

Instructions 23343
for
Piezo-Electric Calibrator
Type TMV-133A Stock No. 9572

INTRODUCTION

The Type TMV-133A calibrator is a small self-contained testing unit its overall dimensions being only $5\frac{1}{2}$ x $2\frac{7}{8}$ x $2\frac{5}{8}$ inches. It is applicable for making the following frequency calibrations:

1. Dial Scale readings of Receivers and similar instruments.
2. Test Oscillators.
3. Other R-F Oscillators.
4. Signal Generators.
5. Any apparatus generating at specific frequencies between 100 and 50,000 kilocycles.

The test values for any particular calibrations are indicated on the dial scale of the instrument being tested or are of known frequencies. The exact frequency is checked by listening to the note from the calibrator, and the accuracy for all frequencies capable of being tested is that of the piezo electric crystal

fundamental, ± 0.05 per cent. The method of test is extraordinarily quick, easy and simple as explained later.

The output from the calibrator is in harmonic steps from 100 k.c. to 20,000 k.c. in 100 k.c. steps, and from 1,000 k.c. to 50,000 k.c. in 1,000 k.c. steps, the former with the lever of the operating toggle switch turned to "Lo" and the latter with it turned to "Hi."

The instrument operates on 110—120 Volt, A-C, 50—60 cycle current, which is used for both heater and plate supply in complete A-C operation, but for heater only in D-C operation. In the former case the plate of the radiotron in the crystal oscillator is supplied with raw A-C potential which gives a 60 cycle modulated RF output signal for receiver dial calibration work. In the latter case an unmodulated signal results from the D-C voltage applied to the plate.

DESCRIPTION

The calibrator consists of a Piezo-Electric Crystal accurately ground for two modes of oscillation (100 k.c. and 1,000 k.c. test steps), and a transformer through which A-C power is supplied for energizing the heater element of an RCA 955 acorn type triode and supplying plate voltage in the case of A-C operation. There are three binding-posts on the front of the case, one marked "-", one marked "+", and one unmarked. These are used only for D-C operation. The A-C power cord with plug is attached inside the case to the central unmarked and negative (-) terminals. The central and positive (+) binding-posts must al-

ways be connected by a link for A-C operation. For D-C operation this link must be removed. A double-pole double-throw toggle switch, located on the front of the case, selects either of the two output frequency steps. The necessary coils, resistors and capacitors for completing the circuit are as shown in the accompanying illustrations.

Important—Always remove link between center and "+" binding-posts before connecting for D-C operation. Be careful to prevent electrical contact between binding-posts and ground, as any one binding-post may be 110 Volts above ground according to the way the power cord plug is inserted in outlet.

OPERATION

Before making tests examine the unit by removing the back cover and seeing that the Acorn Tube is properly inserted in its socket. Replace back cover and proceed in the following manner:

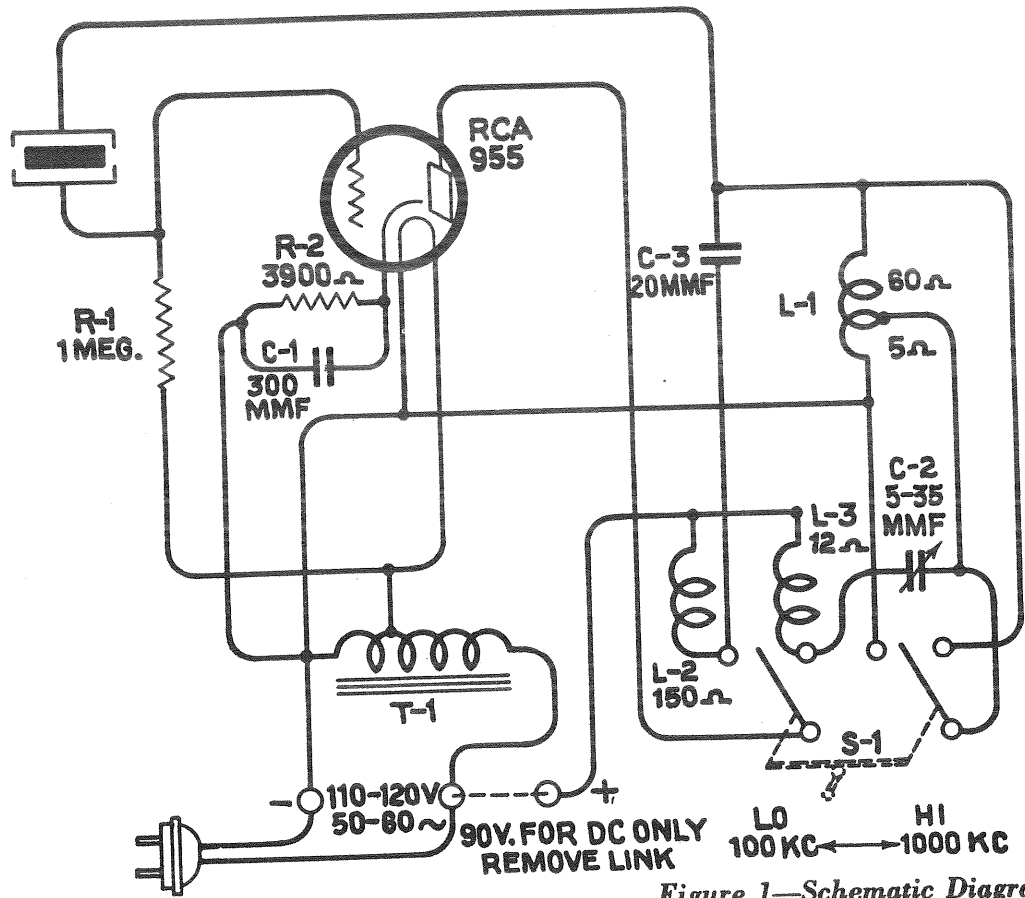
A.C. Operation

1. Unwrap Power Cord and insert plug into 110—120 Volt, 50—60 cycle, A-C outlet.
2. Place instrument in convenient location on flat surface, with back cover down, in close proximity to the instrument to be calibrated (within two or three feet).
3. Set lever of toggle switch to "Lo" for

100 k.c. steps or "Hi" for 1,000 k.c. steps according to the requirements of the test.

4. Tune the instrument being tested and notes will be heard at frequencies which are multiples of the fundamental being used. If an audible note is not produced by direct radiation, it may be necessary to provide sufficient coupling by connecting a wire to the terminal marked "ant" of the instrument being tested, winding a few turns and laying the coil so formed lengthwise on top of the calibrator. Too much coupling is apt to cause confusion in distinguishing the correct calibration point.

5. In testing a series of values such as the



VIEWED FROM BACK

Figure 1—Schematic Diagram

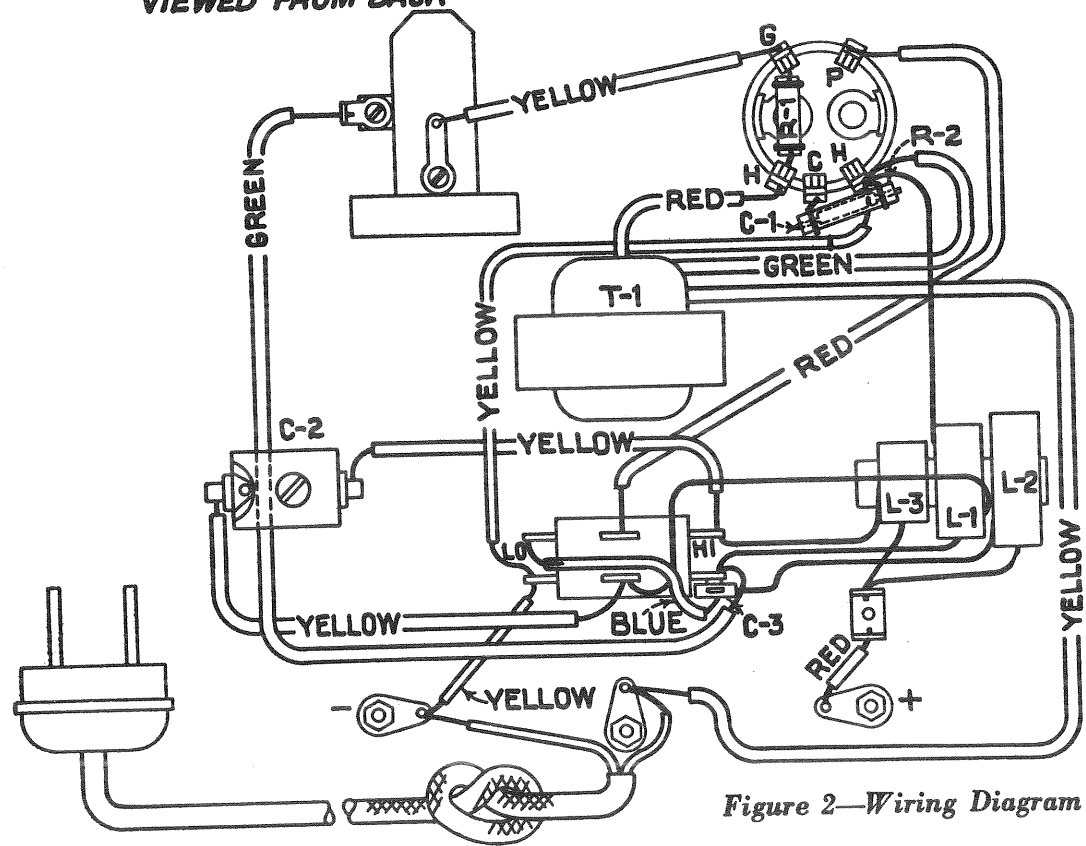


Figure 2—Wiring Diagram

markings on the dial scale of an "All-Wave" receiver, the operating switch is placed on "Lo" for the lower frequencies, and the tuning knob of the receiver turned. At each 100 k.c. value the calibrator note is heard, and the receiver may be adjusted accordingly. When the note becomes weak, perhaps as the 10,000 k.c. range is approached, depending on receiver sensitivity and noise level, attach a few feet of wire to the antenna stud of the receiver and wind a coil in the free end for coupling, as explained in the foregoing paragraph. To check an independent value, such as that of 15,250 k.c. (FYA, Paris, France), turn the Switch to "Hi" for 1,000 k.c. steps and locate the 15 m.c. point. Now, switch to "Lo" and count forward to the 15.2 and 15.3 m.c. points. The 15,250 k.c. point will be midway between.

D-C Operation

1. Remove link between center unmarked binding-post and the one on the left marked "+", and attach the leads from the D-C source to the two outside posts marked "+" and "-".
2. Insert plug on power cord in A-C, 110-120 Volt, 50-60 cycle outlet. On grounded systems where D-C line voltage is used for plate potential the grounded side of the two systems must be connected common.
3. Locate calibrator and proceed as for A-C operation using coupling coil where necessary. The note will be a hiss with the unmodulated D-C excitation.

Additional Tests

1. Calibration of Test Oscillator or Signal Generator connected to Receiver:

- a. Connect calibrator for either A-C or D-C operation and couple to receiver to give output at required frequency.
- b. Couple Test Oscillator or Signal Generator to receiver and adjust frequency to give zero beat with calibrator.
- c. Take reading on Test Oscillator or Signal Generator Scale and record any error on calibration chart.
- d. Proceed to make tests in a similar manner for all points desired to be checked.

2. Calibration of Test Oscillator Alone.

- a. Set Test Oscillator for heterodyne detection.
- b. Locate calibrator using coupling if necessary, and listen with headphones for beat note as frequency is slowly varied. With Calibrator on "Lo", zero beat should occur at each 100 k.c. mark.
- c. Record errors as required.

Note: It will be found better to make the above tests with calibrator connected for D-C operation.

In calibrating an oscillator such as the TMV 97-C, with receiver, harmonics of the lower oscillator frequencies should be used to beat against harmonics of the calibrator. For example, the tenth harmonic of 360 k.c. on oscillator being tested, will give a beat with the 3600 k.c. signal from the calibrator. Also the tenth harmonic of 370 k.c. will give a beat with the 3700 k.c. crystal calibration signal. Interpolation between the 360 and 370 k.c. point will give a 365 k.c. point on oscillator when calibrating closer than 10 k.c. The following table will serve as a guide in such calibration work. Obviously there are several combinations which may be used. In general it is best to select the lowest oscillator harmonic which will beat with a harmonic from the calibrator.

Oscillator		Calibrator		Receiver Setting
Setting k.c.	Harmonic used	Fundamental k.c.	Harmonic used	k.c.
90	10th	100	9th	900
100	10th	100	10th	1000
100	10th	1000	1st	1000
100	5th	100	5th	500
110	10th	100	11th	1100
120	10th	100	12th	1200
120	5th	100	6th	600
130, 140, 150	10th	100	13th, 14th, 15th	1300, 1400, 1500
160, 170, 180	10th	100	16th, 17th, 18th	1600, 1700, 1800
190	10th	100	19th	1900
200	3rd, 4th, 5th	100	6th, 8th, 10th	600, 800, 1000
200	10th	1000	1st	1000
200	10th	1000	2nd	2000
210	10th	100	21st	2100
:	:	:	:	:
:	:	:	:	:
1000	1st	1000	1st	1000
1500	2nd	1000	3rd	3000
2000	1st	1000	2nd	2000

MAINTENANCE

It may be necessary occasionally to replace the radiotron RCA 955, but other troubles should not occur. The crystal is a single unit with two modes of oscillation and so long as the 1000 k.c. adjusting capacitor is not moved, the two frequencies will maintain their proper

relation to each other. After long continued usage if output becomes weak or unit becomes inoperative make a careful check for circuit troubles. Then, finally, if necessary, remove and clean the crystal. This is done by removing the three nuts from the studs holding the

crystal top plate, lifting off the top plate, taking out crystal and cleaning crystal and top and bottom plates with pure alcohol. To reassemble, tighten nuts evenly till top plate just touches crystal when there will be no "shake" and crystal will not oscillate. Now back off approximately one turn on each nut until crystal oscillates normally. Check by means of a broadcast station such as WLW- 700 k.c., or other even 100, with a receiver and with calibrator switch on "Lo". Readjust crystal by turning nuts on top plate till the 700 k.c. point

gives an audio beat with the station. For 0.05 per cent accuracy the audio note will vary with the station used. Using 700 k.c., crystal would be adjusted for an audio note of 350 cycles. Adjusting to a lower audio frequency gives a higher accuracy on crystal. If adjustment of the 1000 k.c. trimmer has not been changed the 1000 k.c. steps (switch on "Hi") will automatically be correct. A fibre or bakelite wrench should be used for making final adjustments.

REPLACEMENT PARTS

Insist on genuine factory tested parts, which are readily identified and may be purchased from authorized dealers.

Stock No.	DESCRIPTION	List Price
11858	Capacitor—18 mmfd.—(C3).....	\$0.16
3981	Capacitor—300 mmfd.—(C1).....	.30
11859	Capacitor—Trimmer capacitor—(C2).....	.25
11854	Case—Crystal calibrator case and cover.....	1.45
11852	Coil—Coil assembly—(L1, L2, L3).....	1.10
11856	Electrode—Bottom section.....	1.20
11855	Electrode—Top section.....	1.20
5113	Resistor—3900 ohms—Carbon type— $\frac{1}{4}$ watt—(R2)—Package of 5.....	1.00
3033	Resistor—1 megohm—Carbon type— $\frac{1}{4}$ watt—(R1)—Package of 5.....	1.00
11860	Socket—Radiotron socket—5 contact.....	.25
11857	Spring—Electrode spacing spring—Package of 6.....	.20
11851	Switch—Toggle switch.....	1.20
11853	Transformer—Power transformer—(T1).....	1.00

*Caution—Before operating with D-C plate potential, remove link between center and positive (+) binding posts on front of case.
Any binding post may be 110 volts above ground. Avoid possibilities of electrical contact from any one to ground.*