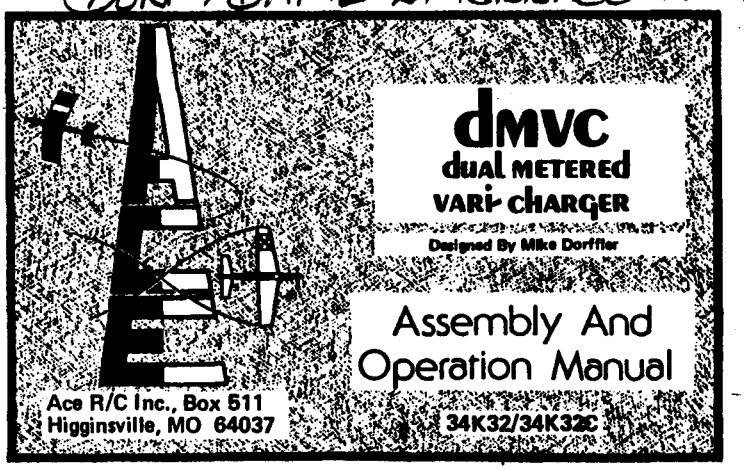
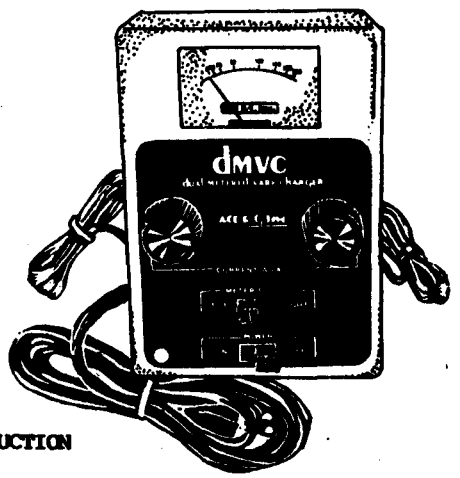
VON ADAMS 21 TEICACE HILL DR. GREENE N.Y.





I. INTRODUCTION

The Dual Metered Vari Charger is a high output, variable rate, constant current, dual output solid state charger designed to fill all ordinary plus specialized charging needs of today's R/C'er. It is a rugged, dependable, and attractive device and will provide many years of service.

Capable of charging either one or two 1-10 cell ni-cd packs at up to 250 ma of current, it is perfect for small, standard, large, or very large packs up to 2500 mah capacity. Will also work to charge a 12 V starting battery or other lead-acid cells.

A meter accurately monitors both outputs so the exact current going into the batteries is known. No guesswork, no worry.

If you have obtained an assembled unit, proceed to the Connector Wiring and Operation Sections for proper use of your DMVC. If you are building a kit, skip to the Construction and Checkout Sections when the unit is complete.

II. CONNECTOR WIRING

CAUTION: Proper polarity MUST be maintained at all times. If it is reversed at the batteries being charged, severe damage can result.

COPPER COLORED WIRES = POSITIVE (+, RED)
SILVER COLORED WIRES = NEGATIVE (-, BLACK)

If your situation requires longer wires than furnished with the unit, use wire at least as heavy as the cables used on the DMVC.

Both the left and the right outputs of your DMVC are identical and can be used for charging receiver packs, transmitter packs, or whatever your needs are. In any event, some type of connector will need to be installed on the output cables to accomodate the batteries being charged. This may be a charge plug to mate your system or simply alligator clips to hook to the battery being charged. You may want to use Dean's Connectors (Ace No. 19K54) and make up adaptor cables to accomodate whatever system is being charged. Ace has charge connectors to fit many popular brands of radios; write or call for details. If it is necessary to splice, heat shrink tubing is supplied to insulate the joint.

Always make sure PROPER POLARITY IS MAINTAINED!
Always make sure the JOINTS ARE SECURE!
Always make sure the JOINTS ARE PROPERLY INSULATED!

COPPER COLORED WIRE = POSITIVE (+, RED)
SILVER COLORED WIRE = NEGATIVE (-, BLACK)

III. OPERATION

A. CHARGE RATES

Some basics on ni-cd battery charging are in order.

When charging batteries with a charger such as the DMVC, we are concerned about the charge rate, or the amount of electrical energy flow that is going into the batteries while being charged. This amount of energy flow, the charge rate, is measured in milliamperes (ma). The DMVC is capable of providing from 0-250 milliamperes of energy for one or two sets of batteries from 1.2 volts to 15 volts.

By definition, there are four different charge rates for ni-cds: Overnight, Quick, Fast, and Trickle.

OVERNIGHT: When charged at the overnight rate, discharged ni-cds will reach 100% of charge in 14 to 16 hours. This rate is determined by the formula C/10, or the rated capacity of the batteries divided by 10. So, if we are charging 500 milliampere hour (mah) batteries at the overnight rate, the rate would be 50 ma. For 900 mah cells it would be 90 ma; 1200 mah, 120 ma; etc. This rate is the most commonly used in R/C. It is also the safest because ni-cd batteries can be left on charge at this rate for extended periods (days, even weeks) without damage. (The preceeding statement is for ni-cd batteries only, not lead-acid.)

QUICK: Discharged batteries charged at the Quick Rate will reach full charge in 4-6 hours. It is determined by the formula C/3 or the capacity divided by 3. For 500 mah batteries it would be 166 ma; 900 mah would be 300 ma; 1200 mah, 400 ma; etc. It is not recommended that the batteries be left on beyond the 6 hour period or overcharge could result. Also realize that only batteries up to 750 mah can be charged at the quick rate with the DMVC.

FAST: The Fast Rate will charge ni-cds in 15 minutes or less. It is determined by the formula 3C or three times the capacity. For 500 mah batteries, this would be 1500 ma or 1.5 amps. It is not recommended for R/C receiver and transmitter batteries because the charge time is very critical to prevent overcharge and damage. Of course, the DMVC is not capable of delivering the current necessary for fast charging; only specialized chargers for fast charging should be used.

TRICKLE: The Trickle (or Float) rate replaces the energy that ni-cds lose by just setting around. It is defined by C/50 (capacity divided by 50); for 500 mah batteries, it would be 10 ma; for 1200 mah, 24 ma; etc. Ni-cds can be left on trickle indefinitely without damage and always be 100% charged. Realize that the batteries can't be charged up at this rate, only maintained. If you use the Trickle Rate, only do so after the batteries have been fully charged preferably at the overnight rate.

B. USING THE DMVC

Plug the DMVC into a wall outlet.

Without any batteries plugged in, turn the unit on. Note the LED comes on.

Plug a battery pack into the left output. Flip the "Meter Status" switch to the left side. Note that the knob on the left side varies the current going into the pack as displayed on the meter and you can set the charge rate as desired.

Plug a pack to the right side of the DMVC and flip the "Meter Status" switch; note the right knob now varies

the rate on the right side. When you do so, the current setting on the left side is not affected by monitoring and adjusting the right side and visa versa. Once the adjustment knobs are set for the desired current, that current will remain constant until the batteries are unplugged.

The LED performs an additional function. If you have one pack plugged in properly and the power switch is OFF, the LED will glow, showing proper polarity of hookup (assuming the pack has enough charge in it to light the LED). This test is only valid if one pack is plugged in to one side or the other; not if both sides are occupied. This safety feature is important to keep in mind when hooking up the batteries; but, because of this feature, do not leave the batteries plugged in with the unit OFF, because they wil discharge thru the LED.

You'll find the DMVC a safe, dependable, versatile charger for all your routine and special charging needs. With proper care, it will last for many years.

IV. PARTS LIST

RESISTORS

( )	1	R2-24X	2.4ohm 1/2 W.1% (Red, Yell, Gold, Brown)
( )	4	R2-100	10 ohm 1/2 W. (Brown, Black, Black)
( )	1	R2-391	390 ohm 1/2 W. (Orange, White, Brown)
( )	2	R4-121	120 ohm 1/4 W. (Brown, Red, Brown)
( )	2	R4-123	12K 1/4 W. (Brown, Red, Orange)
( )	2	R4-151	150 ohm 1/4 W. (Brown, Green, Brown)
( )	1	R4-331	330 ohm 1/4 W. (Orange, Orange, Brown)

CAPACITORS

( )	1	CE108PI	1000mf Electrolytic Capacitor
( )	2	CE475PI	4.7mf Electrolytic Capacitor

SEMICONDUCTORS

( )	2	SS000B	MJE180 Transistor
( )	1	SS041	LM340L 5.0 V. Voltage Regulator
( )	1	SS074	Small Red LED
( )	1	SS108	LM358 IC
( )	4	SS120	IN4001-5 Diode

HARDWARE AND MISCELLANEOUS

( )	2	HW009	Pot Nuts
( )	2	HW010E	3mm x 6mm Phillips Head Bolts
( )	2	HW011E	No. 4 Lockwashers
( )	4	HW082B	4-40 x 1/4" Flat Head Bolts
( )	4	HW002	4-40 Hex Nuts
( )	2	HW111	#2 x 3/16" Self Tap Screw
( )	2	HW 139	Mica Transistor Insulator
( )	1	HW171	#6 Solder Lug
( )	1	LB110	DMVC Label
( )	1	MT011	DMVC Meter
( )	1	PC163	DMVC PC Board
( )	2	PLA008A	Pot Knobs
( )	1	PLA022	Small Wrap 'N Tie
( )	1	RP016	No. 3 Line Cord Grommet
( )	4	RP025	Rubber Feet
( )	2	RV155	5K Pot
( )	1	SM 198	DMVC Case
( )	2	SW001	DPDT Slide Switch
( )	1	TB026	3/32 x 1" Heat Shrink Tubing
( )	2	TB027	1/8" x 1-1/2" Heat Shrink Tubing
( )	1	TT018	DMVC Transformer
( )	1	WW073	Three Conductor Line Cord
( )	6" ea.		Hookup Wire (Orange, Green)
( )	36"		Two Conductor Output Cable
( )	36"		Solder

V. CONSTRUCTION

( ) Read the "Kit Builder's Hints" thoroughly.

( ) Check parts received against Parts List. Notify Ace R/C immediately of any shortages.

( ) Refer to Figure 1 Overlay Drawing and Parts ID Legend for the following steps.

( ) Begin by installing and soldering R1 (2.4ohm 1/2 W. 1%). Clip off leads and save for the next step.

( ) Note that there is a jumper that must be installed on the circuit board. Use one of the resistor leads saved from the preceeding step. Carefully bend the lead so it will lay flat and straight between the holes, and solder into place, clip off excess leads.

( ) Install and solder diodes D1-D4 (IN4001-5) making sure the banded ends (cathodes) are as shown on the overlay drawing figure 1.

( ) Install and solder all other resistors except R6, and R10 Make sure all resistors are in the proper place, check the PC Overlay drawing, Figure 1. while doing this.

( ) Install C2 and C3 (4.7mf Electrolytic capacitor) as shown on the Overlay Drawing Figure 1, making sure to note polarity. Use the part I.D. Picture of electrolytic cap to determine negative and positive leads. Bend leads so that electrolytics lay flat against the P.C. Board as shown. Solder in place.

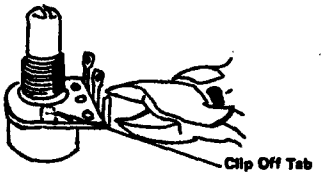
( ) Install and solder U1 (LM340L) making sure the flat side is positioned properly and the bottom of the device is about 3/16" from the P.C. Board.

( ) Install IC-1 (LM358), Make sure the identifying mark is downward toward the switch location. Double check the Overlay Drawing, being certain that it is installed properly, and then solder all 8 pins into place.

( ) Install LED in P.C. Board with the flat side toward the bottom of the board. Leave the bottom of the LED 1/4" from the board, (it will not be down against P.C. Board.) Solder into place.

( ) Install and solder S1 and S2 as shown on Overlay Drawing. The base of switch should lay flat against the board.

FIGURE 2
BENDING POT TERMINALS



( ) Carefully re-bend the three terminals of R6 and R10 so they point toward the end of the pot shaft and are parallel to it. Bend the Small tab on the side of the pot back up against the pot body, or cut it off. Trim off the pot terminals as shown in Figure 2. Note- if any of the terminals broke, a simple repair can be made with a resistor lead.

( ) Insert the threaded part of the pot from the Bottom (circuit side) of the board. . . line up and insert pot terminals through the appropriate holes. Use nut provided to secure the pot to the board. Solder the terminals to the board.

( ) Reread the section in the "Kit Builder's Hints" on wire preparation and installation.

( ) Cut the 36" two conductor output cable into two 18" lengths. Separate both ends of each cable for about 1".

( ) Prepare each end of all wires by stripping off 1/8" insulation, twisting the strands together and applying a small bit of solder to "Tin" wire.

( ) Referring to Wiring Diagram (Figure 3) install and solder the green and orange wires to the P.C. Board. Twist these two wires together.

( ) Referring to the Wiring Diagram (Fig. 3) Install and solder the left and right output wires noting polarity and making sure copper wires are to positive (+) and Silver wires to negative (-).

( ) Prepare the end of the three conductor line cord by carefully slitting the black insulation on both sides of the center green wire for about 1/2" with an X-acto knife; then, by hand, peel the two outer wires apart for about 1". The green wire should now be free and about 1" long.

( ) Strip 3/16" insulation off all 3 wires, twist, and tin with solder.

( ) Slip the No. 3 Line Cord Grommet over the end of the A/C line cord.

( ) Solder the center green wire to the end of the No. 6 Solder Lug that has the small hole.

( ) Referring to Figure 3 A,Install and solder line cord to P.C. Board as shown. LINE CORD IS SOLDERED ON CIRCUIT SIDE (BOTTOM SIDE) OF PC BOARD.

( ) Measuring from transformer, cut black wires 4" from transformer and leave the red wires as they are. Strip off 1/8" of insulation from these wires, twist strands together and "tin" with a small amount of solder.

( ) Install and solder the black and red transformer wires as shown in Wiring Diagram, figure 3. Either black wire can go in either hole indicated; same goes for the red wires.

( ) Install C1 (1000mf electrolytic capacitor) on BOTTOM (circuit side) of Board, noting polarity as shown on Overlay Drawing (fig. 1). Bend the leads of electrolytic cap so that it lays flat against P.C. Board and is parallel to it. Solder into place and clip excess leads from component side of board.

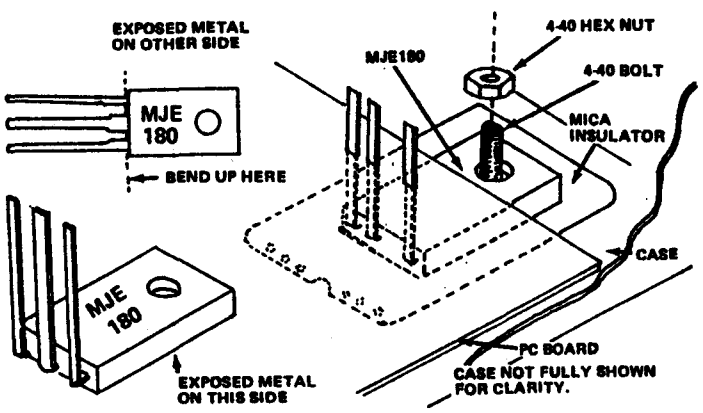
( ) Clean bottom of P.C. Board with alcohol and an old toothbrush. Carefully inspect for missed joints, solder bridges and misplaced components.

( ) Bend the leads of Q1 and Q2 as shown in Figure 4. Try to bend the leads as accurately as possible.

( ) Install Q1 and Q2 into P.C. Board but do not solder yet.

( ) Route the transformer wires as shown in figure 5 (Mechanical Assembly drawing).

FIGURE 4
MJE180 INSTALLATION

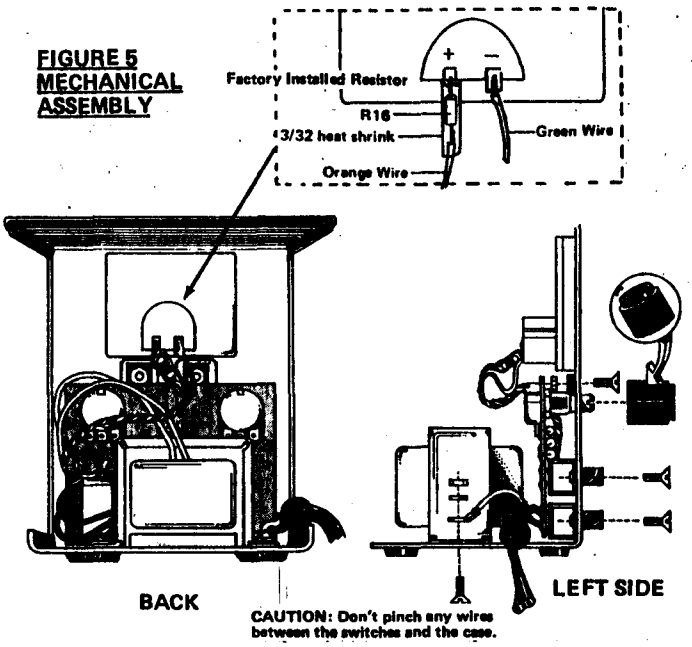


( ) Fit the P.C. Board into case lining up switches with switch holes and pot shafts with knob holes. make sure LED is lined up with the small hole in the bottom left hand corner of the case front. Be sure the left and right output wires are routed toward the outer case sides with left going left and right going right, from the front of the case.

( ) Slip a Mica Insulator between Q1 and Q2 and the case. install but do not tighten a 4-40 flathead bolt and nut into each transistor to hold it in place. See Figure 4.

( ) Secure the P.C. Board into case with two 3mm x 6mm Phillips Head bolts tightened securely into the bottom switch. Make sure switch is flat against case and P.C. Board is parallel to front of case. See Figure 5.

FIGURE 5
MECHANICAL ASSEMBLY



( ) Adjust transistors Q1 and Q2 so they are flat against the case and well insulated with the Mica insulators. Tighten the bolts fastening Q1 and Q2 securely to the case. See figure 4.

( ) Push on the back of pots (R6 and R10) until the threaded bushing is against the case front and solder Q1 and Q2 into place. Clip off excess leads.

( ) Center the face of meter into case front making sure the meter reads correctly from the front of case. (Meter is positioned at the top of the case, make sure it doesn't read upside down.)

( ) Glue meter into place. (Glue is not included in kit.) We recommend using R-TV Silicone Rubber Sealant, but an acceptable alternative would be a thick cyanoacrylate adhesive such as "Hot Stuff Super T".

( ) Install the transformer into place as shown in Figure 5 with two 4-40 x 1/4 FH bolts, lockwashers, and nuts, making sure the Solder lug that is attached to the green line cord wire is installed between the lock washer and transformer case. Tighten securely.

( ) Install transformer into case using two 4-40 flathead bolts with lockwashers and nuts, tighten transformer securely to case.

( ) Slip the 3/32 x 1" heat shrink tubing over the orange wire.

( ) Solder the Orange wire to the exposed end of the factory installed resistor already on the positive terminal of the meter. Slide the heat shrink tubing over the resistor and close to the meter. Shrink with a hair dryer to insulate the joint. (See Figure 5).

( ) Solder the green wire to the negative (-) terminal of the meter. Make sure the orange wire goes to the resistor on the positive (+) terminal and the green wire goes directly to the negative (-) terminal.

( ) For strain relief, put a nylon Wrap 'n Tie around the line cord between the PC board and the grommet so there is a bit of slack in the line cord when the case back is installed. (Fig. 3A) Trim off the excess Wrap 'n Tie.

( ) Fit case front to case back sliding the line cord grommet into the large slot in case back, and having the left and right output cables through the small slots in the case back. Being careful not to damage any wires.

( ) Mount the pressure sensitive label to case front centering it with the switches and pot shafts.

( ) Put the pot knobs over the pot shafts and tighten the set screw in the side of the knob to hold it in place.

( ) Install the rubber feet to the bottom four corners of the case.

( ) See Section II. Connector Wiring, and install proper connectors.

( ) After final checkout, secure the back with two #2 x 3/16 self tap screws.

VI. CHECKOUT

Checkout of your DMVC is simple and straightforward. No calibration is necessary.

Make sure the outputs are not shorting together and plug the unit in. Turn the DMVC on and note the LED lights.

Hook the left output up to a battery pack, maintaining proper polarity (silver wire to (-) negative, copper wire to (+) positive). Flip the "Meter Status" switch to the left and rotate the left knob. You should see the meter indicate current flow from 10-250 milliamperes, indicating proper operation.

Repeat for the right side.

That's all there is to it. Proceed to the Operation Section.

If the unit fails to operate properly, disassemble and recheck for proper parts placement, good solder joints, and no solder bridges. Double check the IC, voltage regulator, LED and transistor installation. Check the wiring hookup.

If the unit remains inoperable, refer to the "Kit Builders Hints" for service policies.

We hope you have enjoyed building your DMVC. Your comments are appreciated. We need your feed back for any improvements on this product or any other future products needed.

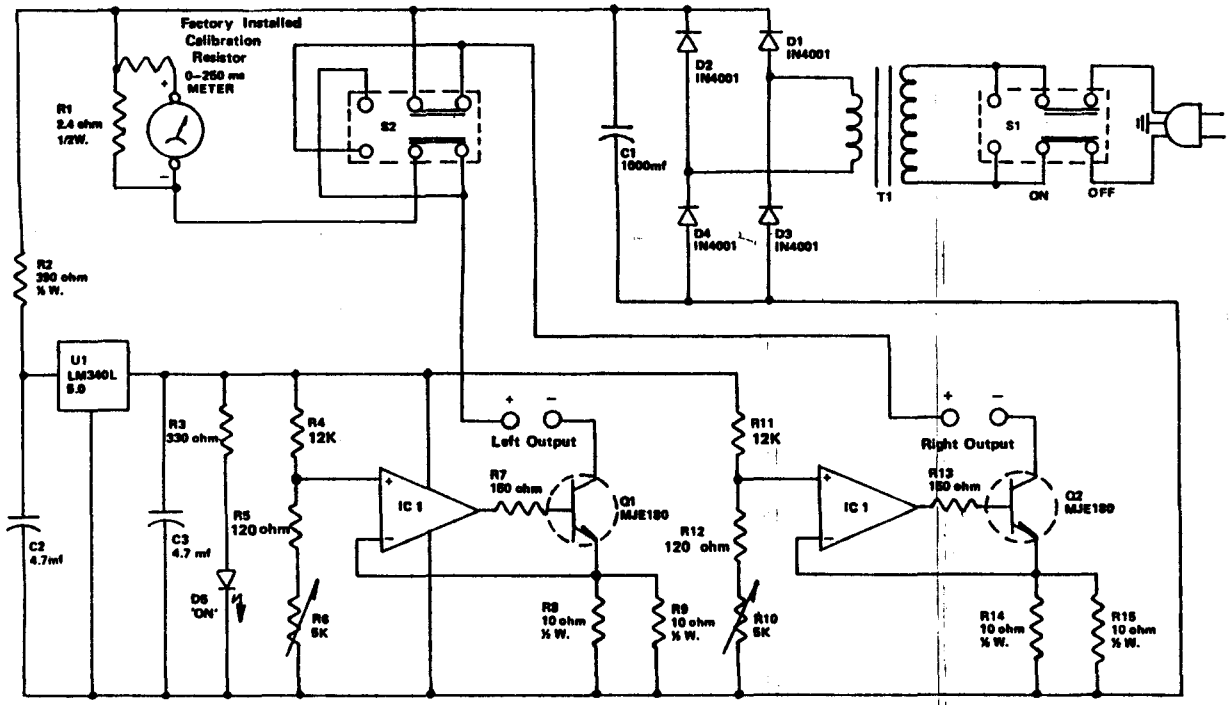


FIGURE 6
DMVC SCHEMATIC

VII. CIRCUIT DESCRIPTION

The Ace Dual Metered Vari Charger is a constant current design for charge currents as high as 250 ma at either output. Once set, the charge current will remain constant throughout the entire time the battery(s) are being charged.

The circuit employs a transformer, a diode bridge and a 1,000 mfd capacitor to transform the 115 VAC household current to about 16 to 20 volts D.C., depending on the charge currents being used.

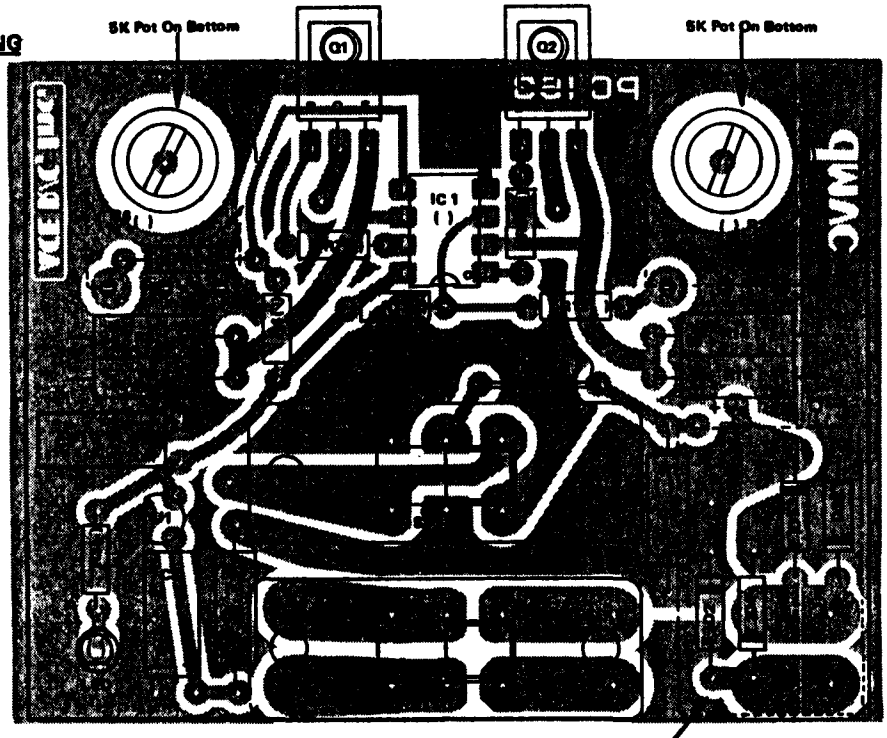
From this voltage, a 5 volt regulator is used to power an LM358 dual Op-Amps employed in the constant current circuitry. Each Op-Amp drives an MJE180 NPN power transistor which delivers the current to the batteries.

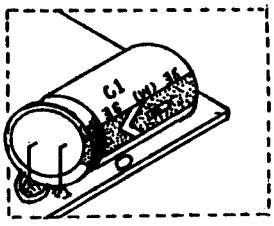
The two pots are used to select the charge currents by establishing a specific voltage at the (+) inputs of the Op-Amps. In doing so, a constant voltage is maintained across the transistor emmiter resistors and therefore a constant current through them.

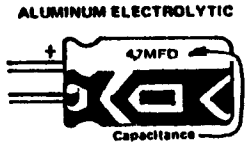
In addition to the on-off switch, another switch is used to engage the meter so it monitors the charge current of either charging circuit. It will not interupt or alter the setting of either circuit regardless of its position.

The meter is necessary to monitor and set the charge currents and has been designed to be quite accurate. In use the unit will run warm and is normal with any charger. It should be noted that as the charge currents increase, so does the heat disipated by the unit. Again, this is normal.

FIGURE 1
OVERLAY DRAWING







C1 – DO NOT INSTALL UNTIL INSTRUCTED

PARTS ID LEGEND

C1.....1000mf Electrolytic Cap. (Note polarity)
C2,C3.....4.7mf Electrolytic Cap. (Note polarity)

D1,D2,D3,D4.....IN4001-5 Diode (Note orientation of banded ends)
D5.....Small Red LED (Note orientation of flat side, elevate 1/4" from board)

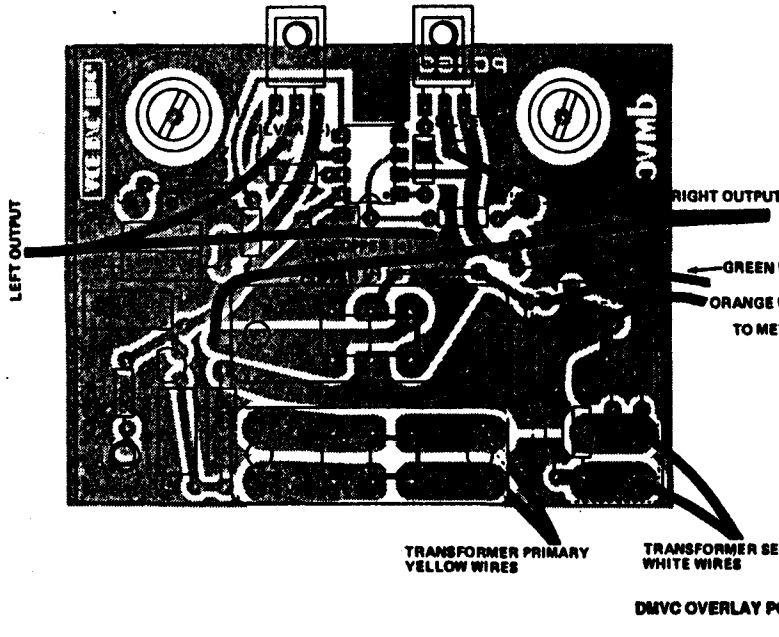
IC-1.....LM358 (Note orientation of mark identifying pin 1)

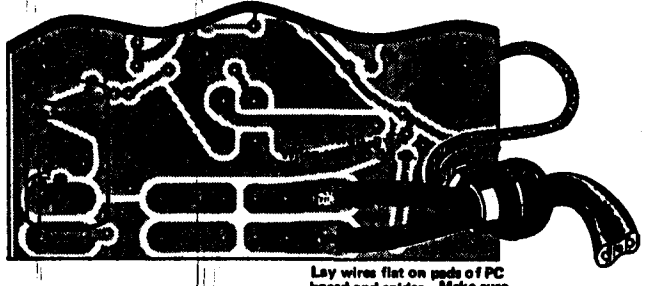
Q1,Q2.....MJE180 Transistor (Bend leads per Fig. 4, do not install until instructed to do so.)

R1..... 2.4 ohm 1/2 W. 1% (red, yel, gld, brn)
R2.....390 ohm ½W (org, wht, brn)
R3.....330 ohm ¼W (org, org, brn)
R4.....12K ¼W (brn, red, org)
R5.....120 ohm ¼W (brn, red, brn)
R6.....5K Pot (Bend and clip per Fig. 2) Mount on circuit side of board)
R7.....150 ohm ¼W (brn, grn, brn)
R8,R9.....10 ohm ½W (brn, blk, blk)
R10.....5K Pot (Bend and clip per Fig. 2, Mount on circuit side of board)
R11.....12K ¼W (brn, red, org)
R12.....120 ohm ¼W (brn, red, brn)
R13.....150 ohm ¼W (brn, grn, brn)
R14, R15.....10 ohm ½W (brn, blk, blk)

S1, S2.....DPDT Slide Switch

U1.....LM340L 5.0V. Regulator (note flat side and elevate 3/16" from board)





Lay wires flat on pads of PC board and solder. Make sure there are no frayed wires and joint is secure.

FIGURE 3 A
LINE CORD INSTALLATION