists.

STEP 5:
At the end of the test display D3 will be active, record this data as new battery test data. The relative percentage of battery time available as well as the status OK or NOT OK is presented. Comparing the BATT % data prior to and immediately following the Battery Test will allow for identification of any failure trend caused by a weak battery.

5.2 BATTERY MAINTENANCE AND TESTING (cont)

STEP 6:
If both battery strings indicate OK, this concludes battery maintenance and testing. If either battery string indicates NOT OK, further testing is needed, continue to step 7.

STEP 7:
Consider replacing all of the batteries if any or all of the following are true:

1) Batteries have been in service for several years.

2) Ambient temperature is greater than 30◦C.

3) Several hundred discharge cycles have occurred.

The conditions contribute to battery death.

STEP 8:
If none of the conditions in step 6 are true, check for a single bad battery. While the batteries are **recharging** after a battery test, measure the voltage across each battery of the NOT OK battery string. Mark any batteries which are 1 volt or greater than the average battery voltage.

*** * * * * * * WARNING * * * * * * ***

* BATTERIES ARE AT LETHAL POTENTIALS.

* WEAR SAFETY GLASSES WHEN TESTING BATTERIES.

* BATTERIES ARE CAPABLE OF DELIVERING EXTREMELY HIGH CURRENTS IF SHORTED.

* BATTERIES MAY EXPLODE IF SHORTED.

* USE EXTREME CARE TO PREVENT ACCIDENTAL SHORTING OF TOOLS ACROSS BATTERIES.

* REMOVE ALL WATCHES, RINGS, AND OTHER JEWELRY BEFORE SERVICING THE BATTERIES.

*** * * * * * * WARNING * * * * * * ***

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5.2 BATTERY MAINTENANCE AND TESTING (cont)

STEP 9:
This step should be done quickly. Perform another battery test, steps 3 and 4 above. During the battery test measure the voltage across each battery and mark any batteries which are 1 volt or less than the average battery voltage. If additional time is needed perform another battery test.

STEP 10:
Any battery which was greater than 1 volt, of the average battery voltage, during charging and less than 1 volt, of the average battery voltage, during discharge has high internal impedance and should replaced. Any battery which was less than 2 volts, of the average battery voltage, during discharge may have a shorted cell and should be replaced.

STEP 11:
To replace batteries turn the UPS off and refer to section 3.7 Battery Installation.

TABLE 5.2 BATTERY MAINTENANCE LOG

DATE: ____/____/____

TECHNICIAN: ____________________________

BATTERY STATUS

I2: INPUT	Bus/BATT	BATT
LVPS	+_____VDC	______ADC
+_____VDC	+_____VDC	______ADC
-_____VDC		_______kW

LAST BATTERY TEST

D3: DIAGNOSTIC	+BATT ________	%+_______V	
LAST BATTERY	_____ OK		________A
TEST. PRESS f3	-BATT ________	% -_______V	
FOR NEW TEST.	_____ OK		________A

NEW BATTERY TEST

D3: DIAGNOSTIC	+BATT ________	%+_______V	
LAST BATTERY	_____ OK		________A
TEST. PRESS f3	-BATT ________	% -_______V	
FOR NEW TEST.	_____ OK		________A

COMMENTS

____

____

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SECTION 6

SERVICE

6 SERVICE

The 3060-UMS has been designed using a subassembly concept. This design feature allows for service via the assembly exchange approach. The service procedures described in this section will isolate a problem to the replaceable assembly or component level as appropriate. Printed circuit board assemblies are considered to be replacement items. Mainframe components such as contactors, diode bridges, filter capacitors, etc. are considered replaceable components.

This section is organized as follows:

Para. 6.1 Provides a brief description of each assembly.

Para. 6.2 Provides the theory of operation required to troubleshoot the system.

Para. 6.3 Provides step-by-step troubleshooting procedures.

Para. 6.4 Provides procedures for replacing defective assemblies.

Para. 6.5 Provides procedures for replacing defective components.

Para. 6.6 Provides instructions for returning assemblies for repair.

Para. 6.7 This section contains D-Size drawing of an overall system block diagram and schematic diagrams for the Mainframe, and Inverter assemblies.

6.1 DESCRIPTION

6.1.1 MAINFRAME DESCRIPTION

This paragraph describes the various assemblies and components of the Mainframe. Each assembly's and component's function is described below. The numbers listed are to be used when ordering spare assemblies and components. Refer to Figure 6.1.1 for the location of the assemblies and components listed below.

1. MAINFRAME ASSEMBLY (P/N 126500)
   The top assembly. The mainframe assembly contains the main cabinet sheet metal, input transformer and input and output power contactors.

2. REGULATOR PCB ASSEMBLY (P/N 126670)
   There are 2 Regulator PCB Assemblies. One for the positive power supply and one for the negative power supply. This PCB drives 6 SCRs to generate regulated voltage for the inverter assemblies and charging the batteries.

3. DISCHARGE PCB ASSEMBLY (P/N 126075)
   This PCB assembly contains a transistor switch which is used to switch a load into the high voltage DC supply. This switch is active during shutdown sequences so that the DC voltages are brought to safe levels. This board also contains signal conditioning circuits that scale down high voltages to low voltages which are required for the control and display PCB's.

4. UTILITY INVERTER ASSEMBLY (P/N 126700)
   This inverter uses the ±200 VDC to generate AC voltage which drives the fans, contactors and LVPS when on battery power.

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6.1.1 MAINFRAME DESCRIPTION (cont)

5. MAINFRAME COMPONENTS
   BR1-6, SCR Bridges (P/N 742008)
   C10-15, Filter Caps (P/N 720096-10)
   C30-39, Power Supply Caps (P/N 720219-12)
   CB1, Input Circuit Breaker
      100A for 480 VAC Input (P/N 716049)
      125A for 380 VAC Input (P/N 716056)
      200A for 240 VAC Input (P/N 716057)
      225A for 208 VAC Input (P/N 716032)
   CB2, Output Circuit Breaker Optional (P/N 716048)
   CT1-2, Battery Current sensors (P/N 703120)
   CT11-13, Input CT's (P/N 731029)
   F1-3, Input Fuses
      1A for 480 VAC Input (P/N 712043)
      1½A for 380 VAC Input (P/N 712045)
      2A for 240 or 208 VAC Input (P/N 712044)
   F4-6, Utility Inverter Fuses (P/N 712025)
   F10 and F11, DC fuses (P/N 712042)
   L1-6, SCR Filter Inductors (P/N 530025)
   R1-3, Slow turn on resistors (P/N 769990-037)
   R4 and R5, Discharge Resistors (P/N 769990-056)
   S3, Main Input Contactor (P/N 717036)
   S5, Output Contactor (P/N 717029)
   S7, Slow turn on Input Contactor (P/N 717005)
   T2, 3φ LVPS Transformer (P/N 531247)

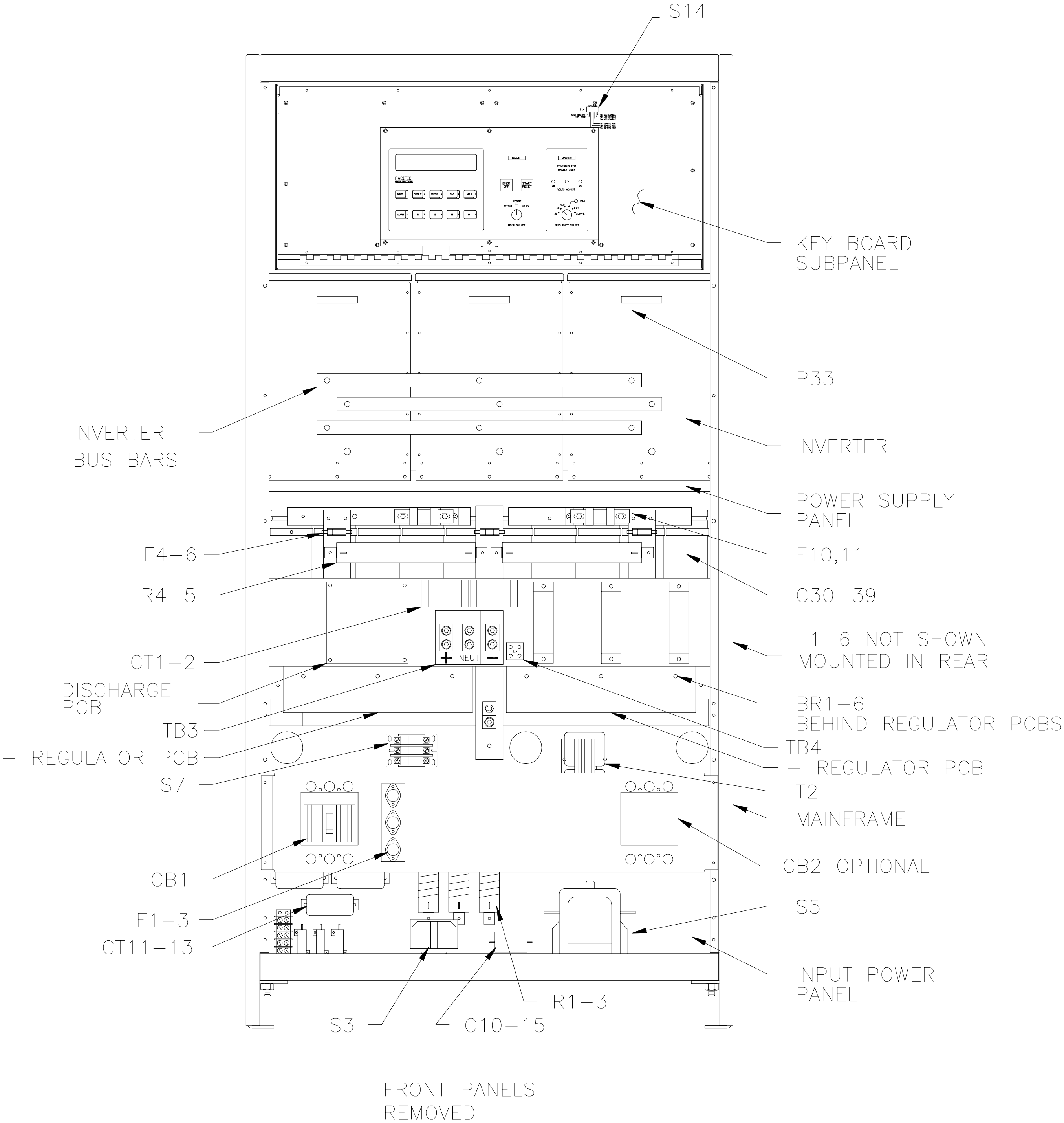

FIGURE 6.1.1 MAINFRAME

6.1.2 CONTROL MODULE DESCRIPTION

This paragraph describes the various assemblies and components of the Control Module. Each assembly's and component's function is described below. The numbers listed are to be used when ordering spare assemblies and components. Refer to Figure 6.1.2 for the location of the assemblies and components listed below.

1. CONTROL PCB ASSEMBLY (P/N 126570)
   A PCB assembly which contains logic, comparator and oscillator circuits. This board determines the state of the system and controls the system. This assembly also contains the local oscillator which develops the output waveform. This is a crystal referenced oscillator. The output is a digitally synthesized sinewave.

2. MODULATOR PCB ASSEMBLY (P/N 126071)
   This PCB assembly receives the output of the oscillator and produces the signals required to drive the inverter assemblies.

3. DISPLAY PCB ASSEMBLY (P/N 126572)
   This PCB assembly is mounted to the front panel and contains a CPU which drives an LCD for metering, status, diagnostics, alarms and the RSP IV. Two RS232 serial ports are also available for a remote terminal or modem.

4. LVPS PCB ASSEMBLY (P/N 126074)
   This is a PCB assembly which is used to develop a regulated ± 18 VDC. This DC voltage is distributed throughout the mainframe and is used to create low voltage DC on each PCB.

4. COMPONENTS
   C21 and C22, LVPS caps (P/N 720449-95)
   S12 and S13, Push button switches (P/N 710023)
   EMER OFF lamp (P/N 701024)
   B1, fan (P/N 703104)
   T3, 1φ LVPS Transformer (P/N 731043)

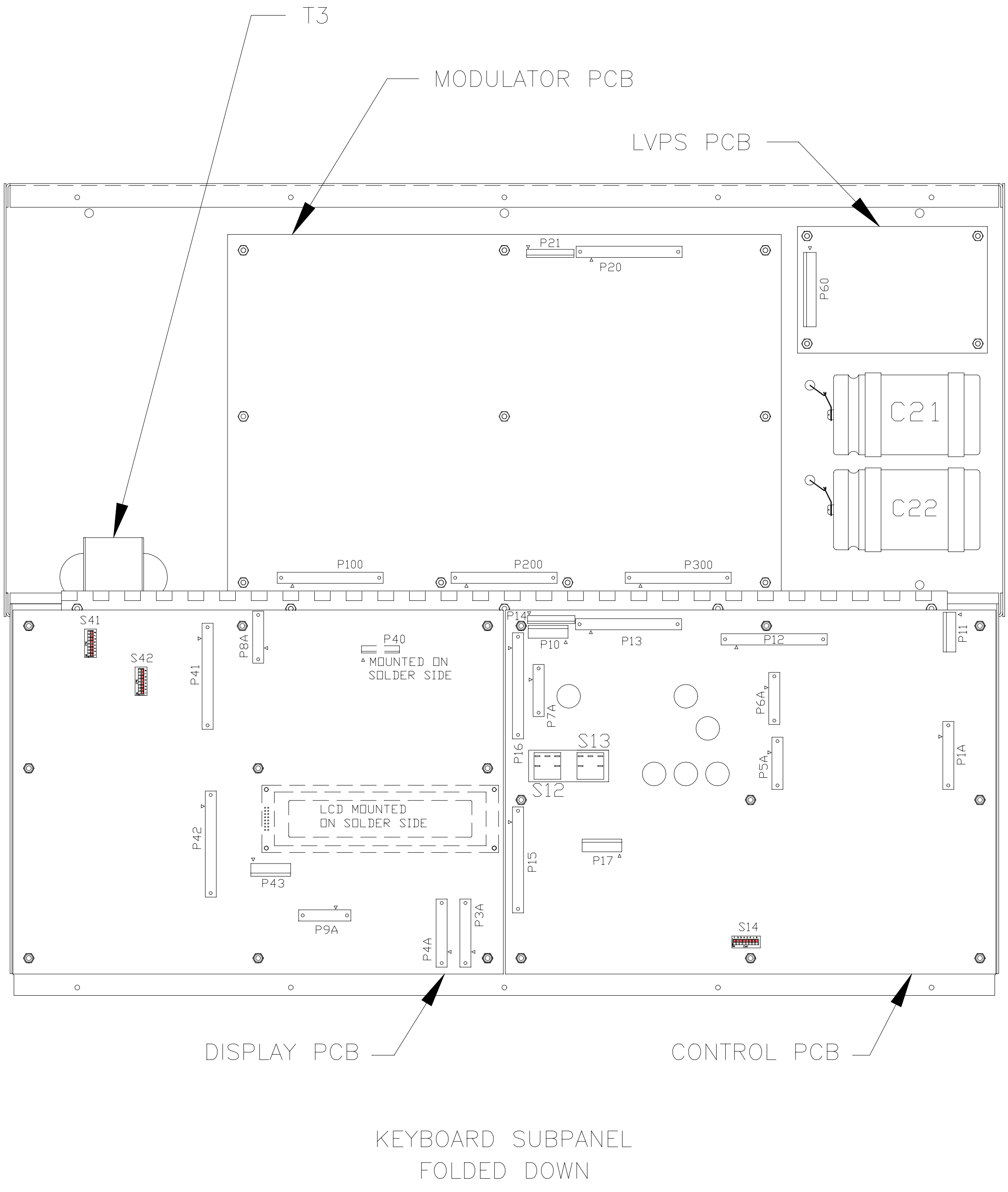

FIGURE 6.1.2 CONTROL MODULE

6.1.3 INVERTER DESCRIPTION

This paragraph describes the various assemblies and components of the Inverter assembly. Each assembly's and component's function is described below. The numbers listed are to be used when ordering spare assemblies and components. Refer to Figure 6.1.3 for the location of the assemblies and components listed below.

1. INVERTER ASSEMBLY (P/N 126200)
   A 21kVA inverter assembly which contains the power circuits that convert DC to AC and drives the output. The inverter assembly is housed in a metal case. This inverter assembly has been designed to reduce RFI/EMI.

2. DRIVER PCB ASSEMBLY (P/N 126270)
   This PCB assembly receives control signals from the modulator, provides isolation and then drives the power transistors. This PCB is a subassembly of the inverter assembly.

3. SNUBBER PCB ASSEMBLY (P/N 126272)
   This PCB assembly is used to snub voltage spikes on the power transistors. This PCB is a subassembly of the inverter assembly.

4. COMPONENTS
   C11-13, Feed through cap (P/N 720545-30)
   C1-8, Filter cap (P/N 720096-10)
   CT1, Current sensor (P/N 703130)
   B1 and B2, Fan (P/N 703106)
   R1-8, Snubber resistor (P/N 760180-10)
   TAS1-4, Temp sensor (P/N 710039)
   L1-12, Filter inductor (P/N 530014)

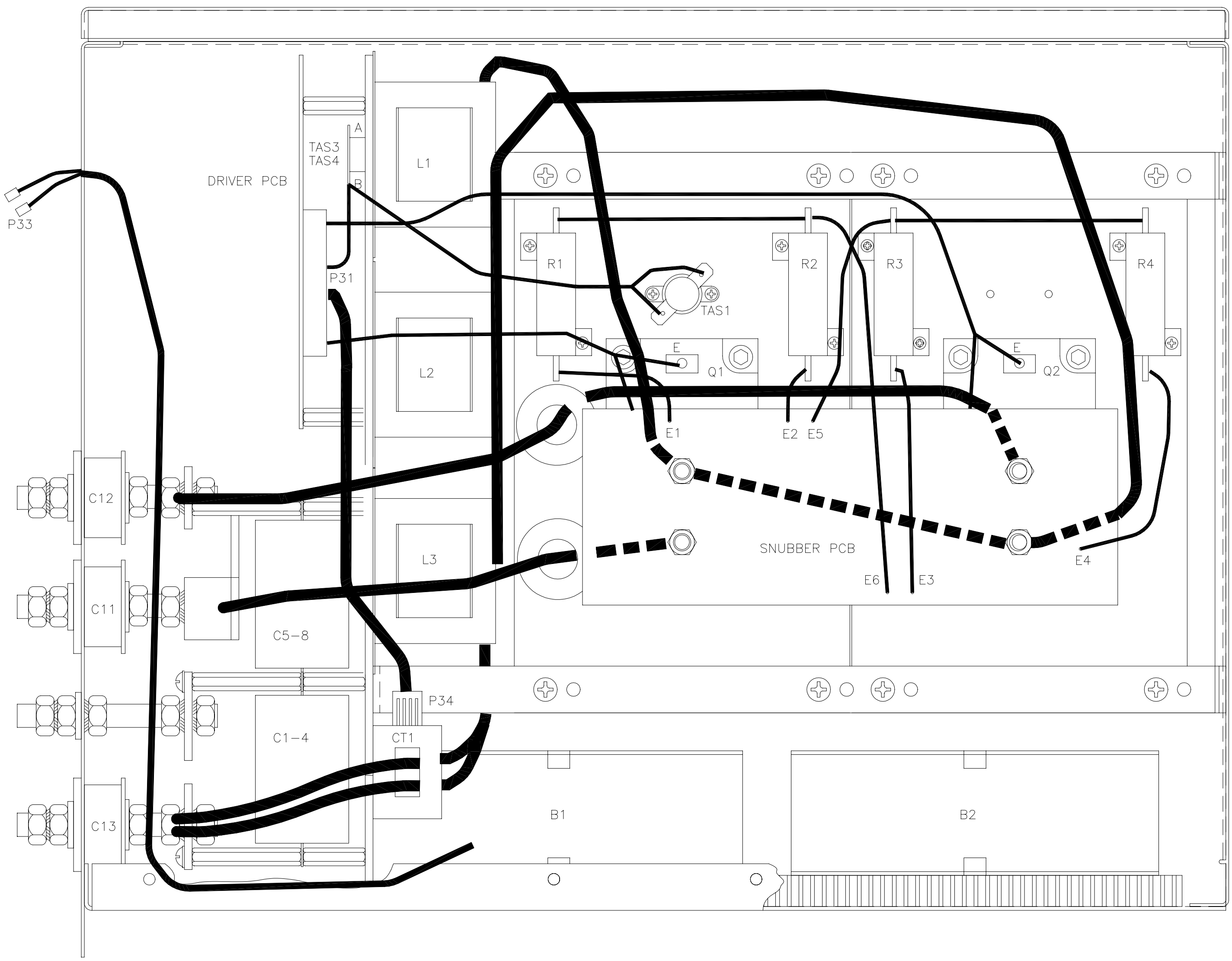

FIGURE 6.1.3 INVERTER

6.2 THEORY OF OPERATION

This paragraph describes the basic theory of operation for the 3060-UMS Uninterruptible AC Power Source. The information which follows is provided as technical reference to aid troubleshooting of the equipment.

The system consists of five basic subsystems which are as follows:

1. Control Term Definitions.
   (Ref. Para. 6.2.1)

1. Power Conversion Circuits.
   (Ref. Para. 6.2.2)

2. System Control Circuits.
   (Ref. Para. 6.2.3)

3. DC Power Supply Circuits.
   (Ref. Para. 6.2.4)

4. Metering and Display Circuits.
   (Ref. Para. 6.2.5)

5. Paralleling Circuits.
   (Ref. Para. 6.2.6)

Each of the circuits is discussed in detail in each of the above referenced paragraphs.

When the DIAG then f4 keys are pressed the digital inputs to the Display PCB are displayed. Reference section 4.4.1.4. This display may be used to determine the state of control terms in the system.

6.2.1 CONTROL TERM DEFINITIONS

3 PHASE PRESENT	True when all three input phases are present.
AGC	Automatic Gain Control, provides better steady state regulation of the output voltage.
AUTO RESTART PULSE	Same as POWER ON RESET if selected.
$\overline{\text{BLC}}$	Battery Low Charge.
$\overline{\text{BOP}}$	Battery Operation.
C0	Control mode 0.
C2	Control mode 2.
DISCHARGE	True if S3 CLOSE COMM and S7 CLOSE COMM is false.
EMER OFF SW	True when switch is pressed. Momentary contact panel switch with integral lamp.
EMER OFF LAMP	Is lit whenever Q6 is true.
ERROR IN	Error signal to the modulator.
ERROR OUT	Error signal from the modulator.
ERROR	System Error signal from the master modulator.
EXT EMER OFF	External Emergency Off input. External contacts have shorted connector P1-18 to P1-19 together and has caused an emergency off.

6.2.1 CONTROL TERM DEFINITIONS (cont)

$\overline{\text{IAC}}$	Input AC Normal.
INPUT VOLTS	Line to neutral input voltage.
INPUT LINE FAULT	True when Input voltage is less than 80 % of nominal or greater than 120 % of nominal or 3 PHASE PRESENT is false.
INPUT AMPS	Input amps from current transformers.
INV OVERTEMP	One of the inverters has overheated.
INV HOLD COMM	Inverter Hold Command.
INV FAULT	Is true when INVERTER HOLD COMM and MXEN is true and INV TST OK is false. Possible shorted transistor.
INV TST OK	Inverter test OK indicates that the Inverters, 2 per phase, are switching at approximately 30 khz and no fuses are blown. Does not test the quality of the sinewave being produced and does not care if inverter is in current limit.
INV VOLTS	Inverter output voltage. Inverter side of the output contactor.
INV AMPS	Inverter output amps.
INV O/L	Inverter is in current limit.
LM	Local Master, the FREQUENCY SELECT switch is not in the SLAVE position.
LS	Local Slave, the FREQUENCY SELECT switch is in the SLAVE position.
LVPS FAULT	Checks ± 12 VDC on PCB's.

6.2.1 CONTROL TERM DEFINITIONS (cont)

MASTER LAMP	Is lit whenever the FREQUENCY SELECT switch is not in the SLAVE position.
MASTER EMER OFF	The master cabinet is in an EMER OFF state.
ML	Master on line, at least one Cabinet is a Master.
MOD ENABLE	Modulator enable.
$\overline{\text{OAC}}$	Output AC Normal.
OFF LAMP	Is lit if Q6, S3 CLOSE COMM and S7 CLOSE COMM is false.
ON LAMP	Is lit if S5 CLOSE COMM is true.
OSC IN	Oscillator signal.
OVER FREQUENCY	OF Condition exists if output frequency is greater than preset limit. Limit is set by the ALARM KEY.
OVER VOLTAGE	OV Condition exists if output voltage is greater than preset limit. Limit is set by the ALARM KEY.
OVERTEMP	Either INV OVERTEMP or XFMR OVERTEMP is true.
POLARITY	Polarity of the signal is being metered.
POWER ON RESET	Pulse, after 3 PHASE PRESENT is true.
Q6	Local EMER OFF state.

6.2.1 CONTROL TERM DEFINITIONS (cont)

R0	Remote mode 0.
R2	Remote mode 2.
REMOTE VOLTS	Remote line to neutral voltage.
REMOTE SENSE	Voltage and current metering from a remote location. AGC may be selected to regulate to this point.
REMOTE START	True if the master is starting.
REMOTE AMPS	Remote amps from remote current transformers.
S3 CLOSE COMM S4 CLOSE COMM S5 CLOSE COMM S7 CLOSE COMM	Drive signal which causes the relay to close.
SLAVE LAMP	Is lit whenever the FREQUENCY SELECT switch is in the SLAVE position.
STANDBY LAMP	Is lit if S3 CLOSE COMM or S7 CLOSE COMM is true and S5 CLOSE COMM is false.
START/RESET SW	True when switch is pressed. Momentary contact.
SUSTAINED O/L	Inverter is in current limit for more than 50% duty cycle for longer than 20 seconds.
SYSTEM AMPS	Total system output amps from all of the inverters in a paralleled system.
SYSTEM VOLTS	System output volts on the output side of the output contactor.
TRI SYNC	Triangle Wave synchronization signal.

6.2.1 CONTROL TERM DEFINITIONS (cont)

UNDER FREQUENCY UF	Condition exists if output frequency is less than preset limit. Limit is set by the ALARM KEY.
UNDER VOLTAGE	UV Condition exists if output voltage is less than preset limit. Limit is set by the ALARM KEY.
VDC > 160	Term goes true when <u>both</u> BUSES are greater than 180 VDC. Term goes false when <u>either</u> Bus goes below 160 VDC.
VDC > 240	True when <u>either</u> Bus voltage exceeds 240 VDC.
XFMR OVERTEMP	Input Transformer has overheated.
XFMR TEMP	Analog signal from embedded thermocouple in input transformer.

6.2.2 THEORY OF OPERATION - POWER CONVERSION CIRCUITS

The power conversion circuits of the 3060-UMS power source consist of the following assemblies:

1. Control PCB which contains the Oscillator
2. Modulator PCB
3. Inverter Assemblies (3 each)

Figure 6.7.2 is a schematic of the mainframe. Figure 6.7.3 is a schematic of the inverter assembly.

The oscillator, located on the Control PCB, generates three low level sinewaves which are at the fundamental output frequency. The amplitude of these signals is 4.8 VAC_{rms} when the output is set to 120 VAC_{l-n}. The front panel voltage control potentiometers supply DC voltage levels which control the amplitude of the appropriate oscillator outputs. Automatic Gain Control (AGC) is also provided in the oscillator for good output voltage regulation. S14 enables or disables and selects local or remote operation of AGC. When the FREQUENCY SELECT SWITCH is in the EXT or SLAVE positions, all outputs of the oscillator are disabled and will be 0 VAC.

The oscillator output is fed into the modulator PCB. The modulator takes the signal and creates a pulse width modulated digital signal required by the inverter assemblies. The modulator also receives six current signals, two from each inverter assembly, which are representative of individual inverter assemblies output current. These signals are used to guarantee current sharing between assemblies on the same phase. The modulator develops the INV AMPS term which is used to drive the system output ammeter. The output voltage of each phase is fed back to the modulator PCB. This is done to achieve high waveform quality.

The inverter assembly uses large transistors which switch between the ± 200 VDC power supplies as controlled by the modulator. The output of this switch is filtered to create the output sinewave.

6.2.3 THEORY OF OPERATION - CONTROL CIRCUITS

The Control PCB is mounted to the rear of the keyboard subpanel. The Control PCB assembly is central to the system control of a 3060-UMS mainframe. This PCB monitors key system parameters and either allows or prohibits operation accordingly. Figure 6.7.1 is a block diagram of the system. All of the logic on this block diagram is on the control PCB.

When input power is applied and the input circuit breaker is closed the LVPS is on. At this point, the Control PCB is performing preliminary diagnostics and will light the red System Off LED on the front panel when all diagnostic tests have been passed. The INPUT LINE FAULT signal will be at - 12 VDC when all input diagnostic tests have been passed.

If the machine has an internal fault the EMER OFF push button will light. After the fault has been cleared, pressing the START/RESET push button will allow normal operation.

Rotating the MODE SELECT switch to STANDBY and then pressing START/RESET will turn on S7, the Slow-Turn-On Contactor. Resistors R1, R2 and R3 limit the inrush current during transformer turn on. At this point the MXEN signal is high allowing the inverter to operate. 200 milliseconds later S3 closes and the Regulator PCB is enabled. The Regulator turns on the SCRs and charges the power supply capacitors. When the power supplies have charged S4, the Battery contactor, will close. Rotating the MODE SELECT switch to ON will close the output contactor, S5.

Rotating the MODE SELECT switch to OFF will open all input and output contactors and cause the Discharge PCB to become active. The Discharge PCB switches in a pair of resistors, R4 and R5, whose sole purpose is to discharge the DC supplies.

Pressing the red EMER OFF switch will open all input and output contactors and cause the Discharge PCB to become active. The emergency off flip-flop, Q6, is also set.

Figure 6.7.1 shows the various control signals used in the system. These signals are named appropriately to aid understanding.

6.2.4 THEORY OF OPERATION - DC POWER SUPPLY

The low voltage power supply transformer, T2, generates 3 phase 16/28 VAC for the low voltage DC power supplies and 3 phase 115 VAC for input contactor coils. The LVPS PCB generates a regulated ± 18 VDC from the 16/28 VAC. When the ± 200 VDC supplies are active T3 also generates ± 18 VDC. This allows LVPS operation when input power has failed. The Control PCB continuously monitors the ± 18 VDC Low Voltage DC supplies. If any of these become abnormal, logic circuits on the Control PCB will initiate system shutdown. Refer to Figure 6.7.1 for the block diagram of the system.

The main input power transformer, T1, and power supply panel assembly, which contains the Regulator PCB, SCRs, capacitors and DC fuses, make up the main DC Power Supply Circuits. The main DC Power Supply is a bipolar supply which produces ± 200 VDC. This supply is regulated and current limited to charge the batteries. The battery contactor S4 closes as required to directly connect the batteries to the ± 200 VDC Power Supplies. It is actually two independent 200 VDC supplies which are stacked on top of each other. The SCRs are configured as two, full-wave three-phase bridges. These two bridges are connected as shown and feed the capacitor assembly. The capacitors filter the bridge outputs and DC is produced. The common point of this supply is Output Neutral and is connected to chassis. Two red LEDs, one for positive and one for negative, on the Discharge PCB indicate Bus voltages are present.

The Control PCB continuously monitors the ± 200 VDC and will shut down the system if the DC is higher than 240 VDC or lower than 160 VDC.

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6.2.5 THEORY OF OPERATION - DISPLAY CIRCUITS

The Display PCB is mounted to the rear of the keyboard subpanel. The metering circuits are contained on the Display PCB assembly. A CPU is used to meter and display system information on a LCD. The Discharge PCB assembly contains the resistor voltage dividers to scale down system voltages to a low level. These system voltages are sent to the Control PCB. The Control PCB provides all input signals (analog and digital), except input amps, to the Display PCB. CT11-CT13 provides the input current terms required by the Display PCB. Figure 6.2.5 is the block diagram for the meter and display portion of the 3060-UMS power source.

The 2 serial ports and the RSP IV are controlled by the Display PCB.

The Control PCB drives the EMER OFF, OFF, STANDBY, ON, MASTER and SLAVE lamps.

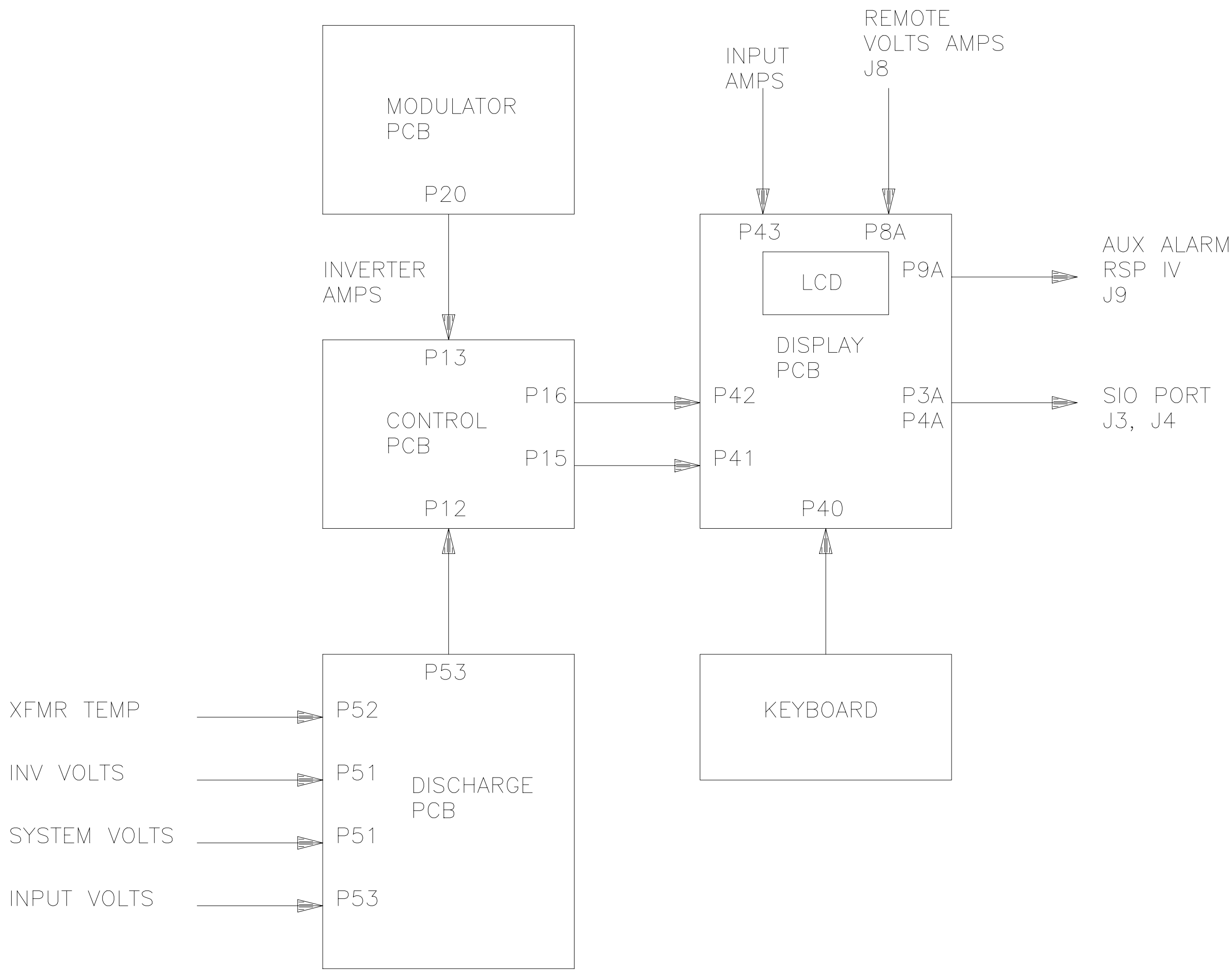

FIGURE 6.2.5 BLOCK DIAGRAM DISPLAY CIRCUITS

6.2.6 THEORY OF OPERATION - PARALLELING CIRCUITS

The paralleling circuits are located on the Control PCB. The Control PCB is mounted to the rear of the keyboard subpanel. The Master Cabinet's Control PCB assembly is central to the system control of a Multi-Cabinet paralleled system. This PCB monitors key system parameters and either allows or prohibits operation accordingly. Figure 6.7.1 is a block diagram of the system.

P1 and P2 are the paralleling connectors. Tying pin 18 and pin 19 together with isolated external contacts shall cause an external emergency off of the system.

If a cabinet is a master and in an EMER OFF state, it will cause all cabinets to be in an EMER OFF state. The master EMER OFF must be cleared first; then all slave's EMER OFF may be cleared.

When all slave cabinets have no EMER OFF and the mode select switch is in the ON position, the MASTER controls total system operation.

Each cabinet in a paralleled system generates it's own inverter amps signal. This signal is summed together to create the system amps signal. System amps is total amps of the system and may be displayed at any cabinet.

SECTION 6 SERVICE

6.3 TROUBLESHOOTING PROCEDURE

This paragraph outlines a detailed troubleshooting procedure for the 3060-UMS. Read and understand section 4 of this manual prior to troubleshooting.

These procedures apply to a single cabinet system or the master cabinet of a paralleled cabinet system with all slave cabinets operating normally as a single cabinet system. Two distinct groups of procedures are provided. They are briefly described below:

1. Performance Check - This procedure, figure 6.3.1, is used to verify that the system is operating properly.

2. Service Procedures - These procedures, figures 6.3.2 through 6.3.6, are used to locate and repair problems which may require removal of input power. Do not use any of these procedures unless instructed to do so by the performance check flow chart.

The procedures make use of flow charts along with explanatory text. This will lead the technician to the defective component or assembly. PCB assemblies and power assemblies are assumed to be replacement items. No attempt is made to troubleshoot these assemblies to the component level.

*** * * * * * * WARNING * * * * * * ***

* <u>ALWAYS</u> REMOVE ALL INPUT AND BATTERY POWER FROM THE MAINFRAME PRIOR TO ATTEMPTING ANY SERVICE TO THE EQUIPMENT.

* <u>LETHAL VOLTAGES</u> ARE PRESENT WITHIN THE MAINFRAME WHEN INPUT OR BATTERY VOLTAGE IS APPLIED TO THE MAINFRAME.

* <u>LETHAL VOLTAGES</u> ARE PRESENT WITHIN THE MAINFRAME WHEN RED LEDS ARE LIT ON THE DISCHARGE PCB, EVEN IF THE INPUT OR BATTERY VOLTAGE IS <u>NOT</u> APPLIED TO THE INPUT TERMINALS.

* THE SERVICE PROCEDURES OUTLINED IN THIS MANUAL ARE INTENDED FOR USE ONLY BY PERSONNEL AUTHORIZED BY THE MANUFACTURER.

*** * * * * * * WARNING * * * * * * ***

6.3.1 PERFORMANCE CHECK

The purpose of this paragraph is to provide a quick, yet thorough procedure that allows the user to verify that the UPS is operating properly. Always start with the performance check flow chart.

The numbered comments below correspond to the circled numbers on figure 6.3.1 and provide detailed instructions relative to the referenced step.

1. With input power applied and the input circuit breaker closed, at least some panel lights should be on. If there are no panel lights the Low Voltage Power Supply may not work, go to figure 6.3.2.

2. At power up, the welcome message should be displayed. If the display is not working go to figure 6.3.3.

3. Pressing the INPUT then f1 keys should cause the LCD to display input voltages. NORMAL should be displayed. If ABNORMAL is displayed this indicates input power is not acceptable and the machine will not start. Check the nameplate at the rear of the machine for proper input voltages and that all three phases are present.

4. The EMER OFF lamp should be off. If you suspect the lamp it's self is bad press the EMER OFF button. This will cause the EMER OFF lamp to light. Pressing START RESET should clear the EMER OFF. If an EMER OFF cannot be cleared go to figure 6.3.4.

5. Pressing the OUTPUT then f2 KEYS shall cause the O2 display to be active. This allows metering of inverter volts or CABINET VOLTS. Verify the power source is in STANDBY or ON mode. Verify CABINET VOLTS are OK. If not go to figure 6.3.5.

6. Pressing OUTPUT then f3 KEYS shall cause the O3 display to be active. This allows metering of SYSTEM VOLTS, the output terminals. With a load applied verify the output volts or SYSTEM VOLTS are OK. If not go to figure 6.3.6.

7. Go to section 5.2 and do a battery test.

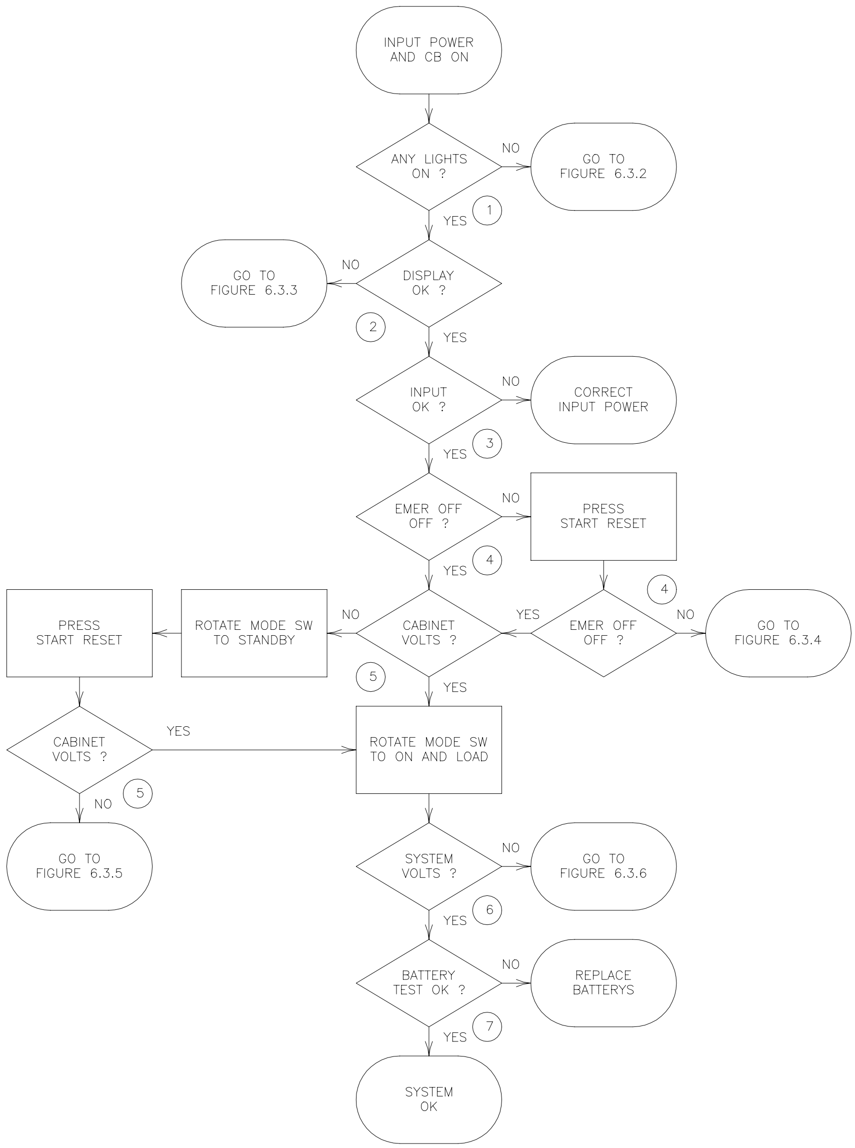

FIGURE 6.3.1 PERFORMANCE CHECK FLOW CHART

6.3.2 LVPS SERVICE PROCEDURE

The troubleshooting procedure contained in this paragraph is to be used to locate a problem within the Low Voltage Power Supply of the 3060-UMS power source. Directions are given which locate a fault to the PCB level or component level as appropriate. Do not use this procedure unless instructed to do so by the performance check flow chart.

The numbered comments below correspond to the circled numbers on figure 6.3.2 and provide detailed instructions relative to the referenced step.

1. If the machine is dead, check F1, F2 and F3. If the fuses are not good, check for shorts then replace the fuses. At least 2 fuses must be ok for the LVPS to operate.

2. Check for 16 VAC from P60-8 to P60-1, P60-8 to P60-5 and P60-8 to P60-13, of the LVPS PCB. If input voltage is present on the primary of T2 but not on the secondary, replace T2.

3. If 16 VAC voltage is present check for + 18 VDC from P60-8 to P60-9 and - 18 VDC from P60-8 to P60-7 on the LVPS PCB. If no DC voltage is present, replace the LVPS PCB. Check for + 18 VDC from P10-4 to P10-7 and - 18 VDC from P10-4 to P10-8 on the CONTROL PCB. If voltage is present and no LEDs are lit on the CONTROL PCB replace the CONTROL PCB. Reference figure 6.7.2 Mainframe Schematic.

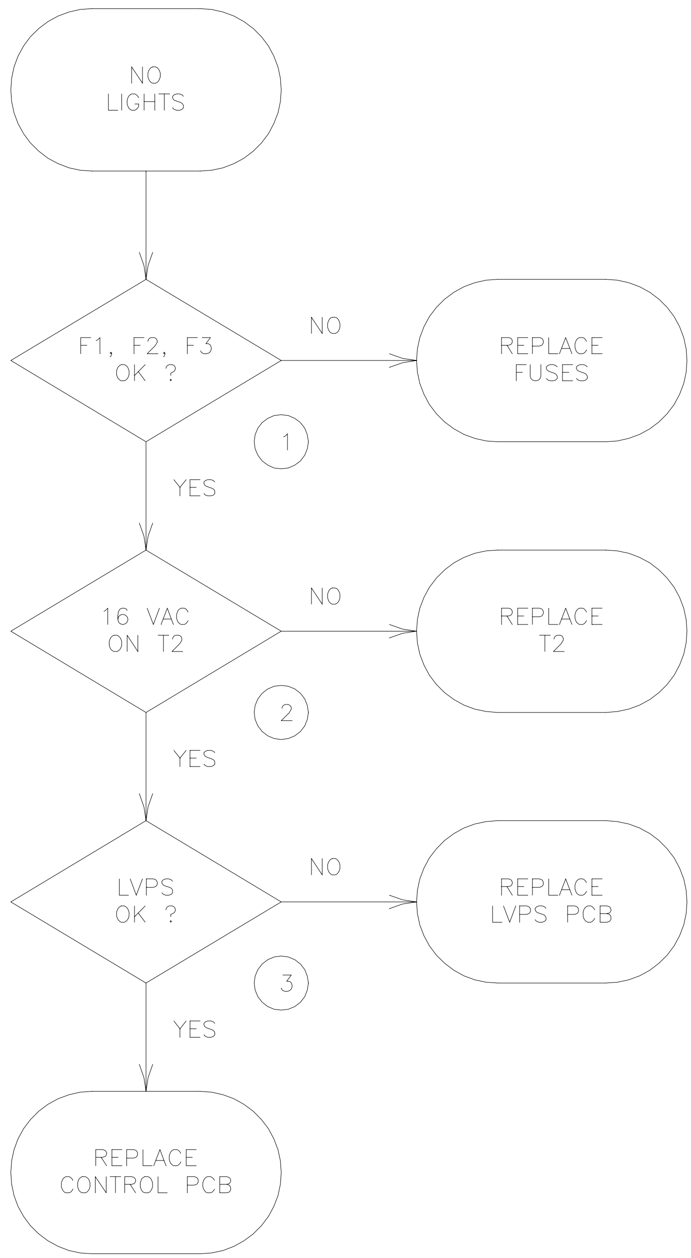

FIGURE 6.3.2 LVPS FLOW CHART

6.3.3 DISPLAY SERVICE PROCEDURE

The troubleshooting procedure contained in this paragraph is to be used to locate a problem within the Display Circuits of the 3060-UMS power source. Directions are given which locate a fault to the PCB level or component level as appropriate. Do not use this procedure unless instructed to do so by the performance check flow chart.

The numbered comments below correspond to the circled numbers on figure 6.3.3 and provide detailed instructions relative to the referenced step.

1. Verify +18 VDC on C1 and -18 VDC on C54, these LVPS voltages are required for the Display PCB to operate. C1 and C54 are near the two heatsinks. Reset the Display PCB by simultaneously pressing INPUT, OUTPUT and HELP keys. If this does not cause a reset remove input power from the machine and reapply input power. If this does not reset the Display PCB, replace the Display PCB.

2. Pressing the INPUT then f2 keys causes the LCD to display LVPS voltages. Ignore Bus and BATT voltages at this time. The LVPS should be between 15 and 20 VDC. If the LVPS is outside of this range the machine will not turn on. If the display is not correct replace the Display PCB.

3. Pressing the INPUT then f1 keys should cause the LCD to display input power. If the input voltages are not within 3% of the displayed voltages, replace the Discharge PCB.

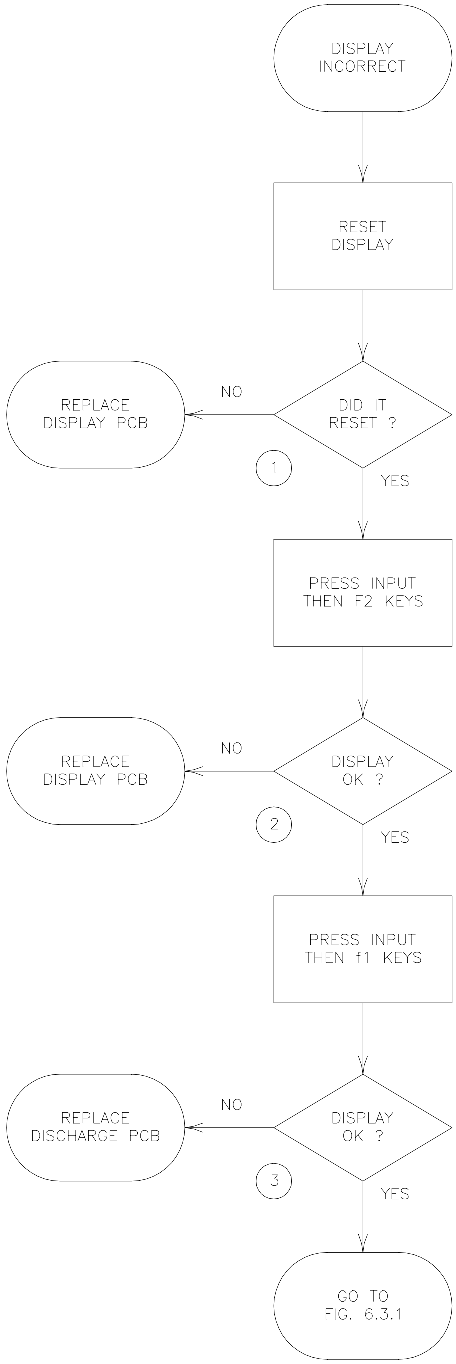

FIGURE 6.3.3 DISPLAY FLOW CHART

6.3.4 EMER OFF SERVICE PROCEDURE

The troubleshooting procedure contained in this paragraph is to be used to locate the cause of an EMER OFF condition. Directions are given which locate a fault to the PCB level or component level as appropriate. Do not use this procedure unless instructed to do so by the performance check flow chart.

The numbered comments below correspond to the circled numbers on figure 6.3.4 and provide detailed instructions relative to the referenced step.

1. Press the DIAG then f1 KEY, the cause of the EMER OFF should be displayed. If the cause is displayed correct the fault. If the cause is not displayed press the f4 KEY to determine which bit(s), would cause an EMER OFF. If a bit is true (1) for an Emergency OFF condition, on the NOW line, this could be the cause. Reference section 4.4.1.4.

MASTER EMERGENCY OFF indicates that the master of the system was/is in an EMER OFF state. Reset the Master's EMER OFF.

SUSTAINED OVERLOAD indicates the machine was in an overload condition for an extended period of time and shut off. Pressing the OUTPUT then f2 KEYS displays the system load in percentages, %I-PEAK, %kVA and %kW. If any of the six fields are greater than 100% the machine is overloaded.

INVERTER FAULT indicates an inverter or modulator PCB failure. If F10 and F11 are open, power transistors in the Inverter assembly have shorted. Replace the transistors, in pairs, and the fuses.

EMER OFF BUTTON, the EMER OFF button was pushed. Press START RESET to clear.

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6.3.4 EMER OFF SERVICE PROCEDURE (cont)

TRANSFORMER OVERTEMP indicates the input transformer has overheated. Allow to cool by leaving the fans on. This may take several hours.

INVERTER TEMP indicates one of the inverters has overheated. A fan may have failed.

LVPS FAULT indicates the regulated ± 12 VDC on a control, modulator or driver PCB's has failed.

Bus VOLTAGE > 240 VDC indicates one of the Regulator PCBs has failed. Replace the Regulator PCB.

EXTERNAL EMERGENCY OFF, pin 19 of the paralleling connector has positive voltage applied.

NO MASTER ON LINE, one and only one cabinet must be a master.

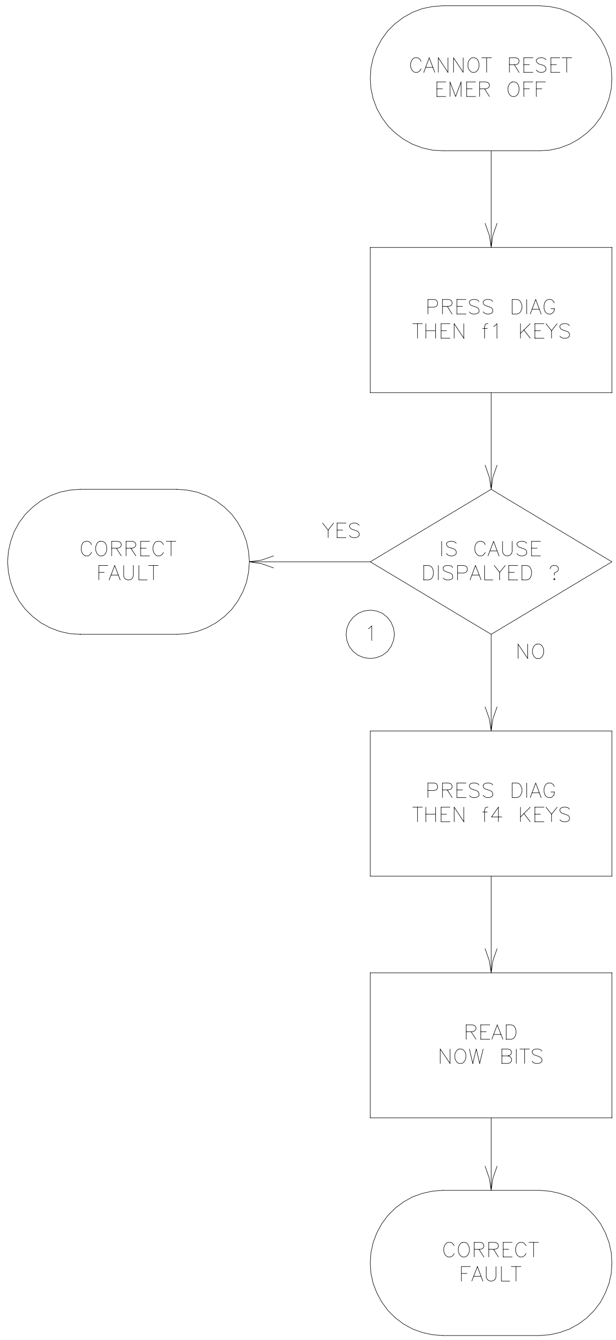


FIGURE 6.3.4 EMER OFF FLOW CHART

6.3.5 NO INVERTER VOLTS SERVICE PROCEDURE

The troubleshooting procedure contained in this paragraph is to be used to locate a problem within the Inverter circuits of the 3060-UMS power source. Directions are given which locate a fault to the PCB level or component level as appropriate. Do not use this procedure unless instructed to do so by the performance check flow chart.

The numbered comments below correspond to the circled numbers on figure 6.3.5 and provide detailed instructions relative to the referenced step.

1. Press the INPUT then f2 keys and verify both Bus/BATT voltages are at 204 VDC with no batt current. Voltages may be different if batteries are charging. The two red LEDs on the Discharge PCB should be lit when voltages are present, one for positive and negative.

2. If both Bus voltages are 0 VDC verify the input contactor S3, is closed. If only one voltage is present, replace the Regulator PCB that is not producing voltage.

3. If the Input Contactor, S3, is open, try to close it by rotating the MODE SELECT to STANDBY and press START RESET. This should cause the Slow Turn-on Contactor, S7, then the main Input Contactor, S3, and last the Battery Contactor, S4 to close. Check for 115 VAC on the coils of these contactors during the turn on sequence. If 115 VAC is present on the coil and the contactor does not close replace the contactor. If no voltage is present on the coil and the STANDBY lamp is on during the turn on sequence, replace the Control PCB.

4. If the fans are not spinning check for + 200 VDC on F4, 115 VAC on F5 and - 200 VDC on F6. Replace if needed. If the fans are still not spinning replace the Utility Inverter.

5. Verify the FREQUENCY SELECT switch is in the 50, 60, 400 or VAR positions as desired. Turn the VOLTS ADJUST pot, on the front panel, to maximum. On the Modulator PCB, verify an Oscillator signal exists of about 5 VAC on C107, C207 and C307. If no Oscillator signal is present replace the Control PCB. If an Oscillator signal is present and there is no INVERTER VOLTS replace the Modulator PCB.

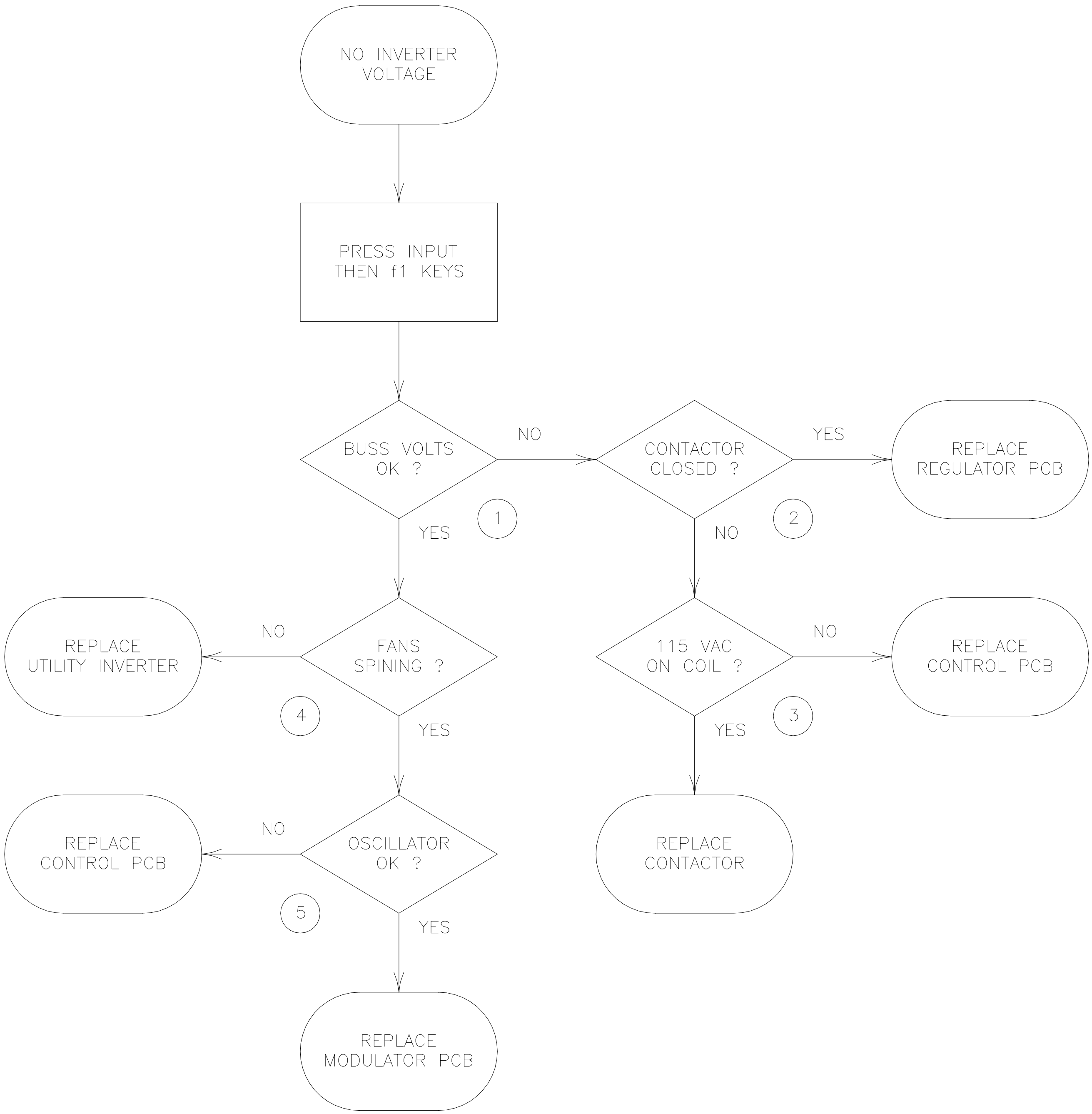


FIGURE 6.3.5 NO INVERTER VOLTS FLOW CHART

6.3.6 ABNORMAL VOLTAGE SERVICE PROCEDURE

The troubleshooting procedure contained in this paragraph is to be used to locate a problem within the Inverter circuits of the 3060-UMS power source. Directions are given which locate a fault to the PCB level or component level as appropriate. Do not use this procedure unless instructed to do so by the performance check flow chart.

The numbered comments below correspond to the circled numbers on figure 6.3.6 and provide detailed instructions relative to the referenced step.

1. If the Output Contactor, S5, is open, try to close it by rotating the MODE SELECT to ON and press START RESET. This should cause the Output Contactor, S5, to close.

2. If the Output Contactor, S5, is not closed, check for 115 VAC on the coil. If 115 VAC is present on the coil and the contactor does not close replace the contactor. If no voltage is present on the coil and the ON lamp is on, replace the control PCB.

3. Pressing the OUTPUT then f2 KEYS displays the system load in percentages: %I-PEAK, %kVA and %kW. Verify that the machine is not overloaded, (all six fields are less than 100%). If any field is greater than 100% the machine is overloaded; reduce the load.

4. If voltage regulation is a problem, verify AGC is enabled. Switch S14-6, S14-7 and S14-8 ON. Switch S14-3, S14-4 and S14-5 OFF. Reference section 4.5.2.

5. If all three phases have the same problem replace the Modulator PCB. If only one phase has a problem swap two of the Inverters and see if the problem follows the Inverter. If the problem follows the Inverter replace that Inverter. If the problem stays on the same phase replace the Modulator PCB.

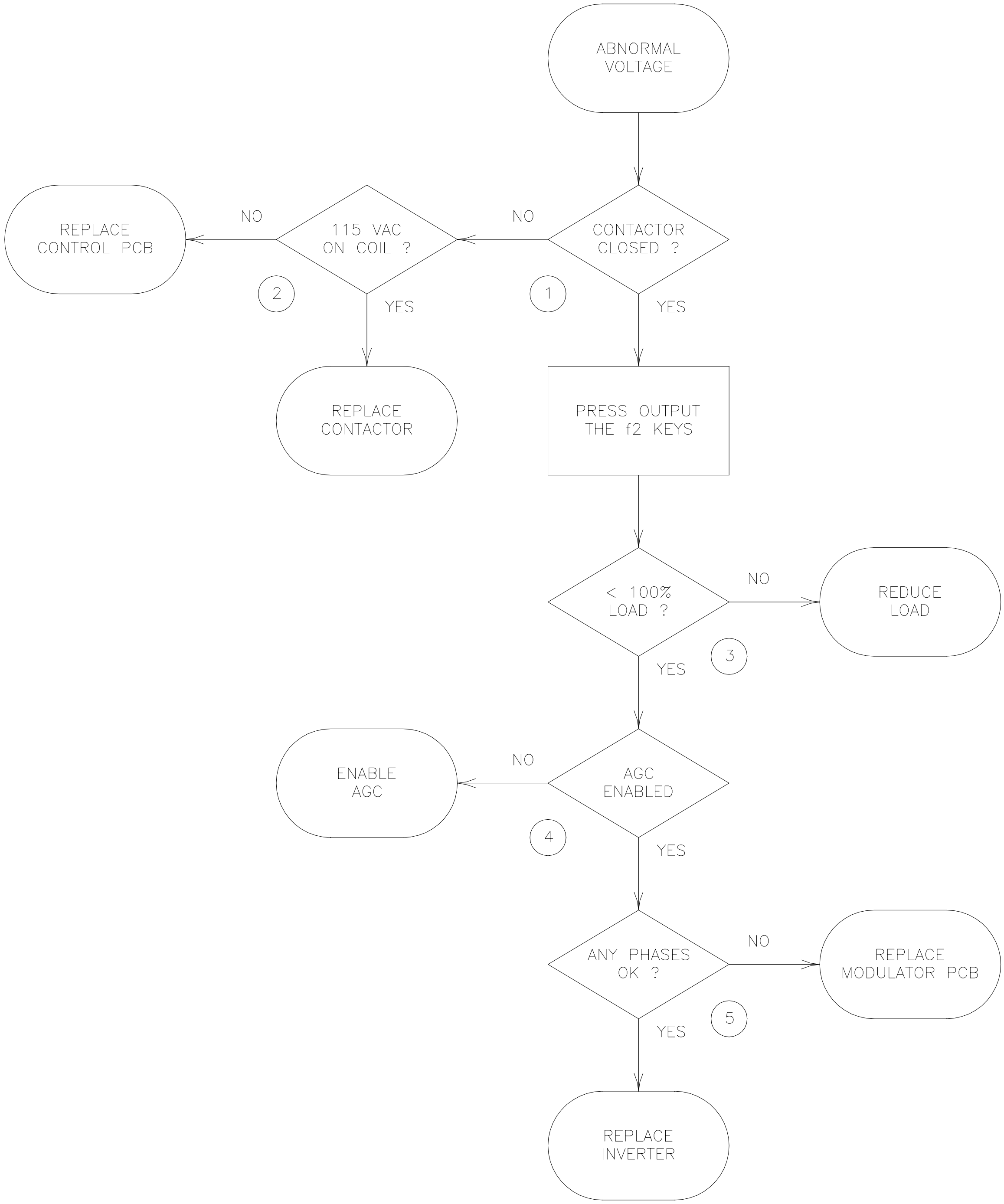


FIGURE 6.3.6 ABNORMAL VOLTS FLOW CHART

6.4 ASSEMBLY REPLACEMENT PROCEDURES

This paragraph describes the various procedures to be used to replace assemblies contained in the 3060-UMS mainframe.

*** * * * * * * WARNING * * * * * * ***

* ALWAYS REMOVE ALL INPUT AND BATTERY POWER FROM THE MAINFRAME PRIOR TO ATTEMPTING ANY SERVICE TO THE EQUIPMENT.

* LETHAL VOLTAGES ARE PRESENT WITHIN THE MAINFRAME WHEN INPUT OR BATTERY VOLTAGE IS APPLIED TO THE INPUT TERMINALS.

* LETHAL VOLTAGES ARE PRESENT WITHIN THE MAINFRAME WHEN RED LEDS ARE LIT ON THE DISCHARGE PCB, EVEN IF THE INPUT OR BATTERY VOLTAGE IS NOT APPLIED TO THE INPUT TERMINALS.

* THE SERVICE PROCEDURES OUTLINED IN THIS MANUAL ARE INTENDED FOR USE ONLY BY PERSONNEL AUTHORIZED BY THE MANUFACTURER.

*** * * * * * * WARNING * * * * * * ***

6.4.1 INVERTER ASSEMBLY REPLACEMENT

This procedure is to be used to replace a 3060-UMS Inverter Assembly. Input power **MUST** be removed before attempting this procedure. See figure 6.1.1.

STEP 1:
Remove input and battery power.

STEP 2:
Remove front covers.
Remove subpanels.

STEP 3:

*** * * * * * * WARNING * * * * * * ***

* LETHAL VOLTAGES ARE PRESENT ON THE DC Bus WHEN RED LEDS ARE LIT ON THE DISCHARGE PCB, EVEN IF THE INPUT OR BATTERY VOLTAGE IS NOT APPLIED TO THE INPUT TERMINALS.

*** * * * * * * WARNING * * * * * * ***

Verify the red LEDs on the discharge PCB are off.
With a DC voltmeter verify less than 5 VDC from each Bus bar to chassis.

STEP 4:
Remove five screws from the top of the keyboard subpanel.
Fold down the keyboard subpanel.
Disconnect ribbon cables from Modulator PCB.

STEP 5:
Remove Bus bars from the front of the inverters. Be careful not to spin the studs.
Disconnect P33, the fan wires.
Remove three screws at the bottom of the Inverter assembly.
Slide Inverter assembly out of mainframe.

\- - - - - - - CAUTION - - - - - - -

\- Assembly may be hot.

\- Inverter assembly weighs approximately 75 lbs.

\- - - - - - - CAUTION - - - - - - -

6.4.1 INVERTER ASSEMBLY REPLACEMENT (cont)

STEP 6:
Slide Inverter assembly into mainframe.
Reinstall three screws at the bottom of the Inverter assembly.

STEP 7:
Replace Bus bars on the front of the inverters. Be careful not to spin the studs.
Reconnect P33, the fan wires.

STEP 8:
Reconnect ribbon cables from Modulator PCB.
Fold up the keyboard subpanel.
Replace five screws from the top of the keyboard subpanel.

STEP 9:
Replace fuses, F10 and F11 if needed.

STEP 10:
Replace subpanels.
Replace front covers.

6.4.2 CONTROL PCB ASSEMBLY REPLACEMENT

This procedure is to be used to replace a 3060-UMS Control PCB Assembly. Input power **MUST** be removed before attempting this procedure. See figure 6.1.2.

STEP 1:
Remove input and battery power.

STEP 2:
Remove front covers.

STEP 3:
Remove yellow cover from top of MODE SELECT and FREQUENCY SELECT knobs.
Loosen nut inside of knob.
Remove knobs.

STEP 4:
Remove five screws from the top of the keyboard subpanel.
Fold down the keyboard subpanel.

STEP 5:
Disconnect all cables from Control PCB.
Remove nine nuts holding the Control PCB.
Remove Control PCB assembly.

STEP 6:
Install Control PCB assembly.
Install nine nuts holding the Control PCB.
Install all cables to the Control PCB.

STEP 7:
Fold up the keyboard subpanel.
Replace five screws from the top of the keyboard subpanel.

STEP 8:
Install knobs.
Tighten nut inside of knob.
Install yellow cover on top of MODE SELECT and FREQUENCY SELECT knobs. Note position of line on the yellow cover.

STEP 9:
Install front covers.

6.4.3 MODULATOR PCB ASSEMBLY REPLACEMENT

This procedure is to be used to replace a 3060-UMS Modulator PCB Assembly. Input power **MUST** be removed before attempting this procedure. See figure 6.1.2.

STEP 1:
Remove input and battery power.

STEP 2:
Remove front covers.

STEP 3:
Remove five screws from the top of the keyboard subpanel.
Fold down the keyboard subpanel.

STEP 4:
Disconnect all cables from the Modulator PCB.
Remove ten nuts holding the Modulator PCB.
Remove the Modulator PCB assembly.

STEP 5:
Install Modulator PCB assembly.
Install the nuts holding the Modulator PCB.
Install all cables to the Modulator PCB.

STEP 6:
Fold up the keyboard subpanel.
Replace five screws from the top of the keyboard subpanel.

STEP 7:
Install front covers.

6.4.4 DISPLAY PCB ASSEMBLY REPLACEMENT

This procedure is to be used to replace a 3060-UMS Display PCB Assembly. Input power **MUST** be removed before attempting this procedure. See figure 6.1.2.

STEP 1:
Remove input and battery power.

STEP 2:
Remove front covers.

STEP 3:
Remove five screws from the top of the keyboard subpanel.
Fold down the keyboard subpanel.

STEP 4:
Disconnect all cables from Display PCB.
Remove nine nuts holding the Display PCB.

STEP 5:
Lift up Display PCB and remove keyboard connector.
Remove Display PCB assembly.

STEP 6:
Install keyboard connector.
Install Display PCB assembly.
Install nine nuts holding the Display PCB.
Install all cables to the Display PCB.

STEP 7:
Fold up the keyboard subpanel.
Replace five screws from the top of the keyboard subpanel.

STEP 8:
Install front covers.

6.4.5 LVPS PCB ASSEMBLY REPLACEMENT

This procedure is to be used to replace a 3060-UMS LVPS PCB Assembly. Input power **MUST** be removed before attempting this procedure. See figure 6.1.2.

STEP 1:
Remove input and battery power.

STEP 2:
Remove front covers.

STEP 3:
Remove five screws from the top of the keyboard subpanel.
Fold down the keyboard subpanel.

STEP 4:
Disconnect all cables from the LVPS PCB.
Remove four nuts holding the LVPS PCB.
Remove the LVPS PCB assembly.

STEP 5:
Install LVPS PCB assembly.
Install four nuts holding the LVPS PCB.
Install all cables to the LVPS PCB.

STEP 6:
Fold up the keyboard subpanel.
Replace five screws from the top of the keyboard subpanel.

STEP 7:
Install front covers.

6.4.6 DISCHARGE PCB ASSEMBLY REPLACEMENT

This procedure is to be used to replace a 3060-UMS Discharge PCB Assembly. Input power **MUST** be removed before attempting this procedure. See figure 6.1.1.

STEP 1:
Remove input and battery power.

STEP 2:
Remove front covers.
Remove subpanels.

STEP 3:

* * * * * * * **WARNING** * * * * * * *

* <u>LETHAL VOLTAGES</u> ARE PRESENT ON THE DISCHARGE PCB WHEN RED LEDS ARE LIT ON THE DISCHARGE PCB, EVEN IF THE INPUT OR BATTERY VOLTAGE IS <u>NOT</u> APPLIED TO THE INPUT TERMINALS.

* * * * * * * **WARNING** * * * * * * *

Verify the red LEDs on the discharge PCB are off.
With a DC voltmeter verify less than 5 VDC from each Bus bar to chassis.

STEP 4:
Disconnect all cables.
Remove four nuts holding the Discharge PCB.
Remove the Discharge PCB assembly.

STEP 5:
Install Discharge PCB assembly.
Install four nuts holding the Discharge PCB.
Install all cables to the Discharge PCB.

STEP 6:
Replace subpanels.
Replace front covers.

6.4.7 DRIVER PCB ASSEMBLY REPLACEMENT

This procedure is to be used to replace a 3060-UMS Driver PCB Assembly. Input power **MUST** be removed before attempting this procedure. See figure 6.1.3.

STEP 1:
Remove the Inverter assembly as described in section 6.4.1.

STEP 2:
Remove all screws holding the top screen and side covers.
Remove top screen and side covers.

STEP 3:
Disconnect all cables.
Remove six nuts holding the Driver PCB.
Remove the Driver PCB assembly.

STEP 4:
Install Driver PCB assembly.
Install six nuts holding the Driver PCB.
Install all cables to the Driver PCB.

STEP 5:
Install top screen and side covers.
Install all screws holding the top screen and side covers.

STEP 6:
Install the Inverter assembly as described in section 6.4.1.

6.4.8 SNUBBER PCB ASSEMBLY REPLACEMENT

This procedure is to be used to replace a 3060-UMS Snubber PCB Assembly. Input power **MUST** be removed before attempting this procedure. See figure 6.1.3.

STEP 1:
Remove the Inverter assembly as described in section 6.4.1.

STEP 2:
Remove all screws holding the top screen and side covers.
Remove top screen and side covers.

STEP 3:
Un-solder and mark all resistor wires.
Remove four nuts holding the Snubber PCB.
Remove the Snubber PCB assembly.

STEP 4:
Install Snubber PCB assembly.
Install four nuts holding the Snubber PCB.
Solder resistor wires to the Snubber PCB.

STEP 5:
Install top screen and side covers.
Install all screws holding the top screen and side covers.

STEP 6:
Install the Inverter assembly as described in section 6.4.1.

6.4.9 REGULATOR PCB ASSEMBLY REPLACEMENT

This procedure is to be used to replace a 3060-UMS Regulator PCB Assembly. Input power **MUST** be removed before attempting this procedure. See figure 6.1.1.

STEP 1:
Remove input and battery power.

STEP 2:
Remove front covers.
Remove subpanels.

STEP 3:

*** * * * * * * WARNING * * * * * * ***

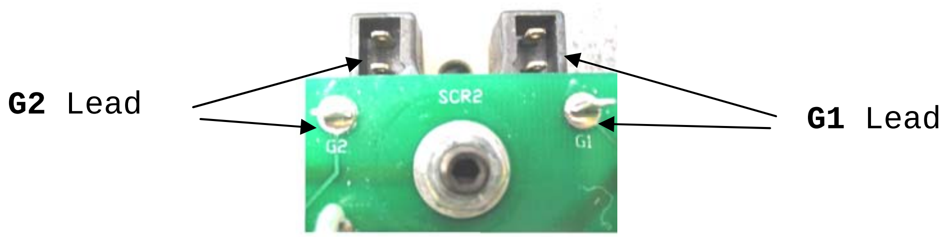
* <u>LETHAL VOLTAGES</u> ARE PRESENT ON THE REGULATOR PCB WHEN RED LEDS ARE LIT ON THE DISCHARGE PCB, EVEN IF THE INPUT OR BATTERY VOLTAGE IS <u>NOT</u> APPLIED TO THE INPUT TERMINALS.

*** * * * * * * WARNING * * * * * * ***

Verify the red LEDs on the discharge PCB are off.
With a DC voltmeter verify less than 5 VDC from each Bus bar to chassis.

STEP 4:
Disconnect ribbon cables P1 and P2.
Disconnect G1/G2 wires.
Disconnect transformer sense wires AC1,AC2,AC3.
Disconnect current transducer plug P3
Remove nine nuts holding the Regulator PCB.
Remove the Regulator PCB 126670 or 126671 assembly.

STEP 5:
Install new Regulator PCB 126671 assembly.
Install nine nuts to secure the Regulator PCB, but **<u>DO NOT</u>** tighten.
Connect current transducer plug P3
Connect transformer sense wires AC1,AC2,AC3.
Connect G1/G2 wires. **Care must be exercised when installing G1/G2 wires on Regulator PCB to prevent lead breakge.**
Connect ribbon cables P1 and P2.
Tighten nine nuts to secure the Regulator PCB



G1 / G2 Lead Positions

STEP 6:
Perform the following FIELD CALIBRATION procedure:

6.4.9.6.1 SCOPE

The purpose of this procedure is to establish a method to calibrate the UMS REGULATOR PCB at the client premises.

6.4.9.6.2 SAFETY NOTICES

The purpose of Safety Notices are to protect **YOU** from being injured or **KILLED.**

Warnings are conditions that are hazardous to user personnel. All warnings throughout this procedure will be formatted as shown below. A condition that is hazardous to both personnel and equipment will be issued as a **WARNING.**

* * * * * * * **WARNING** * * * * * * *

THIS EQUIPMENT CONTAINS HIGH
ENERGY, LOW IMPEDANCE CIRCUITS!!
LETHAL POTENTIALS ARE CONTAINED
WITHIN THE SYSTEM.

* * * * * * * **WARNING** * * * * * * *

* * * * * * * **WARNING** * * * * * * *

THE BATTERIES ARE CONNECTED IN
SERIES, LETHAL POTENTIALS
EXIST ON THE BATTERY RACK.

* * * * * * * **WARNING** * * * * * * *

6.4.9.6.2 SAFETY NOTICES (cont.)

* * * * * * **WARNING** * * * * * * *

CARE MUST BE EXERCISED WHEN SERVICING THIS EQUIPMENT IN ORDER TO PREVENT SERIOUS INJURY TO THE OPERATOR OR EQUIPMENT DAMAGE.

OBSERVE THE FOLLOWING WHEN SERVICE AND MAINTENANCE ARE REQUIRED:

1) REMOVE ALL JEWELRY FROM ARMS AND NECK WHEN SERVICING THIS EQUIPMENT. THIS PREVENTS THE POSSIBILITY OF SHORTING THROUGH THE JEWELRY AND CAUSING BURNS TO THE OPERATOR.

2) **WEAR SAFETY GLASSES** WHEN SERVICING THIS EQUIPMENT TO PREVENT EYE INJURY DUE TO FLYING PARTICLES CAUSED BY ACCIDENTAL SHORT CIRCUIT CONDITIONS.

* * * * * * **WARNING** * * * * * * *

Caution statements indicate a dangerous situation that may damage the equipment but is not a threat to life or limb. Cautions will assume the format shown. All cautions must be rigorously observed.

- - - - C A U T I O N - - - -

VERIFY THAT **ALL** INPUT AND OUTPUT CONNECTIONS ARE CORRECT AND TIGHTENED PROPERLY PRIOR TO APPLYING POWER TO THE SYSTEM.

- - - - C A U T I O N - - - -

6.4.9.6.3 TEST EQUIPMENT REQUIREMENTS

1) Digital voltmeter (Fluke 8010A or equivalent).

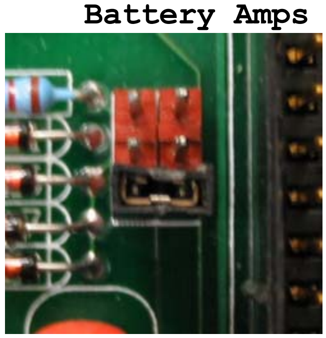
2) 50kW LOAD capable of 10kW steps (Cannon Load Banks Model L-69-80 or equivalent).

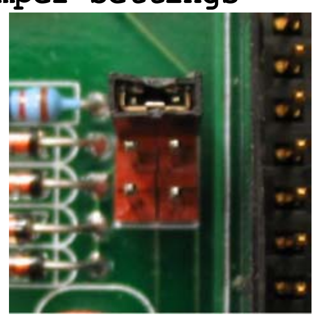
6.4.9.6.4 TEST SETUP

The test setup assumes the following:
1) Input power to the 3060UMS is disconnected.
2) The battery cabinet circuit breaker is open.
3) The positive and the negative Regulator PCBs are installed into the 3060UMS.

Set the BATTERY AMPS jumper as shown:
(middle set of pins not used)

Battery Amps Jumper Settings





Positive Regulator Left PCB **Negative Regulator Right PCB**

Note: If the battery jumpers are incorrectly positioned the 3060 UMS will operate correctly. However, the battery test will fail and the battery current indication on the display panel will indicate incorrectly on the incorrectly positioned jumper.

Connect the 50kW load bank to the output of the 3060UMS.

6.4.9.6.5 PERFORMANCE TESTS

The purpose of these load tests is to verify that the REGULATOR PCB shall perform as required.

5.1 INITIAL CHECKS

The following checks use the heat sink of the +12VDC regulator at U1 as ground reference.

Apply input power to the 3060UMS with the MODE SELECT SWITCH set to OFF. NOTE: Battery cabinet circuit breaker is still OPEN (see test setup).

Check the TACH VOLTAGE, cathode of CR23: about 8.5 VDC @ 60Hz or about 7.5 VDC @ 50Hz.

Check the REF VOLTAGE, U22-7, it should be 0V.

Check the CURRENT LIMIT VOLTAGE, U23-7, it should be about -2.8VDC.

Check the ERROR VOLTAGE, U22-1, it should be about -12VDC.

5.2 FULL LOAD TESTS & DC BUS VOLTAGE ADJUSTMENTS

Switch the MODE SELECT SWITCH to STANDBY then press START/RESET. The DC BUS should charge up in about ½ second.

The following adjustments use the Neutral Buss as the ground reference. The DMM will monitor either the negative or positive DC BUS depending on whether the right or left PCB, respectively, is being adjusted.

Adjust the DC BUS voltage to 204VDC using R281.

Set the MODE SELECT SWITCH to ON; however, DO NOT engage the load.

Start a battery test with NO load.

While the battery test is running adjust the DC BUS voltage to 175VDC using R282.

Allow the battery test to complete normally.

At the end of the battery test turn the MODE SELECT SWITCH to STANDBY.

Connect the battery cabinet to the DC BUSS by engaging the battery cabinet circuit breaker.

Set the MODE SELECT SWITCH to ON, set the load bank to draw a 10kW load and start another battery test.

At the end of the battery test set the MODE SELECT SWITCH to STANDBY and observe the battery charging current does not exceed 10A.

As the batteries charge, observe the DC voltage rising and peaks at 212 ± 1.0VDC until battery charging current drops to under 5A, then the DC voltage drops back to 204VDC. Adjust the DC BUS voltage to 212VDC peak using R280 (may need to run the battery test a few times to make this adjustment).

Set the load bank to draw 50kW load and start a final battery test. It must complete with “Test OK.”

Switch the MODE SELECT SWITCH to OFF, remove Input Power, disconnect the load bank and reconnect the normal output load.

STEP 7:

Replace subpanels.
Replace front covers.

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6.4.10 UTILITY INVERTER ASSEMBLY REPLACEMENT

This procedure is to be used to replace a 3060-UMS Utility Inverter Assembly. Input Power **MUST** be removed before attempting this procedure. See figure 6.1.1.

STEP 1:
Remove Input and Battery Power.

STEP 2:
Remove front covers.
Remove subpanels.

STEP 3:

*** * * * * * * WARNING * * * * * * ***

* <u>LETHAL VOLTAGES</u> ARE PRESENT ON THE DC Bus WHEN RED LEDS ARE LIT ON THE DISCHARGE PCB, EVEN IF THE INPUT OR BATTERY VOLTAGE IS <u>NOT</u> APPLIED TO THE INPUT TERMINALS.

*** * * * * * * WARNING * * * * * * ***

Verify the red LEDs on the Discharge PCB are off.
With a DC voltmeter verify less than 5 VDC from each Bus bar to chassis.

STEP 4:
If possible, remove the rear cover and go to step 8. This is easier than removing the Output Inverters.

STEP 5:
Remove five screws from the top of the Keyboard Subpanel.
Fold down the Keyboard Subpanel.
Disconnect ribbon cables to the Modulator PCB.

6.4.10 UTILITY INVERTER ASSEMBLY REPLACEMENT (cont)

STEP 6:

Remove Bus bars from the front of the Output Inverters. Be careful not to spin the studs.
Disconnect P33, the fan wires.
Remove three screws at the bottom of the Output Inverter assembly.
Slide all three Output Inverter out of the mainframe.

\- - - - - - - CAUTION - - - - - - -

\- Inverter assembly weighs approximately 75 lbs.

\- - - - - - - CAUTION - - - - - - -

STEP 7:

With the Output Inverters removed you can access the Utility Inverter down through the holes left by the Output Inverters. The Utility Inverter is behind the Power Supply Panel.

STEP 8:

Disconnect J1 and J2 from the Utility Inverter Assembly.

STEP 9:

Remove the six screws holding the Utility Inverter Assembly to the Power Supply Panel and remove the assembly.

STEP 10:

Using six screws reinstall Utility Inverter Assembly to the rear of the Power Supply Panel.

STEP 11:

Reconnect J1 and J2 to the Utility Inverter Assembly.

STEP 12:

Replace F4-6 if needed.

6.4.10 UTILITY INVERTER ASSEMBLY REPLACEMENT (cont)

STEP 13:
If you removed the Output Inverters continue to step 14.
If you removed the rear panel skip to step 17.

STEP 14:
Slide the Output Inverter Assemblies back into the mainframe.
Reinstall three screws at the bottom of each Output Inverter assembly.

STEP 15:
Replace the Bus bars on the front of the Output Inverters. Be careful not to spin the studs.
Reconnect P33, the fan wires.

STEP 16:
Reconnect ribbon cables from Modulator PCB.
Fold up the keyboard subpanel.
Replace five screws from the top of the keyboard subpanel.

STEP 17:
Replace Subpanels.
Replace Front Covers.
Replace Rear Panel if applicable.

6.5 COMPONENT REPLACEMENT PROCEDURES

This procedure provides procedures which allow the user to replace various components. The following paragraphs detail the order of disassembly/assembly for particular portions of the system.

*** * * * * * * WARNING * * * * * * ***

* ALWAYS REMOVE ALL INPUT AND BATTERY POWER FROM THE MAINFRAME PRIOR TO ATTEMPTING ANY SERVICE TO THE EQUIPMENT.

* LETHAL VOLTAGES ARE PRESENT WITHIN THE MAINFRAME WHEN INPUT OR BATTERY VOLTAGE IS APPLIED TO THE INPUT TERMINALS.

* LETHAL VOLTAGES ARE PRESENT WITHIN THE MAINFRAME WHEN RED LEDS ARE LIT ON THE DISCHARGE PCB, EVEN IF THE INPUT OR BATTERY VOLTAGE IS NOT APPLIED TO THE INPUT TERMINALS.

* THE SERVICE PROCEDURES OUTLINED IN THIS MANUAL ARE INTENDED FOR USE ONLY BY PERSONNEL AUTHORIZED BY THE MANUFACTURER.

*** * * * * * * WARNING * * * * * * ***

6.5.1 INPUT POWER PANEL COMPONENT REPLACEMENT

This procedure is used to replace components located on the Input Power Panel. Input power **MUST** be removed before attempting this procedure.

STEP 1:
Remove input and battery power.

STEP 2:
Remove front covers.
Remove subpanels.

STEP 3:

*** * * * * * * WARNING * * * * * * ***

* LETHAL VOLTAGES ARE PRESENT ON THE DISCHARGE PCB WHEN RED LEDS ARE LIT ON THE DISCHARGE PCB, EVEN IF THE INPUT OR BATTERY VOLTAGE IS NOT APPLIED TO THE INPUT TERMINALS.

*** * * * * * * WARNING * * * * * * ***

Verify the red LEDs on the discharge PCB are off. With a DC voltmeter verify less than 5 VDC from each Bus bar to chassis.

STEP 4:
Remove the panel holding CB1, if needed, and support it in front of the machine.

STEP 5:
Disconnect the AC wires as needed.
Remove screws as needed.
Remove defective component.

STEP 6:
Replace defective component.
Replace screws as needed.
Reconnect the AC wires as needed.

STEP 7:
Reinstall the panel holding CB1.

STEP 8:
Replace subpanels.
Replace front covers.

6.5.2 DC POWER SUPPLY COMPONENT REPLACEMENT

This procedure is used to replace components located on the Power Supply Panel assembly. Input power **MUST** be removed before attempting this procedure.

STEP 1:
Remove input and battery power.

STEP 2:
Remove front covers.
Remove subpanels.

STEP 3:

*** * * * * * * WARNING * * * * * * ***

* LETHAL VOLTAGES ARE PRESENT ON THE DISCHARGE PCB WHEN RED LEDS ARE LIT ON THE DISCHARGE PCB, EVEN IF THE INPUT OR BATTERY VOLTAGE IS NOT APPLIED TO THE INPUT TERMINALS.

*** * * * * * * WARNING * * * * * * ***

Verify the red LEDs on the discharge PCB are off.
With a DC voltmeter verify less than 5 VDC from each Bus bar to chassis.

STEP 4:
Disconnect cables to the discharge PCB.
Disconnect output cables to the Inverters.
Disconnect battery cables.
Remove the panel holding the discharge PCB and support it in front of the machine.

STEP 5:
Remove Bus bars as needed.
Disconnect the AC wires as needed.
Remove screws as needed.
Remove defective component.

6.5.2 DC POWER SUPPLY COMPONENT REPLACEMENT (cont)

STEP 6:
Replace defective component.
Replace screws as needed.
Reconnect the AC wires as needed.
Replace Bus bars as needed.

STEP 7:
Reinstall the panel holding the discharge PCB.
Reconnect output cables to the Inverters.
Reconnect cables to the discharge PCB.
Reconnect battery cables.

STEP 8:
Replace subpanels.
Replace front covers.

6.5.3 INVERTER COMPONENT REPLACEMENT

This procedure is used to replace components located on the Inverter assembly. Input power **MUST** be removed before attempting this procedure.

STEP 1:
Remove Inverter assembly as described in section 6.4.1.

STEP 2:
Remove all screws holding the top screen and side covers.
Remove top screen and side covers.

STEP 3:
Remove the Snubber PCB assembly if needed as described in section 6.4.8.

STEP 4:
Disconnect wires as needed.
Remove screws as needed.
Remove defective component.

STEP 5:
Replace defective component.
Replace screws as needed.
Reconnect wires as needed.

STEP 6:
Install the Snubber PCB assembly if needed as described in section 6.4.8.

STEP 7:
Install top screen and side covers.
Install all screws holding the top screen and side covers.

STEP 8:
Install the Inverter assembly as described in section 6.4.1.

6.6 RETURNING ASSEMBLIES FOR REPAIR

Equipment requiring service or repair must be returned to the Huntington Beach, California factory or to a Pacific Power Source Corporation authorized service center. Freight must be prepaid by the shipper. IMPORTANT instructions are:

1) Attach a tag to the equipment identifying the owner's name and address, and the name and phone number of an individual that can be contacted.

2) Attach the mainframe serial number from which the assembly came from and a description of the service required.

3) Pack the equipment in the original carton or crate if available. PACK CAREFULLY TO AVOID EQUIPMENT DAMAGE IN TRANSIT. PACIFIC POWER SOURCE CORPORATION SHALL NOT BE RESPONSIBLE FOR REPAIR OF DAMAGE DUE TO IMPROPER PACKAGING AND HANDLING.

If the equipment to be serviced is under warranty, Pacific Power Source Corporation will repair and return the equipment, freight collect, to the original purchaser.

If the equipment to be serviced is out of warranty, Pacific Power Source Corporation will inspect the equipment and will contact the owner with an estimate of repairs, and will return the equipment, freight collect, to the owner.

6.6 RETURNING ASSEMBLIES FOR REPAIR (cont)

WARRANTY PROVISIONS

Pacific Power Source Corporation warrants each unit to be free of defects in material and workmanship for a period of one year beginning with the date of shipment to the original purchaser. Excepted from this warranty are fuses and batteries which carry the warranty of their original manufacturer if applicable. Within this warranty period Pacific Power Source Corporation will service, repair, or replace any defective part when examination shows that fault has not occurred because of misuse, abnormal operation, or user modification. The unit must be returned by the original purchaser to the Huntington Beach, California factory or to a Pacific Power Source Corporation authorized service location. Freight must be prepaid by the original purchaser.

SECTION 6 SERVICE

6.7 BLOCK AND SCHEMATIC DIAGRAMS

This section contains D-Size drawings of an overall system block diagram figure 6.7.1, schematic diagrams for the Mainframe figure 6.7.2 and Inverter assemblies figure 6.7.3.

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INSERT D SIZE FIGURE 6.7.1 HERE

FIGURE 6.7.1 SYSTEM BLOCK DIAGRAM

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FIGURE 6.7.2 MAINFRAME SCHEMATIC

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INSERT D SIZE FIGURE 6.7.3 HERE

FIGURE 6.7.3 INVERTER SCHEMATIC

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SECTION 7

MODIFICATIONS

7 MODIFICATIONS

Any modifications or changes to the UPS will be included in this section.