GENERAL OPERATION AND INSTALLATION INSTRUCTIONS FOR THE A52 UNINTERRUPTIBLE POWER SYSTEM

SYSTEM OPERATION

The A52 power system consists of a battery charger, static inverter, and transfer system. A battery must be connected to the battery D.C. output terminals.

There are two basic types of systems: continuous and standby. In a continuous system, the inverter normally supplies regulated, sine wave AC power to the load. The charger supplies DC power to the inverter, and the battery charger maintains the batteries in a fully-charged state.

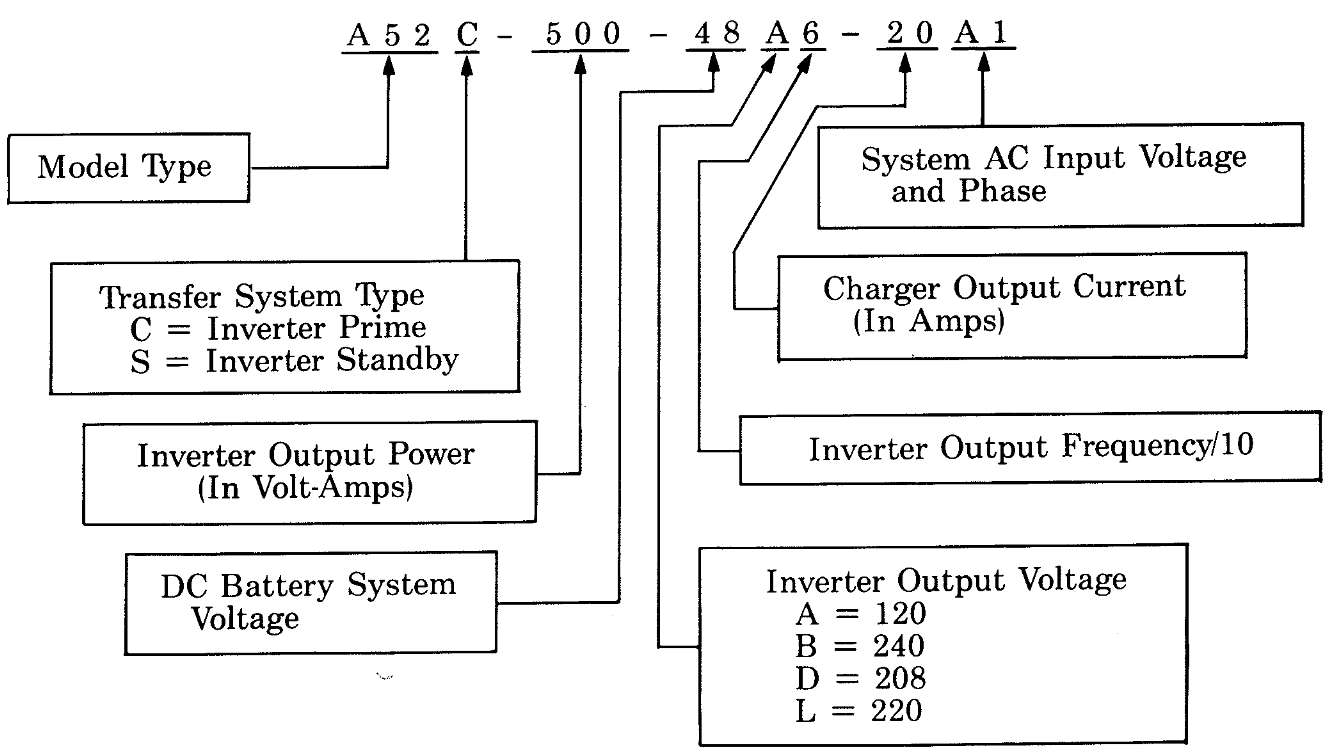
If AC line voltage fails, the system batteries supply the inverter input power without interruption. When the AC line returns to normal, the charger automatically resumes supplying the inverter input power, and the batteries are automatically recharged. In the case of system overload or equipment failure, the transfer switch connects the load directly to the AC line.

In a standby system, the load is normally supplied from the commercial AC line through an electromechanical or static switch. If the AC line fails, the load is transferred to the inverter and the inverter draws its input power from the system batteries. When AC service is restored, the load is retransferred to the AC line and the batteries are automatically recharged.

NAMEPLATE

All inquiries should include the uninterruptible power system's (A52) model and serial number. Each unit has a nameplate which gives model number, serial number, type of system (continuous or standby), inverter output VA, battery voltage, inverter output voltage and frequency, charger amps, and charger input voltage and phase (single or three phase).

The model number breakdown is as follows:



INSTALLATION

LOCATION

The LaMarche Model A52 is designed to operate in an ambient temperature, 0 to 50°C. Since the equipment is convection cooled, there should be adequate ventilation in the room where it is placed. Vent holes in the top and bottom of the case should not be constricted in any way. A minimum of two inches should be clear above and below the case. The unit must not be enclosed in any area less then 10 times the volume of the case.

INPUT AND OUTPUT CONNECTIONS

Before wiring unit, compare nameplate information with customer AC line and battery voltage. All input and output cable sizes must be selected for full load continuous operation. They should be as short as possible and permanently fastened.

Charger: Connect the AC input cables to the charger AC input terminals; the battery must be connected to the inverter DC input terminals.

CAUTION: When connecting the battery to the inverter DC input terminals, the negative battery cable must be connected to the negative DC input terminal; the positive battery cable must be connected to the positive DC input terminal. (Refer to capacitor pre-charge instruction sheet.) Connect the utility to the alternate AC line terminals. Connect the AC load to the AC load terminals. Ø and neutral polarity must be connected to the correct Ø and neutral terminals. (See table #1 for U.P.S. DC input & AC output wire size.)

CAPACITOR PRE-CHARGE INSTRUCTIONS (A52)

To prevent the inverter d.c. input fuse from blowing when connecting the battery to the UPS System the batteries should be connected in the following order.

1.) Connect the a.c. input line to the battery charger a.c. input terminals. Be sure the a.c. input power is off.

2.) Observe the polarity of the battery cables and inverter d.c. input terminals.

3.) Connect the positive battery cable to the inverter positive d.c. input terminal. Now energize the battery charger by turning on the a.c. input power. This will charge the capacitors inside the UPS and eliminate heavy arcing and the d.c. fuse blowing when the remaining battery cable is connected. After one minute turn off the a.c. input power and immediately connect the remaining battery cable to the inverter d.c. input terminal.

4.) Apply a.c. power to the battery charger, after the batteries are charged, turn on the inverter.

TABLE #1

**INPUT/OUTPUT
WIRE SIZE CHART MODEL A52
UPS SYSTEM
C=Continuous S=Standby**

INVERTER			BATTERY CHARGER				
OUTPUT KVA	DC INPUT WIRE SIZE	AC OUTPUT WIRE SIZE	CONTINUOUS AC INPUT WIRE SIZE		STANDBY AC INPUT WIRE SIZE		DC OUTPUT WIRE SIZE
24 VOLT SYSTEM							
.5	8	16	10	120V	12	120V	8
1.0	6	14	8	120V	12	120V	6
1.5	4	12	6	120V	10	120V	2
48 VOLT SYSTEM							
.5	10	16	10	120V	12	120V	10
1.0	8	14	8	120V	12	120V	8
1.5	8	12	6	120V	12	120V	6
2	6	10	10	208/240	10	120V	6
3	4	8	8	208/240	8	120V	2
4	2	6	6	208/240	6	120V	1/0
5	2	6	6	208/240	6	120V	1/0
130 VOLT SYSTEM							
.5	14	16	8	120V	12	120V	12
1.0	12	14	8	120V	12	120V	12
1.5	8	12	6	120V	8	120V	12
2	8	10	4	120V	8	120V	12
3	8	8	2	120V	8	120V	10
4	6	6	6	208/240	6	120V	10
5	6	6	6	208/240 **	6	120V	10

BATTERY CHARGER

OPERATION

Upon installation, the charger will charge at its maximum rate and taper to a trickle charge at the battery float voltage. The desired float voltage may be obtained by adjusting the potentiometer marked "Float". The desired equalize voltage may be obtained by adjusting the potentiometer marked "Equalize". The battery should then be given a 24-hour freshening charge by putting the float/equalize switch in the equalizing position to make certain the battery is fully charged. The unit should then be returned to the float position for normal operation.

CHARGER COMPONENTS

The charger has four (4) basic components: a Transformer, Saturable Reactor, Silicon Rectifier Stacks, and Control Unit. The basic operation of these units is as follows:

> The Transformer transforms the incoming AC voltage to the required level to charge the battery. The transformer also isolates the incoming power from the output. The Saturable Reactor regulates the power output of the transformer continuously over the charger cycle. The Rectifier Stacks are made up of silicon diodes connected in a full wave center tap or full wave bridge configuration. These silicon diodes rectify the secondary AC power to DC power. The control senses the condition of the battery and controls the reactor which in turn regulates the power output of the transformer.

The standard float charger is provided with a potentiometer for adjusting the float and equalizing voltage level and a float/equalize switch for transferring the output of the charger from float charge to equalize charge. Dual post for independently adjusting the float and equalizing points are provided as an additional option. A 24 hour equalizing timer may be provided in place of the manual float/equalizing switch as an additional option. The time switch is set at a pre-determined setting (usually 24 hours) and when the timer times out, the charger is automatically returned to the float position.

BATTERY CELL TYPES AND VOLTAGES

The LaMarche Float Chargers are designed specifically to charge lead acid, nickel cadmium, or nickel iron batteries. These chargers float the batteries at 2.17 volts per cell (lead acid), 1.4 volts per cell (nickel cadmium), or 1.5 volts per cell (nickel iron or Edison). The equalizing charge setting for the batteries is 2.33 volts per cell (lead acid), 1.55 volts per cell (nickel cadmium), or 1.6 volts per cell (nickel iron). The potentiometer adjustment allows for a $\pm 5\%$ adjustment from the nominal float/equalize voltages. The charger nameplate indicates the type of battery and the number of cells the charger is designed to charge.

ADJUSTMENTS

The charger is factory tested and preset so that no field adjustments are necessary. However, potentiometer(s) are provided for adjusting the float and equalizing voltages to the required levels.

TROUBLESHOOTING

General Information
Battery Information

This troubleshooting guide should be used by trained service personnel or an experienced electrician.

CAUTION: Hazardous A.C. and D.C. voltages are present within the units enclosure.

Equipment: The only equipment required is a multi-scale volt-ohm meter, and a standard tool kit.

Before setting up any complicated testing or jumping to any conclusions, give the unit a general inspection. Check the following:

1. Check D.C. ouput cables, connections, battery type, and number of battery cells with charger rating.
2. Check unit specifications with customer order.
3. Check input connections, input voltage, and line breaker size.
4. Check for shipping damage, loose connections, broken wires, etc.
5. Certain failures can be caused by defective batteries and customer loads; make sure batteries and loads are free from defects.

NOTE: If the problem is found to be located in the printed circuit boards, the board should be replaced. No attempt should be made to repair circuit boards in the field.

Information you should have when calling in for troubleshooting assistance:

1. Equipment model number and serial number.
2. The actual A.C. input voltage.
3. The D.C. output voltage with and without battery.
4. Result of check of A.C. breaker and D.C. output fuse.
5. D.C. output amps when measuring the D.C. ouput voltage with battery and load connected to rectifier.

TROUBLESHOOTING CONSTAVOLT BATTERY CHARGERS AND POWER SUPPLIES

SYMPTOM	POSSIBLE CAUSE	PROCEDURE
Open AC Input Fuse	1. Incorrect AC input	1. Compare AC input voltage with voltage on unit nameplate
	2. Shorted diodes	2. See "Troublshooting and Diode Replacement Sheet"
Open DC Output Fuse	1. Defective or wrong voltage battery	1. Compare battery voltage with unit nameplate.
	2. Shorted connector	2. Check with volt-ohmmeter
	3. Shorted or reverse output	3. Check with volt-ohmmeter
	4. Shorted Diodes	4. See "Troubleshooting and Diode Replacement Sheet"
TYPE (AC1) CONTROL PANEL:		
Charger operates but will not charge battery	1. Open RV1 and RV2 voltage divider resistor	1. Red slider band must be connected to wires on resistor; with volt-ohmmeter, check continity of resistor

SYMPTOM	POSSIBLE CAUSE	PROCEDURE
TYPE (AC1) CONTROL PANEL (CONTINUED):		
	2. Defective control panel	2. To check control panel, disconnect the blue and black wires going to Terminal #1 on control panel; connect the two (2) wires together, but do not reconnect to panel. Connect battery and turn on unit. If charger goes into high rate, the control panel is defective.
	3. Defective cutout relay	3. To check cutout relay, turn unit on and measure the voltage from pin one on the control panel to the positive output terminal of the battery charger. If zero DC voltage is measured, the relay is defective.
	4. Open cell in battery	4. Check battery cells
Charger will not taper to finish rate	1. Defective battery	1. Check for defective cells in battery
	2. Defective control panel	2. To check control panel, disconnect and separate blue and black wires going to pin one on the control panel. If the unit shuts down, the control panel may be defective.
TYPE (AC41) CONTROL PANEL:		
Charger operates, but will not charge battery	1. Defective Power Failure Relay	1. Measure voltage from Pin 5 on Control Panel to negative DC output terminal. If voltage is zero, the power failure relay may be defective.
	2. Defective Control Panel	2. To check Control Panel on units (without a power stage) turn off unit and disconnect 12 Pin connector from AC41-2 Circuit Board, jump Pin 3 to 8 on connector. Power up unit if unit goes to high rate, electronic panel may be defective.
	3. Open Float/Equalize Potentiometer	3. Check continuity of float/equalize potentiometer with volt-ohmmeter. An open circuit from its slider to the control Pin 2 will cause low unit output.
	4. Shorted Transistor on Power Stage AC7-(B1) (D1)	4. Remove Power Transistors from heatsink and check with ohmmeter. A shorted transistor will cause low unit output.
Charger will not taper to finish rate	1. Defective Battery	1. Check for defective cells in battery
	2. Defective Electronic Panel	2. Jump center coil on saturable reactor if unit runs low; problem may be control panel.
	3. Open Float/Equalize Potentiometer or Switch	3. Check continuity of float/equalize Potentiometer and Float/Equalize Switch. An open switch or potentiometer may cause the unit to run higher than normal.

INVERTER

OPERATION

Upon installation the inverter is designed to supply a.c. sine wave voltage from a d.c. battery system. The inverter uses highly reliable, solid state, SCR circuitry with a ferroresonant transformer that has inherent regulation, output filtering and overload protection.

The inverter is self-protected for AC-DC shorts, reverse polarity and over/under d.c. voltage. Battery protection is provided by a low voltage shutdown and d.c. input fusing.

The inverter is equipped with an on/off switch on the front of the case. Turning the switch on, puts the inverter into operation.

The inverter DC terminal voltage reading should be the same as the battery voltage and should agree with the nominal nameplate voltage. The inverter is designed to operate on a battery within a voltage range of 1.75 to 2.45 volts per cell (lead acid battery) or 1 to 1.55 volts per cell (nickel cadmium battery).

The AC output load wires should be disconnected or all AC loads turned off. Turn the inverter on and measure the AC output voltage.

Reconnect the load wires or turn on the AC loads. Turn on the inverter to power the load. The voltage drop should be checked between the inverter and the battery when the inverter is operating. A very slight voltage drop will indicate a good installation.

The low voltage protection feature protects the inverter in the event the DC input voltage is low. The DC contactor will not operate to power the inverter unless the voltage is correct. This also protects the batteries from excessive discharge.

Should the continuous rating of the inverter be exceeded due to an overload or short circuit, the unit will go into a current limit mode of operation.

Excessively high DC input voltages may damage the inverter, therefore, a high voltage protection circuit is employed to protect the inverter and shut the unit off.

The maximum "on charge" voltage of the battery charger should be adjusted so that voltage does not exceed 2.45 volts per cell on lead acid batteries or 1.55 volts per cell on nickel cadmium batteries. If the on charge voltage exceeds the above values, the inverter high voltage protective circuitry will automatically turn the inverter off.

The battery size is an important consideration in successful inverter operation. The amp hour capacity of the battery must be large enough so that the voltage will not drop below 1.75 volts per cell when the inverter is operating at its full load capacity. If the inverter is to operate on the battery continuously without charging equipment, the battery size must be large enough to carry the inverter load for the length of time required. Other DC loads on the battery must also be considered in sizing the battery. The number of battery cells must agree with the nameplate rating of the inverter, otherwise the inverter will not operate correctly.

ADJUSTMENT INSTRUCTIONS FOR MODEL A-52 (INVERTER SECTION)

The inverter is factory tested and adjusted so that no field adjustments are necessary upon installation. Should field adjustments become necessary, apply the following:

Two potentiometers are provided for adjusting the inverter.

P2 Under voltage cut-out

P3 Over voltage cut-out

UNDER VOLTAGE CUT-OUT POTENTIOMETER P2

Should the d-c input voltage drop below the voltage setting of this potentiometer, the inverter will automatically turn off. The inverter will automatically turn on again, after a time delay, when the input voltage is restored to normal. The factory low d-c voltage cut-out point is set at 1.75 volts per cell for lead acid batteries and 1.1 volts per cell for nickel cadmium batteries. If the inverter does not start, due to misadjustment of low potentiometer setting, proceed as follows:

1. Check input voltage for normal (2.17 LA, 1.4 NC) input voltage.
2. Turn potentiometer P2, fully counterclockwise.
3. Turn switch on, start inverter.
4. Lower d-c input (apply load or reduce cells) until the low voltage setting is reached (1.75 volts per cell, lead acid, 1.1 volts per cell, nickel cadmium).
5. Raise the cut-out voltage setting by turning potentiometer P2 in the clockwise direction. When the cut-out voltage is reached, the inverter will turn off.
6. When the voltage returns to normal, the inverter will automatically turn on after a two second time delay.
7. The adjusting screw should be resealed to prevent further movement.

OVER VOLTAGE CUT-OUT POTENTIOMETER P3

The over voltage cut-out potentiometer is located on the over and under voltage protection printed circuit card AC3. This potentiometer is located to the right of the under voltage potentiometer (see schematic).

The over voltage cut-out will turn the inverter off should the d-c input voltage exceed the high voltage setting. Potentiometer P3 is factory set at 2.5 volts per cell for lead acid batteries and 1.65 volts per cell for nickel cadmium batteries.

Adjusting instructions are as follows:

1. Check input voltage for normal output.
2. Turn adjusting screw on potentiometer P3 or PC card AC3, clockwise. This will raise the voltage cut-out point.
3. Turn switch on, start inverter.
4. Raise the d-c input voltage. Adjust the charge voltage to 2.5 volts per cell (lead acid), 1.6 volts per cell (nickel cadmium).
5. Turn the potentiometer adjusting screw counterclockwise to lower the cut-out voltage until the inverter shuts off.
6. The inverter will automatically turn on when the voltage is returned to normal after a two second time delay.
7. Reseal the adjusting screw to prevent further movement.

TROUBLESHOOTING GUIDE FOR A52 INVERTER SECTION

INSTALLATION

If the unit is newly installed and does not function, recheck installation and operating instructions.

Check the nameplate data — input voltage, input and output connections, fuses, etc. Check to see that terminals 1 and 2 on the terminal board are jumpered.

Check reverse polarity fuse (F3). If fuse blows, check input cables for reverse polarity.

OPERATING FAILURE (See Procedure)

I. D-C input fuse blows.

- A. Check power stage.
- B. Check surge and DV/DT protection.
- C. Check oscillator printed circuit card.
- D. Check over and under voltage protection printed circuit card.
- E. Check Resonating Capacitors C3.

II Fuses good — no output volts.

- A. Contactor does not pull in.
- B. Contactor pulls in but output voltage is zero or low.

PROCEDURE

I. A. Power Stage

1. Remove small 4 amp fuse F2. Removing this fuse de-energizes the pilot start relay which controls the main contactor. The oscillator is also de-energized so that the gates to the silicon controlled rectifiers (SCR) are not energized.
2. Manually close the contacts DK-1 of relay DK. This connects the battery to the mainpower stage. If the SCR's are shorted, the relay contacts will draw a big arc. If the contacts remain closed, the main d-c fuse F1 will blow.

   On small low voltage units, the contactor may be totally enclosed. In this case, the relay contacts can be closed by energizing the relay. To energize the relay, turn on the on-off switch and short out terminals 3 and 5 on the over and under voltage card AC3.
   If the main fuse blows. one of the feedback diodes SD1 and SD2 or the SCR's may be shorted. Check the SCR's as follows: Disconnect the leads to the cathodes of the SCR's. Disconnect the gates at terminals 2 and 7 of the surge and DV/DT card AC5. Check the continuity of the SCR's with an ohmmeter. Clip the ohmmeter leads to the anode (heatsink) and cathode, check continuity, reverse leads or polarity and check continuity again. The meter should read open circuit in both polarity directions.
3. Check feed back diodes SD1 and SD2. Disconnect the wire to the cathode end (pigtail) of the diode so that one end of the diode is free. Check continuity with ohmmeter from pigtail end of diode to the heatsink. Ohmmeter should read continuity in one direction and high resistance in the other.
4. The commutating capacitors can be checked for a shorted or open condition with an ohmmeter. Disconnect the wires from the capacitor terminals, and momentary short the terminals to insure that the capacitor is discharged. Connect the ohmmeter leads to the capacitor terminals. The meter should indicate a low initial resistance and gradually increase to a high resistance.

I. B. Check surge and DV/DT protection card. If the SCR's in test I. A. are not shorted, the DV/DT circuit may be shorted.

1. Reconnect all wires disconnected in test I. A. Replace fuse F2.
2. Remove wires from terminals 4 and 5 of the surge and DV/DT card AC5. This completely disconnects the snubber circuits.
3. Try to start the unit by turning the DC switch to the "ON" position. The inverter may be operated with these terminals disconnected.

I. C. Check oscillator printed circuit card AC2. Turn on-off switch off.

1. Put a piece of paper (insulator) between the contacts of relay DK so that when the relay is energized, the contacts will be insulated and not make contact. If the relay is a totally enclosed type, remove the heavy wire from one side of the relay contact to open the main circuit.

2. Turn on the on-off switch DCS. The unit should be energized except for the power stage.

3. Check the control voltage at terminals 1 and 2 on the over and under protection card AC3. This voltage should measure approximately 26 volts with a d-c input float voltage of 2.17 volts per cell (lead acid), 1.4 volts per cell (nickel cadmium).

4. Check the output of the oscillator at the output terminals of the oscillator transformer OT. The a-c output voltage at terminals 4 and 5, and 5 and 6 should be approximately 4 volts. If no voltage is measured at these points, turn the on-off switch off and remove the wires from terminals 4 and 6 of the oscillator transformer OT. Turn the inverter on and measure the voltage again as above. If no voltage is measured, the oscillator card should be replaced. Note, turn the on-off switch off before reconnecting the oscillator leads.

I. D. Check over and under voltage protection printed circuit card. The main fuse may blow due to a defective timing circuit in the over and under voltage card AC3. The timing sequence is as follows: When the on-off switch (DCS) is turned on, the oscillator panel AC2 is energized immediately. Card AC3 is also energized and its timing circuit begins timing. After a two second delay, a pilot relay is energized and its contacts close connecting terminals 3 and 5. These terminals in turn apply voltage to DK. DK operates to energize the power stage. The time delay allows the oscillator time to start so that the gates of the SCR's are properly energized when the power circuit is connected.

1. The time delay can be manually checked by disconnecting the wire from terminal 5 of AC3. Turn the on-off switch on. This will energize the oscillator and the gates to the SCR's should be properly firing. Connect a jumper wire — one end to the disconnected wire from terminal 5, the other end of the jumper wire to touch firmly to terminal 5. The contactor should energize immediately and the inverter should operate.

2. If the inverter starts and runs when manually started (per I. D. 1.), turn the on-off switch off and reconnect the wire to terminal 5.

3. Turn the on-off switch on. If the contactor pulls in immediately with no time delay and the fuse blows, the timing circuit is defective. Replace the over and under voltage protection card AC3.

I. E. Check Resonating Capacitor C3 as in step I. A. 4.

II. Fuses good — no output volts.

A. Contactor does not pull in.

1. Check input voltage and jumper between terminals 1 and 2 on Main Terminal Board.

2. The over or under voltage setting may be outside of the limits of the input voltage. See adjustment instructions.

3. If the input voltage is proper for the unit and the main contactor does not pull in, the contactor can be energized by jumpering terminals 3 and 5 on the over and under voltage card AC3. Note, the on-off switch must be turned on before terminals 3 and 5 are jumpered. See I. D. If the inverter starts and runs, check the pilot relay on the card or replace the card AC3.

B. Contactor pulls in but output is 0 or low.

1. If the inverter starts and runs but the output voltage is low, capacitors C3 may be open or leaky. Voltage across capacitors should be approx. 660 volts A.C. Check as per 1. A. 4.

2. Check for broken wires. Voltage checks can be made from terminals 4 and 5 of the power transformer PT, through the a-c output terminals.

TRANSFER SWITCHES

NEMA describes the UPS (transfer) switch in Section 5 of the PE-1 Standard.

The connection of load power from the prime to the alternate source of a.c. power is accomplished with a transfer switch.

The type of switch used depends on the speed of the transfer of power which is dictated by specified load requirements.

TRANSFER TIME

The time it takes to sense a load voltage is out of specification until the time that the load voltage is again restored within the specification is the transfer time. The time and method used to sense a true load voltage failure is important. Even in a fast electronic transfer system, most of the time used for load transfer is used in sensing the failure. Sensing time also applies to the electromechanical systems.

MECHANICAL BYPASS

If no specific transfer time is required, but connection to an alternate source is desired, a mechanical switch can be provided in the UPS output. When the prime source of power fails, someone must physcially change the switch position.

ELECTROMECHANICAL TRANSFER SWITCH

The electromechanical transfer switch is capable of sensing and transferring the load power in about (12) milliseconds to (100) milliseconds. The speed depends mostly on the physical size of the relay. Larger relays are much slower simply because of the mass of their armatures. Generally, units over 1KVA have transfer times of 50MS and units over 8KVA are approximately 100MS.

STATIC SWITCH

The static or electronic transfer switch is used where the load requires the minimum discontinuity in a.c. power. It is called "static" because it has no moving parts. The power switching is done with SCR's, triacs, or transistors.

Total transfer times (including sensing) in most static switches can be less than (4) milliseconds.

The La Marche static switch utilizes a SCR power stage. Electronic sensing is provided for the load, inverter, and bypass voltages and the load current, and the phase angle between the a.c. bypass line and the inverter.

Adjustments are provided for the inverter and a.c. bypass source availability, the load voltage transfer point, and the retransfer time. Retransfer occurs after the prime source has become available for a programmed time. If this source is spuratic, the time delay will keep resetting itself.

The La Marche static switch can be configured for either the a.c. line or the inverter as the prime source of power. This function is switch programmable on the static switch circuit board.

The status of the sources and the switch are displayed by the status indicator circuit board mounted on the UPS or inverter front panel. This panel shows inverter or a.c. line availability, load on prime or alternate source and phase lock condition between the inverter and the a.c. line.

If the a.c. line and the inverter are not synchronized (out of phase lock), a transfer is prohibited unless the prime source dies completely. Optional relay contacts may also be provided for all of the status conditions.

DESCRIPTION OF FRONT PANEL OPERATION WITH STATIC SWITCH

The static switch normally has five indicating LED's on the front status panel AC#33.

The first three lights indicate the conditions which the static switch finds true of the two input power sources. The static switch is constantly monitoring the A.C. input voltages from the inverter and the A.C. line. This information allows it to determine whether the utility source is available (utility available LED), whether the inverter is available (the inverter available LED), and whether the inverter is synced up to the A.C. line (phase lock LED).

The last two LED's indicate which source is powering the load, prime or alternate.

The auto/manual switch in the manual position prevents transfer back to prime source when both sources are available. This switch in the manual position will also prevent test transfer to the alternate source.

The test switch allows active check of the static switch operation. The static switch will execute a test transfer from prime to alternate source only when:

1. The alternate source is within its available voltage range;
2. Manual/auto switch is in the auto position;
3. The inverter is in phase lock with the A.C. line.

The static switch will allow a transfer back to the prime source from the alternate source if the following conditions exist:

1. Position of the automatic/manual switch in the automatic position;
2. Test transfer switch in its normal position;
3. The inverter in phase lock with the A.C. line;
4. The prime source within the available voltage range;
5. Completion of a "retransfer" time delay (normally five seconds - set with the 0-9 position "retransfer delay" thumbwheel).

BASIC TROUBLESHOOTING FOR INVERTER/STATIC SWITCH SYSTEM

The purpose of this procedure is to provide a means to localize a given problem to a general area within the La Marche inverter/static switch system.

1. Turn off the inverter and A.C. line to inverter.
2. Remove F4 (inverter A.C. fuse) *on the static switch assembly.*
3. Turn on the inverter.
4. If the inverter does not start, refer to page 12 for troubleshooting procedure.
5. If the inverter starts, turn it off. *Do not* replace the F4 fuse.
6. Turn on the A.C. line.
7. Turn on the inverter.
8. If the inverter starts, check phase lock system with a dual trace scope. The static switch portion will not be operational due to F4 fuse being pulled.
9. If the unit does phase lock, turn off both the inverter and the A.C. line to the inverter.
10. If the unit fails to lock to the A.C. line, replace the line sync/osc. card.
11. If the inverter blows F1 fuse, replace AC6-13 line sync/osc. card.
12. Replace the F4 fuse on the static switch assembly, pulled previously.
13. Remove the load from terminals.
14. Turn on the A.C. line.
15. Turn on the inverter.
16. If the inverter blows the F1 fuse, the problem is located in the static switch assembly. (Consult the factory for further information).

INSTALLATION AND OPERATION INSTRUCTIONS FOR FLOAT ACCESSORIES

I. ELECTRONIC VOLTAGE SENSING RELAYS

These electronic relays incorporate solid state circuitry that provides a means of sensing D.C. voltage changes. A change in D.C. voltage will operate an electromechanical relay at adjustable predetermined levels. The relay incorporates a time delay circuit from 3 to 5 seconds which insures immunity against false operation from tolerable, momentary loads. The contacts are shown in the de-energized state on the printed circuit board.

The ERTH relay coil will not energize, and the contacts will not transfer until the set operating point is reached.

The ERTL coil is energized and drops out on transfer.

The relays have a fixed differential voltage of approximately 1½% of the nominal relay voltage.

A. Low D.C. Voltage Alarm Relay-Adjustable (ERTL).

The Low D.C. Voltage Alarm Relay has one normally open, and one normally closed form "C" contacts. The relay is factory set so the contacts transfer at 2 volts per cell lead acid, or 1.3 volts per cell nickel cadmium.

A potentiometer is provided for setting the operating point. Turning the potentiometer counter-clockwise lowers the factory setting, clockwise will raise the factory setting.

B. High D.C. Voltage Alarm Relay-Adjustable (ERTH).

The High D.C. Voltage Alarm Relay has one normally open, and one normally closed form "C" contacts. The relay is factory set so the contacts transfer at 2.4 V.P.C. lead acid, or 1.65 V.P.C. nickel cadmium.

Turning the potentiometer counter-clockwise lowers the factory setting, clockwise will raise the factory setting.

NOTE: The above values are the standard factory settings. If order or customer specifications differ, the factory will set as specified.

II. ELECTRONIC CURRENT SENSING RELAYS (ERCF)

The electronic, solidstate relay senses the output current of the unit. The relay will operate when the output current drops below an adjustable, predetermined level. The ERCF relay has one normally open, and one normally closed form "C" contacts.

The ERCF relay is factory set to energize at one amp. At this point, the relay's contacts will transfer from their normal de-energized state.

The relay will de-energize, and the contacts will tranfer if the unit's output current drops below 50 milliamps for 5 seconds or longer.

A potentiometer is provided to re-set the ERCF relay's operating point. To reset the ERCF to approximately zero current, the following procedure should be followed:

1. Turn the power on to the unit with no D.C. loads connected to the output.
2. Turn the ERCF potentiometer counter-clockwise until the small light emitting diode, (L.E.D.) one the printed circuit, lights. Using this diode, we bypass the time delay circuit.
3. Now slowly turn the poteniometer clockwise until the light goes out. The ERCF is now set at approximately zero current.

   When a load is applied to the unit, the (L.E.D.) should be lit. In approximately 5 seconds the relay will energize, and the contacts will transfer.

   Turning the potentiometer counter-clockwise will raise the relay operating point, clockwise lowers the operating point.

NOTE: The above values are the standard factory settings. If order or customer specifications differ, the factory will set as specified.

III. TIMERS

A. Timers—0/24 Hour or 72 Hour Manual Timer.

The 0/24 Hr. Timer or 0/72 hr. Timer replaces the high-float switch. This timer is used to raise the rectifier output to 2.33 V.P.C. lead acid, or 1.55 volts per cell nickel cadmium, so the battery can be given a high rate charge.

To operate the timer, turn the timer dial to the desired number of hours you wish the batteries to charge at the high rate. The timer times out to automatically return the rectifier to the float position.

B. 0/24 Hour Automatic High Rate (Equalize) Timer.

The 0/24 Hr. Automatic Equalize Timer is used to raise the rectifier output voltage to 2.33 V.P.C. lead acid, or 1.55 V.P.C. nickel cadmium cells. When power is applied to the unit, the charger will charge at the high rate for 24 hours. The timer times out to automatically return the charger to the float rate. If an A.C. power failure occurs at the charger's A.C. input for over 5 seconds, the timer will automatically return to the high rate when A.C. power is returned.

Note: Timer knob does not move as timer times out. It is not possible to put the unit in high rate by turning knob while unit is running.

C. 30 Day Timer, 24 Hour Equalize.

This timer will raise the rectifier voltage to high rate setting for 24 hours, automatically, every 30 days.

After 24 hours, the charger returns to the float mode for 30 days.

IV. GROUND DETECTION SYSTEMS

A. Ground Detection Switch.

This system utilizes the unit's D.C. voltmeter, and a three position switch.

To operate this system, push the ground detection switch to the positive position, then to the negative position. If no ground is present in the system, no voltage will be indicated on the unit's D.C. voltmeter. The ground will be indicated on the unit's D.C. voltmeter if a ground is present.

B. Ground Detection Lights.

This system consists of two lights, one marked positive, and one marked negative, Both lights are dimly lit if there is no ground in the unit. If a ground occurs, the light in the ground circuit will light brightly, the other light will diminish.

C. Ground Detection Relays.

This system consists of two relays and a reset switch. Each relay has one normally open contact. The positive relay contact terminal is labeled 1J & 2J. The negative relay contact terminal is labeled 3J & 4J.

If a ground occurs the proper relay will energize and the contact will close. A reset switch is provided to de-energize the relays, and after the ground fault has been corrected, transfer the contacts.

D. Ground Detection Switch & Lights.

This system has two lights, one marked positive, and one negative. The lights are not illuminated until the switch is thrown to the positive or negative position. If a ground is present, the positive or negative light will illuminate to indicate the ground.