MODEL

TPS

BATTERY CHARGER

***Tru*PowerSource**

ECN/DATE

	14575 – 2/01	13374/9-99	9525/5-95
	13608/1-00	13243/8-99	9359/2-95

106 BRADROCK DRIVE
DES PLAINES, IL. 60018-1967
(847) 299-1188
FAX: (847) 299-3061

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IMPORTANT SAFETY INSTRUCTIONS FOR THE LA MARCHE POWER CONVERSION EQUIPMENT

SAVE THESE INSTRUCTIONS

This manual contains important safety and operating instructions for the La Marche Power Conversion Equipment.

Before using this equipment, read all instructions and cautionary markings on (1) unit, (2) battery, and (3) product using the battery.

CAUTION: To reduce risk of injury and/or damage to the batteries, use only the type of batteries specified on the charger.

Do not expose equipment to rain or snow.
Do not operate equipment if it has received a sharp blow, been dropped, or otherwise damaged in any way; take it to a qualified serviceman.
Do not disassemble this unit; take it to a qualified serviceman when service or repair is required. Incorrect re-assembly may result in a risk of electric shock or fire.

To reduce risk of electric shock, disconnect this unit from the a.c. supply, or batteries and loads before attempting any maintenance or cleaning. Turning off controls will not reduce this risk.

WARNING – THERE IS A RISK OF EXPLOSIVE GASSES AND WORKING IN THE VICINITY OF A BATTERY IS DANGEROUS. SOME BATTERIES GENERATE EXPLOSIVE GASES DURING NORMAL BATTERY OPERATION. FOR THIS REASON, IT IS OF UTMOST IMPORTANCE THAT EACH TIME BEFORE USING THIS UNIT, YOU READ THIS MANUAL AND FOLLOW THE INSTRUCTIONS EXACTLY.

To reduce risk of battery explosion, follow these instructions and those published by the battery manufacturer and manufacturer of any equipment you intend to use in the vicinity of the battery.

Review cautionary marking on all products .

PERSONAL PRECAUTIONS:

1. Someone should be within range of your voice or close enough to come to your aid when you work near a battery.
2. Have plenty of fresh water and soap nearby in case the battery electrolyte contacts skin, clothing, or eyes.
3. Wear complete eye protection and clothing protection. Avoid touching eyes while working near a battery.
4. If the battery electrolyte contacts skin or clothing, wash immediately with soap and water. If the electrolyte enters the eye, immediately flood the eye with running cold water for at least ten (10) minutes and get medical attention immediately.
5. Never smoke or allow a spark or flame in vicinity of a battery.
6. Be extra cautious, DO NOT drop metal onto a battery. It might spark or short-circuit the battery or cause an explosion.
7. Remove personal metal items such as rings, bracelets, necklaces, and watches when working with a battery. A battery can produce a short-circuit current high enough to weld these items causing severe burns.
8. NEVER charge a frozen battery.

PREPARING TO CHARGE

1. If it is necessary to remove the battery connections, always remove grounded the terminal from the battery first. Make sure all loads are disconnected and unit is off, so as not to cause an arc.
2. Be sure the area around the battery is well ventilated while the battery is being charged.
3. When cleaning battery terminals, be careful to keep corrosion from coming in contact with eyes.
4. Study all the battery manufacturer's specific precautions such as removing or not removing cell caps while charging, recommended rates of charge, and maintenance procedures.

UNIT LOCATION

- Never place this unit directly above the standard flooded battery. Gases from the battery will corrode and damage equipment. A sealed maintenance free or valve regulated lead acid (VRLA) may be placed below this equipment.
- Never allow the battery electrolyte to drip on this unit when reading the specific gravity or filling the battery.
- Do not operate this unit in a closed-in area or restrict ventilation in any way.
- Do not set any battery on top of this unit.

D.C. CONNECTION PRECAUTIONS

Connect and disconnect d.c. output cables only after setting all of this unit's switches to off position and removing a.c. input supply.

GROUNDING INSTRUCTIONS

This battery charger should be connected to a grounded, metal, permanent wiring system; or an equipment grounding conductor should be run with circuit conductors and connected to equipment-grounding terminal or lead on battery charger. Connections to battery should comply with all local codes and ordinances.

CAUTION: DO NOT PULL ON OUTPUT CABLES WHEN DISCONNECTING CHARGER FROM BATTERY.

RECEIVING INSTRUCTIONS AND GENERAL EQUIPMENT INFORMATION

CAUTION: To ensure safe installation and operation, the information given in the instruction manual should be read and understood before installing or using the equipment.

RECEIVING INSTRUCTIONS

Unpacking and Inspection: Examine the shipping crate upon arrival. If there is obvious damage, describe on the receiving documents. Within a few days after delivery, the equipment should be uncrated and carefully inspected for hidden damages. When removing packaging material, be careful not to discard any equipment, parts, or manuals. If any damage is detected you should:

1. File a claim with the carrier within five (5) days.
2. Send a copy of the claim to La Marche Mfg. Co.
3. Call La Marche Mfg. For a RETURN MATERIAL AUTHORIZATION NUMBER.

Failure to properly file a claim for shipping damages, or provide a copy of the claim to La Marche Mfg., may void warranty service for any physical damages reported for repair.

HANDLING

WARNING: Equipment can be very heavy, and top-heavy. Use adequate manpower or equipment for handling. Until the equipment is securely mounted, care must be used to prevent the equipment from being accidentally tipped over.

NOMENCLATURE PLATES

Each piece of La Marche Mfg. Equipment shipped is identified by part number on the nomenclature plate.

ADJUSTMENTS

All equipment is shipped from the factory fully checked and adjusted. Do not make any adjustments unless the equipment has been powered-up and the settings have been determined to be incorrect.

SPARE PARTS

To minimize downtime during installation or normal service, it is advisable to purchase spare fuses, circuit boards and other recommended components. Please refer to the list of recommended spare parts and their La Marche Mfg. Part numbers included with the instruction manual. It is recommended that spare fuses be ordered for all systems.

To order spare parts, please contact La Marche Mfg. (847)-299-1188 during business hours and ask for the Parts Department.

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1.0 GENERAL

The La Marche Model TPS is a controlled ferroresonant float charger designed to power a load while charging a battery.

The Model TPS is a filtered and may be used without a battery.

The all solid state electronic control circuit provides excellent line-load voltage regulation, current limiting, and a power failure relay with light and Form "C" contacts.

The Model TPS is available in a wide range of single and three phase a.c. input voltages, with 24 volt, 48 volt and 130 volt d.c. outputs in output currents ranging from 6 to 100 amps.

2.0 OUTPUT RATINGS

2.1 D.C. VOLTAGE

The TPS series rectifiers provide separate voltage adjustments for floating or equalizing lead or nickel cadmium cells. The float or equalize mode of operation is selected by a switch located on the front of the rectifier.

The factory settings are as follows:

FLOAT VOLTAGE	EQUALIZE VOLTAGE
2.17 volts/cell (Lead)	2.33 volts/cell (Lead)
1.40 volts/cell (N.C.)	1.55 volts/cell (N.C.)

2.2 VOLTAGE RANGE

FLOAT	EQUALIZE
2.12 - 2.3 volts/cell +/- .1 volts (Lead)	2.25 - 2.40 volts/cell +/- .1 volts (Lead)
1.39 - 1.45 volts/cell +/- .1 volts (N.C.)	1.5 - 1.60 volts/cell +/- .1 volts (N.C.)

2.3 OUTPUT CURRENT

Single Phase Inputs
6, 12, 16, 20, 25, 30, 35, 50, 75, 100, AMPS
24Vdc, 48Vdc, or 130Vdc
Three Phase Inputs
75, 100, AMPS
24Vdc, 48Vdc, or 130Vdc

2.4 REGULATION

Steady state output voltage remains within +/- ½% of rated voltage for any load current from no load to full load and for input voltages within the rated range.

2.5 FILTERING

Single phase units are 30Mv. RMS and three phase units are 100Mv. RMS when connected to a battery with an ampere-hour capacity of four times the output current capacity of the charger (32 DBRN "C" message weighting on unit's 48 volts or less).

2.6 MEAN TIME BETWEEN FAILURE

The mean time between failure (MTBF) in excess of 175,000 hours at 50 degrees C.

3.0 INPUT RATINGS

3.1 A.C. VOLTAGE

Taps are provided for nominal single phase a.c. input voltages of 120/208/240 Vac, with an a.c. input voltage range of +/-10% of nominal.

The 75 and 100 amp units are rated for three phase inputs and available in 208/ 240 or 480 Vac inputs.

3.2 INPUT FREQUENCY RANGE

57 to 63 Hz. (60 HZ nominal)

47 to 57 HZ. (50 HZ nominal)

3.3 INPUT CURRENT

(Refer to TABLE 1)

4.0 TYPICAL ELECTRICAL SPECIFICATIONS

(Refer to TABLE 1)

5.0 STANDARD FEATURES

5.1 INPUT PROTECTION:

AC BREAKER	
Single Phase Units - A two-pole circuit breaker opens both sides of the a.c. service for 120-208 or 240 on single phase models, 50 amps or less.	Three Phase Units - A three-pole circuit breaker opens all three legs of the a.c. service.

5.2 OUTPUT PROTECTION:

A two pole d.c. breaker is provided on all 50 amp or less units.

Current limiting is adjustable from 90% to 120% of rated load, limits the d.c. output current. Factory set at 115% of rated output.

MODEL NUMBER	AMPS	AC INPUT AMPS				PROTECTION					CASE NO.
						INPUT					
TPS		120	240	208	480	120	240	208	480	OUTPUT	
-6-24V-A1	6	4	---	---	---	5	---	---	---	10	4B
-12-24V-A1	12	5	---	---	---	7.5	---	---	---	15	4B
-20-24V-ABD1	20	7	4	5	---	10	5	5	---	30	4
-25-24V-ABD1	25	8	4	5	---	15	7.5	7.5	---	35	4
-35-24V-ABD1	35	11	6	7	---	20	10	10	---	50	4
-50-24V-ABD1	50	19	9	11	---	30	15	15	---	80	4
-75-24V-ABD1	75	28	14	16	---	40	20	20	---	100	4
-100-24V-BD1	100	---	15	18	---	---	25	25	---	130	9
TPS											
-6-48V-A1	6	4	---	---	---	7.5	---	---	---	10	4B
-12-48V-A1	12	9	---	---	---	---	---	---	---	15	4B
-20-48V-ABD1	20	12	6	7	---	30	15	15	---	30	4
-25-48V-ABD1	25	16	8	9	---	30	15	15	---	30	4
-30-48V-ABD1	30	18	9	11	---	30	15	15	---	40	4
-35-48V-ABD1	35	28	14	16	---	40	20	20	---	50	4
-50-48V-ABD1	50	29	14	16	---	40	20	20	---	80	4
-75-48V-ABD1	75	43	23	26	---	70	35	35	---	100	9
-100-48V-BD1	100	---	34	39	---	---	40	40	---	130	9
TPS											
-6-130V-ABD1	6	12	6	7	---	20	10	10	---	10	4
-12-130V-ABD1	12	22	10	13	---	30	15	15	---	15	4
-16-130V-ABD1	16	34	16	19	---	50	25	25	---	30	4
-20-130V-ABD1	20	36	18	21	---	50	25	25	---	30	4
-25-130V-ABD1	25	48	24	27	---	60	30	30	---	35	4
-30-130V-ABD1	30	44	22	26	---	60	30	30	---	40	9
-35-130V-ABD1	35	60	30	36	---	80	40	40	---	50	9
-50-130V-BD1	50	---	47	49	---	---	50	50	---	80	9
THREE PHASE TPS											
-75-130V-BD3	75	---	36	41	---	---	50	50	---	100	72
-75-130V-C3	75	---	---	---	18	---	---	---	25	100	72
-100-130V-BD3	100	---	50	58	---	---	60	60	---	130	72
-100-130V-C3	100	---	---	---	25	---	---	---	30	130	72

TABLE 1

A.C. INPUT - A=120; B=240; D=208 AND C = 480

5.3 STATUS/ALARM INDICATORS

A green pilot light indicator illuminates to indicate a.c. voltage is present to the rectifier.

A red a.c. power failure light with Form "C" contacts for customer connections.

Float Indicator	Equalize Indicator
A green LED illuminates to indicate that the rectifier is in the float mode of operation.	A yellow LED illuminates to indicate that the rectifier is in the equalize mode of operation.

NOTE: REFER TO "INFORMER ACCESSORY ALARM PACKAGE" SECTION OF MANUAL FOR ALARMS.

5.4 PARALLELING

This rectifier will parallel with any other La Marche Model TPS Charger.

5.5 LOAD SHARING

A load sharing circuit is provided on the terminal board. When connected, two (2) or more La Marche TPS units are forced to share the load equally within +/- 5%. Individual unit outputs must be greater than 10% of rated output.

5.6 CURRENT WALK IN

Output current will gradually increase after the rectifier is initially turned on reducing current surges.

5.7 EMERGENCY RESTORATION

This rectifier may be connected to a battery which is heavily discharged and recharge it without clearing any protective devices while powering d.c. loads.

5.8 METERS

Single phase units are equipped with taut-band d.c. ammeter and voltmeter, with accuracy of +/-2% of full scale. Digital meter is optional with "INFORMER" option.

5.9 MOUNTING

These cases are designed for wall, floor and rack mounting. See cabinet dimensions sheet for more information.

6.0 ENVIRONMENTAL RATINGS

6.1 OPERATING AMBIENT TEMPERATURE

0-50 degrees C (32-122 degrees F)

6.2 STORAGE TEMPERATURE

40 to +85 degrees C (-40 to +185 degrees F)

6.3 HUMIDITY

This rectifier is capable of operating in an ambient relative humidity range of 0-95% (non-condensing).

6.4 SHOCK

The rectifier in its shipping container, withstands shock developed when one edge of the container is dropped six (6) inches while the opposite edge is resting on the ground, or it is dropped two (2) inches on any surface without any physical damage or degradation of the electrical performance.

6.5 VIBRATION

The rectifier in its shipping container, withstands vibration encountered in shipping without physical damage or degradation of the electrical performance.

6.6 ALTITUDE

This rectifier is capable of operation at altitudes to 10,000 feet at an ambient temperature of up to +40 degrees C.

6.7 VENTILATION

The unit should be mounted so that ventilating openings are not blocked and air entering the cabinet does not exceed 122 degrees F.

Heat Baffles

It may be necessary to use a baffle plate between the rectifier and other heat producing equipment.

6.8 AUDIBLE NOISE

Audible noise is not greater than 65 DBA measured at 5 feet from any surface on the unit enclosure.

7.0 INSTALLATION INFORMATION

7.1 MINIMUM WIRE SIZES

Table 2 lists the a.c. input and the d.c. output minimum wire size requirements. At distances exceeding 10 feet, the d.c. wire size should be chosen to keep the voltage difference between the units d.c. output terminals and the battery at less than ½ volt when the unit is fully loaded. See Section 7.6 for "POWER CABLING FORMULAS". The total loop length is twice the distance from the wiring point to the unit.

7.2 WIRE SIZE TABLE

FUSE SIZE	WIRE SIZE REQUIREMENT CUSTOMER CONNECTION	EQUIPMENT GROUNDING CONDUCTOR MINIMUM	FUSE SIZE	WIRE SIZE REQUIREMENT CUSTOMER CONNECTION	EQUIPMENT GROUNDING CONDUCTOR MINIMUM
1	#14	#14	150	#1	#6
3	#14	#14	175	#1/0	#6
4	#14	#14	200	#2/0	#6
5	#14	#14	225	#2/0	#4
6	#14	#14	250	#4/0	#4
10	#14	#14	300	250-MCM	#4
15	#12	#12	350	350-MCM	#2
20	#12	#12	400	400-MCM	#2
25	#10	#12	450	500-MCM	#2
30	#10	#10	500	600-MCM	#2
35	# 8	#10	600	900-MCM	#1
40	# 8	#10	700	1500-MCM	1/0
45	# 8	#10	800	2/500-MCM	1/0
50	# 8	#10	1000	2/800-MCM	4/0
60	# 6	#10	1200	2/1000-MCM	4/0
70	# 6	# 8	1600	2/2000-MCM	4/0
80	# 4	# 8	2000		250-MCM
90	# 4	# 8	2500		350-MCM
100	# 4	# 8	3000		400-MCM
110	# 2	# 6	4000		500-MCM
125	# 2	# 6	5000		700-MCM
130	# 2	# 6	6000		800-MCM

TABLE 2

7.3 NATIONAL CODES

These wire sizes are based on those recommended in the National Electric Code Table 310-16 for copper wire at 75 degrees C conductor temperature operating in an ambient of 30 degrees C. For higher operating temperatures refer to the derating factors in the National Electric Code Table 310-16.

7.4 FIELD GROUND TERMINAL

This terminal should be connected to an earth ground. The size of the conductor is based on National Electric Code Table 250-95 for copper wire at 75 degrees C. (See Table #2 for recommended wire sizes.)

7.5 MOUNTING

Install the rectifier so that the flow of air through the ventilators is not obstructed.

7.6 POWER CABLING FORMULAS

The following section may be used to calculate the wire size requirements for wire lengths in excess of 10 ft. (Refer to TABLE 3)

CMA= CROSS SECTION OF WIRE IN CIRCULAR MILS.

A = CURRENT DRAIN IN AMPERES.

LF = CONDUCTOR LOOP FEET.

MAX AMP= MAXIMUM ALLOWABLE CURRENT FOR A GIVEN VOLTAGE DROP (IN AMPERES).

AVD = ALLOWABLE VOLTAGE DROP.

K = 11.1 CONSTANT FACTOR FOR COMMERCIAL (TW TYPE)

COPPER WIRE (KS5482-01)

WIRE SIZE REQUIRED

CMA = (A*LF*K) / AVD

CURRENT CAPACITY (IN AMPS)

(SEE TABLE 3)

MAX AMPS = (CMA* AVD)/(LF*K)

SIZE AWG.	AREA CIR. MILS	SIZE AWG. MCM	AREA CIR,. MILS	SIZE MCM	AREA CIR. MILS
18	1,620	1	83,690	600	600,000
16	2,580	0	105,600	700	700,000
14	4,110	00	133,100	750	750,000
12	6,530	000	167,800	800	800,000
10	10,380	0000	211,600	900	900,000
8	16,510	250	250,000	1000	1,000,000
6	26,240	300	300,000	1250	1,250,000
4	41,740	350	350,000	1500	1,500,000
3	52,620	400	400,000	1700	1,750,000
2	66,360	500	500,000	2000	2,000,000

TABLE 3

8.0 ELECTRICAL CONNECTIONS & FIELD WIRING

Terminal blocks are provided for connecting the a.c. input and d.c. output. A ground wire must be connected to the unit's case ground.

8.1 A.C. INPUT

Make sure that a.c. power is off at the main a.c. breaker box before installation begins.

Make sure that the input source is the same voltage and frequency as that which is marked on the nameplate of the rectifier.

The wire size and distribution fusing should be adequate for the nameplate input current of the rectifier plus the overload current (usually 10%-15% higher than the nominal rating).

An adequate earth ground lead should be connected to the terminal marked “GROUND” or “GND”.

Be sure the transformer taps are set for the correct a.c. input. An a.c. input tap setting card is located inside the unit.

8.2 D.C. OUTPUT

Make sure that the battery voltage, which is being connected to the rectifier, matches the rectifiers output voltage.

*******OBSERVE PROPER POLARITY!*******

The negative wire from the battery must be connected to the terminal marked “NEGATIVE” or “NEG” and the positive wire from the battery must be connected to the terminal marked “POSITIVE” or “POS” on the rectifier.

To prevent the d.c. output fuse from blowing when connecting the battery, connections to the power supply and batteries should be done in the following order (single power supply).

1. Connect a.c. input line to the terminal block provided. Be sure the a.c. circuit breaker is off.

2. Observe the polarity of the battery cables and the rectifier output. Connect the negative battery cable to the negative rectifier output terminal.

3. Energize the unit by turning the a.c. breaker to the “ON” position. This will charge the capacitors inside the power supply and eliminate heavy arcing when the remaining battery cable is connected. After approximately one (1) minute, turn off the power supply and immediately connect the remaining battery cable.

4. Connect the loads.

5. Turn the a.c. breaker to the “ON” position again and the rectifier will commence charging the batteries and powering the load.

8.3 REMOTE VOLTAGE SENSING

Provisions for remote d.c. voltage sensing are provided. To use the remote sensing circuit remove the wire from the positive d.c. output terminal to the RS+ terminal strip. Connect a #14 gauge wire from the RS+ terminal to the positive battery terminal.

Caution: The polarity of the sensing is critical. Check and verify the polarity carefully.

8.4 LOAD SHARING

When the load sharing terminal (LS) on the (TS) terminal strip is connected, multiple units are forced to share the load current within +/- 5%. Individual unit outputs must be greater than 10% of the rated current output.

#16 gauge wire can be used for loadsharing.

NOTE: If only one unit picks up the load, momentarily put the unit with no load into the equalize mode, and then back to the float mode. The units should share load equally.

8.5 ALARM CONNECTIONS

Form "C" contacts are provided which indicate an a.c. power failure. The contacts are rated at 60Va at 125 Vdc or a.c. **For other alarm information see "INFORMER ACCESSORY ALARM PACKAGE" section.**

9.0 OPERATION

9.1 START UP

When all connections have been made, place the units' a.c. breaker in the "on" position. If there is an optional d.c. breaker place it in the "ON" position. Note: The reset switch on the S2A-178 PCB **must be reset** when the unit is used as a power supply.

Verify the output voltage, output current, and the alarm and status lights to be sure the unit is operating properly.

If the unit is not operating correctly check the connections again and read Section 12 , "TROUBLE SHOOTING".

10.0 ADJUSTMENTS

10.1 CURRENT LIMIT ADJUSTMENT

The current limit adjustment is factory set at approximately 115% of rated d.c. output current. The adjustment provides a means of changing the rectifier current limit between 90-115% of rated output. Turning the adjustment, which is located on the unit front panel, clockwise lowers the current limit; turning counterclockwise raises the current limit.

CAUTION: CURRENT LIMIT MUST NOT EXCEED 115%. OF RATED OUTPUT CURRENT.

10.2 FLOAT ADJUSTMENT

The float adjustment is factory set at 2.17 volts/cell (Lead) or 1.4 volts/cell (N.C.). Turning the adjustment, which is located on the front door of the unit, clockwise raises the float voltage (the F/E switch must be in the float position). The adjustable range is as follows:

2.12-2.3 volts/cell +/- .1 Volts (Lead)

1.39-1.45 volts/cell +/- .1 Volts (N.C.)

Float-Equalize Switch:

(Some units have timers, See "Informer Accessory Alarm Package" section for information)

This switch is located on the unit front panel. When it is in the float position, the rectifier will maintain the battery at the voltage level which was preset by the "Float" potentiometer adjustment and at the same time maintain the load up to the rectifier's rated output.

10.3 EQUALIZE ADJUSTMENT

The equalize adjustment is factory set at 2.33 volts/cell (Lead) or 1.55 volts/cell (N.C.). Turning the adjustment, which is located on the front panel of the unit, clockwise raises the equalize voltage (the F/E switch must be in the equalize position).

The adjustable range is as follows:

2.25-2.4 volts/cell +/- .1 Volts (Lead)

1.5 - 1.6 volts/cell +/- .1 Volts (N.C.)

In the equalize position, the rectifier will maintain the battery at the voltage level preset by the "Equalize" potentiometer adjustment and at the same time maintain the load up to the rectifier's rated output.

11.0 CIRCUIT DESCRIPTIONS

11.1 CIRCUIT OPERATION

The Model TPS rectifier circuit design is a controlled ferroresonant converter. The power transformer PT provides a.c. to d.c. isolation, voltage step down, and inherent magnetic current limit.

The secondary circuit of PT & capacitor C2 form a resonant tank circuit. The secondary voltage of the transformer is controlled by the shunt control which consists of choke L1 and the a.c. switch TR-1. The semiconductor TR-1 is a triac.

The triac is phase controlled by the regulator assembly S2A-188. As the unit output voltage rises the triac is turned on for more time and vice versa. This switches the choke L1 across the resonating winding of PT which reduces the transformer output and lowers the unit output voltage.

In the current limit mode the triac is also fired to regulate the unit output current in the same manner. In this case, however, the unit d.c. current is being monitored, compared against the current limit set point and control is applied to the triac.

The silicon diodes SDI rectify the a.c. output of the transformer PT into pulsating D.C. and the filter components C3 and L2 smooth this output and reduce ripple.

11.2 S2A-188 REGULATOR ASSEMBLY

The regulator assembly contains the circuits which sense the d.c. output changes and fire the (triac) TR-1 to make the necessary corrections.

The triac is timed from the a.c. output of the transformer PT. This assembly also produces the current limit and the current walk-in features.

The regulator board includes the circuitry for the status lights and alarm settings and the output to the shunt trip circuit for the a.c. input breaker which is used for the high voltage shutdown.

The Float/Equalize switch and alarm lights are arranged so that they may protrude through the front panel of the unit.

11.3 AC12-1 POWER FAILURE SWITCH

This assembly is used to electronically switch off the bleeder resistor RL during periods of a.c. failure. This prevents the battery from being discharged back through unit circuitry.

11.4 S2A-149 SNUBBER

This circuit is used to provide DV/DT voltage suppression for the triac switch TR-1. It prevents false firing and voltage transients.

12.0 TROUBLESHOOTING

Troubleshooting should be performed only by trained service personnel or experienced electricians.

CAUTION: Hazardous a.c. and d.c. voltages are present within the rectifier cabinet.

Equipment:

The only equipment required is a multimeter for voltage or resistance readings and analog ohmmeter

12.1 GENERAL INSPECTION

On servicing new equipment, before setting up any complicated testing or jumping to any conclusions, give the unit a general inspection. Check the following:

1. Check d.c. output cables, connections, battery type, and number of battery cells with rectifier 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.

12.2 SERVICE INFORMATION

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 the battery.
4. Result of the check of a.c. breaker and d.c. output fuse.
5. The actual d.c. output current and voltage when measured with battery and load connected to rectifier.

12.3 SYMPTOMS & CAUSES

12.3.1 A.C. Breaker trips.

Possible Cause:

1. Wrong a.c. input voltage.
2. The a.c. input taps on power transformer set incorrectly.
3. (See schematic wiring diagram)
4. An a.c. to d.c. short or a.c. or d.c. short to ground (see ground short circuit test).
5. High d.c. output voltage.

- Check battery voltage for proper number of cells.
- Check control fuse on alarm interface board.
- Float/Equalize voltage potentiometers not set properly. (See Float/Equalize adjustment procedure for proper voltage setting.)
- Disconnect battery and loads from rectifier output terminals, put F/E switch in the float position, and apply a.c. input voltage to rectifier. If d.c. voltage raises above 2.5 v.p.c., circuit regulator assembly or “informer” option may be defective.

6. Check for shorted power diodes or diode modules (SD1). (See diode troubleshooting page)
7. H.V. shutdown improperly set, too low, “informer” option.
8. Open gate or wire on triac TR-1.

12.3.2 Open D.C. Fuse.

Possible Cause:

1. Shorted power diode or diode module (repair/replace as required).
2. Shorted battery cells or customer equipment.
3. Shorted output cables.
4. Capacitors not precharged.
5. Shorted C3 capacitors.
6. Loose connections on the d.c. fuse.

12.3.3 Charger operates but output voltage/current is low.

Possible Cause:

1. Float/Equalize voltage potentiometers not set correctly (see float/equalize adjustment procedure for proper voltage setting).

2. Check power diodes or diode modules and triac (see diode and triac troubleshooting procedure).

3. Regulator assembly or “informer” is defective. (Replace as required)

4. Defective d.c. voltmeter/ampmeter.

5. Unit in current limit.

6. Resonating capacitor open.

7. Defective shunt.

12.3.4 Charger operates but output voltage is high.

Possible Cause:

1. Float/Equalize voltage pots not set correctly (see float/equalize adjustment procedure for proper voltage setting).

2. Circuit regulator assembly S2A-188 is defective.

3. Open gate on triac TR-1.

12.3.5 Ground and short circuit test.

A simple ohmmeter check can be performed to check the unit for a short to ground, primary to secondary breakdown, a.c.-d.c. short, or d.c. ground. Before installation of a new unit, the above checks should be made before installing. If a short of this type is suspected on a unit in service, check as follows:

1. Disconnect a.c. input power to the unit. Disconnect the d.c. battery and loads from the rectifier.

2. Set ohmmeter scale on ohms scale RX100.

3. Measure from one terminal of the input to one terminal of the output. Meter should not indicate. If the meter reads full scale deflection, this indicates an ac-dc short. During shipping, an a.c. wire may rub against the d.c. lugs, terminals, etc. and cause a short. These problems may be eliminated by being very careful in inspecting the wiring to make certain the a.c. wires are not touching the d.c. wiring.

4. Check the input terminals to ground and check the output terminals ground. If the meter indicates full scale deflection, a wire is touching a metal part of the rectifier. Look for wires that are near any metal part and inspect for possible breakdown caused by shipping. The heatsink of the diodes and the control unit are insulated from ground through the mounting legs.

12.4 TROUBLESHOOTING AND REPLACING THE TRIAC

The procedure for checking the triac is as follows:

- On the analog ohmmeter, set the switches on “ohms”, “d.c.”, and “Rx10,000” scale.

- Disconnect the triac to be checked. Using an ohmmeter, measure the resistance between main terminals, MT1 and MT2 in both directions. A good device will indicate open circuit in both directions, a low resistance indicates a shorted device.

- Set analog ohmmeter to Rx100 scale.

- To check for a shorted triac gate lead, measure the resistance between gate (GATE) lead and main terminal MT1. A reading of zero ohms in both directions indicates a shorted gate. A reading of infinity in both directions indicates an open gate and the triac should be replaced. A good device should have resistance in both directions, but not zero ohms.

12.5 TROUBLESHOOTING AND REPLACING POWER SILICON DIODES / MODULES

The procedure for checking a silicon diode is as follows:

- On the analog ohmmeter, set the switches on “ohms”, “d.c.”, and “Rx100” scale.

1. Isolate one end of the diode by disconnecting the wires attached to the nipple (or pigtail) end of the diode (only one end of the diode must be disconnected). On a diode module, both of the outside leads must be disconnected.

2. Clip one lead of the ohmmeter to the anode lead of the diode. Clip the other ohmmeter lead to the cathode.

3. Note the ohmmeter reading. Then reverse the leads to the diode. Again, note the ohmmeter reading. If the diode is good, the meter will indicate a high resistance in one direction and a low resistance with the leads reversed. If the diode is shorted, the meter will read full scale, or zero (“O”) resistance with the leads in either direction. If the diode is “open”, the ohmmeter needle will not indicate or it will show infinite resistance in either direction, indicating an open circuit.

4. All diodes must be checked in the event that more than one diode is defective.

5. If the diode is defective, remove the defective diode from the heatsink and replace with a new diode.

12.6 CHECKING CAPACITORS

When checking capacitors be sure all a.c. power is turned off and battery is disconnected from unit. Check capacitors with d.c. voltmeter to see that d.c. voltage is at near -0- volts, then short circuit capacitor. Momentarily short circuit the capacitor leads to assure complete discharge. Connect the meter test leads to the capacitor leads or terminals and observe indicated resistance.

A good capacitor will indicate an initial low resistance and gradually increase as the capacitor charges. The final resistance of a good capacitor is usually several hundred thousand ohms approaching a megohm.

Initial high resistance approaching infinity indicates an open capacitor. Initial and continued low resistance readings indicate a shorted capacitor.

When ordering replacement parts, drawings, or schematics, always give model number, serial number and a.c. input voltage.

MANUFACTURER'S WARRANTY

All La Marche Manufacturing Co. equipment has been thoroughly tested and found to be in proper operating condition upon shipment from the factory and is warranted to be free from any defect in workmanship and material that may develop within one year from date of purchase.

Any part or parts of the equipment that prove defective within a one year period shall be replaced without charge after examination at our factory, providing such defect in our opinion, is due to faulty material or workmanship and not caused by tampering, abuse or misapplication. All such adjustments are made F.O.B. Des Plaines, Illinois.

Contact your local sales representative for minor parts replacement or equipment adjustments.

Should a piece of equipment require major component replacement or repair, these can be handled in one of two ways:

1. The equipment can be returned to the La Marche factory to have the inspections, parts, replacements and testing performed by factory personnel. Should it be necessary to return a piece of equipment or parts to the factory, the dealer from whom the equipment was purchased will obtain authorization from the factory. If upon inspection at the factory, the defect was due to faulty material or workmanship, all repairs will be made at no cost to the customer.

2. If the purchaser elects not to return the equipment to the factory and wishes a factory service representative to make adjustments and repairs at the equipment location, La Marche's field service labor rates will apply. A purchase order to cover the labor and transportation cost is required prior to the deployment of the service representative.

In accepting delivery of the equipment, the purchaser assumes full responsibility for proper installation, installation adjustments and service arrangements. Should minor adjustments be required, the local La Marche Sales Office should be contacted to provide this service.

All sales are final. Only standard La Marche units will be considered for return. A 25% restocking fee is charged when return is factory authorized. Special units are not returnable.

In no event shall La Marche Manufacturing Co. have any liability for consequential damages, or loss, damage or expense directly or indirectly arising from the use of the product, or any inability to use them either separately or in combination with other equipment or materials, or from any other cause. In addition, any alterations of equipment made by anyone other than La Marche Manufacturing Co. renders this warranty null and void.

La Marche Manufacturing Co. reserves the privilege of making revisions in current production of equipment, and assumes no obligation to incorporate these revision in earlier models.

The failure of La Marche Manufacturing Co. to object to provisions contained in customers' purchase orders or other communications shall not be deemed a waiver of the terms or conditions hereof, no acceptance of such provisions.

The above warranty supersedes and is in lieu of all other warranties, expressed or implied, and no person, agent or dealer is authorized to give any warranties on behalf of the Manufacturer, nor to assume for the Manufacturer any other liability in connection with any of its products unless made in writing and signed by an official of the Manufacturer.

INSERT PICTURE:

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