

**TYPE N1, O AND ON CARRIER TELEPHONE SYSTEMS —
OVER-ALL CHANNEL LINE-UP
TYPE O AND ON CARRIER — PROGRAM CHANNEL UNITS
SCHEDULE C AND D PROGRAM CHANNELS (J98705AT)
CHANNEL LINE-UP AND EQUALIZATION**

This section covers the procedure for aligning and equalizing the C and D program channel unit (J98705AT) used in type O and ON carrier systems.

The program unit is used on channels 2 and/or 3 of a type O or ON group. No provision has been made for applying the unit to channel 1 or 4. The program channel compressor and expander subassemblies are identical for either channel 2 or 3. The carrier-frequency subassembly is identical for both channels, except for the orientation of a 568A plug-in filter.

To establish a Schedule C or D program transmission channel on a type O or ON carrier system, it is necessary to replace the channel units at each carrier terminal (channel 2 or 3, as desired) with the type J98705AT program channel units. The procedure for removing and replacing channel units in the O or ON terminal mountings is described in the sections covering these carrier systems.

When a program channel unit is used, the band filter in the adjacent message channel sharing the same carrier must be changed to a type 568B filter to reduce any interference from the message channel into the program circuit. Since the 568-type filter is physically larger than the 529-type, the new carrier subassembly ED-97012-30 is required in the message channel unit when it is used.

The over-all frequency characteristic of a type O or ON carrier channel equipped with a Schedule C or D program unit is equalized in the 200- to 3500-cycle bandwidth by means of the three separate network arrangements.

- (1) A midrange equalizer at the input to the channel modulator circuit.
- (2) A high-frequency equalizer at the input to the expander circuit.
- (3) A low-frequency equalizer in the channel-demodulator-amplifier circuit.

The amount of equalization obtained is determined by adjustable straps in the networks. The nominal strapping arrangements and the characteristics of some of the available combinations are illustrated in Figs. 3 thru 5.

This section is reissued to delete references to the 568D filter and to add testing information when this program channel unit is used for other than program services such as FAA.

APPARATUS:**Transmitting Terminal**

1 — Type 21A Test Set Oscillator, 200 CD or equivalent variable frequency oscillator

Note: It is important that the oscillator is properly adjusted and calibrated to make certain that the correct frequencies are obtained.

1 — 600-ohm Attenuator, 5A or equivalent

1 — Hewlett-Packard 400-type Vacuum Tube Voltmeter (VTVM)

1 — W2DW Cord (used with the VTVM)

1 — Channel Unit Test Stand (J98705M)

1 — P19A Cord (used with Channel Unit Test Stand)

Receiving Terminal

1 — Transmission Measuring Set, Type 21A, 13A, 40B or equivalent (TMS)

1 — Hewlett-Packard 400-type Vacuum Tube Voltmeter (VTVM)

1 — W2DW Cord (used with the VTVM)

1 — Channel Unit Test Stand (J98705M)

1 — P19A Cord (used with Channel Unit Test Stand)

INITIAL PREPARATION — BOTH TERMINALS

Before proceeding with the line-up and equalization of the program channel unit, the following preparations must be made:

STEP	PROCEDURE
1	Strap the program unit equalizers (low, midrange and high-frequency) for the nominal values shown in Figs. 3 thru 5. See Fig. 2 for location of equalizer in channel units.
2	Properly orient a 568A filter in the program channel unit, as covered in Fig. 1A.
3	Properly orient the 568B filter (as shown in Fig. 1B) in the message channel which uses the same twin channel carrier as the program unit. (a) Channel 1; when the program unit is placed in channel 2. (b) Channel 4; when the program unit is placed in channel 3.
4	The plate and heater voltages on the O or ON carrier terminals must be within the required limits as given in the sections covering these systems.
5	The three channels in the O or ON carrier group unit, with which the program channel unit is associated, should meet the transmission maintenance requirements given in the appropriate sections.

1000 CYCLE LINE-UP AND ADJUSTMENT	
STEP	PROCEDURE
	At Both Terminals
1	Place the program channel unit in the channel unit test stand and connect the test stand to the channel jack in the O or ON terminal. Operate the switch on the channel unit test stand to N1-O1 NORM position. (See Figs. 2A and 2B.)
	At the Transmitting Terminal
2	Connect the oscillator 600-ohm balanced output to the 600-ohm input to the attenuator. (If the 21A test set oscillator is used, the attenuator may be eliminated from the test arrangements. Proceed to Step 4.)
3	Connect the 600-ohm output of the attenuator to the 600-ohm transmission measuring set.
4	Adjust the frequency control on the oscillator for an output of 1000 cycles.
5	Adjust the attenuator loss and/or the output control on the oscillator for a reading of -27 dbm on the TMS. For other than program services adjust for -16 dbm.
6	Disconnect the attenuator from the TMS (or -16 dbm as set in Step 5).
7	Connect the -27 dbm output from the attenuator (or 21A test set oscillator, if used) to the VF IN jacks of the channel unit test stand.
8	Using a W2DW cord, or equivalent, connect the lower (ground) INPUT terminal of the VTVM to the GRD jack on the channel unit test stand. Connect the upper (hot) INPUT terminal of the VTVM to TP6 on the carrier subassembly.
9	Adjust the compressor potentiometer COMP for a reading on the VTVM of — <i>Requirement:</i> -12.0 db -6.5 db (for other than program services such as FAA)
10	Connect the upper (hot) INPUT terminal of the VTVM to the T jack on the front of the carrier subassembly. (Leave the lower (ground) INPUT terminal connected to ground.)
11	Adjust the T potentiometer on the left side of the carrier subassembly for a reading on the VTVM of — <i>Requirement:</i> -42.5 db -41.0 db (for other than program services such as FAA)

STEP	PROCEDURE
12 13 14 15 16	<p>At the Receiving Terminal</p> <p>Connect the 600-ohm TMS to the VF OUT jacks in the channel unit test stand.</p> <p>Turn the REC pot. on the front of the compressor subassembly to the extreme clockwise position and leave in this position.</p> <p>Turn the EXP pot. on the expander subassembly to the extreme clockwise position and leave in this position.</p> <p>Adjust the R potentiometer on the left side of the carrier subassembly for a reading on the TMS of —</p> <p>Requirement: −4.0 dbm +10.0 dbm (for other than program services such as FAA) — Also in such cases, adjust REC pot for a reading of +7 dbm.</p> <p>Note: In case trouble is encountered in obtaining an output of −4 dbm at the VF OUT jacks, a measurement at the R jack of the carrier subassembly may help in locating the trouble. With the channel operating normally, the reading at the R jack on the VTVM should be about +1.5 to +3.0 db. With the R pot. of the DEMOD amplifier in its extreme clockwise position, the reading of the VTVM at the R jack on the VTVM should be about +18 to +20 db. With the R pot. in its extreme counterclockwise position, the reading of the VTVM at the R jack, should be in the order of −27 to −30 db.</p> <p>Proceed with the equalization of the program channel, unless this is the final 1000-cycle adjustment. In this case, remove all of the test connections at both terminals and replace the program units in the terminal mountings. Then proceed with the Over-all Channel Net Loss Frequency Measurements.</p>
EQUALIZATION OF PROGRAM CHANNEL	
<p>Before performing the equalization tests the equalizers in the channel units should be strapped for the nominal condition and the over-all channel 1000-cycle alignment completed as covered above. After the equalization test is completed the 1000-cycle channel net loss should be rechecked.</p> <p>The transmission-frequency characteristics of the program channel is checked on an over-all basis between the carrier terminals. The amount of equalization obtained is determined by adjustable straps in the networks. The nominal strapping arrangements and the characteristics of some of the available combinations are illustrated in Figs. 3 thru 5. The object of this test is to strap the equalizer so that the deviation between the 1000-cycle transmission measurement and that of any other frequency over the band from 200-cycles to 3500-cycles is within ± 1.0 db. <i>For this reason it is important that the oscillator used for transmitting the test frequencies is properly adjusted and calibrated to ensure that the correct frequencies are obtained for the transmission measurements.</i></p>	

STEP	PROCEDURE
1	<p>Preparation for Test</p> <p>If this test is a continuation of the 1000-cycle alignment proceed to Step 2; otherwise, prepare for the test as follows —</p> <p>(a) <i>At Both Terminals</i> place the program channel unit in the channel unit test stand and connect the test stand to the channel jack in the O or ON terminal. Operate the switch on the channel unit test stand to N1-O1 NORM position. (See Figs. 2A and 2B.)</p> <p>(b) <i>At the Transmitting Terminal</i> connect the oscillator 600-ohm balanced output to the 600-ohm input to the attenuator. (If the 21A test set oscillator is used, the attenuator may be eliminated from this test.)</p> <p>(c) <i>At the Receiving Terminal</i> connect the 600-ohm TMS to the VF OUT jacks in the channel unit test stand.</p>
2	<p>At the Transmitting Terminal</p> <p>Connect the 600-ohm output of the attenuator (or 21A test set oscillator, if used) to the 600-ohm transmission measuring set.</p>
3	<p>Adjust the frequency controls on the oscillator for the frequency being measured, (see Table A).</p>
4	<p>Adjust the attenuator loss and/or the output control on the oscillator for a reading of -27 dbm on the TMS or -16 dbm (for other than program services). (IMPORTANT — be sure this level is maintained for all frequencies measured.)</p>
5	<p>Disconnect the attenuator from the TMS.</p>
6	<p>Connect the -27 dbm or -16 dbm output from the attenuator (or 21A test set oscillator, if used) to the VF IN jacks of the channel unit test stand.</p>
7	<p>At the Receiving Terminal</p> <p>Measure the channel net loss of each of the frequencies in Table A at the VF OUT jacks.</p>
8	<p>Strap the low, high and mid-band equalizers so that the deviation between the 1000-cycle transmission measurement and that of any other frequency over the band from 200 cycles to 3500 cycles is within —</p> <p>Requirement: ± 1.0 db</p> <p>The amount of equalization obtained is determined by adjustable straps. The nominal strapping arrangements and the characteristics of some of the available combinations are illustrated in Figs. 3 thru 5.</p>
9	<p>Repeat Steps 2 thru 8 until the program channel meets the loss frequency requirements.</p>
10	<p>After the channel has been equalized, the 1000-cycle channel net loss should be re-adjusted as covered in this section.</p>

OVER-ALL CHANNEL NET LOSS FREQUENCY MEASUREMENTS

After the program channel has been aligned and equalized in the channel unit test stands, the over-all transmission frequency characteristics of the channel must be rechecked with the program channel units in the terminal mountings.

STEP	PROCEDURE						
1	<i>At Both Terminals</i> place the program channel units in the terminal mountings.						
2	Recheck the over-all transmission frequency characteristics by sending each of the frequencies shown in Table A into the MOD IN jacks, or equivalent VF IN jack, at the <i>transmitting terminal</i> as follows —						
	<table style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th></th> <th style="text-align: center;">OTHER THAN PROGRAM</th> </tr> </thead> <tbody> <tr> <td style="padding-right: 20px;">Channels arranged for input of -16 dbm</td> <td style="text-align: center;">-27 dbm -16 dbm</td> </tr> <tr> <td style="padding-right: 20px;">Channels arranged for input of -13 dbm</td> <td style="text-align: center;">-24 dbm -13 dbm</td> </tr> </tbody> </table>		OTHER THAN PROGRAM	Channels arranged for input of -16 dbm	-27 dbm -16 dbm	Channels arranged for input of -13 dbm	-24 dbm -13 dbm
	OTHER THAN PROGRAM						
Channels arranged for input of -16 dbm	-27 dbm -16 dbm						
Channels arranged for input of -13 dbm	-24 dbm -13 dbm						
3	At the <i>Receiving Terminal</i> remeasure the channel net loss of each frequency shown in Table A at the DEMOD OUT jacks, or equivalent VF OUT jacks. <i>Requirements:</i> The 1000-cycle measurement should be within ± 1.0 db of -4.0 dbm or +7 dbm or the value shown on the circuit layout card. The other frequency measurements should be within ± 1.0 db of 1000-cycle measurement.						
4	If the requirements are not met, the channel must be re-equalized.						

TABLE A

Frequency of Test Tones

200 cycles
 300 " "
 400 " "
 500 " "
 1000 " "
 1500 " "
 2000 " "
 2500 " "
 3000 " "
 3400 " "
 3500 " "

**C AND D PROGRAM CHANNELS
(568 TYPE FILTER ORIENTATION)**

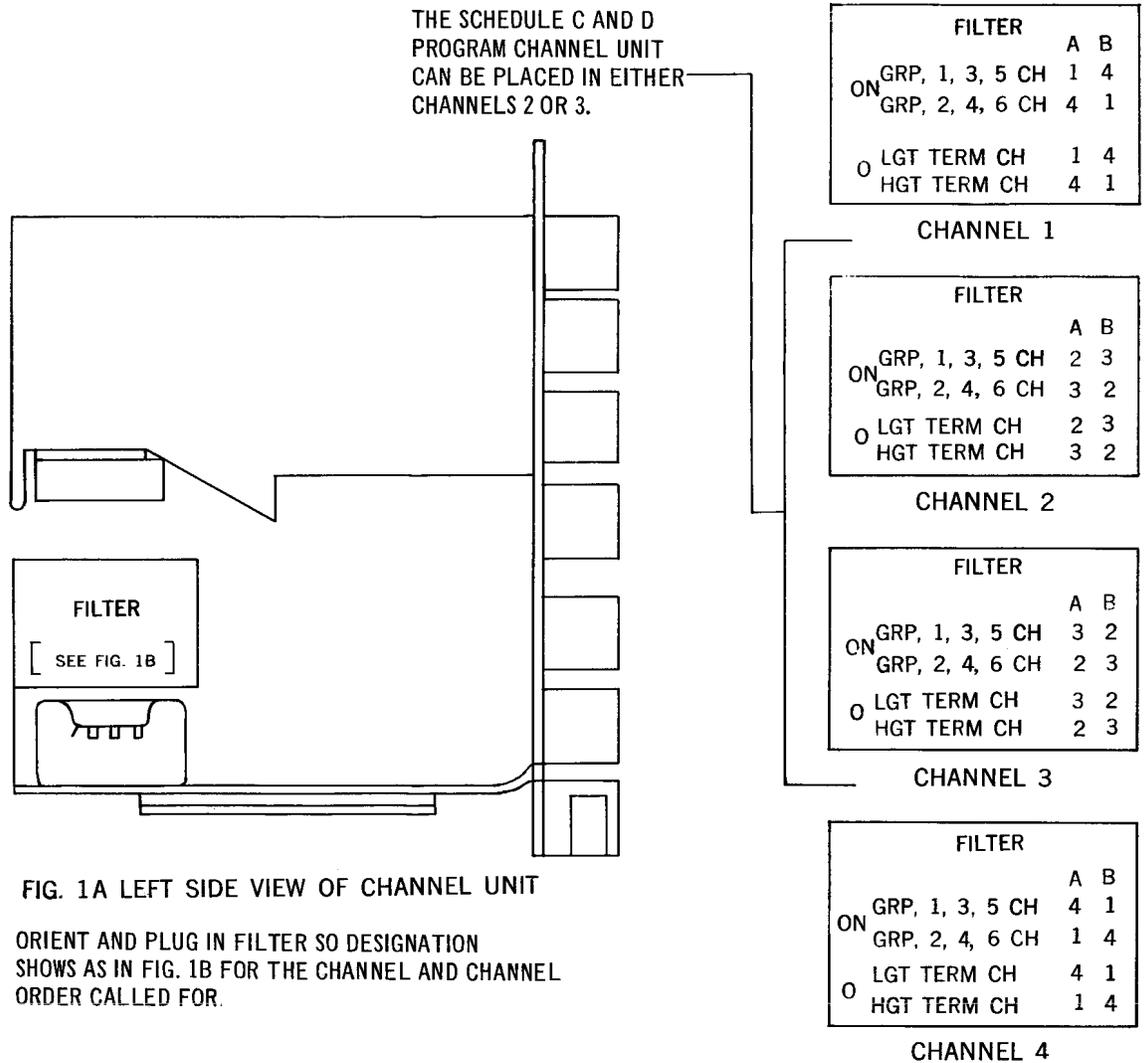


FIG. 1B ORIENTATION OF FILTERS

FILTER INFORMATION

1. NORMALLY A 529A FILTER IS USED ON MESSAGE CHANNELS 1 AND 4 AND A 529B FILTER IS USED ON MESSAGE CHANNELS 2 AND 3
2. A 568A FILTER MUST BE USED IN A SCHEDULE C AND D PROGRAM CHANNEL UNIT
3. WHEN A PROGRAM CHANNEL IS USED, THE MESSAGE CHANNEL USING THE SAME TWIN CHANNEL CARRIER AS THE PROGRAM CHANNEL MUST BE EQUIPPED WITH A 568B FILTER

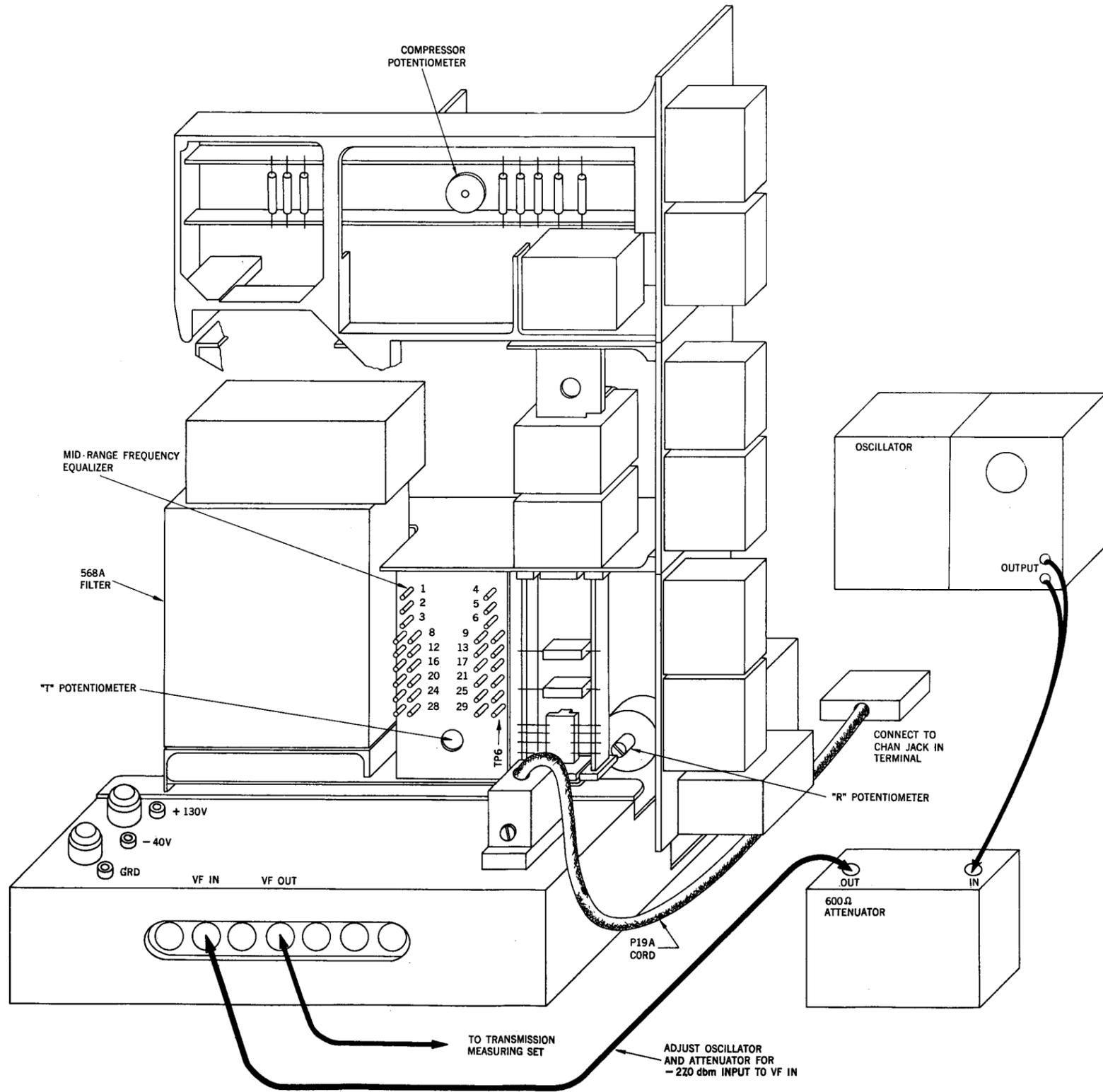


Fig. 2A - Transmitting

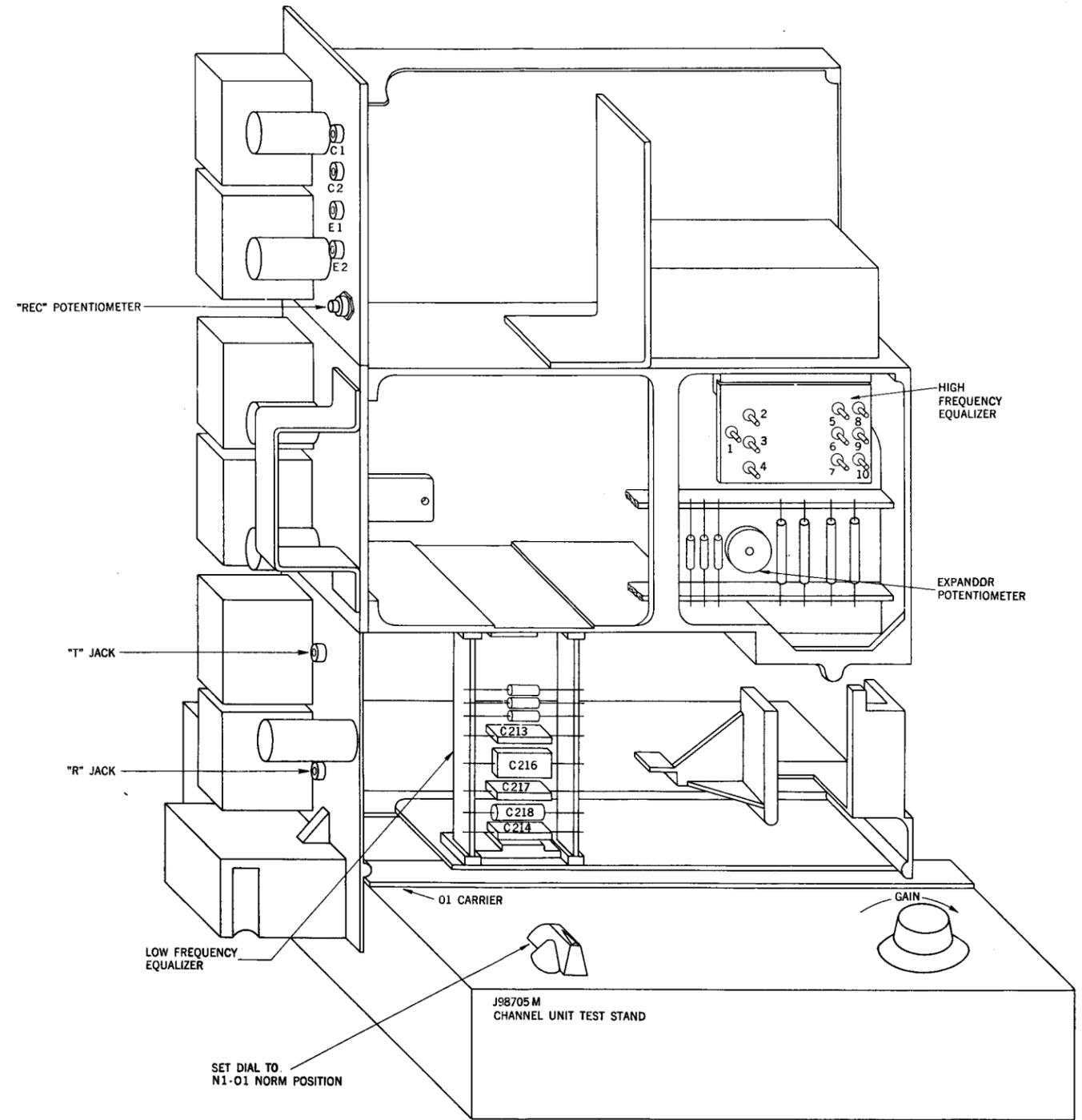


Fig. 2B - Receiving

TEST ARRANGEMENTS FOR ALIGNING AND EQUALIZING THE SCHEDULE C AND D PROGRAM CHANNEL UNITS FOR TYPES O AND ON CARRIER SYSTEMS

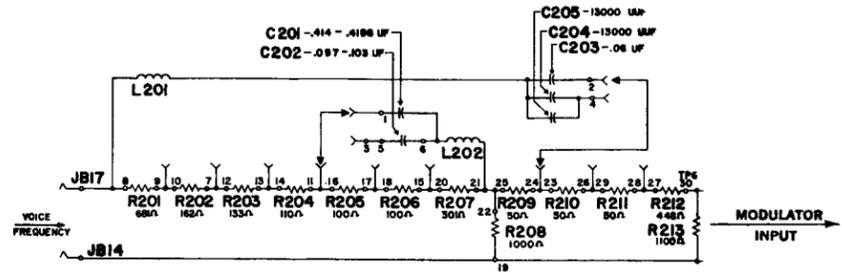


FIG. 3A MID-BAND EQUALIZER SCHEMATIC

CARRIER	TRANSMITTING FREQ. BAND	STRAP TERMINALS
184 KC	184 - 188 KC	1 TO 11-16 2 TO 23-24
192 KC	188 - 192 KC	3-5 TO 17-18 4 TO 23-24

FIG. 3B NOMINAL STRAPPING INFORMATION

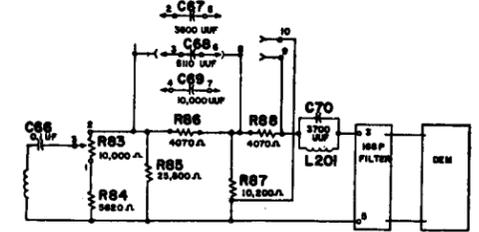


FIG. 5A H.F. EQUALIZER SCHEMATIC
NOMINAL STRAPPING (1-3) (6-8)

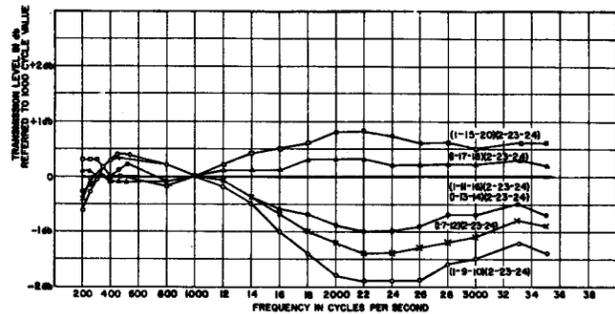
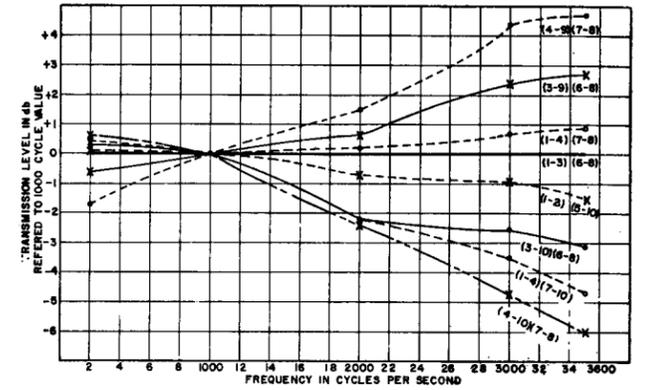
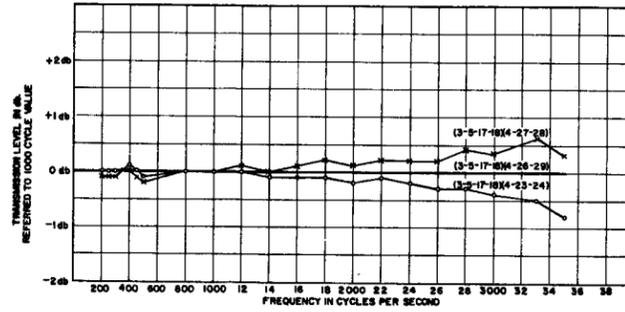
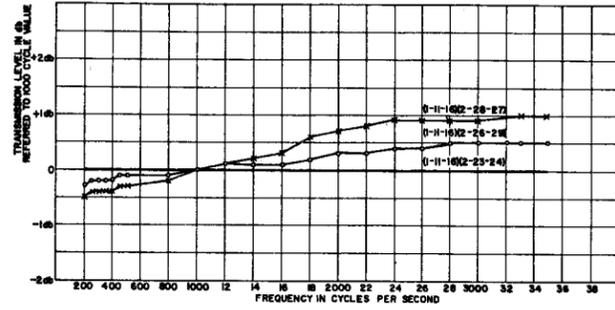


FIG. 3C MID-BAND EQUALIZER CHARACTERISTICS
184 KC CARRIER (184-188 KC BAND)

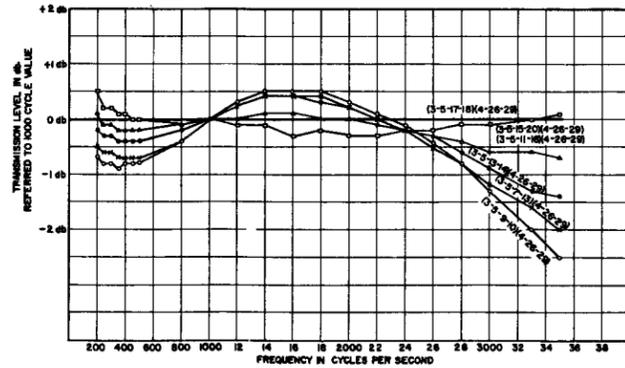


FIG. 3D MID-BAND EQUALIZER CHARACTERISTICS
192 KC CARRIER (188-192 KC BAND)

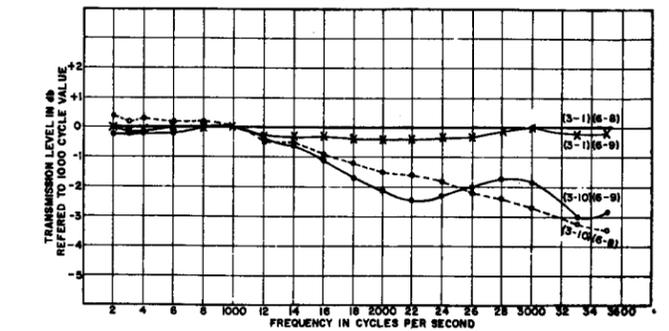
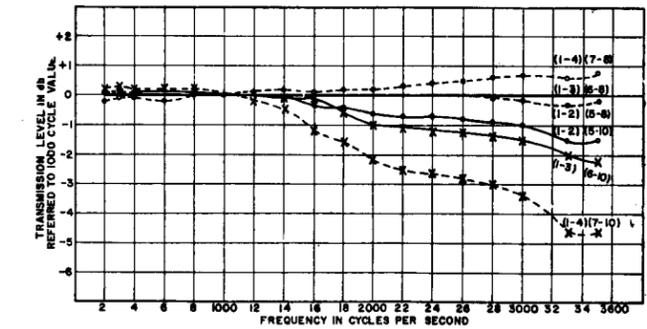


FIG. 5B HIGH FREQUENCY EQUALIZER CHARACTERISTICS

FIG. 5 - HIGH FREQUENCY EQUALIZER

FIG. 3 - MID-BAND EQUALIZER

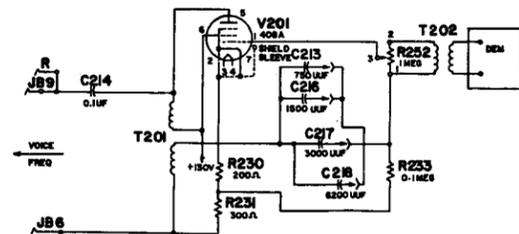


FIG. 4A L.F. EQUALIZER SCHEMATIC

CAPACITOR	INITIAL WIRING	TO INCREASE GAIN	TO DECREASE GAIN
C215	IN	OPEN	IN
C216	OPEN	OPEN	IN
C217	OPEN	OPEN	IN
C218	IN	OPEN	IN

FIG. 4B STRAPPING INFORMATION

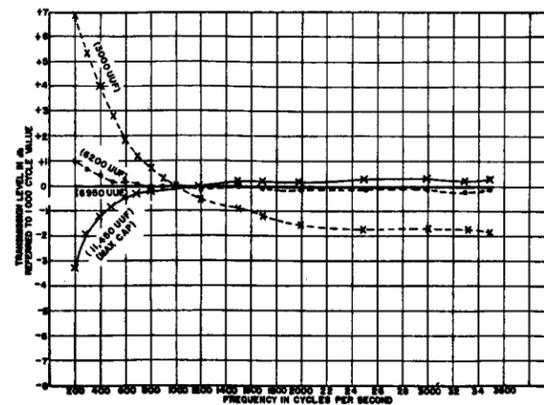


FIG. 4C LOW FREQUENCY EQUALIZATION CHARACTERISTICS
CURVES SHOW MAXIMUM AND TYPICAL VALUES
OF CAPACITANCE STRAPPING

FIG. 4 - LOW FREQUENCY EQUALIZER