ON/RADIO — RADIO MULTIPLEX POINTS
CARRIER LINE-UP — 96 CHANNEL COMBINING UNITS
DC TESTS AND ADJUSTMENTS
PLACEMENT OF PLUG-IN UNITS AND TUBE TESTS

The 96-channel multiplex mounting ordinarily mounts three plug-in units: The power supply and alarm unit, the transmitting amplifier-modulator unit and the receiving amplifier-modulator unit, as well as permanently mounted filters and transformers. In some cases (for example: at radio repeater dropping points where the S (316-412 kc) and T (452-548 kc) groupings are carried through from radio to radio, and the L (36-132 kc) and/or H (172-268 kc) groupings are dropped), the plug-in units are not provided and, hence, no dc tests and adjustments or alarm circuit tests will be required. In such cases, 20-contact connector plugs are provided in jacks J1 and J51. In all cases, such plugs are provided in the switching jacks J14, J15, J64 and J65.

The purpose of the procedures and tests described herein is to place the plug-in units and measure and adjust the dc supply voltages. Filament activity tests covered in this section should be made every 6 months. Transmission tests are covered in Section 362-705-505.

APPARATUS:

1 — DC Voltmeter, 0-50 Volts, Weston Model 931
1 — Volt-Ohm-Milliammeter, KS-14510, L1 or L5
1 — Pair Voltmeter Test Leads
1 — Relay Blocking Tool — 508A Tool

STEP	PROCEDURE
1	Remove ED-92309-30, Group 6 connectors from switching jacks J14, J15, J64 and J65 (Fig. 2). These should not be reinserted until completion of the following tests.
2	In cases where plug-in transmitting and receiving amplifier-modulator units are ***not*** required, plug ED-92309-30, Group 6 connectors in jacks J1 and J51 (Fig. 2). In such cases, this completes the placement procedure.
3	In cases where the plug-in transmitting and receiving amplifier-modulator units ***are*** required, refer to Figs. 1 and 2 and proceed with Step 4.

STEP	PROCEDURE
4	In the power supply and alarm unit, before plugging into the mounting: (a) Determine, from office records, whether filament power is to be derived from −48 or +130 volt supply. The power supply and alarm unit is shipped from the factory wired for −48 volt supply, "G" option (see two side views of this unit shown in Fig. 1). If the filaments of the transmitting and receiving amplifier-modulators are to be supplied from +130 volt battery, provide "H" option. This involves cutting straps on resistors R12 and R13 and removing leads "F" and "F1" from pin jacks J10 and J60 and reconnecting to resistors R4 and R7, respectively, as shown in the side views of the power unit. (b) Turn key ALM RLS horizontal (normal). (c) Block relay K2 nonoperated. (d) Turn rheostats TRSG-FIL CUR, REC-FIL CUR, TRSG-48V FIL, and REC-48V FIL fully counterclockwise. (e) Check that fuses of proper value are provided and not blown.
5	Plug the power supply and alarm unit into plug P2 in the multiplex mounting (Fig. 1 to Fig. 2). Plug the Hubbell power connector on the rubber cord into jack J13 in the rear mounting (Fig. 1).
6	Check that covers and tubes are in place on the transmitting amplifier-modulator unit (J98706AB) and plug this unit into jack J1 in the multiplex mounting (Fig. 1 to Fig. 2).
7	Check that covers, tubes and relay are in place in the receiving amplifier-modulator (J98706AA) and plug this unit into jack J51 in the mounting (Fig. 2).
8	If filament power is derived from −48 volt battery: (a) Connect the Weston Model 931 dc voltmeter to measure the voltage between the left-hand −40V pin jack on the power unit and ground on J58 pin jack on the multiplex mounting (Fig. 1). Adjust to requirement with TRSG-48V FIL potentiometer, accessible by screwdriver at the bottom of the left-hand slot in the casting faceplate. ***Requirements:*** ***Initial Adjustment:*** −38.5 volts when −48 volt supply is at its average value. When supply is different from average, determine requirement from Fig. 3. ***Maintenance:*** 38.5 ± 0.5 volts when supply is at its average value. When supply is different from average, use value obtained from Fig. 3 ± 0.5 volts. (b) Connect the Weston Model 931 dc voltmeter to measure the voltage between the right-hand −40V pin jack on the power unit and ground on J58 pin jack on the multiplex mounting (Fig. 1). Adjust to requirement with REC-48V FIL potentiometer, accessible by screwdriver at the bottom of the right-hand slot in the casting faceplate. ***Requirements:*** ***Initial Adjustment:*** −38.5 volts when −48 volt supply is at its average value. When supply is different from average, determine requirement from Fig. 3. ***Maintenance:*** 38.5 ± 0.5 volts when supply is at its average value. When supply is different from average, use value obtained from Fig. 3 ± 0.5 volts.

STEP	PROCEDURE
9	***Caution: In Steps 9, 10 and 11, protect the KS-14510, L1 or L5 volt-ohm-milliammeter by setting switch on 300 dc volts before connecting to, and before disconnecting from, test jacks.*** If filament power is obtained from +130 volt battery: (a) Connect the KS-14510, L1 or L5 meter to measure voltage between the left-hand pair of FIL CUR pin jacks on the power supply and alarm unit, observing polarity designations (Fig. 1). This voltage is a measure of the filament current for the tubes in the transmitting amplifier-modulator unit. Adjust to requirement with the TRSG-FIL CUR potentiometer, accessible, by screwdriver, at the top of the left-hand slot in the casting faceplate. ***Requirements: Initial Adjustment:*** 1.95 volts (on 3-volt dc scale) when supply is within 1.5 volts of its average value. When supply differs from average by more than 1.5 volts and less than 3.0 volts, offset the requirement by 0.05 volt (1 scale division), raising the requirement when supply voltage is high, lowering the requirement when the supply voltage is low. When supply differs from its average by more than 3.0 volts, adjust for 1.95 volts temporarily and readjust when supply has returned to normal range of average ± 3.0 volts. ***Maintenance:*** 1.95 ± 0.05 volts when supply is within 1.5 volts of the average value. When supply differs from average by more than 1.5 volts and less than 3.0 volts, offset this requirement by 0.05 volt (1 scale division) as described in "Initial Adjustment." (b) Connect the KS-14510, L1 or L5 meter to measure voltage between the right-hand pair of FIL CUR pin jacks, observing correct polarity (Fig. 1). This voltage is a measure of the filament current for the tubes in the receiving amplifier-modulator unit. Adjust to requirement with the REC-FIL CUR potentiometer, accessible, by screwdriver, at the top of the right-hand slot in the casting faceplate. ***Requirements: Initial Adjustment:*** 1.95 volts (on 3-volt dc scale) when supply is within 1.5 volts of its average value. When supply differs from average by more than 1.5 volts and less than 3.0 volts, offset the requirement by 0.05 volt (1 scale division), raising the requirement when supply voltage is high, lowering the requirement when the supply voltage is low. When supply differs from its average by more than 3.0 volts, adjust for 1.95 volts temporarily and readjust when supply has returned to normal range of average ± 3.0 volts. ***Maintenance:*** 1.95 ± 0.05 volts when supply is within 1.5 volts of the average value. When supply differs from average by more than 1.5 volts and less than 3.0 volts, offset this requirement by 0.05 volt (1 scale division) as described in "Initial Adjustment."
10	On the transmitting amplifier-modulator, measure the dc voltage between the K2 and GRD pin jacks, using the KS-14510, L1 or L5 volt-ohm-milliammeter (3-volt dc scale, negative side of meter to GRD) (Fig. 1). ***Requirement:*** 0.95 to 2.00 volts ***Note:*** This test is intended to indicate that tube V2 is drawing about the right amount of space current.

STEP	PROCEDURE
11	On the receiving amplifier-modulator, measure the dc voltage between the K52 and GRD pin jacks, using the KS-14510, L1 or L5 volt-ohm-milliammeter (3-volt dc scale, negative side of meter to GRD) (Fig. 2). ***Requirement:*** 0.95 to 2.00 volts ***Note:*** This test is intended to indicate that tube V52 is drawing about the right amount of space current.
12	On the power supply and alarm unit, remove the blocking tool from the K2 relay. The relay should operate as indicated by lighting of the CARR lamp and sounding of office alarms, if they have been connected.
13	Turn key ALM RLS to the vertical position (Fig. 1). The K2 relay should release (observe armature), but the CARR lamp should remain lighted, and office alarm should be silenced.
14	Block relay K2 nonoperated and restore the ALM RLS key to normal (horizontal). The CARR lamp should be extinguished.
15	Test operation of the −48 volt and +130 volt alarms (or only +130 volt alarm if 48 volts is not provided) by replacing each fuse, in succession, with a blown fuse, observing that the appropriate lamp, −48V or +130V, lights.
16	Replace good fuses.
17	Remove the relay blocking tool from the K2 relay and turn the ALM RLS key vertical (Fig. 1). This will silence the office alarms until the system is operating.
18	Replace connectors in switching jacks J14, J15, J64 and J65 (Fig. 2).
	TUBE TESTS
1	For the tubes in the transmitting amplifier modulator and receiving amplifier demodulator of the 96-channel multiplex equipment, perform the filament activity test as follows: (1) Read cathode voltage at the K2 jack for the transmitting amp. mod. and at K52 for the receiving amp. demod. using the KS-14510 meter. ***Requirement:*** 0.9 to 1.7 volts (2) Depress the FIL ACT button located on the power supply panel. (3) After 30 seconds, read the cathode voltage as in Step (1). ***Requirement:*** The reading in Step (3) should not be more than 18% lower than the original reading in Step (1). ***Note:*** If this requirement is not met: (1) Check filament power. (2) Replace the tube.
2	Remove the oscillator tube and test in the Hickok Tube Tester KS-15559, KS-15560 or KS-15750.

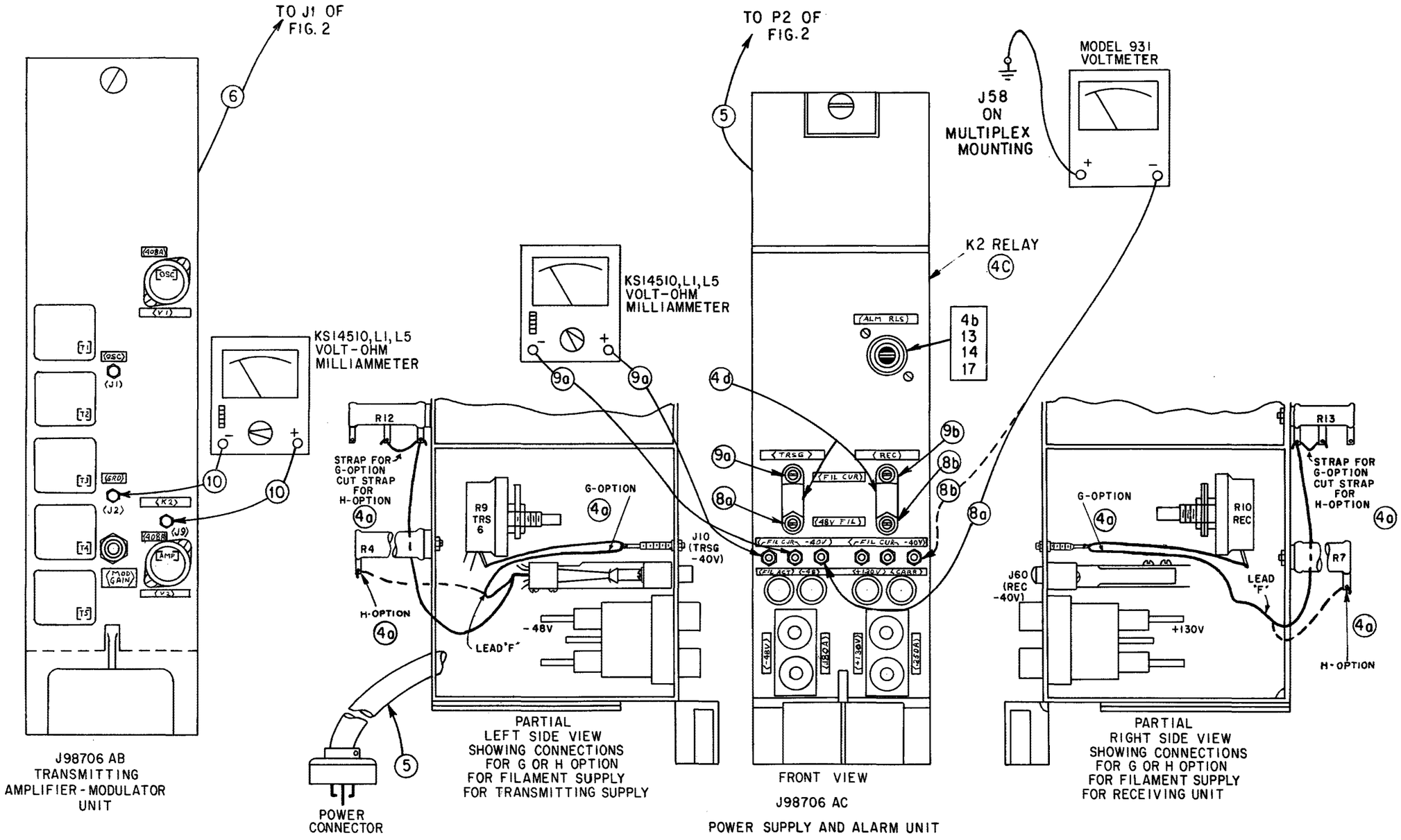
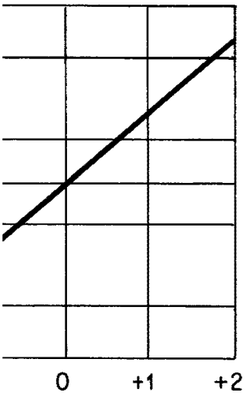

TO J1 OF FIG. 2
6
J98706 AB
TRANSMITTING
AMPLIFIER-MODULATOR
UNIT
KS14510, L1, L5
VOLT-OHM
MILLIAMMETER
10
10
STRAP FOR G-OPTION CUT STRAP FOR H-OPTION
4a
R12
R4
H-OPTION
4a
LEAD "F"
-48V
R9 TRS 6
G-OPTION
4a
J10 (TRSG -40V)
5
POWER
CONNECTOR
PARTIAL
LEFT SIDE VIEW
SHOWING CONNECTIONS
FOR G OR H OPTION
FOR FILAMENT SUPPLY
FOR TRANSMITTING SUPPLY
KS14510, L1, L5
VOLT-OHM
MILLIAMMETER
9a
9a
TO P2 OF FIG. 2
5
K2 RELAY
4c
4b
13
14
17
4d
9a
9b
8a
8b
8b
8a
FRONT VIEW
J98706 AC
POWER SUPPLY AND ALARM UNIT
MODEL 931
VOLTMETER
J58
ON
MULTIPLEX
MOUNTING
R13
STRAP FOR G-OPTION CUT STRAP FOR H-OPTION
4a
G-OPTION
4a
R10 REC
R7
LEAD "F"
J60 (REC -40V)
+130V
4a
H-OPTION
PARTIAL
RIGHT SIDE VIEW
SHOWING CONNECTIONS
FOR G OR H OPTION
FOR FILAMENT SUPPLY
FOR RECEIVING UNIT

Fig. 1



OF SUPPLY VOLTAGE
AVERAGE VALUE.

etermining Heater Voltage
— When Heater Supply is
om −48 Volt Battery

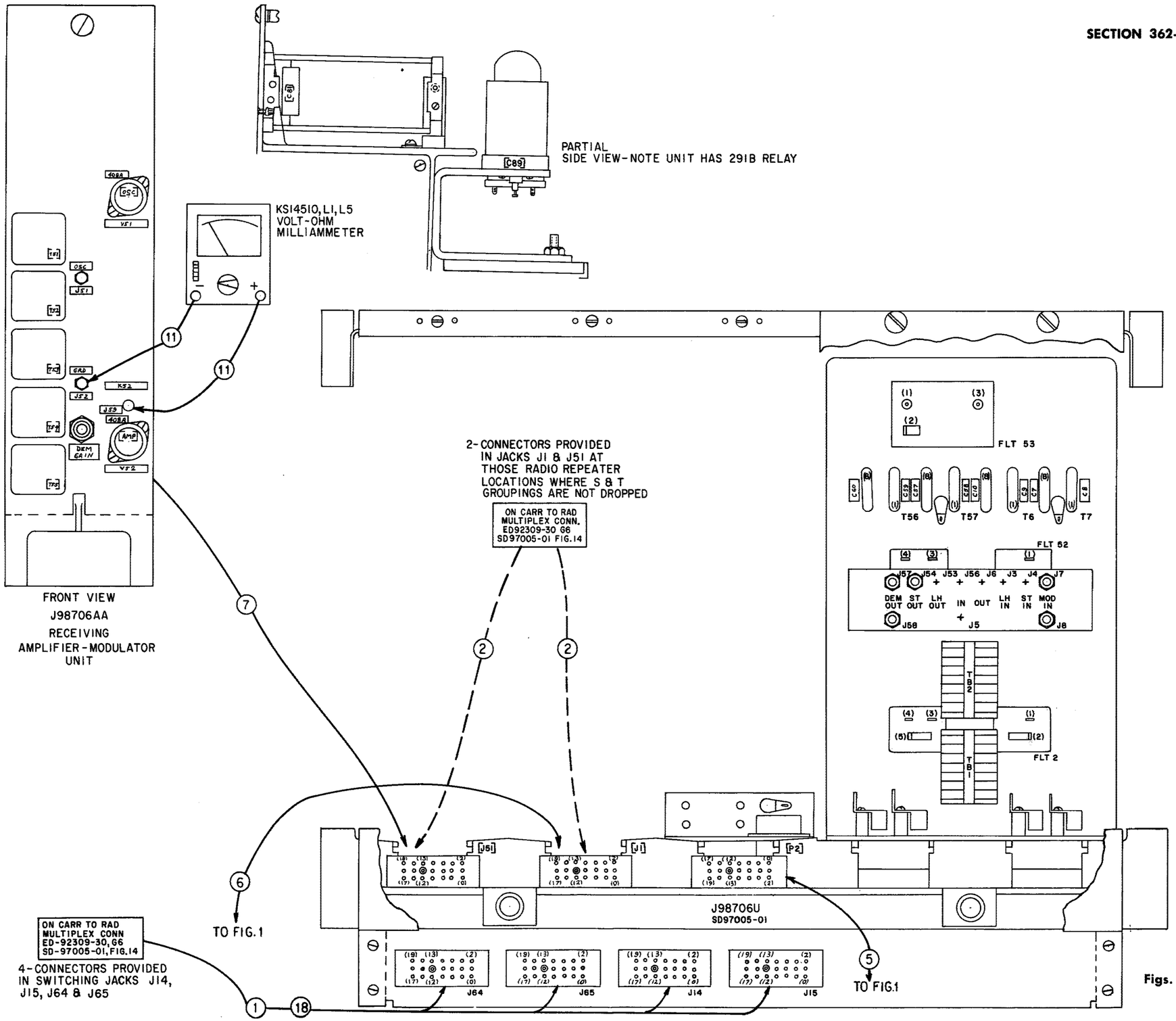


Fig. 2

Figs. 2 and 3

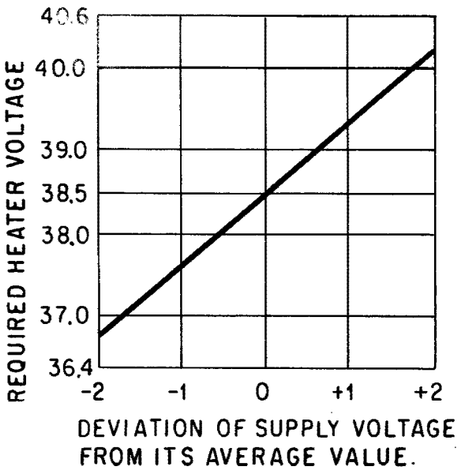


Fig. 3 – Chart For Determining Heater Voltage Requirement — When Heater Supply is Obtained From −48 Volt Battery

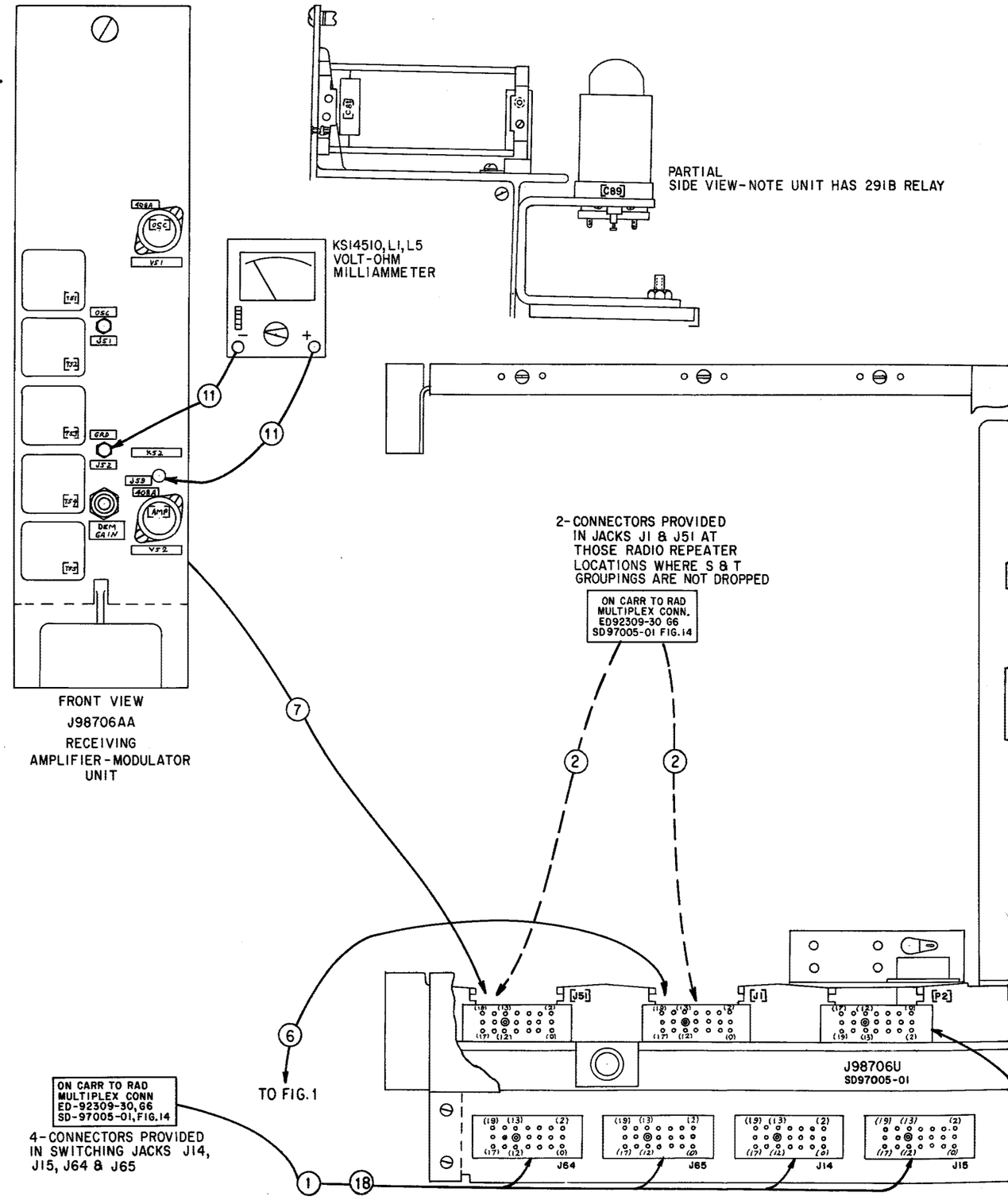


Fig. 2