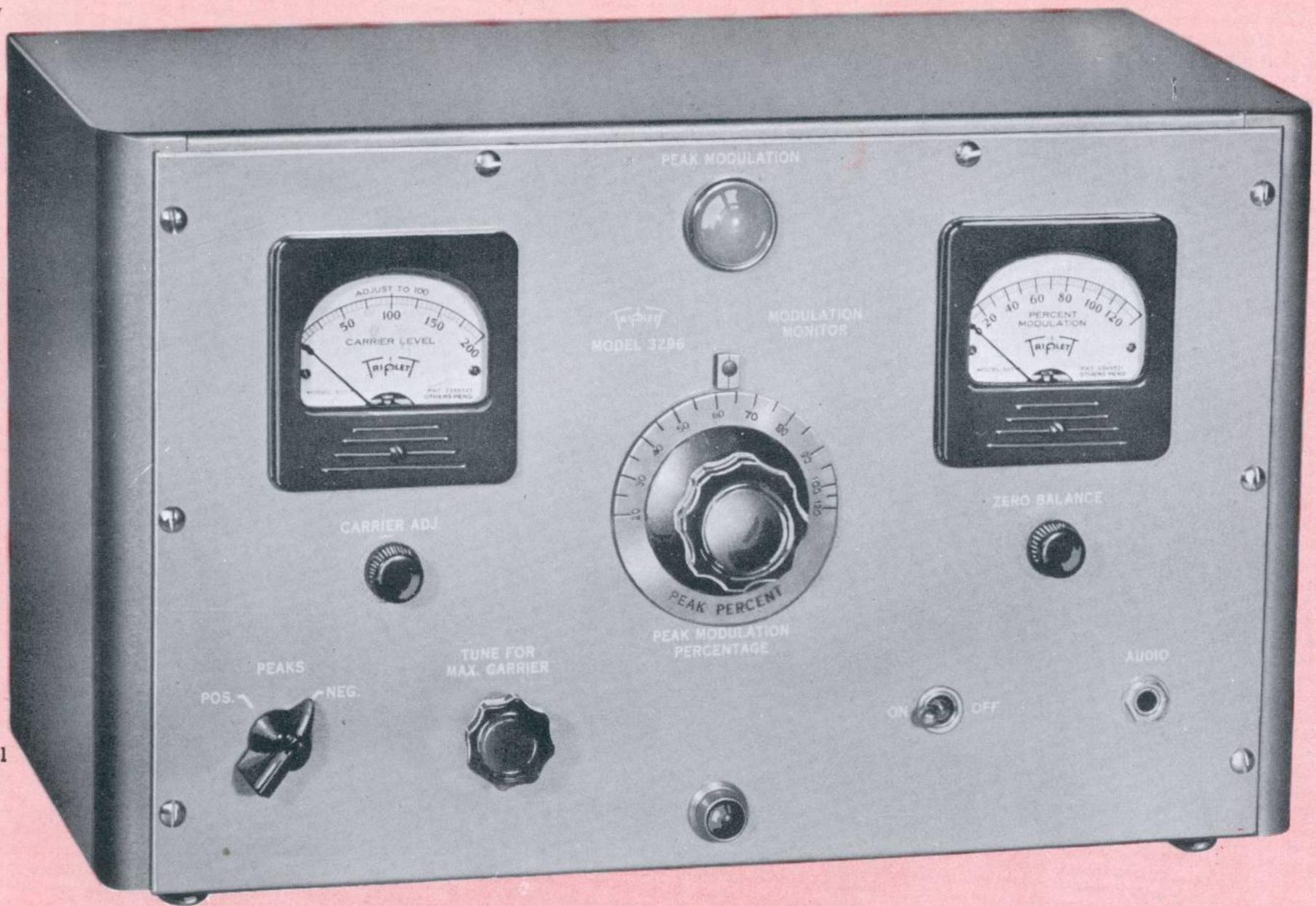


Model  
3296



# A New Modulation Monitor

## MODEL 3296

With this new Modulation Monitor for radio amateur, police and Marine radiophone use, you've solved the problem of getting maximum efficiency from your transmitter. It provides four separate circuits for measuring amplitude modulation:

- 1—Percent Modulation (Average)
- 2—Peak Flash Percent Modulation
- 3—Carrier Shift
- 4—Audio Output for Headphone

Unique advantages of this new model include the following:

- ◆ The Peak indicator may be pre-set for any percent of modulation from 20-120, and will provide instantaneous flash when the pre-determined modulation level is reached.
- ◆ The flash indicator is triggered by a Thyratron tube which gives an instantaneous flash with no semblance of lag or retentivity in its operation.
- ◆ The percent modulation meter is designed to provide a rapid up and slow down swing. This makes it easier for the eye to follow, and registers an average reading nearer the peak.
- ◆ Precision built, this instrument will meet the most exacting requirements for modulation measurement standards.
- ◆ The exterior appearance of Model 3296 will blend with standard amateur radio equipment, and definitely will enhance the appearance of any radio station.
- ◆ Plug it into your A.C. line—make simple coupling to the transmitter output and the monitor is ready for operation.
- ◆ Regulation of grid bias voltage and plate voltage by means of voltage regulated tubes provides for excellent stability of calibration settings.
- ◆ R.F. and A.F. stages are isolated and separated by ample shielding. This greatly reduces high frequency R.F. difficulties often inherent in this type of an instrument. The tuned input circuit is coupled to the R.F. source by a vario-coupler, further reducing the possibility of stray R.F. pickup, and making possible very loose coupling to the transmitter. R. F. power requirements are quite small.

## GENERAL DESCRIPTION

### TUNING RANGES

1550-2950 KC (Police Band)	14,000-14,400 KC
3500-4000 KC	28,000-30,000 KC
7000-7300 KC	Audio Frequency
	60-10,000 CPS

**INPUT**—Variable inductance and capacity tuned coil.

**SWITCHING**—Front panel switch is provided for checking the positive and negative peaks of the RF Signal. Frequency Range Selector Switch on rear of chassis.

**CARRIER METER**—Provides indication for adjustment of carrier level.

**PERCENTAGE MODULATION METER**—Provides indication of average modulation percentage.

**PEAK MODULATION**—A dial, calibrated in peak percentages, is provided for adjustment of the peak flash indicator.

**PEAK INDICATOR**—The peak indicator flashes when RF Modulation reaches percentage set on peak modulation dial.

**AUDIO OUTPUT**—A phone jack is provided for monitoring the audio component of the modulated wave.

**POWER SUPPLY**—Voltage regulated, 115 Volt 60 Cycle AC.

### TUBES

1 6X5	1 6SJ7
1 VR105	1 2050
1 VR150	1 6SN7
2 6H6	

**PANEL**—Metal, gray enamel with white screened markings and black control knobs.

**CASE**—Metal with dark gray "hammered" enamel finish; overall dimensions 15½" x 9" x 8"; nickel plated hardware.

**WEIGHT**—20 pounds.

U.S.A. Amateur Net Price.....\$109.75

INSTRUCTION MANUAL  
FOR  
MODEL 3296  
MODULATION MONITOR



The Triplett Electrical Instrument Co.  
Manufacturers of  
PRECISION MEASURING INSTRUMENTS  
Bluffton, Ohio

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# Section I

## DESCRIPTION

### I. GENERAL.

The Triplett Model 3296 Modulation Monitor provides the radio operator with a means for continuously monitoring the carrier level, percentage of modulation, modulation peaks, and aural monitoring of the audio component of the transmitted carrier.

### 2. CIRCUIT.

#### R. F. INPUT AND CARRIER LEVEL (Fig. 1)

A small amount of R. F. voltage is employed to operate the monitor which is obtained by coupling the monitor input circuit to the final plate tank or antenna coil of the transmitter. The secondary of the input coil is tuned to the transmitter frequency and the R. F. voltage rectified by the first 6H6 diode, then passed through a low pass filter which removes the R. F. component and passes on a pulsating direct current corresponding to the modulation envelope.

A D. C. Milliammeter is placed in the circuit so that it reads the average value of this current. This reading is proportional to the R. M. S. value of the transmitted carrier. A switch is provided for measuring either the positive or negative peaks.

#### Peak Flash (Fig. 2).

Capacity coupling is employed to apply the audio component of the modulation envelope to the control grid of the 6SJ7 amplifier tube which amplifies the A. F. peaks. The output of this tube is impressed on the grid of a 2550 Thyatron tube which operates as a relay tube to trigger the 115 volt flash lamp. The bias of this tube is controlled by the calibrated percent modulation dial located on the front panel and its adjustment will permit a setting for the desired percent of modulation peaks which will cause plate current to flow in the 2050 Thyatron and the light to flash, therefore, causing it to operate as a peak indicating light.

A phone jack is provided for aural monitoring of the audio component of the modulated wave.

#### Percent Modulation (Fig. 3).

Capacity coupling is also used here to apply the audio component of the modulation envelope to the second 6H6 diode rectifier. The rectified output of this tube is used to charge a capacitor.

During the intervals when the output of the diode is zero, the capacitor discharges into a resistor having a value high enough to make the rate of discharge relatively slow. Voltage across this resistor is impressed on one grid of a 6SN7 tube operating in a balanced bridge type of vacuum tube

voltmeter causing the milliammeter in the cathode circuit to act as a "semi-peak indicator."

In order that the advantages of the fast up swing of a high speed meter and the slow return advantages of a slow speed meter may be obtained, a high speed meter and a retarding circuit are used.

To obtain 90 percent readings of peaks of approximately 50 milliseconds duration, the current passed by the rectifier is used to charge a condenser which stores the energy long enough for the meter to come up to the desired reading. The condenser discharges into a 25 megohm resistor at a slow discharge rate providing the slow pointer returns to 10 percent of zero within approximately 800 milliseconds.

When a peak of modulation occurs, the meter pointer begins to rise, and if the peak is approximately 50 milliseconds long it reaches a deflection of 90 percent of true level (although the peak indication will occur slightly after the actual peak of modulation). On longer peaks, it reaches a deflection of from 90 to 105 percent. After the peak has passed, the pointer returns very slowly, corresponding to the slow discharge of the condenser and for ordinary modulation will not return to zero but instead will provide a floating reading between peaks.

Thus the peaks of the envelope of the modulation are accurately indicated while at the same time the wild swinging of the pointer, otherwise accompanying the high speed action, is eliminated.

#### Power Supply (Fig. 4).

The power supply consists of a power transformer which operates at 115 volts 50-60 cycle alternating current with a 6X5GT tube operating as a full wave rectifier followed by a capacity input filter. A VR150 tube regulates the positive DC voltage and a VR75 tube regulates the negative bias voltage.

The use of these voltage regulator tubes provide stable operation of the Modulation Monitor with the line voltage variations generally present with a plate modulated transmitter.

## Section II

### OPERATION

### I. GENERAL.

Before using the Model 3296 Modulation Meter, read the operating instructions carefully.

The "OFF-ON" toggle switch controls the power to the power supply. For best operation, the unit should be allowed to warm up for at least five minutes before making any adjustments. The controls are clearly identified by the markings on the panel and rear of the chassis. These controls serve the following purposes:

1—"PEAKS". Selector switch for checking positive and negative peaks of modulation.

2—"TUNE FOR MAX. CARRIER". Variable capacitor for tuning unit to transmitter frequency.

3—"CARRIER ADJ.". Variable inductance adjustment for adjusting carrier level meter to 100.

4—"PEAK MODULATION PERCENTAGE". Calibrated dial indicating percentage of peak modulation flasher.

5—"ZERO BALANCE". Control for adjusting Percent Modulation Meter circuit.

6—"OFF-ON". Power supply switch.

7—"AUDIO". Phone jack for aural monitoring.

8—"R. F. INPUT" (REAR CHASSIS)". R. F. input connection from transmitter including switch for selecting frequency range of tuned input circuit.

Examine meters to make sure pointers read exactly zero. If not, adjust meter zero adjuster screw for zero set. Tap the meter lightly when making this adjustment for exact setting. Connect A. C. line cord to the 115 volt, 50-60 cycle alternating current line, turn the "OFF-ON" switch to "ON" and allow the unit to warm up. During the warm up, the Percent Modulation Meter may read up or off scale and adjustment of the "ZERO BALANCE" control should be made; adjusting the meter to read zero. Continue this adjustment until meter remains on zero indicating that the warm up is complete. The Carrier Level Meter needs no further adjusting at this point.

Turn the "RF INPUT (REAR CHASSIS)" switch to the appropriate frequency range and connect a twisted pair line or coaxial cable to the input binding posts. This line is terminated with a one or two turn link and loosely coupled to the cold end of the transmitter antenna coil or R. F. amplifier plate tank.

With the transmitter turned on, but with no modulation, the "PEAKS" switch is set to "POS." and the "TUNE FOR MAX. CARRIER" capacitor is adjusted for maximum indication on the Carrier Level Meter. Adjust the "CARRIER ADJ." control until the Carrier Level Meter reads exactly 100.

When the above adjustments have been completed, the transmitter may be modulated. This modulation will be indicated in percentage by the "PEAK MODULATION" flasher and by the Percent Modulation Meter which responds to the average value.

The "PEAK MODULATION" flasher will light when the modulation peaks reach the value indicated by the setting of the "PEAK MODULATION PERCENTAGE" dial. Since the Percent Modulation Meter responds to the average value of the modulated wave, it will indicate a lower percentage of modulation than the peak indicator.

The "PEAKS" polarity switch is provided to allow checking both the

positive and negative peaks of modulation. A shift in Carrier Level Meter reading when this switch is changed from positive to negative indicates that an unsymmetrical wave is being radiated. A four position switch is used to make the reverse in polarity, and the two positions under "PEAKS" are for cross over to "POSITIVE" or "NEGATIVE" only and have no significance in operation.

For normal operation of the Modulation Monitor, the "PEAKS" switch should be in the "POSITIVE" position.

With average speech the flasher will indicate 100 percent peaks while the Percent Modulation Meter shows an average modulation of approximately 60 to 80 percent. However, with a sine wave, the two indicators should very nearly indicate the same percent reading.

The Percent Modulation Meter will not show readings above 100 percent on negative peaks. This is strictly normal phenomenon.

When head phones are plugged in for aural monitoring, the Flash Indicator Circuit is disabled as the same amplifier is used for both purposes. When the phones are removed, the Flasher will immediately resume its normal function.

The Monitor may be grounded by connecting a ground wire to one of the self-tapping screws on the rear of the chassis. Whether or not a ground is needed will depend upon the peculiarities of each individual installation.

The accuracy of this instrument can be checked by comparing its readings with those obtained with an oscilloscope, using a sine wave source of modulation or a very steady whistle into the microphone. Details regarding how to use an oscilloscope for modulation indication may be found in the "ARRL Handbook" or any other comparable publication. Simultaneous measurements should be made and relative readings noted. It is possible to read an accuracy of at least 10 percent using an oscilloscope in this manner.

It is well to remember that complex speech waves vary considerably and allowances for such differences must be figured in these relative measurements. When in doubt, keep your modulation on the low side, that is, a safe percent under the 100 percent mark. This instrument was very carefully calibrated before leaving the factory and should not need further calibration adjustment when installed.

TABLE OF TUBE SOCKET VOLTAGES.

(Measured with 1000 ohm per volt meter from socket pin to ground).

A. C. Line — 115 Volts.

Socket	Pin	Pin	Pin	Pin	Pin	Pin	Pin
	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7 No. 8
RF Section							
6H6	0	6.3	0	0	0	0	0
VR75	0	-45V DC	0	0	0	0	0
VR150	0	0	0	0	+170 DC	0	0
2050	0	6.3	-60V	0	0	0	0
6X5	0	0	-60V	0	-60V	0	240V
6H6	0	6.3	0	0	0	0	0
6SJ7	0	6.3	0	-1V	0	0	0
6SN7	0	160V	6V	0	160	0	6.3

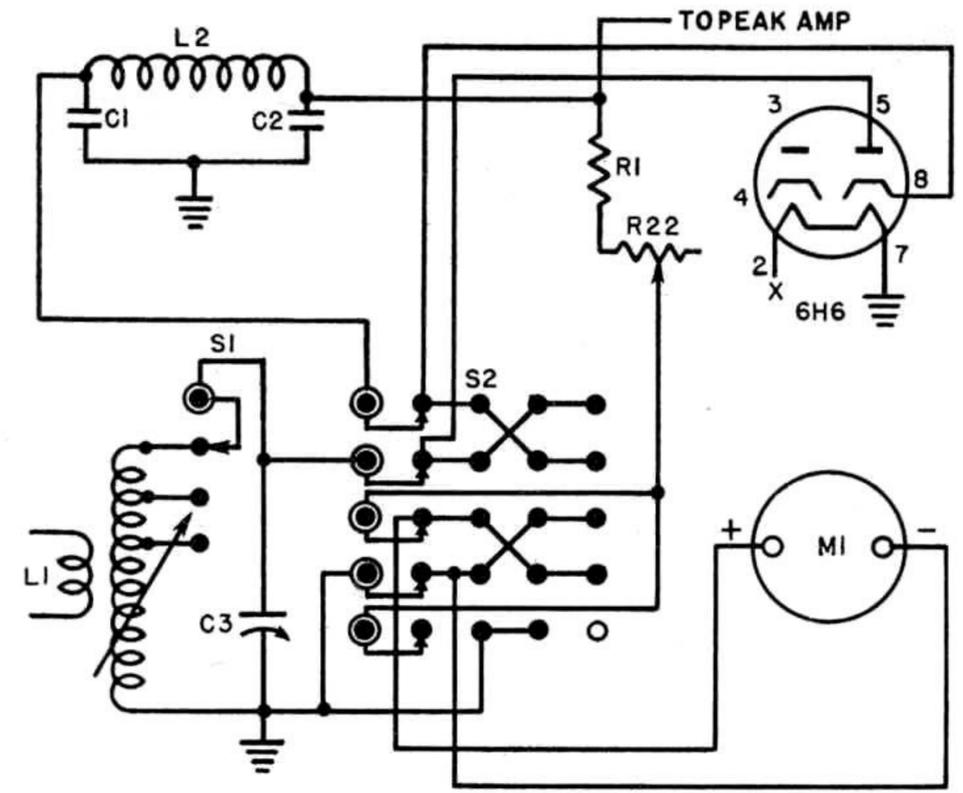


FIGURE 1- SIMPLIFIED RF INPUT CIRCUIT

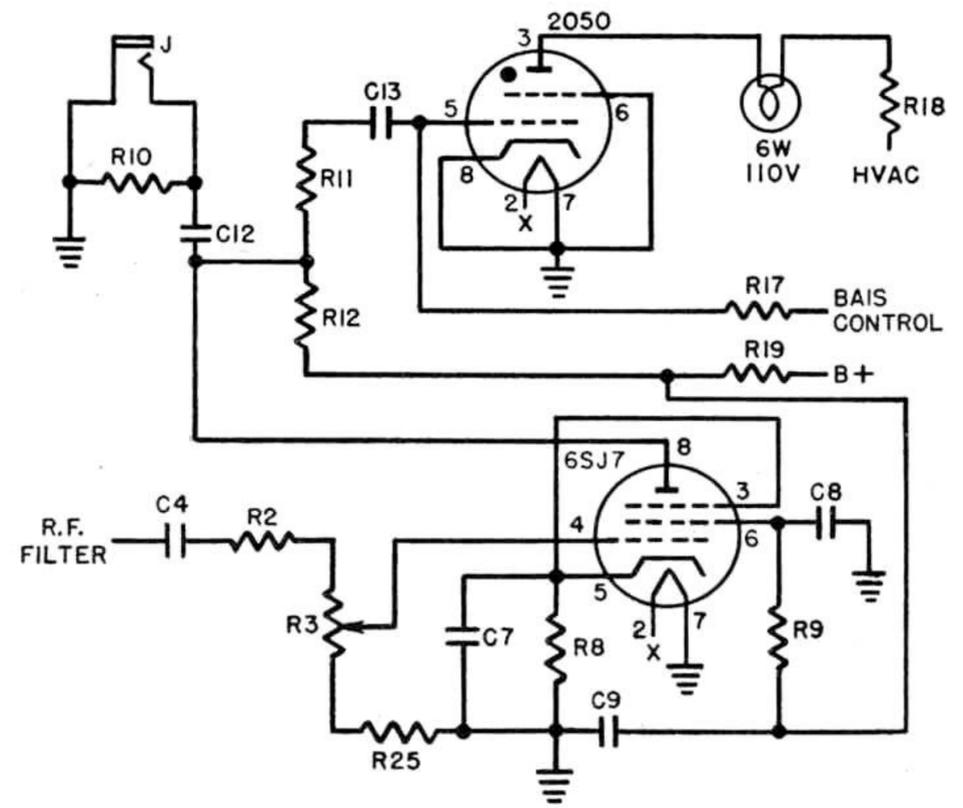


FIGURE 2- SIMPLIFIED PEAK MODULATION CIRCUIT



## Section III MAINTENANCE AND PARTS LIST

The Model 3296 Modulation Monitor is designed to require little or no maintenance. With the exception of replacing tubes when they are defective, no trouble should be experienced with this unit. Simplified circuit drawings, Figures 1 to 5 inclusive, are provided to easily acquaint the user with the various circuits.

Ref. No.	Quan.	Part Name	Description	Function	Triplet Part No.
C1	1	Capacitor	.0003 Mfd. $\pm 20\%$ , Ceramic	R. F. Filter	T-43-39
C2	1	Capacitor	.0002 Mfd. $\pm 20\%$ , Ceramic	R. F. Filter	T-43-36
C3	1	Capacitor	140 Mfd. Bud MC-1876	Tuning (Frequency)	T-43-52
C4 C5	2	Capacitor	.25 Mfd. 400 WV, Paper	Coupling	T-43-38
C6	1	Capacitor	.03 Mfd. 200 WV, Paper	Meter Timing	T-43-54
C7	1	Capacitor	10 Mfd. 25 WV, Dry Electrolytic	By-pass	T-43-50
C8 C9 C12	3	Capacitor	.05 Mfd. 400 WV, Paper	By-pass & No. 12	T-43-37
C10 C11 C13	3	Capacitor	.01 Mfd. 400 WV, Paper	Coupling	T-2631-P14
C14	1	Capacitor	10 Mfd. Dual 450 WV, Electrolytic	Line Filter & No. 13	
C15	1	Capacitor	8 Mfd. 450 WV, Electrolytic	Coupling	
M1	1	Instrument	1 Ma. 55 ohm, 327-T Carrier Level	H. V. Filter	T-43-23
M2	1	Instrument	1 Ma. 370 ohm, 327-T % Modulation	Bias Filter	T-43-34
R1	1	Resistor	20K ohm $\pm 1\%$ Carbofilm 1W	Carrier Indicator	T-52-420
R2 R17	2	Resistor	1 Megohm $\pm 10\%$ Carbon 1W	% Modulation (Avg.)	T-52-419
R3	1	Resistor	50K ohm Potentiometer Slotted Shaft	Voltage Drop	T-15-877
R4 R7	2	Resistor	500K ohm $\pm 1\%$ Carbofilm 1W	Voltage Drop	T-2601-1-1 Meg.
R5	1	Resistor	100K ohm $\pm 1\%$ Carbofilm 1W	Flash Calibrating Resistor	T-16-26
R6	1	Resistor	25 Megohm $\pm 5\%$ Carbon 1/2W	Voltage Drop & No. 7 Grid. R.	T-15-878
R8	1	Resistor	510 ohm $\pm 10\%$ Carbon 1W	Voltage Drop	T-15-978
				Meter Timing	T-15-876
				Cathode Resistor	T-2601-1-510

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Ref. No.	Quan.	Part Name	Description	Function	Part No. Triplet
R9	1	Resistor	2.4 Megohm $\pm 10\%$ Carbon 1W	Screen Resistor	T-2601-1-2.4 Meg
R10	1	Resistor	5.1 Megohm $\pm 10\%$ Carbon 1/2W	Loading Resistor	T-2601-1/2-5.1 Meg.
R11	1	Resistor	2 Megohm $\pm 10\%$ Carbon 1W	Grid Resistor	T-15-998
R12	1	Resistor	510K ohm $\pm 10\%$ Carbon 1/2W	Bias Resistor	T-2601-1/2-510K
R13 R14	2	Resistor	2K ohm $\pm 10\%$ Carbon 1W	Plate Resistor	T-2601-1-2K
R15 R16	2	Resistor	1K ohm $\pm 10\%$ Carbon 1W	Cathode Resistor	T-2601-1-1K
R18 R20	2	Resistor	1K ohm $\pm 10\%$ Wirewound 10W	Voltage Dropping Resistor	T-15-729
R19	1	Resistor	51K ohm $\pm 10\%$ Carbon 1W	Voltage Dropping Resistor	T-2601-1-51K
R21	1	Resistor	4K ohm $\pm 10\%$ Wirewound 10W	Resistor	
R22	1	Resistor	5K ohm Variable, Slotted Shaft	Bias Resistor	T-15-803
R23	1	Resistor	2.5K ohm Potentiometer	Carrier Calibration	T-16-11
R24	1	Resistor	2K ohm Potentiometer	Zero Balance	T-16-15
R25	1	Resistor	20K ohm $\pm 10\%$ Carbon 1/2W	Flasher % Control	T-16-25
L1	1	Coil	R. F. Pickup	Grid Resistor	T-2601-1/2-20K
L2	1	Choke	RFC 2.5 MH	Inductance	T-2542-60
L3	1	Choke	6.25 H Filter	Inductance	T-3022-13
S1	1	Switch	14 Pos. 1 Deck	Inductance	T-3022-10
S2	1	Switch	14 Pos. 5 Deck	Band Set	T-22-74
S3	1	Switch	Toggle, SPST	+ & - Selector	T-22-72
T	1	Transformer	Open Circuit, Midget	Power	T-2439-12
J	1	Jack	Bar, 1 1/4" long	Power	T-23-28
	3	Knob	Round, 23/32 OD x 17/32T	Phone	T-33-16
	2	Knob	Round, 2 1/16 OD x 7/8T	Band Set; Panel Adjustment	5804
	1	Knob	Round, 2 1/16 OD x 7/8T	Panel Adjustment	T-2558-1
	1	Lamp	110V, 6W, Mazda No. 6S6	Panel Adjustment	T-34-22
	1	Lamp	12-16V Mazda No. 1815	Flasher Lamp	T-67-53
	2	Binding Post	Eby Ensign No. 38	Pilot Lamp	T-67-55
	1	Case	Tester	Connections	T-211-4
				Housing	T-10-608

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