

**TL MICROWAVE RADIO
POWER SUPPLY
COMPONENT AND SUBASSEMBLY REPLACEMENT**

This section describes the procedure for replacing the J86499C regulator and inverter, the J86499D regulator, the J86499E battery voltage alarm, and the procedure for reforming the electrolytic capacitors. The necessity for replacing any of this equipment shall be determined from tests outlined in separate bell system practice sections. Replacement of any of the above equipment requires an out-of-service condition; therefore, rapid maintenance is mandatory. When it is necessary to remove equipment from service or restore equipment to service, see Fig. 1 of Section 409-308-500.

Warning: Voltages inside the power supply are higher than those usually encountered in the telephone plant. Avoid all contact with terminals as high voltages are present. Do not allow a test probe to touch two metal parts at the same time or destructive and dangerous short circuits may occur. Care should be taken to be sure that any parts of the power supply on which maintenance work is to be done are properly disconnected, and then restored to normal when the work is completed. Disconnect the power before removing internal plastic grids to work inside the power supply.

Tests contained in this section are as follows:

- (a) Replacing J86499C Regulator and Inverter
- (b) Replacing J86499D Regulator
- (c) Replacing J86499E Battery Voltage Alarm
- (d) Reforming Electrolytic Capacitors
- (e) Replacing Semiconductors

APPARATUS:

- 931 Weston DC Voltmeter (15- and 30-volt dc scales)
- KS-14510, List 1 Volt-ohm-milliammeter (VOM)
- Common Field Equipment

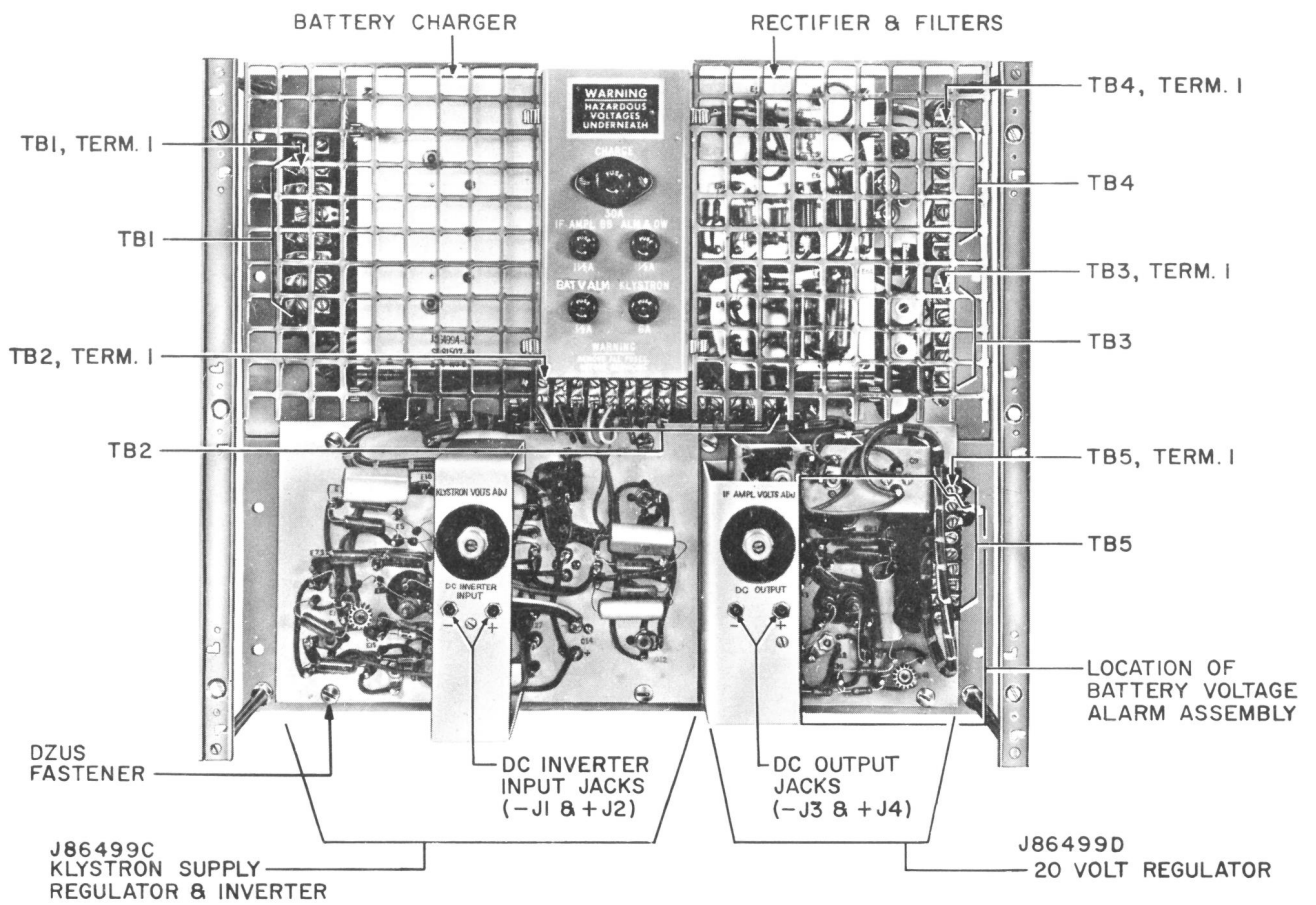
STEP	PROCEDURE
	REPLACING J86499C REGULATOR AND INVERTER
	APPARATUS:
	931 Weston DC Voltmeter
	KS-14510, List 1 Volt-ohm-milliammeter
1	Remove the four fuses (IF AMPL BB, ALM & OW, BAT V ALM, and KLYSTRON) from the front panel of the J86499A power supply, and open the 117-volt ac input line to the radio equipment. In the case of cabinet mounted equipment, this can be done by removing the 8-ampere fuse F2 in the ac distribution box located in the upper right-hand portion of the cabinet. In the case of the bay equipment in equipment shelters or buildings, use disconnects provided in ac power line.

STEP	PROCEDURE
2	Remove the power supply cover after the dc voltages, as indicated on the lower meter of the meter and control panel, have dropped to zero.
3	Remove the local cable card attached to the J86499C regulator and inverter from terminal strip TB2 of the J86499A power supply.
4	Loosen the four Dzus fasteners on the regulator and inverter and remove the regulator and inverter from the power supply.
5	Place a new regulator and inverter panel in the same location and tighten the four Dzus fasteners.
6	Connect the 931 Weston voltmeter (15-volt range) to terminals 4 and 5 of terminal strip TB3 of the J86499A power supply, the negative lead of the meter being connected to terminal 4.
7	Connect the local cable card attached to the J86499C regulator and inverter to the terminal strip TB2, replace the four fuses (IF AMPL BB, ALM & OW, BAT V ALM, and KLYSTRON) located on the front panel of the J86499A power supply and restore ac power to the radio equipment.
8	Five minutes after the klystron currents (XMTR CATH and RCVR CATH) have reached approximately their steady state value, adjust the KLYSTRON VOLTS ADJ potentiometer to obtain a reading of -10.5 volts on the 931 Weston voltmeter.
9	Check the -400 and -200 volts on the lower meter of the meter and control panel to ensure that they are within limits, as shown in Fig. 1.
10	If the voltages in Step 9 are not within limits, taps have to be adjusted on transformer T2 as described in Section 409-308-501.
11	Remove the four fuses (IF AMPL BB, ALM & OW, BAT V ALM, and KLYSTRON) from the front of the J86499A power supply located on the front panel, and open the 117-volt ac input line to the radio equipment per second part of Step 1.
12	After the dc voltages have dropped to zero as in Step 2, remove the 931 Weston voltmeter from power supply.
13	Replace power supply cover.
14	Replace the four fuses (IF AMPL BB, ALM & OW, BAT V ALM, and KLYSTRON) located on the front panel and restore ac power to the radio equipment.
15	Five minutes after klystron currents (XMTR CATH and RCVR CATH) have reached approximately their steady state value, align transmitter frequency and linearity and receiver automatic frequency control (AFC). (See Sections 409-304-501 and 409-306-501.) Equipment is now ready to be put back in service.
16	At the end of 30 to 45 minutes, readjust transmitter frequency, if necessary, and re-check receiver AFC alignment in accordance with the above sections.
REPLACING J86499D REGULATOR OR REPLACING J86499E BATTERY VOLTAGE ALARM (SEE PHOTO A AND FIG. 2)	
APPARATUS:	
931 Weston DC Voltmeter	
KS-14510, List 1 Volt-ohm-milliammeter	

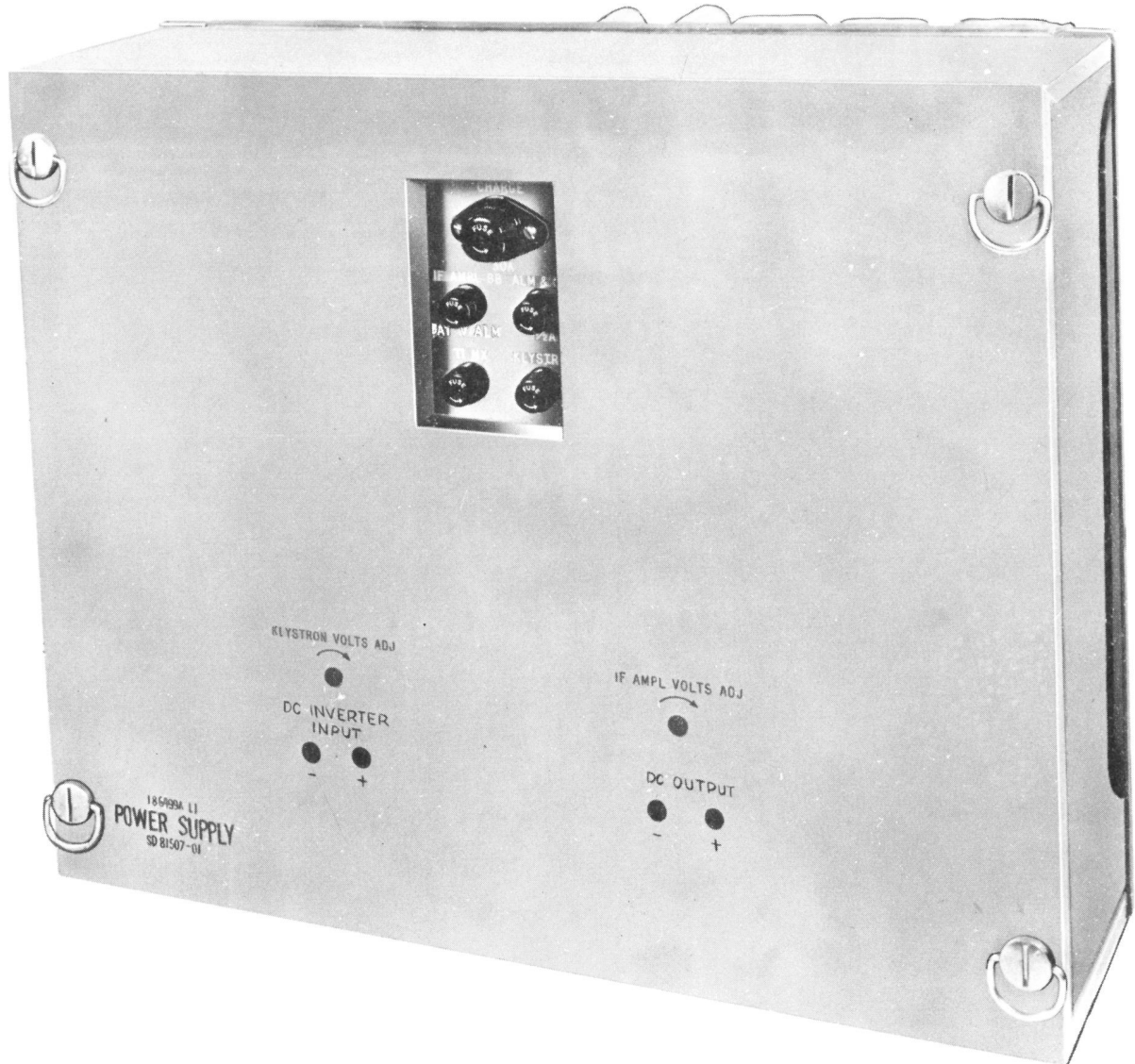
STEP	PROCEDURE															
	<p>The J86499D List 1, -20 volt regulator subassembly, which also contains the J86499E, List 1 battery voltage alarm subassembly when required, is removable from the power supply. It can be removed from the power supply by loosening the screws holding the spade terminated cables to terminal strips and loosening four Dzus fasteners. When either or both the -20 volt regulator or the battery voltage alarm circuits are defective, the quickest method for replacement is to remove the -20 volt regulator subassembly with the battery voltage alarm subassembly attached to it and install a new combined assembly. The defective and nondefective assemblies should then be separated and the defective unit sent to be repaired. The -20 volt regulator subassembly and the battery voltage alarm subassembly should always be connected together as spares where both are required to minimize replacement time.</p>															
17	<p>Remove the four fuses (IF AMPL BB, ALM & OW, BAT V ALM, and KLYSTRON) from front panel of the J86499A power supply, and open the 117-volt ac input line to the radio equipment per second part of Step 1.</p>															
18	<p>Remove the power supply cover after the dc voltages, as indicated on the lower meter of the meter and control panel, have dropped to zero.</p>															
19	<p>Remove the bay cable from terminal strip TB5, and the local cable card attached to regulator panel from terminal strip TB2.</p>															
20	<p>Loosen the four Dzus fasteners on the regulator and remove the regulator from the power supply.</p>															
21	<p>Place the new regulator with the battery voltage alarm attached, if required, in the same location and tighten the four Dzus fasteners.</p>															
22	<p>Connect the bay cable to the terminal strip TB5, connect the local cable card attached to the regulator to the terminal strip TB2, replace the four fuses (IF AMPL BB, ALM & OW, BAT V ALM, and KLYSTRON) located on the front panel, and restore ac power to the radio equipment.</p>															
23	<p>After a warmup time of 5 minutes, connect the 931 Weston voltmeter, with the scale set to the 30-volt dc range, to jacks -J3 and +J4 located under the potentiometer IF AMPL VOLTS ADJ on the J86499C regulator.</p>															
	<p>Requirement: Weston voltmeter should indicate -20 volts direct current.</p>															
24	<p>If requirement is not met, adjust potentiometer IF AMPL VOLTS ADJ so that the voltage indicates -20 volts direct current.</p>															
25	<p>Check the voltages on the lower meter of the meter and control panel as listed below.</p>															
	<table border="1"> <thead> <tr> <th>SWITCH POSITION</th> <th>LOWER METER INDICATION</th> <th>FULL-SCALE DEFLECTION</th> </tr> </thead> <tbody> <tr> <td>-400</td> <td>365 — 435 V</td> <td>600 V*</td> </tr> <tr> <td>-200</td> <td>180 — 220 V</td> <td>600 V*</td> </tr> <tr> <td>BAT</td> <td>21.1 — 29.2 V</td> <td>30 V*†</td> </tr> <tr> <td>-20</td> <td>19 — 21 V</td> <td>30 V*</td> </tr> </tbody> </table>	SWITCH POSITION	LOWER METER INDICATION	FULL-SCALE DEFLECTION	-400	365 — 435 V	600 V*	-200	180 — 220 V	600 V*	BAT	21.1 — 29.2 V	30 V*†	-20	19 — 21 V	30 V*
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-400	365 — 435 V	600 V*														
-200	180 — 220 V	600 V*														
BAT	21.1 — 29.2 V	30 V*†														
-20	19 — 21 V	30 V*														
	<p>* If the voltage is not within limits, see Section 409-308-501.</p>															
	<p>† If the power has been on for a prolonged period, the battery should be at or near full charge. Meter indication should be -27.6 ± 1.0 volts.</p>															

STEP	PROCEDURE															
26	Remove the 931 Weston voltmeter.															
27	If no battery voltage alarm is required, omit Steps 28, 29, and 30 and proceed with Step 31.															
28	<p>When the battery voltage alarm circuit is required and the batteries are fully charged (-27.6 ± 1 volts), check the battery voltage alarm circuit by opening the 117-volt ac input line to the radio equipment per second part of Step 1, and observe that the alarm relay on the battery voltage alarm panel releases before the voltage drops below 25 volts as read on the lower meter of the meter and control panel with the selector switch in the BAT position.</p> <p><i>Note:</i> When the 117-volt ac input is removed, the time interval required for the battery voltage to drop below 25 volts may vary from a few minutes to a few hours, depending upon the temperature and condition of the batteries.</p>															
29	Restoring the 117-volt ac input should cause the relay to operate when the battery voltage comes up 1 volt as indicated on the meter described in Step 28.															
30	Check the voltages on the lower meter as listed below on the meter and control panel:															
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-20	19 — 21 V	30 V*														
	* If the voltage is not within limits, see Section 409-308-501.															
	† If the power has been on for a prolonged period, the battery should be at or near full charge. Meter indication should be -27.6 ± 1.0 volts.															
31	Replace the power supply cover.															
32	After a warmup time of between 30 and 45 minutes, check the transmitter frequency as described in Section 409-304-501 before leaving the station.															
	<p>Separating and Mounting J86499E Battery Voltage Alarm Subassembly to J86499D -20 Volt Regulator Subassembly (see Fig. 2)</p>															
	<p>APPARATUS:</p> <p>Common Field Equipment</p>															
33	To remove the battery voltage and alarm subassembly from the -20 volt regulator subassembly, loosen the Dzus fastener on the battery voltage alarm panel and swing battery voltage alarm panel to the open position.															
34	Remove battery voltage alarm cable card from terminal strip TB5 located on the -20 volt regulator.															

STEP	PROCEDURE
35	Remove six screws holding battery voltage alarm panel hinge to -20 volt regulator.
36	To mount the battery voltage alarm subassembly on the -20 volt regulator assembly, repeat Steps 33 through 35 in the reverse order.
REFORMING ELECTROLYTIC CAPACITORS	
APPARATUS:	
See Section 032-110-701	
37	To reform electrolytic capacitors, see Section 032-110-701.
REPLACING SEMICONDUCTORS	
APPARATUS:	
Common Field Equipment	
38	When replacing semiconductors, it is <i>important</i> to use a heat sink between the semiconductor and the terminal to which the device is attached. Otherwise, the heat transfer along the conductor lead may permanently damage the semiconductor. (See Fig. 3.)



J86499A Power Supply — Cover Removed



J86499A Power Supply

TL RADIO SYSTEM
TROUBLE LOCATION CHART*

OUT OF LIMITS READINGS				POSSIBLE REASONS FOR OUT OF LIMITS METER READINGS ARE																									
	LIMITS	FULL SCALE DEF	TR KLY	REC KLY	PRECEDING STATION		53A DET 1	53A DET 2	1A MOD CR1	1A MOD CR2	CR1 & CR2	REC IF & BB AMPL	XMTR BB AMPL	13A MAG AMPL	FUSES					10.5V RECT BRDG &/OR FLT	-200V RECT BRDG &/OR FLT	-400V RECT BRDG &/OR FLT	REG & INV	EX-HAUST BAT	-20V REG				
					TR BB AMPL	TR KLY									KLY	IF AMPL & BB	OW & ALM	BAT VOLT ALM	CHGR										
J99262K METER & CONTROL PANEL	SELECTOR SWITCH																												
	-400	365-435 VDC	600 VDC																						X	X	X		
	-200	180-220 VDC	600 VDC																						X	X	X		
	BAT	21.1-29.2 VDC	30 VDC																									X	
	-20	19-21 VDC	30 VDC																									X	X
	RCVR AFC	D 12-20 VDC	30 VDC		X		X					X	X		X	X	X								X	X	X	X	X
	CR1	E 0.4-1.2 MA	6 MA		(X)				X			(X)	X		X	X	X								X	X	X	X	X
	CR2	E 0.4-1.2 MA	6 MA		(X)					X		(X)	X		X	X	X								X	X	X	X	X
	AGC	SEE FIG. 1 SEC 409-302-501	6 VDC		X		X		X	X	X	X	X		X	X	X								X	X	X	X	X
	CATH	33-50 MA	60 MA		X																				X		X	X	
	XMTR RF PWR	-1.0 - +6.0 DBM	+6.0 DBM	X			X																		X	X	X	X	
	CATH	33-50 MA	60 MA	X																					X		X	X	
	FREQ SWITCH																												
	IF	C 0 ± 7 UA	±50 UA		X		X						X		X											X	X	X	X
XMTR	25-40 UA (NO MOD)	±50 UA	X				X																		X	X	X	X	X
TEST JACKS																													
FIL J1 & J2	5.7-6.3 VDC																								X		X	X	
TEST POINTS																													
RCVR IF & BB AMPL	LIM IN	VOLTAGE STAMPED ON CHASSIS ±.03 VDC										X		X	X	X									X	X	X	X	X
XMTR BB AMPL	BIAS	7.0 ± 0.2 VDC											X			X											X	X	
J86499A POWER SUPPLY	-10.5	10.3 - 10.7 VDC																							X		X	X	
	-J1 & +J2	18.3-19.7 VDC																								X	X	X	
	-J3 & +J4	19.5-20.5 VDC																								X	X	X	
ORDER WIRE	2600 CPS LEVEL																												
	OW-IN **	-20 - -24 DBM									X	X		X	X	X								X	X	X	X	X	

X INDICATES OUT OF LIMITS READINGS

() INDICATES BOTH READINGS OUT OF LIMITS SIMULTANEOUSLY

NOTES:

A. METER NEEDLE UNSTEADY.

B. GRADUALLY DROPS TO -24 VOLTS.

C. WITH AFC ON, IF OUTSIDE ±7 UA CONSULT SECTION 409-306-502.

D. IF OUTSIDE 12-20 VDC CONSULT SECTION 409-306-502.

E. IF THE SUM OF CR1 & CR2 IS NOT 1.6 ± 0.1 MA, CONSULT SECTION 409-302-501.

* THIS CHART IS A GUIDE ONLY-SPECIFIC TROUBLES COULD GIVE OUT-OF-LIMIT READINGS WHICH DO NOT CONFORM EXACTLY WITH THE ABOVE PATTERN.

** MEASURED ON OW-IN JACKS ASSOCIATED WITH RECEIVER UNDER TEST.

Fig. 1 - Trouble Location Chart

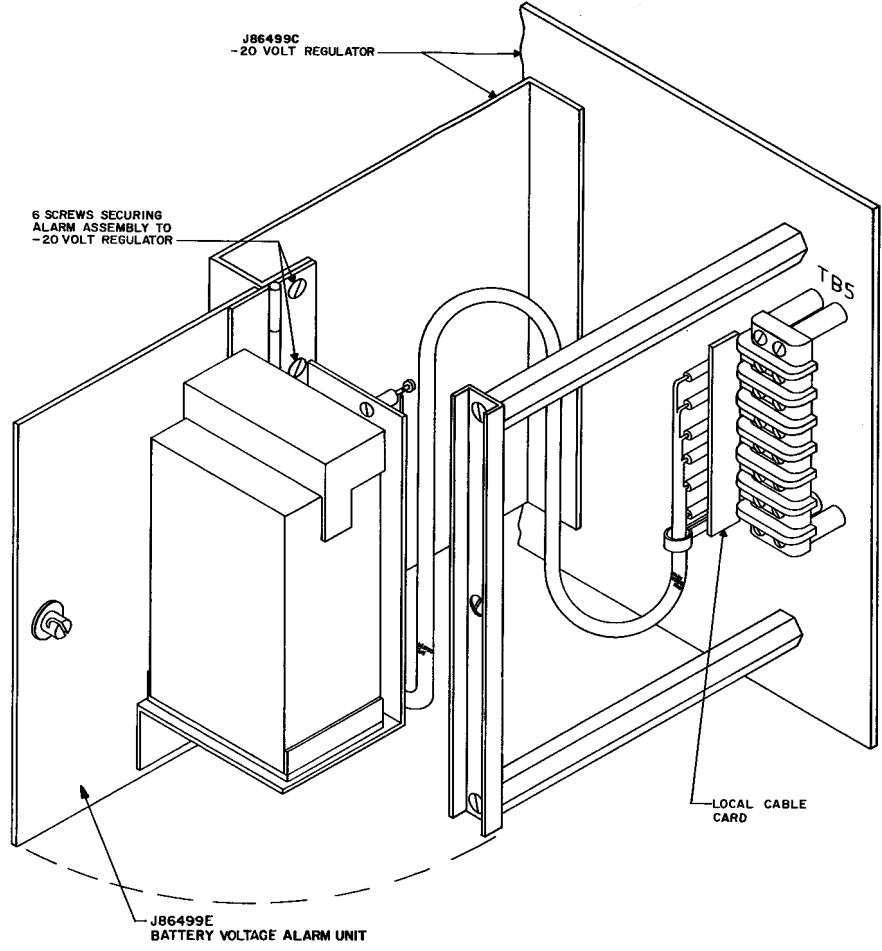


Fig. 2 - Battery Voltage Alarm Assembly

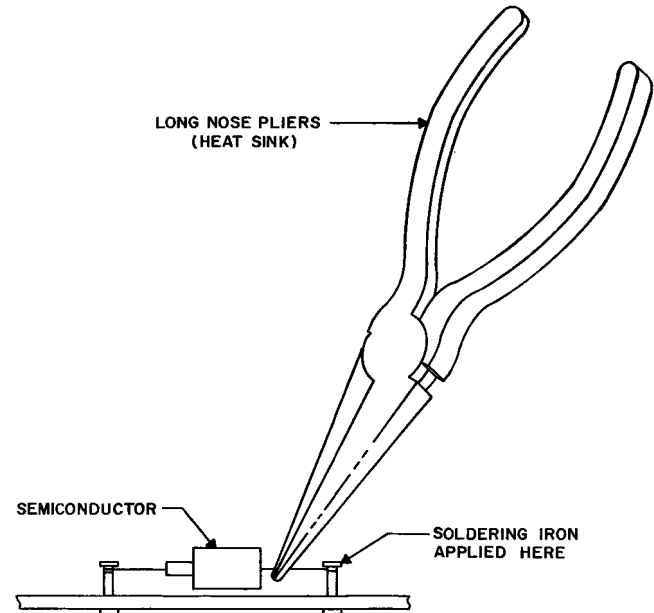


Fig. 3 - Replacing Semiconductors