



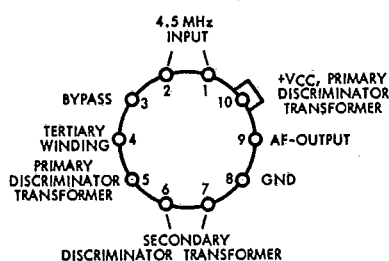
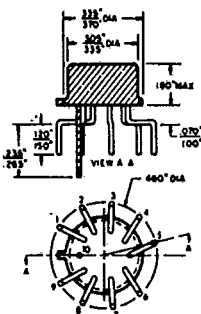
# ECG704

TV SOUND IF

T-77-07-07

### FEATURES & APPLICATIONS:

- **exceptionally high gain:**  
power gain at 4.5 Mc/s — 75 dB typ.
- **excellent limiting characteristics —**  
input limiting voltage (knee)  
= 300  $\mu$ V typ. at 4.5 Mc/s
- **excellent AM rejection:** > 50 dB  
at 4.5 Mc/s
- **high audio-voltage recovery —**  
220 mV typ. at 4.5 Mc/s,  
25 kc/s deviation
- **wide frequency capability —** 100 kc/s  
to > 20 Mc/s
- **comprehensive circuit functions:**  
if amplifier, AM and noise limiter,  
FM detector, audio preamplifier



OPERATING-TEMPERATURE RANGE . . . -55 to +125 °C

STORAGE-TEMPERATURE RANGE . . . . -65 to +200 °C

MAXIMUM INPUT-SIGNAL VOLTAGE:

Between Terminals 1 and 2 . . . . .  $\pm 3\text{ V}$

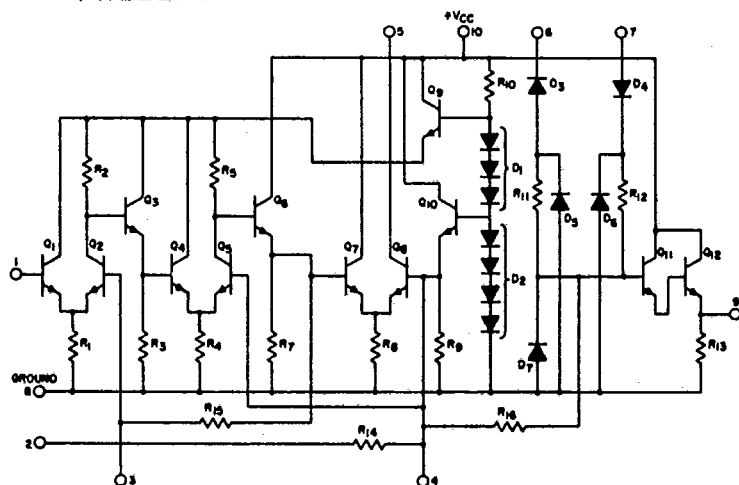
MAXIMUM DEVICE DISSIPATION..... 300 mW

RECOMMENDED MINIMUM DC

**SUPPLY VOLTAGE (V<sub>CC</sub>)** . . . . . 5,5 V

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**Fig.1**

**ABSOLUTE-MAXIMUM VOLTAGE LIMITS AT  $T_A = 25^\circ\text{C}$** 

Indicated voltage limits for each terminal can be applied under the specified voltage conditions for other terminals. All voltages are with respect to ground (Terminal 8).

| VOLTAGE CONDITIONS AT OTHER TERMINALS |                                                         |     |           |           |                               |             |     |           |           |        |           |     |
|---------------------------------------|---------------------------------------------------------|-----|-----------|-----------|-------------------------------|-------------|-----|-----------|-----------|--------|-----------|-----|
| TERMINAL                              | VOLTAGE LIMITS                                          |     |           |           |                               |             |     |           |           |        |           |     |
|                                       |                                                         |     | 1         | 2         | 3                             | 4           | 5   | 6         | 7         | 8      | 9         | 10  |
| 1                                     | -3                                                      | +3  | -         | Same as 1 | Do Not Apply External Voltage | +2.5 to +10 | +10 | Same as 4 | Same as 4 | Ground | AF Output | +10 |
| 2                                     | -3                                                      | +3  | Same as 2 | -         |                               | +2.5 to +10 | +10 | Same as 4 | Same as 4 | Ground | AF Output | +10 |
| 3                                     | -3                                                      | +3  | -3 to +3  | Same as 1 |                               | +2.5 to +10 | +10 | Same as 4 | Same as 4 | Ground | AF Output | +10 |
| 4                                     | +2.5                                                    | +10 | -3 to +3  | Same as 1 |                               | -           | +10 | Same as 4 | Same as 4 | Ground | AF Output | +10 |
| 5                                     | 0                                                       | +13 | -3 to +3  | Same as 1 |                               | +2.5 to +10 | -   | Same as 4 | Same as 4 | Ground | AF Output | +10 |
| 6                                     | +2.5                                                    | +10 | -3 to +3  | Same as 1 |                               | Same as 6   | +10 | -         | Same as 4 | Ground | AF Output | +10 |
| 7                                     | +2.5                                                    | +10 | -3 to +3  | Same as 1 |                               | +2.5 to +10 | +10 | Same as 4 | -         | Ground | AF Output | +10 |
| 8                                     | -3                                                      | +10 | -3 to +3  | Same as 1 |                               | +2.5 to +10 | +10 | Same as 4 | Same as 4 | Ground | AF Output | +10 |
| 9                                     | 0                                                       | +10 | -3 to +3  | Same as 1 |                               | +2.5 to +10 | +10 | Same as 4 | Same as 4 | Ground | -         | +10 |
| 10                                    | 0                                                       | +13 | -3 to +3  | Same as 1 |                               | +2.5 to +10 | +10 | Same as 4 | Same as 4 | Ground | AF Output | -   |
| CASE                                  | INTERNALLY CONNECTED TO TERMINAL No.8 (GROUND TERMINAL) |     |           |           |                               |             |     |           |           |        |           |     |

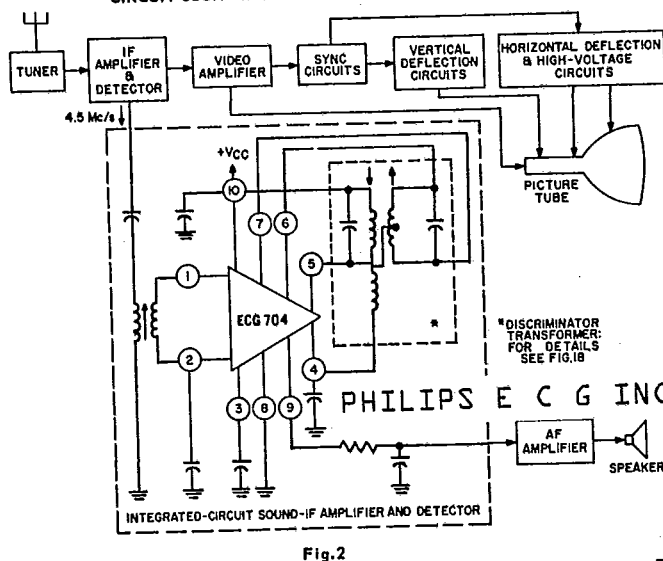
**BLOCK DIAGRAM OF TYPICAL TELEVISION RECEIVER USING INTEGRATED-CIRCUIT SOUND-IF AMPLIFIER AND DETECTOR SECTION**


Fig.2

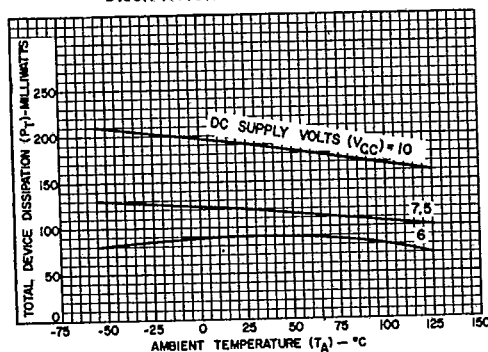
**DISSIPATION vs. TEMPERATURE**


Fig.4

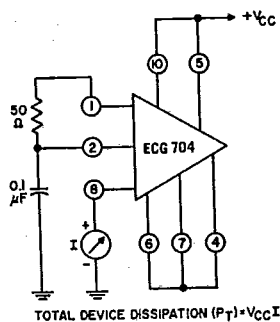
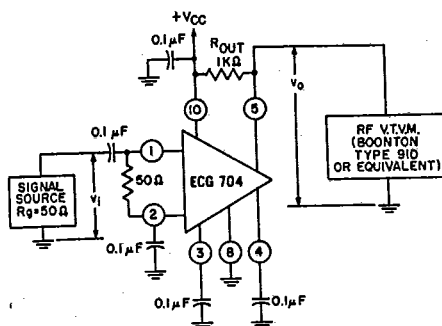
**DISSIPATION TEST SETUP**


Fig.3

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**VOLTAGE-GAIN TEST SETUP**

**PROCEDURE:**

- 1) Set input frequency at desired value,  $V_i = 100 \mu\text{V rms}$ .
- 2) Record  $V_o$ .
- 3) Calculate Voltage Gain A from  $A = 20 \log_{10} V_o / V_i$ .
- 4) Repeat Steps 1, 2, and 3 for each frequency and/or temperature desired.

Fig.5

### 1-Mc/s VOLTAGE GAIN vs. TEMPERATURE

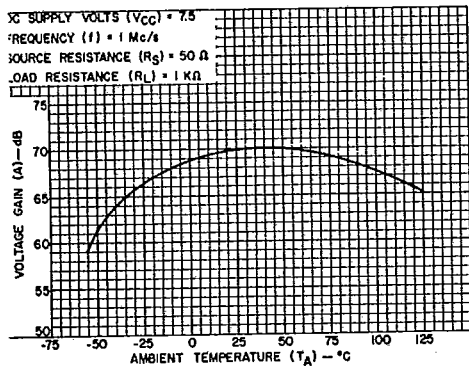


Fig. 6

### VOLTAGE GAIN vs. FREQUENCY

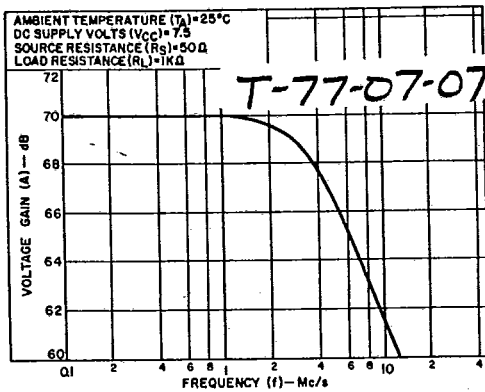


Fig. 7

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### INPUT-IMPEDANCE COMPONENTS TEST SETUP

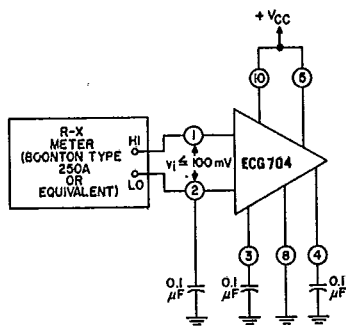


Fig. 8

### INPUT-IMPEDANCE COMPONENTS vs. FREQUENCY

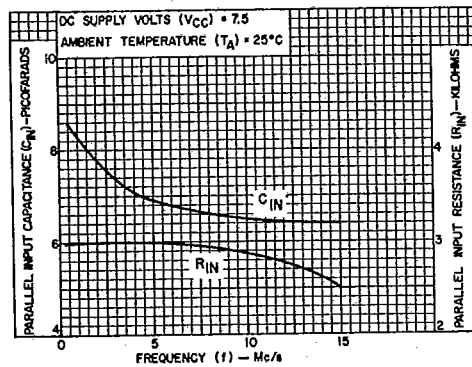


Fig. 9

### OUTPUT-IMPEDANCE COMPONENTS TEST SETUP

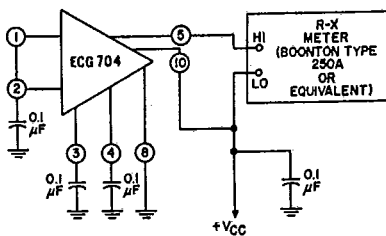


Fig. 10

### OUTPUT-IMPEDANCE COMPONENTS vs. FREQUENCY

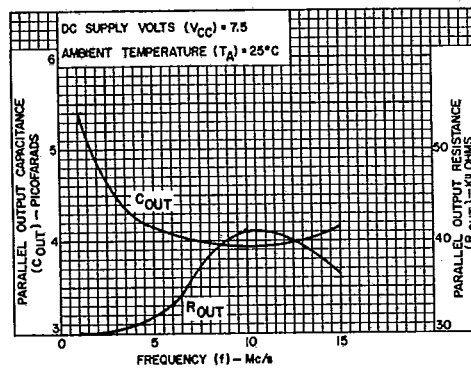


Fig. 11

# NOISE FIGURE TEST SETUP

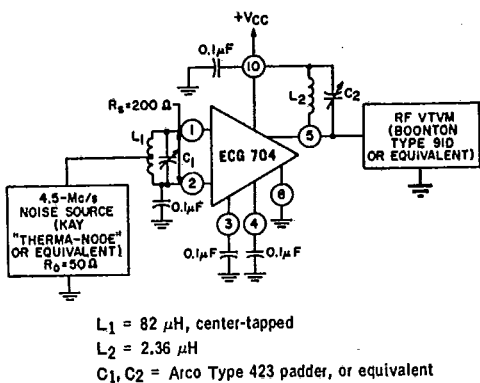


Fig. 12

# NOISE FIGURE vs. DC SUPPLY VOLTAGE

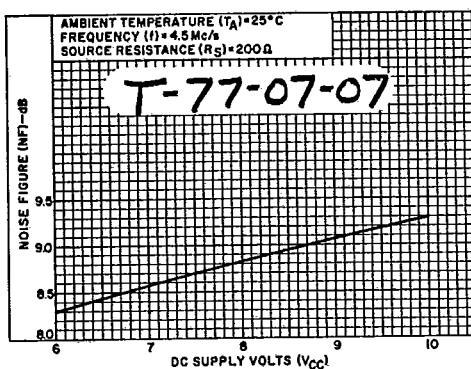
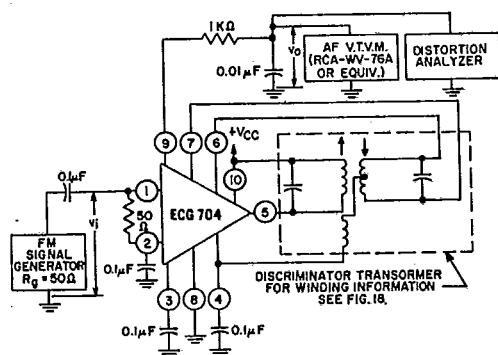


Fig. 13

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# INPUT LIMITING VOLTAGE, RECOVERED AF VOLTAGE, AND TOTAL HARMONIC DISTORTION TEST SETUP



## PROCEDURE:

### A - Recovered-AF Voltage Output:

- 1) Set input frequency = 4.5 Mc/s,  $v_i = 100 \text{ mV rms}$ , modulating frequency = 1 kc/s, frequency deviation =  $\pm 25 \text{ kc/s}$ .
- 2) Record  $v_o$  as Recovered-AF Voltage Output.

### B - Input Limiting Voltage (Knee):

- 1) Repeat Steps A1 and A2, using  $v_i = 100 \text{ mV rms}$ .
- 2) Decrease  $v_i$  to the level at which  $v_o$  is 3 dB below its value for  $v_i = 100 \text{ mV}$ .
- 3) Record  $v_i$  as Input Limiting Voltage (Knee).

Fig. 14

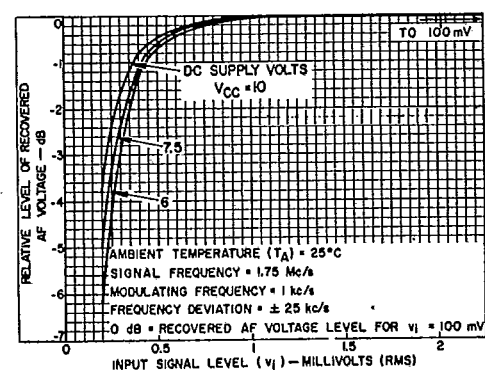
| CHARACTERISTICS                    | SYMBOLS               | TEST CONDITIONS         |                |                                            |                                               | LIMITS  |      |       |       | TYPICAL CHARAC-<br>TERISTICS<br>CURVES |    |
|------------------------------------|-----------------------|-------------------------|----------------|--------------------------------------------|-----------------------------------------------|---------|------|-------|-------|----------------------------------------|----|
|                                    |                       | SETUP<br>&<br>PROCEDURE | FREQUENCY<br>f | DC<br>SUPPLY<br>VOLTAGE<br>V <sub>CC</sub> | AMBIENT<br>TEMPERA-<br>TURE<br>T <sub>A</sub> | ECG 704 |      |       | UNITS |                                        |    |
|                                    |                       |                         |                |                                            |                                               | Fig.    | Mc/s | volts |       |                                        | °C |
| Total<br>Device<br>Dissipation *   | P <sub>T</sub>        | 3                       | -              | 6                                          | -55                                           | 73      | 80   | 120   | mW    | 4                                      |    |
|                                    |                       |                         |                |                                            | +25                                           | 73      | 90   | 110   | mW    |                                        |    |
|                                    |                       |                         |                |                                            | +125                                          | 60      | 70   | 110   | mW    |                                        |    |
|                                    |                       | 3                       | -              | 7.5                                        | -55                                           | 106     | 130  | 170   | mW    | 4                                      |    |
|                                    |                       |                         |                |                                            | +25                                           | 106     | 120  | 150   | mW    |                                        |    |
|                                    |                       |                         |                |                                            | +125                                          | 90      | 100  | 150   | mW    |                                        |    |
|                                    |                       | 3                       | -              | 10                                         | -55                                           | 165     | 210  | 250   | mW    | 4                                      |    |
|                                    |                       |                         |                |                                            | +25                                           | 165     | 190  | 230   | mW    |                                        |    |
|                                    |                       |                         |                |                                            | +125                                          | 150     | 160  | 230   | mW    |                                        |    |
| Voltage Gain **                    | A                     | 5                       | 1              | 6                                          | -55                                           | 50      | 55   | -     | dB    | 6                                      |    |
|                                    |                       |                         |                |                                            | +25                                           | 60      | 66   | -     | dB    |                                        |    |
|                                    |                       |                         |                |                                            | +125                                          | 50      | 61   | -     | dB    |                                        |    |
|                                    |                       | 5                       | 1              | 7.5                                        | -55                                           | 55      | 59   | -     | dB    | 6                                      |    |
|                                    |                       |                         |                |                                            | +25                                           | 65      | 70   | -     | dB    |                                        |    |
|                                    |                       |                         |                |                                            | +125                                          | 55      | 65   | -     | dB    |                                        |    |
|                                    |                       | 5                       | 1              | 10                                         | -55                                           | 55      | 61   | -     | dB    | 6                                      |    |
|                                    |                       |                         |                |                                            | +25                                           | 65      | 71   | -     | dB    |                                        |    |
|                                    |                       |                         |                |                                            | +125                                          | 55      | 66   | -     | dB    |                                        |    |
|                                    |                       | 5                       | 4.5            | 7.5                                        | +25                                           | 60      | 67   | -     | dB    | 7                                      |    |
|                                    |                       |                         | 10.7           | 7.5                                        | +25                                           | 55      | 60   | -     | dB    |                                        |    |
|                                    |                       | PHILIPS E C G INC 17E D |                |                                            |                                               |         |      |       |       |                                        |    |
| Input-Impedance<br>Components:     |                       |                         |                |                                            |                                               |         |      |       |       |                                        |    |
| Parallel Input<br>Resistance       | R <sub>IN</sub>       | 8                       | 4.5            | 7.5                                        | +25                                           | -       | 3    | -     | kΩ    | 9                                      |    |
| Parallel Input<br>Capacitance      | C <sub>IN</sub>       | 8                       | 4.5            | 7.5                                        | +25                                           | -       | 7    | -     | pF    | 9                                      |    |
| Output-Impedance<br>Components:    |                       |                         |                |                                            |                                               |         |      |       |       |                                        |    |
| Parallel Output<br>Resistance      | R <sub>OUT</sub>      | 10                      | 4.5            | 7.5                                        | +25                                           | -       | 31.5 | -     | kΩ    | 11                                     |    |
| Parallel Output<br>Capacitance     | C <sub>OUT</sub>      | 10                      | 4.5            | 7.5                                        | +25                                           | -       | 4.2  | -     | pF    | 11                                     |    |
| Noise Figure                       | NF                    | 12                      | 4.5            | 7.5                                        | +25                                           | -       | 8.7  | -     | dB    | 13                                     |    |
| Input Limiting<br>Voltage (Knee)   | v <sub>i</sub> (lim)  | 14                      | 4.5            | 7.5                                        | +25                                           | -       | 300  | 400   | μV    | 15                                     |    |
| Recovered AF Voltage               | v <sub>o</sub> (af)   | 14                      | 4.5            | 6                                          | +25                                           | -       | 155  | -     | mV    | 15                                     |    |
|                                    |                       |                         |                | 7.5                                        | +25                                           | -       | 135  | 188   | -     |                                        | mV |
|                                    |                       |                         |                | 10                                         | +25                                           | -       | 220  | -     | mV    |                                        |    |
| Amplitude-Modulation<br>Rejection  | AMR                   | 16                      | 4.5            | 7.5                                        | +25                                           | -       | 50   | -     | dB    | -                                      |    |
| Discriminator<br>Output Resistance | R <sub>O</sub> (disc) | -                       | 4.5            | 7.5                                        | +25                                           | -       | 60   | -     | Ω     | -                                      |    |
| Total Harmonic<br>Distortion       | THD                   | 14                      | 4.5            | 7.5                                        | +25                                           | -       | 1.8  | -     | %     | 17                                     |    |

\* Total current drain may be determined by dividing P<sub>T</sub> by V<sub>CC</sub>.

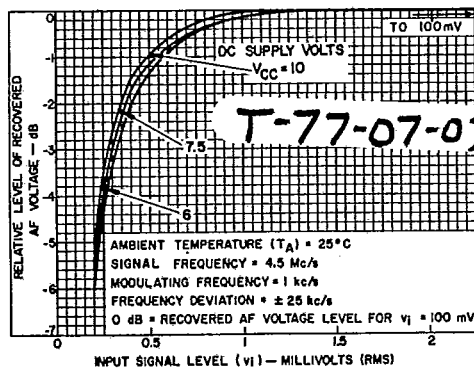
\*\* Recommended minimum dc supply voltage (V<sub>CC</sub>) is 5.5 V.  
Nominal load current flowing into terminal 5 is 1.5 mA at 7.5 V.

at 1.75 Mc/s

at 4.5 Mc/s

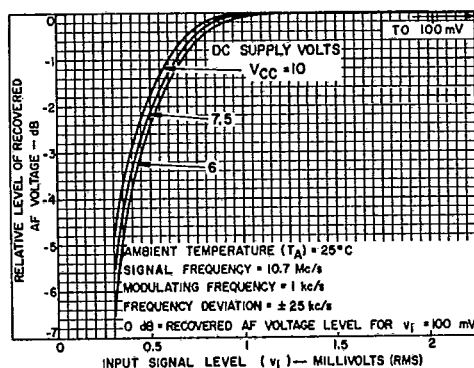


(a)



(b)

at 10.7 Mc/s



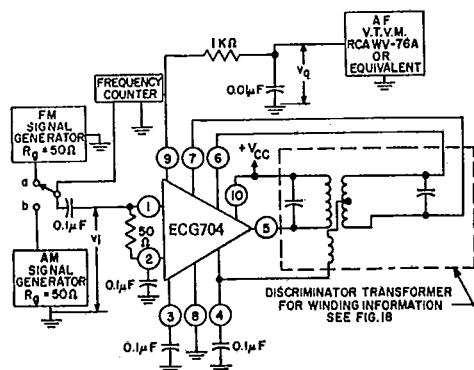
(c)

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**Fig. 15**

### AM-REJECTION TEST SETUP



**PROCEDURE:**

- 1) With Switch S in position "a", set input frequency = 4.5 Mc/s,  $v_i = 10$  mV rms, modulating frequency = 1 kc/s, frequency deviation =  $\pm 25$  kc/s.
- 2) Record  $v_o$ .
- 3) Place Switch S in position "b", and set input frequency = 4.5 Mc/s,  $v_i = 10$  mV rms, modulating frequency = 1 kc/s, % modulation = 50.
- 4) Measure  $v_o$ , and record value in dB below value in Step 2 as AM Rejection.

**Fig. 16**

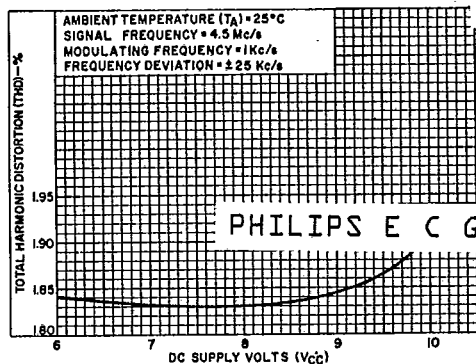


Fig. 17

## DEFINITIONS OF TERMS

**Total Device Dissipation ( $P_T$ )**

The total power drain of the device with no signal applied and no external load current.

**Voltage Gain (A)**

The ratio of the signal voltage developed at the output of the device to the signal voltage applied to the input, expressed in dB.

**Input Impedance**

The ratio of a change in input voltage to a change in input current, measured at the input terminal of the device, with respect to ground.

**Output Impedance**

The ratio of a change in output voltage to a change in output current, measured at the output terminal of the device, with respect to ground.

**Input Limiting Voltage (Knee) [ $V_i(lim)$ ]**

The input signal voltage which will cause the output signal to decrease 3 dB from its maximum level.

**Recovered AF Voltage [ $V_o(af)$ ]**

The rms value of the AF output voltage of the device produced by a specified frequency deviation of an FM input signal.

**Amplitude-Modulation Rejection (AMR)**

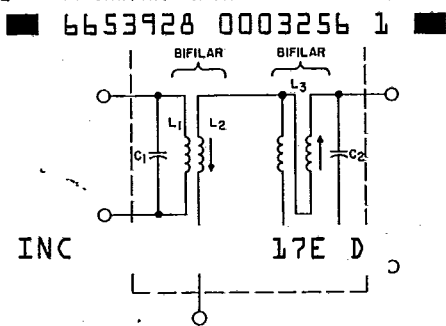
The ratio of the recovered AF output voltage produced by a specified frequency deviation of an FM input signal to the recovered AF output voltage produced by an amplitude-modulated input signal having the same carrier frequency, expressed in dB.

**Discriminator Output Resistance [ $R_O(disc)$ ]**

The ratio of a change in AF output voltage to a change in output current, measured between the output terminal of the device and ground.

**Total Harmonic Distortion (THD)**

The ratio of the total rms voltage of all harmonics to the rms voltage of the fundamental, expressed in per cent. These voltages are measured at the af output terminal of the device, with respect to ground.



(a)

T-77-07-07

## CONSTRUCTION DETAILS OF DISCRIMINATOR TRANSFORMERS SHOWN IN FIGS. 2, 14 AND 16

Coil-Form Outside Diameter = 7/32 inch

Slugs: Radio Industries, Inc. Type "E" Material, or equivalent

Wire Type: "GRIPPEZE", or equivalent

| Operating Frequency<br>Mc/s | Wire Size<br>(AWG #) | Turns           |                 |                                | C1<br>pF | C2<br>pF |
|-----------------------------|----------------------|-----------------|-----------------|--------------------------------|----------|----------|
|                             |                      | L1 <sup>A</sup> | L2 <sup>A</sup> | L3                             |          |          |
| 1.75                        | 40                   | 44              | 20              | 44 total<br>(22 bifilar wound) | 820      | 820      |
| 4.5                         | 36                   | 18              | 7               | 22 total<br>(11 bifilar wound) | 560      | 330      |
| 10.7                        | 36                   | 18              | 18              | 18 total<br>(9 bifilar wound)  | 100      | 100      |

\* Registered Trade Mark, Phelps-Dodge Copper Products.

<sup>A</sup> wound bifilar.

NOTE: The mutual coupling between L1 and L3 is adjusted for the desired degree of linearity.

(b)

Fig. 18