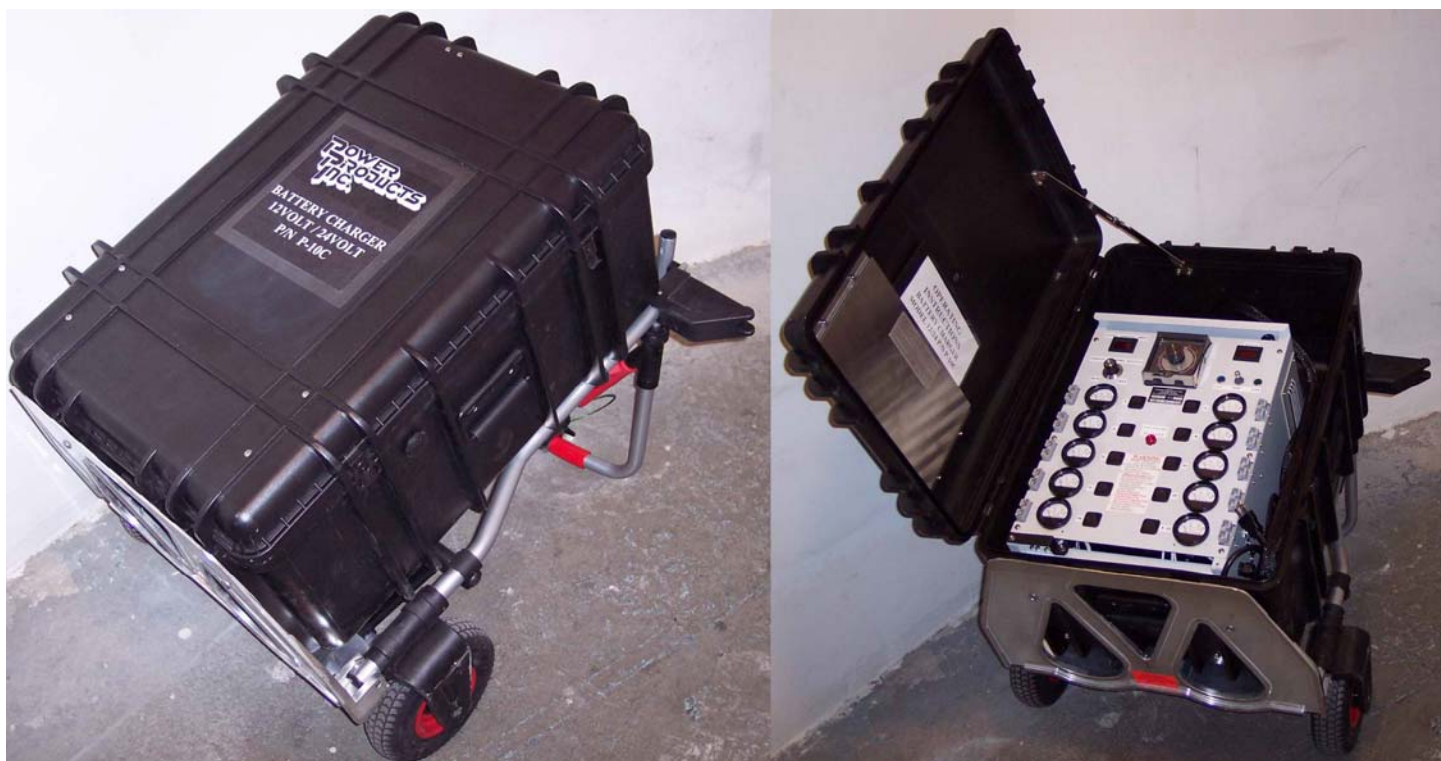


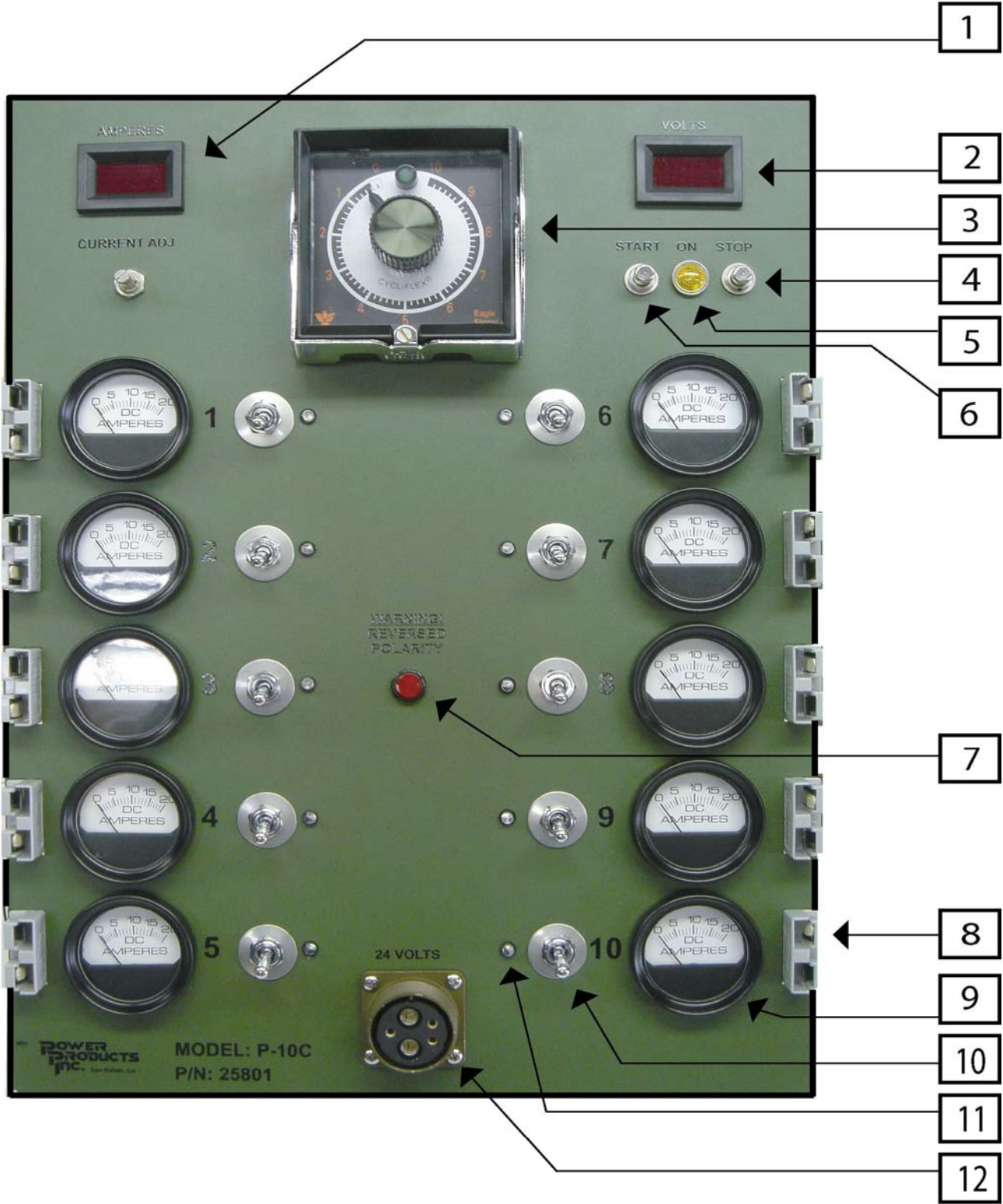
INSTRUCTIONS

BATTERY CHARGER FOR 12 AND 24 VOLT BATTERIES MODEL P-10C; P/N 25801



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P – 10C CONTROL PANEL WITH TEN 12 VOLT CHARGE STATIONS AND ONE 24 VOLT CHARGE CABLE



ITEMS

- 1 Ammeter (Reads charge amps to one decimal)**
- 2 Volt Meter (Reads charge volts to one decimal)**
- 3 Timer 0-10 hours adjustable with preset and progress pointers. Displays set point, elapsed time and remaining time.**
- 4 Charge Stop Pushbutton**
- 5 On Light**
- 6 Charge Start Pushbutton**
- 7 Reverse Polarity indicator and Alarm**
- 8 12 Volt Battery connectors**
- 9 0-20 Amp ammeter**
- 10 12 Volt Battery toggle switch**
- 11 12 Volt Battery toggle switch on indicator**
- 12 MS Connector for 24 Volt Battery**

MODEL 12/24 P/N P-10C

I. GENERAL

- A. The P-10C is a multi-output battery charger for both 12 and 24 volt batteries. The unit will charge from 1 to 10 12 volt batteries or 1 24 volt battery. A toggle switch selects the 12 or 24 volt mode. The unit was initially designed for the Optima “Red Top” batteries used in military vehicles such as the 8 battery bank in the Expeditionary Fighting Vehicle. The P-10C can charge and re-condition (conditioning charge) each of the 8 12 volt batteries in the bank, thus charging, restoring if required, and balancing each battery individually. The unit can also charge any individual or bank of 12 volt sealed or vented lead acid battery other than the “Red Top.”

The P-10C also has a separate DC cable with a NATO connector. This can be plugged into the vehicle DC power receptacle and charge the vehicle 24 volt battery bank and/or assist the batteries during the vehicle’s pre-start procedures. A current limit of approximately 50 amperes** assures that the maximum output of the unit is available to relieve the battery drain during pre-start. This conserves the batteries for actual starting and will also contribute to starting current, as the P-10C will not overload or cut-out even when connected to the batteries during starting. Therefore, if left Powered-On, the unit contributes current for pre-start, starting and recharging after starting.

** CAUTION

The P-10C is designed for operation as a battery charger for the 12 volt battery operation, and as a charger/DC power augmentation unit for 24 volt operation. It is designed for operation at a 50 degree C ambient temperature.

However, in the 24 volt mode, if the unit is operated at a continuous high output at a high ambient temperature, the current control knob should be set to the dot position, to a maximum of about 35 amperes. This limit can be set internally so that even if the control knob is set to maximum, the current will not exceed 35 amperes. An adjustment of a trimpot located on the left panel inside the unit can be set in a CCW direction so that the output current is limited to 35 amperes, even when the current control knob is set to full maximum.

II. AC INPUT/OUTPUT

- A. The P-10C requires a nominal 120 volt 60 hz AC input. The line cord and plug are standard 3 wire USA 125 volt AC.
- B. 12 Volt Output: The total of all 10 stations of the 12 volt outputs (15 volts charge) will deliver approximately 50-60 amperes DC. At 60 amperes, the AC current will be approximately 12 amperes, therefore any 15 amp 120 volt source will be adequate. The unit is provided with 10 6 foot long DC cables with plug-in connector to the unit and plier-type solid copper alligator clamps for the battery.
- C. 24 Volt Output: The 24 volt output (29 volts at the end of charge) will be 50 amperes DC maximum. The AC draw is 18 amperes, therefore a 20 ampere 125 volt AC line is required. However, if only a 15 amp AC line is available, the DC current adjust knob may be set to less than maximum so that the AC current draw will be within the capacity of the AC line. (See operating instructions.) the 24 volt DC cable (29 volts charging) is 15 feet long. The voltage to the battery is sensed at the NATO connector, and read on the panel digital meter.

III. OPERATING INSTRUCTIONS

A. General

The P-10C has 10 sets of cables for the multi-station 12 volt battery charge. Therefore, from 1-10 batteries may be charged simultaneously.

B. Optional Battery Voltage Pre-Balancing Before Charging

A feature of the P-10C is the ability to self-balance the voltages of individual 12 volt batteries of a set or bank of the same type of battery. This may be desirable if time allows for interchanging batteries among vehicles, some of which were used more frequently or differently (more starts, less charge time, etc.) than other vehicles or even for differences in batteries in the same bank.

Note: No AC power is required to balance, as the higher capacity, therefore higher Open Circuit Voltage batteries will drain into the lower ones, lifting the lower batteries voltages until each battery of a bank is exactly the same voltage.

1. Set all 12 volt station switches to the "Off" position (lower part of the switches pressed in)

2. With 12/Off/24 volt switch in the “Off” position, or without plugging-in the AC line, connect each of the 12 volt batteries to a 12 volt charging station.

NOTE: Observe polarity, if incorrect, the red reverse polarity lamp will light and warning signal/beep sounds.

3. Put the station switches for each battery “On.” The switch LED lights, some battery currents will read below scale, some high circuit-breakers may trip if current is too high, then reset itself. Those reading below scale are feeding current into the high scale reading batteries.

When all batteries read approximately the same low scale current, the batteries are balanced and ready for charging. A multimeter may confirm the voltages of each battery.

NOTE: If balancing is done, and when the batteries are being charged, any battery(s) that reads higher charge current than others should be observed for heating and that they taper in current. A battery or batteries that read differently from most of the others under charge are to be specially observed and noted as they may be aged, defective, etc.

CHARGING 12 VOLT BATTERIES

1. Plug unit in to a 115 volt 60 hz standard AC line.
2. Important – check all 10 station rocker switches. THEY ALL MUST BE OFF
3. Set Timer. 4 hours recommended unless the application requires different time
4. Switch to 12 volt position on the 12V-OFF-24V switch.
5. Connect battery(s). Observe polarity. If any are reversed, the “RED” lamp will illuminate and loud continuous beep sounds. Correct the polarity before proceeding.
6. Switch on the rocker switch (es) corresponding to the connected battery(s). The switches LED(s) will illuminate red, and corresponding ammeter will read.

NOTE: When the switches are turned on, some ammeters may read upscale and some read below scale, this is due to higher voltage battery(s) (below scale) feeding lower voltage batteries (upscale). These are currents between batteries which eventually tend to balance all battery voltages. Pre-balance as in III B will allow a closer balance, but is optional depending on field experience.

7. If the current control knob is turned completely clockwise to maximum and the battery(s) are accepting high charge current, the internal circuit breaker for each station will trip-out that station, and then reset it self, then repeat this cycle until the station charge current tapers below about 15-20 amperes
8. If the internal breaker clicks on and off rapidly, adjust the current control knob so that no ammeter reads greater than about 20 Amps. NOTE: Off –scale amperes will not damage the ammeter. An internal circuit breaker will trip at a higher current, then reset itself.
9. When circuit breaker on-off cycling stops, and the current knob is set to Max, continue charging until all battery amperes read under about 3-4 amps. The digital voltmeter will read approx. 14.8 -15 Volts. The batteries are now charged, but may be left on charge until the completion of the timer setting. If they are not charged i.e.: Current is above about 5 amperes, the timer may be reset by switching to “OFF”, then back to the 12 volt position.

NOTE: When the timer red pointer reaches the box near zero time, the charge current will stop, but the fan remains on for about 5 Minutes Cool-Down.

10. Fast Charge for One or More Batteries: If one or more batteries require a higher charge to bring it up quickly, charge stations may be connected together (paralleled) to drive more current to a battery – connect 2 or even 3 sets of battery clamps together onto the battery terminals – the current will divide among the connected stations. For example, if 2 stations are connected, 40 amps (20 from each station) can be obtained

to quick-charge a battery. Observe Polarity – Red to red (positive) black to black (negative).

I. CONDITIONING

If a battery is left uncharged for a long period of time, or discharged without recharge for even a couple of days, it may be sulfated. A chemical coating occurs internally on the battery plates and the battery may not accept charge. This is exhibited by a Low Open Circuit Voltage (OCV) at or lower than about 12 volts, and it will not support a load (voltage collapses).

The battery(s) require a conditioning charge.

Conditioning Procedure:

- a. Set the timer to 8-10 hours
- b. Set the current knob to max
- c. Charge the battery(s) – the charge current will be low initially, the voltage will be about 29 volts. As the charge current increases, the voltage will lower. This indicates that the battery is accepting charge.
- d. Allow to charge normally, or the current adjust knob can be adjusted if there are rapid on/off clicks. The battery will eventually (can take 5-6 hours or more) taper in current and increase to 29 volts. When it is down to 2 or 3 amperes, the battery is restored/conditioned.

CHARGING 24 VOLT BATTERIES

1. Read the 12 volt instructions for reference. The 10 12 volt station rocker switches and analog meters are not in operation on 24 volts. Warning: Do not connect 12 volt batteries when in 24 volt operation.
2. Recommended timer setting is 6 hours. Although depending on battery state of charge, charge may require more or less time, and can be set to the full 10 Hours.
3. Connect the battery connector to the vehicle.
4. Set the current control to minimum, switch to 24 Volts. The battery open circuit voltage will be displayed.
5. Turn the control knob to the dot on the control knob legend plate. Charge current will display, and battery voltage will slowly rise.

NOTE:

- On 24 volt charge, the charge current knob may be initially set to maximum if the AC line will go to about 18 amps.
 - Charge current will never exceed 50 Amperes under any condition. The unit can be powered with the knob set high.
 - An on/off circuit breaker for the 24 volt mode is located on the top of the unit. The switch guard and switch toggle can be pushed toward the rear to cut DC power to the cable in an emergency.
6. The P-10C can charge the battery and also power the vehicle. Therefore it may remain connected to the batteries while the vehicle is being powered and also when the vehicle engine is started. In either case, it will continuously contribute about 45-50 Amperes to the vehicle. The current limiting feature of the P-10C prevents overload of the unit, or false trip of its breaker.

I. MAINTENANCE

A. General

The P-10C has been ruggedized for military use and is protected within limitation against rain. Louvers allow air flow and rain protection, but wind blowing or splattering may allow some rain in the unit. Therefore during rain operation, the unit should be placed in an upright position instead of at an angle or horizontal.

B. Cleaning

1. The louvers are not filtered so that maximum air flow is obtained. Therefore, a periodic clean-out of the unit should be provided by blow-out with dry compressed air. The front rear or top panels of the unit may be dropped by removing the bolts

holding the panel(s). At this time, inspection for tightness of components and connections should be made.

2. Meters, Timer. Do not use solvents or abrasives to clean, but apply acceptable cleaning methods for electronic equipment. The cart is rated to carry 550 lbs. The unit weighs approximately 100 lbs.
3. Cart. The pneumatic tires of the cart should be periodically checked for pressure. Rated pressure is 20 PSI. The cart should be kept clean and free of dirt and debris especially around the wheels.
The wheels have roller bearings on the inside of the hub, with a sleeve bearing inserted. Removal of the wheel is easily done by removing the 4 inch bolt and nut retaining the wheel to the cart. Clean the bearing periodically and coat with a light bearing grease.

II. CALIBRATION

A. General

The P-10C does not require periodic calibration, but is shipped with a factory calibration certificate certifying that the unit had been calibrated with instruments traceable to the National Institute of Standards and Technology (NIST).

However, the unit's digital ammeter and voltmeter should have their readings verified when convenient or required by the user or manager of the equipment. To verify these, a calibrated multimeter such as the various Fluke models including the military Fluke 77/AN which reads DC volts and DC millivolts, is required.

B. Test Jacks

There are 2 sets of test jacks, one set near each digital meter. The test meter is plugged into these jacks and output is verified. Use the DC volts scale of the test meter for volts and DC millivolts scale for amperes. The millivolt reading is a direct reading of amperes.

Note that the 2 digital meters of the unit seldom if ever go out of calibration after initial factory setting. However, if one or both meters fail they cannot be repaired as they are encapsulated, and must be replaced.

C. Shunt

The ammeter shunt reads one millivolt per ampere, and if an outside shunt is used to verify the ampere reading, we suggest a 100 amperes 100 millivolt calibrated shunt.

D. Analog Ammeters

The 10 analog ammeters have an accuracy of approximately +/- 5% of full scale, or for this 20 amp scale, +/- 1 ampere at any reading. They do not require accuracy for telling if the 12 volt battery is charged, only that the current has tapered to a low value such as 2 or 3 amperes when the voltage is approximately 15 volts.

There is no adjustment on these 10 analog meters, but they can be checked against the digital ammeter, one analog ammeter at a time.

III. ADJUSTMENTS

A. General

There is one current control knob on the P-10C which is used for charge current limiting. The charge voltage for 12 and 24 volt charge is not adjustable from the front panel, but is factory set to 15.0 volts for the 24 volt charge.

B. Changing the Maximum Voltage

Although the above voltage settings are now the set values, under certain conditions such as when the batteries are always in a very hot or a very cold location, these can be changed by a 12 and a 24 volt trimpot located on the left inside of the unit. For example, it may be better generally to set the 24 volt mode to 28 volts for continuously hot conditions, and 31 volts for cold conditions. For the 12 volt mode, 13.8-14 volts hot and 16 volts cold may provide a more efficient/faster charge. The voltage trimpots are marked 12V and 24V.

If any doubt, the factory settings of 15 and 29 volts are recommended.

NOTE: To change the voltages, a charged battery drawing only 1-3 amperes should be connected to set the end-voltage. A capacitor such as 220 MFD 35 volts can also be used – contact factory for additional information.

IV. TROUBLESHOOTING

A. General

The P-10C has 2 output configurations. For 12 volts, the unit has a full-wave center-tap with 2 SCR's. The 24 volt output uses a full-wave bridge with 2 SCR's and 2 diodes. Power contactors are switched between configurations.

A regulator/gating PCB controls the gating to the SCRs and therefore regulates the DC charge voltage and current to required values.

SPECIFICATIONS

DIMENSIONS:

CASE	27 in. H x 18 in.W x 14 in.D
UNIT ENCLOSURE	19 in.H x 14 in.W x 10 in.D
OVERALL WITH CART (Handle Folded Down)	33 in. H x 27 in.W x 25 in.D
WEIGHT WITH CART AND CABLES	178 Lbs

AC INPUT 115V 60Hz 18 AMPERES MAX

DC OUTPUT 15V 10 STATIONS TOTAL OF 60 AMPERES

OR 29V 50 AMPERES

NOTES:

- a. THE CURRENT ADJUSTMENT KNOB ALLOWS CONTROL OF OUTPUT CURRENT FOR 15 AMPERES AC INPUT MAXIMUM IE: 38 AMPERES DC, 28 VOLTS DRAWS 14 AMPS AC.
- b. VOLTAGE IS SENSED AND REGULATED AT THE NATO PLUG END OF THE 24 VOLT CABLE AND AT UNIT ENDS OF 12 VOLT CABLES. VOLTAGE REGULATION IS APPROXIMATELY 1 VOLT FROM 25 AMPS DOWN TO 2 AMPS.
- c. IF THE CURRENT CONTROL KNOB IS USED TO SET A CURRENT VALUE, THE CURRENT WILL REMAIN CONSTANT AT APPROX. 2% UNTIL THE CURRENT TAPERS BELOW THE SET VALUE.

TROUBLESHOOTING

<u>SYMPTOMS</u>	<u>POSSIBLE CAUSE/ CORRECTIONS</u>
A. AC input, but no DC output.	1. Timer set to zero – must have time set, green timer light must be on. Timer may have completed time, but fan runs for 5 minutes. 2. Current control knob set to zero – turn CW. 3. AC circuit breaker on side of unit is tripped. Remove load, reset. 4. DC circuit breaker on top of unit is tripped.
B. 20 amp AC circuit breaker on side of unit trips, will not remain reset.	Shorted diode or SCR – call factory.
C. In the 24 volt mode, there is high DC voltage on the voltmeter, (33-35 volts), no DC current.	The DC cable is not plugged into the connector on top of the unit. DC cable or connector is defective. See Cable Wiring diagram in this manual, check for continuity.

For any problems or questions, the following are contact numbers:

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If a unit has to be returned to the factory, either location can be used. Unless there is a problem with the cart or the black plastic case, remove the unit by releasing the two latches on top of the metal enclosure and tilt the unit to slide out.

Latest Version – April 1

My documents/Operating Instructions Battery Charger 12 24 Volt P-10C