

NAVSHIPS 94517



**MOTOROLA** test equipment

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# portable test set

|        |        |        |
|--------|--------|--------|
| MODELS | S1056A | S1057A |
|        | S1058A | S1059A |

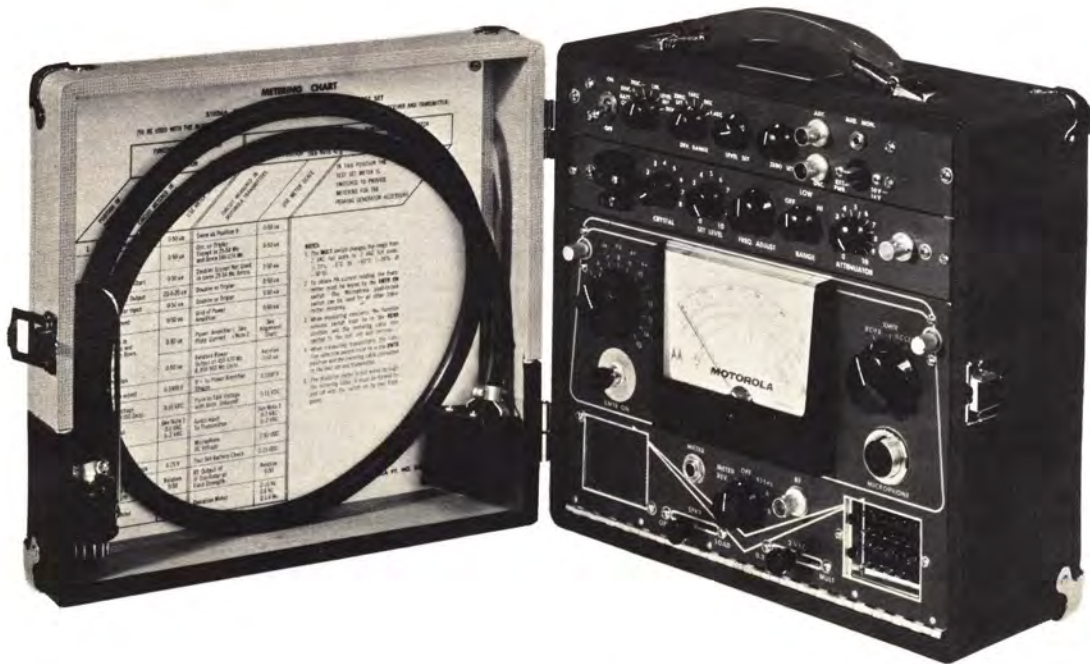


NAVSHIPS 94517

# MOTOROLA

## PORTABLE TEST SET

MODELS S1056A  
S1057A  
S1058A  
S1059A



S1059A PORTABLE TEST SET



**MOTOROLA INC.**

Engineering Publications

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COMMUNICATIONS DIVISION

Chicago 51, Illinois

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## GUARANTEED PERFORMANCE SPECIFICATIONS

### PORTABLE TEST SET

|                                    |                                                                                                                                                                                                                                                                                                         |
|------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| MODELS                             | S1056A, S1057A, S1058A and S1059A                                                                                                                                                                                                                                                                       |
| ALIGNMENT                          | Metering facilities for alignment of receiver and tune-up of transmitter through a single, 11-pin plug and cable.                                                                                                                                                                                       |
| RECEIVER OUTPUT                    | Accurate measurement of output voltage for receiver quieting measurement. Self-contained PM speaker permits audio reception.                                                                                                                                                                            |
| IF PEAKING                         | Transistorized i-f oscillator provides output from 350 kc to 13 mc when used with appropriate crystals.                                                                                                                                                                                                 |
| CRYSTAL TESTING                    | Activity of crystals between 350 kc and 13 mc may be checked.                                                                                                                                                                                                                                           |
| FIELD INTENSITY METER              | Relative values of the r-f field intensity radiated from the transmitter antenna may be measured.                                                                                                                                                                                                       |
| RF WATTMETER                       | Accurate measurement of transmitter power output with optional calibrated dummy load.                                                                                                                                                                                                                   |
| METER                              | 0-50 microamps; 2% full scale accuracy                                                                                                                                                                                                                                                                  |
| TRANSISTOR COMPLEMENT AND FUNCTION | (1) oscillator<br>(2) AC voltmeter ampl.                                                                                                                                                                                                                                                                |
| POWER SUPPLY                       | four 1-1/2 volt "D" batteries                                                                                                                                                                                                                                                                           |
| AC VOLTMETER                       | Accurately measures audio input to transmitter and audio output of receiver<br>Range: 0 to .2 v a-c; 0 to 2 v a-c<br>Frequency Response: $\pm 1$ db from 35 cps to 5000 cps<br>Input Impedance: 2 v range 400,000 ohms; .2 v range 40,000 ohms<br>Stability: -1 db from -5°C to +60°C<br>-3 db at -30°C |
| SIZE                               | 12-1/2" high x 12" wide x 6-1/2" deep                                                                                                                                                                                                                                                                   |
| WEIGHT                             | 11 lbs.                                                                                                                                                                                                                                                                                                 |

# FOREWORD

## NOMENCLATURE

Motorola radio equipment is specifically identified by the model number on the nameplate.

### NOTE

Be sure to use the entire model number when making inquiries about your equipment.

Identifiers have been assigned to chassis and kits. Use these identifiers when requesting information or ordering replacements.

## PRODUCTION CHANGES

When production and engineering changes are incorporated into the equipment, a revision numeral is assigned to the chassis or kit affected.

### Typical Example:

The Model NTD6041AA becomes NTD6041AA-1 with the first revision.

This chassis number complete with revision numeral, if any, is stamped on the chassis at the time of production. The revision numeral becomes an integral part of the chassis identifier.

A schematic diagram number complete with its issue letter is also stamped on each chassis. This establishes direct correlation between the chassis and its schematic. The schematic issue is advanced each time a change occurs in the chassis.

## INSTRUCTION MANUAL REVISIONS

Changes which occur after an instruction manual is printed are described in the Instruction Manual Revision. These bulletins give the reader complete information on the change including pertinent parts listing data.

## NATIONAL SERVICE ORGANIZATION

Motorola provides a nation-wide service organization. Through its maintenance and instal-

lation program Motorola makes available the finest service to those desiring reliable continuous communications on a contract basis.



The largest service organization specializing in mobile communications is Motorola's National Service Organization. Over 800 strategically located, adequately staffed and trained, independently owned and operated stations, manned with several thousand FCC licensed personnel constitute the sub-contracting force.

The administrative forces of area and district service managers and district service representatives are in the direct employ of Motorola.

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National Service Manager  
Motorola Communications Division  
4501 W. Augusta Blvd., Chicago 51, Illinois

## REPLACEMENT PARTS ORDERING

Motorola maintains parts and service depots and authorized service stations strategically located throughout the country. These facilities are fully equipped to give the finest service.

When ordering replacement parts, the complete number identification of the item must be used whether it be a component, kit or complete chassis. This will fix proper identification and insure receipt of the desired item. Complete number identification should also be used when requesting equipment information.

Crystal orders should specify crystal type number, crystal frequency, carrier frequency and the chassis model number in which the crystal is to be used.

CAREFUL USE OF THE INSTRUCTION MANUAL AND THE MANY SUGGESTIONS CONTAINED IN IT WILL FURTHER INSURE PROPERLY INSTALLED AND MAINTAINED RADIO EQUIPMENT.

THE EQUIPMENT DESCRIBED IN THIS MANUAL IS MANUFACTURED UNDER ONE OR MORE OF THE FOLLOWING MOTOROLA U. S. PATENTS:

|             |             |             |             |             |
|-------------|-------------|-------------|-------------|-------------|
| RE-24, 110  | 2, 602, 842 | 2, 738, 466 | 2, 809, 236 | 2, 918, 571 |
| RE-24, 815  | 2, 608, 648 | 2, 740, 891 | 2, 810, 068 | 2, 924, 705 |
| 2, 404, 359 | 2, 608, 649 | 2, 743, 144 | 2, 830, 200 | 2, 925, 562 |
| 2, 439, 408 | 2, 626, 384 | 2, 743, 361 | 2, 833, 994 | 2, 938, 082 |
| 2, 439, 412 | 2, 637, 782 | 2, 750, 451 | 2, 834, 879 | 2, 963, 577 |
| 2, 472, 021 | 2, 650, 333 | 2, 759, 052 | 2, 835, 794 | 2, 966, 585 |
| 2, 524, 300 | 2, 662, 942 | 2, 759, 103 | 2, 852, 730 | 2, 968, 739 |
| 2, 524, 534 | 2, 688, 059 | 2, 770, 721 | 2, 860, 239 | 2, 974, 221 |
| 2, 547, 023 | 2, 691, 094 | 2, 777, 950 | 2, 883, 521 | 2, 984, 740 |
| 2, 547, 025 | 2, 691, 560 | 2, 784, 263 | 2, 888, 652 | 2, 994, 844 |
| 2, 547, 027 | 2, 699, 425 | 2, 799, 001 | 2, 899, 547 | 3, 009, 115 |
| 2, 566, 759 | 2, 705, 281 | 2, 799, 010 | 2, 901, 601 | 3, 014, 127 |
| 2, 583, 032 | 2, 731, 555 | 2, 808, 507 | 2, 912, 573 |             |

Other U. S. Patents Pending

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# PORTABLE TEST SET

MODEL TABLE

| MODEL NO. | EQUIPMENT INCLUDED |                   |                 |
|-----------|--------------------|-------------------|-----------------|
|           | TEST SET           | PEAKING GENERATOR | DEVIATION METER |
| S1056A    | X                  |                   |                 |
| S1057A    | X                  | X                 |                 |
| S1058A    | X                  |                   | X               |
| S1059A    | X                  | X                 | X               |

## 1. INTRODUCTION

The Motorola Portable Test Sets provide the metering necessary to align and check Motorola transmitters and receivers in the 25-960 mc frequency range.

The test set housing is a convenient carrying case with a removable front cover. Clips mounted in the front cover hold the metering cable when carrying the test set. The accessories supplied with the test set can be stored in the meter protective cover, inside the test set, which is accessible by twisting the two quarter turn screws and opening the front panel.

The Model SLN6057A Peaking Generator, used in the S1057A and S1059A Test Sets, is available as a separate item for mounting in all models not equipped with a peaking generator.

The Model SLN1000A Deviation Meter Panel, used with the S1058A and S1059A Test Sets, is available in the Model S1062A Conversion Kit for mounting in all models not equipped with a deviation meter.

Operating voltage for the test set, is supplied by an internal 6 volt d-c source consisting of four 1-1/2 volt "D" batteries connected in series.

The test sets incorporate the following performance features:

- Direct reading multi-scale meter
- Transistorized a-c voltmeter
- Transistorized oscillator
- Selection of metering circuits in transmitters and receivers
- Zero center scale
- Peaking generator (included in Models S1057A and S1059A only or available as an optional accessory)
- Deviation Meter (included in Models S1058A and S1059A only or available as an optional accessory as part of the S1062A Conversion Kit.

## 2. ACCESSORIES SUPPLIED

All models include a metering cable, a 455 kc crystal, an r-f probe, r-f probe extension cable, r-f probe adapter and an accessory cable.

The metering cable has a 20-pin connector which mates with the receptacle on the test set and an 11-pin connector to plug into the meter receptacle on the receiver or transmitter being tested.



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The 455 kc crystal is used for receiver i-f alignment. It plugs into a socket inside the test set.

The r-f probe is a shielded cable with a connector at one end which mates directly with the BNC connector on the r-f probe extension cable. The extension cable mates with the r-f connector on the test set to supply the required r-f for specific testing purposes.

The r-f probe adapter is used with the r-f extension cable to permit the cable to connect directly to the antenna receptacle on the radio set for the r-f source.

The accessory cable is described in paragraph 4e.

### 3. METERING FACILITIES

The test set meter is calibrated in six different scales. Metering Chart (EPD-7603) which is included with this instruction manual, indicates every meter scale and its application. This chart is largely self-explanatory; however, certain procedures cannot be fully explained on the chart and are described in text form under the RECEIVER METERING PROCEDURES and TRANSMITTER METERING PROCEDURES paragraphs of this instruction manual. All metering not explained in the text can be accomplished by following the metering chart and the alignment procedures described in the instructions supplied with the equipment being tested.

In a receiver, the following stages can be measured: last i-f grid, first limiter grid, second limiter grid, discriminator output, oscillator grid, first oscillator multiplier (450-470 mc and 890-960 mc equipment), second oscillator multiplier (450-470 mc and 890-960 mc equipment), B+ voltage, A+ or filament voltage and audio output.

In a transmitter, the following stages can be measured: multiplier grids, driver grid, final amplifier grid, PA plate current, relative r-f power output (450-470 mc and 890-960 mc equipment), B+ (highest B+ to final amplifier stage), push-to-talk relay voltage, audio input and microphone d-c voltage.

Other measurements which can be made are: internal batteries of the test set, r-f voltage from the i-f oscillator and relative field strength.

The meter scales and applications are as follows:

#### a. 20 - 0 - 20 ua Scale

The 20 - 0 - 20 ua scale is the top scale on the meter. The "0" center feature of this scale provides direct, accurate readings, both positive and negative, without switching meter polarity. This arrangement simplifies adjustment of receiver discriminator output and improves local oscillator tuning for exact "on-frequency" readings.

#### b. 0 - 50 ua Scale

The 0 - 50 ua scale is the second scale from the top of the meter. This scale is used for most of the transmitter and receiver alignment requirements. The metering chart indicates the various applications for which this scale is used.

#### c. 0 - 16 K. C. DEV. Scale

The 0 - 16 K. C. DEV. scale is the third scale from the top of the meter. This scale is used when measuring the deviation of transmitters with 15 KC channel spacing. This scale is also 0 - 1.6 KC and is used for measuring "Private-Line" tones on units equipped with this feature.

#### d. 0 - 8 K. C DEV. Scale

The 0 - 8 K. C. DEV. scale is the fourth scale from the top of the meter. This scale is used to measure the deviation of transmitters with 5 KC channel spacing.

#### e. 0 - 1000 Volt DC Scale

The 0 - 1000 volt d-c scale is the fifth scale from the top of the meter. This scale is used primarily for reading B+ voltages in transmitters and receivers.

#### f. 0 - 15 Volt DC Scale

The 0 - 15 volt d-c scale is the sixth scale from the top of the meter. This scale is used when measuring filament and relay voltages and also the internal power supply of the test set.

#### g. 0 - 30 Volt DC Scale

The 0 - 30 volt d-c scale is the seventh scale from the top of the meter. This scale is used primarily for measuring microphone d-c voltage.

#### h. 0 - 2 Volt AC Scale (0 - .2 Volt AC)

The 0 - 2 volt a-c scale is the bottom scale on the meter. This scale is used to measure the audio output of a receiver and the audio input of a transmitter. The meter sensitivity can be changed, by means of a switch on the front of the test set, to indicate a full scale reading of 0.2 volts a-c.

### 4. CONTROLS

All controls used for testing and aligning are located on the front panel of the test set. These controls are shown on the Controls Location Detail, number EPD-7580, which is included in this instruction manual, and are as follows:

#### a. Position Selector Switch

The position selector switch is a 15-position switch used to select the circuit to be metered. The correct switch positions are determined by the type of equipment being tested. The Metering Chart, EPD-7603, included in this manual, indicates the switch positions in relation to the circuits. Refer to the instruction manual supplied with the radio set for switch positions to be used.

The following chart shows the relationship between the selector switch positions of previous Motorola Test Sets compared with those of the Models S1056A, S1057A, S1058A, and S1059A. An asterisk in the chart indicates there is no switch position on the P-8500 and P-8501 series comparable to the S1056A-9A.

|             |                        |   |   |   |        |   |   |               |              |      |      |       |          |    |    |       |
|-------------|------------------------|---|---|---|--------|---|---|---------------|--------------|------|------|-------|----------|----|----|-------|
| RECEIVER    | P-8500 & P-8501 Series | 1 | 2 | 3 | +4, -4 | 5 | 6 | -4 (see note) | 5 (see note) | 7    | *    | 8     | *        | *  | *  | *     |
|             | S1056A-9A              | 1 | 2 | 3 | 4      |   | 5 | 6             | 7 PA         | 8 PO | B+ 9 | A+ 10 | Audio 11 | 12 | 13 | 14 15 |
| TRANSMITTER | P-8500 & P-8501 Series | 1 | 2 | 3 | -4     |   | 5 | 6             | +4           | 1    | 7    | 8     | *        | *  | *  | *     |
|             | S1056A-9A              | 1 | 2 | 3 | 4      |   | 5 | 6             | 7 PA         | 8 PO | B+ 9 | A+ 10 | Audio 11 | 12 | 13 | 14 15 |

Note: The K-9326 Adapter Plug must be used.

#### b. Function Selector Switch

The function selector switch is labeled RCVR - XMTR - ACCESS. The switch should be placed in the RCVR position when metering a receiver and the XMTR position when metering a transmitter. The switch should be placed in the ACCESS position when metering accessory equipment.

#### c. XMTR ON Switch

The XMTR ON switch is used when measuring transmitter power amplifier (PA) current. Transmitter PA current can be measured only by pressing the XMTR ON switch and not by operating the push-to-talk button on a microphone connected to the test set.

#### d. SPKR Switch

The SPKR switch is labeled OPEN - SPKR - LOAD. In the OPEN position, a 30 ohm load is placed across the receiver output. In this position, the speaker on the test set is in operating condition, at reduced level, and messages can be heard. The main function of this switch position is to set the GAIN control on a receiver from the trunk of an automobile without double-loading the receiver output. In the SPKR position, which is the normal position of the switch, the speaker on the test set is in operating condition and messages can be heard. In the LOAD position a 3 ohm resistive load is placed across the receiver audio output, which disables the test set speaker.

e. METER Phone Jack

The accessory cable supplied is used when metering certain types of Motorola equipment. The red plug on the cable mates with the METER receptacle on the test set; the black plug mates with the phone-jack on the receiver or transmitter being metered. Motorola equipment with a phone-jack metering receptacle has a switch on the receiver and transmitter chassis to select the circuit to be metered. The accessory cable is also used for measuring transmitter r-f power output with the P-7208 Series Dummy Load.

f. Oscillator and Metering Reversing Switch

The oscillator and meter reversing switch is labeled METER REV. - OFF - 455 KC - A - B.

The METER REV. position is used to reverse the polarity of the meter to provide an on-scale reading when the needle tends to indicate in the negative direction past zero.

The OFF position is the normal position used for most applications of the test set. If the switch is in the METER REV. position and then placed in the OFF position, the polarity of the meter will be reversed.

In the 455 KC position, a signal of 455 kc is generated by the test set. This signal is used for measuring the grid of the last i-f amplifier and the discriminator input of a receiver. A 455 kc crystal is supplied with the test set.

The A and B positions are also used for crystal selection. Position A selects the crystal inserted in the "A" terminals of the crystal socket in the test set. Position B selects the crystal inserted in the "B" terminals of the crystal socket in the test set. The oscillator in the test set is capable of operation up to 12 mc. Normally, the three crystals used will be 455 kc, 5.5 mc and 12 mc. These crystals will cover the three most commonly used i-f frequencies.

g. RF Connector

The output of the test set r-f oscillator is available at the r-f connector. The r-f extension cable mates directly with the RF connector. The extension cable is used to couple the signal into the antenna connector of the receiver under test. The probe is used to inject the signal into the various stages of the receiver, as required by the alignment procedure.

h. Multiplier Switch

The multiplier switch is labeled 0.2 VAC - 2 VAC - MULT.

The 2 VAC position is the normal position of the switch. The 0.2 VAC and the 2 VAC refer to the bottom scale of the test set meter. Normally the scale reads 2 volts a-c full scale. If the switch is placed in the 0.2 VAC position, the sensitivity of the meter will be increased 20 db and the scale will be 0.2 volts a-c full scale.

The MULT position is used only when measuring the oscillator multipliers in 450-470 mc and 890-960 mc equipment.

**CAUTION**

DO NOT use the MULT position for metering 25-54, 72-76 or 132-174 mc receivers. These receivers do not have oscillator multipliers; the meter could be damaged in the MULT position with these receivers.

i. MICROPHONE Connector

The MICROPHONE connector is a four-pin female receptacle which mates directly with any Motorola microphone (or equivalent) which has a four-pin male microphone connector.

j. Metering Socket

The metering socket is a 20-pin male plug. The metering cable, supplied with the test set, connects directly to the metering socket.

k. Speaker

The speaker is used for all applications which may require audible indications for adjustment or checking purposes.

**5. RECEIVER METERING PROCEDURES**

Most Motorola FM communications receivers incorporate either an 11-pin metering plug or a phone-jack mounted on the receiver chassis. Receivers which do not have the meter plug or phone-jack have no special facilities for metering purposes. When measuring the latter type of receivers refer to the alignment chart supplied with the receiver.

### NOTE

The 20-pin metering cable plug acts as the internal battery ON-OFF switch. Pins 19 and 20 on the plug are jumpered. Connecting the plug to the test set socket completes the battery circuit. To conserve battery life when not using the test set either (1) disconnect meter cable from test set, or (2) set the Oscillator and Meter Reversing Switch to OFF and put Position Selector Switch to any position except 11 or 13.

a. Receivers Incorporating an 11-pin Metering Plug

The Metering Chart, EPD-7603, included in this instruction manual, lists all of the stages which can be measured in a receiver incorporating an 11-pin metering socket. As an example, with the Position Selector Switch in position 1, the procedure is as follows:

(1) Last IF Stage Alignment

The circuit to be metered is the grid of the last i-f stage. When the metering cable is plugged into the socket on the front panel, the meter is connected across pins #1 and #11 on the 20-pin plug and pins #1 and #11 on the 11-pin plug of the metering cable. At the same time a resistance of 18,000 ohms, in the test set, is placed in series with the meter. The scale to read is the 0-50 ua scale.

The crystal oscillator is used to align receiver i-f sections ranging from 350 kc to 13 mc. The crystal employed must have the same frequency or sub-harmonic of the i-f section being aligned. The frequency of the crystal must be calculated from the formulas given in Table 1. Internal sockets are available to plug-in the AQL, ANL, and/or AUL type crystals, within the frequency range specified above.

A 455 kc crystal is supplied with the equipment. Other crystals must be ordered separately. Table 2 lists the frequency ranges of different types of available crystals. Having calculated the crystal frequency needed, the crystal type number may be selected from this table. When ordering, specify both the crystal frequency and crystal type number. Refer to the receiver block diagram supplied with the receiver for the i-f frequencies required for alignment.

TABLE 1

Crystal Calculations for the Portable Test Set (Crystal calculation information for the peaking generator and deviation meter is contained in their respective sections.)

$F_c$  = Desired test set output frequency  
 $F_x$  = Crystal frequency required

| $F_c$        | $F_x$                 |
|--------------|-----------------------|
| 290-800 kc   | $F_x = F_c$           |
| 800-1600 kc  | $F_x = \frac{F_c}{2}$ |
| 1600-2000 kc | $F_x = \frac{F_c}{3}$ |
| 2-13 mc      | $F_x = F_c$           |

TABLE 2

Crystal Type Available and Their Frequency Range

| Crystal Frequency | Motorola Type |
|-------------------|---------------|
| 290-800 kc        | AQL           |
| 1250-1600 kc      | ANL and AN    |
| 2000-6000 kc      | ANL and AN    |
| 6000-10000 kc     | AUL           |
| 10000-13000 kc    | ANL and AN    |

To align the i-f section of a receiver:

(a) Plug the applicable i-f test crystal into the "A" terminals on the crystal socket inside the test set.

(b) Plug the metering cable into the 20-pin socket on the test set.

(c) Plug the other end of the metering cable into the 11-pin plug on the receiver chassis.

(d) Connect one end of the r-f probe extension cable to the r-f connector on the test set. Connect the other end of the r-f probe extension cable to the r-f probe cable. Place the r-f probe under the receiver chassis near the grid of the last mixer tube.

(e) Place the Function Selector Switch in the RCVR position.

(f) Place the Position Selector Switch in position 1.

(g) Align the receiver as described in the instructions supplied with the receiver. Note that the test set Position Selector Switch positions may differ from those in the receiver instructions. Refer to the chart in paragraph 4a. of these instructions for a cross reference between switch positions.

(2) 450-470 mc and 890-960 mc Receivers - Multiplier Grid Current Measurements

(a) Connect the metering plug to the test set and to the receiver.

(b) Place the Function Selector Switch in the RCVR position.

(c) Place the Position Selector Switch in position #7 or #8.

(d) Hold the Multiplier switch in the MULT position.

Complete, detailed alignment procedures are described in the instructions supplied with the receivers.

**NOTE**

In some early models of the 450-470 mc receivers, the first oscillator multiplier is wired to pin #7 and the second oscillator multiplier is wired to pin #8 of the 11-pin metering socket on the receiver chassis. In later models of the 450-470 mc and the 890-960 mc receivers, the first multiplier is wired to pin #6 and the second multiplier is wired to pin #7 of the 11-pin metering socket on the receiver chassis. In the latter case, the MULT switch is used only to measure the second multiplier.

**CAUTION**

DO NOT use the MULT position when testing receivers which do not have oscillator multipliers, e. g., 25-54 mc, 72-76 mc and 132-174 mc receivers. The 50 ua meter movement can tolerate a 10 times overload which results in 0.5 ma and approximately one volt across the meter. However, with silicon diodes shunting the meter movement, the current required to maintain one volt across the circuit must exceed 10 ma. In the most sensitive meter connection, approximately 200 volts will cause 10 ma to flow in the circuit. The power dissipated by the resistor is approximately

two watts. Since the resistor is rated at 1/2 watt, the duration of this type of overload should be limited, to prevent damage to the precision resistor.

b. Receivers Incorporating a Phone-Jack Metering Connector

To measure receivers which have a phone-jack metering connector, the accessory cable (with a phone-plug at each end) must be used. When the phone-plug is connected to the test set METER receptacle, the Function Selector Switch, Position Selector Switch, XMTR ON button, MICROPHONE connector and the Multiplier Switch are removed from the circuitry. The only exception is the zero center, since it is a separate circuit as described in paragraph 7b.

With the phone-plug connected, the 0-50 ua meter movement is the only scale which can be used. The polarity of the meter may be changed by the METER REV switch.

(1) Plug the red phone-plug, on the accessory cable, into the METER socket on the test set.

(2) Plug the black phone-plug on the other end of the accessory cable into the phone-jack meter connector on the receiver to be tested.

(3) Refer to the instructions supplied with the receiver for detailed metering procedures.

**6. TRANSMITTER METERING PROCEDURES**

Most Motorola FM communications transmitters incorporate either an 11-pin metering plug or a phone-jack mounted on the transmitter chassis. Transmitters which do not have the metering plug or phone-jack have no special facilities for metering purposes. When measuring the latter type of transmitters, refer to the transmitter alignment chart supplied with the transmitter.

a. Transmitters Incorporating an 11-pin Metering Plug

The Metering Chart, EPD-7603, included with this instruction manual, lists all of the stages which can be measured in a transmitter incorporating an 11-pin metering socket. As an example, with the Position Selector Switch in position 2, the procedure is as follows:

The circuit to be metered is the oscillator or tripler in all Motorola transmitters except 25-54 mc and some 132-174 mc transmitters. When the metering cable is plugged into the socket on the front panel, the meter is connected across pins #2 and #11 on the 20-pin plug and pins #2 and #11 on the 11-pin plug of the metering cable. At the same time a resistance of 18,000 ohms, in the test set, is placed in series with the meter. The scale to read is the 0-50 ua scale.

(1) Measurement of Power Amplifier (PA) Plate Current

Measure the PA current as follows:

- (a) Connect the metering plug to the test set and to the transmitter.
- (b) Place the Function Selector Switch in the XMTR position.
- (c) Place the Position Selector Switch in position #7, PA.
- (d) Push the XMTR ON switch and hold it down during the testing period.

The scale to read is the 0-50 ua scale. Refer to the instructions supplied with the transmitter to interpolate the microampere reading to milliamperes plate current.

**NOTE**

For PA readings, the transmitter must be keyed by the XMTR ON button. A PA reading cannot be obtained by keying the transmitter with a microphone push-to-talk switch.

b. Transmitters Incorporating a Phone-Jack Metering Connector

To measure transmitters which have a phone-jack metering connector, the accessory cable (with a phone-plug at each end) must be used. When the phone-plug is connected to the test set METER receptacle, the Function Selector Switch, Position Selector Switch, XMTR ON button, MICROPHONE connector and the Multiplier Switch are removed from the circuitry. The only exception is the zero center, since it is a separate circuit as described in paragraph 7b.

With the phone-plug connected, the 0-50 ua meter movement is the only scale which can be used. The polarity of the meter may be changed by the METER REV switch.

(1) Plug the red phone-plug, on the accessory cable, into the METER socket on the test set.

(2) Plug the black phone-plug on the other end of the accessory cable into the phone-jack meter connector on the transmitter to be tested.

(3) Refer to the instructions supplied with the transmitter for detailed metering procedures.

c. Measurement of Transmitter RF Power Output

The P-7208 and P-7208A RF Dummy Loads are available on separate purchase order for use with the test set to measure transmitter r-f power output. The P-7208 has a standing wave ratio of less than 1.2 between 25 mc and 174 mc with a 50 ohm load impedance. The power capabilities of both dummy loads is 25 watts for continuous operation and 60 watts for intermittent operation. The P-7208A is used with Motorola "Handie-Talkie"® FM Radiophone and Pack Sets. It has the same rated capacity as the P-7208 and is calibrated for a full scale reading of 50 ua with 2 watts r-f power.

Measure the r-f power output as follows:

(1) Plug the red phone-plug, on the accessory cable, into the METER socket on the test set.

(2) Plug the black phone-plug, on the accessory cable, into the dummy load.

(3) Connect the transmitter ANT connector to the coaxial connector on the dummy load. Use the r-f extension cable supplied with the test set.

(4) Turn on the transmitter by means of the microphone used with the radio set.

(5) Note the reading on the meter. Refer to the calibration curve supplied with the dummy load to convert the microamperes to watts.

## 7. MAINTENANCE

a. Service Accessibility

Turn the panel fasteners (one located above the Function Selector Switch and the other is above the Position Selector Switch) one-half turn and pull down for access to the four batteries. Remove the protective cover to expose the circuitry. Refer to the parts location detail for location of the various components of the circuit.

b. Zero Center Adjustment

The zero center scale (top scale) is adjusted at the factory for an exact zero meter reading. Due to aging and battery life, it may be necessary to readjust the zero center. This control is located on the left inside of the test set through a hole in the protective cover. Refer to the parts location detail. Adjust the control as follows:

- (1) Place the Function Selector Switch in the RCVR position.
- (2) Place the Position Selector Switch in position 4.
- (3) Turn the control in the direction which moves the needle toward zero center. When the needle reaches the zero point, the adjustment is completed.

If the adjustment control does not bring the meter to zero center, replace the 1-1/2 volt battery in the zero center circuit.

c. AC Voltmeter Calibration

The voltmeter is calibrated at the factory. If any components in the meter circuitry are replaced, it may be necessary to recalibrate the meter. The meter calibration control is located on the printed circuit board. Refer to the parts location detail for location of the control.

- (1) Plug the 20-pin metering plug into the test set, to jumper pin #19 and #20.
- (2) Place the Function Selector Switch in the XMTR position.
- (3) Connect an a-c power source to pins #1 and #2 of the MICROPHONE receptacle on the front panel.
- (4) Adjust the power source for 2 volts output measured with a voltmeter of known accuracy.
- (5) Adjust the meter calibration control until the meter (bottom scale) indicates 2 volts full scale.

Controls Location Detail  
Motorola No. BEPD-7580-O  
7/19/62-UM

## METERING CHART

S1056A, S1057A, S1058A AND S1059A PORTABLE TEST SET

(TO BE USED WITH THE ALIGNMENT PROCEDURES DESCRIBED IN THE INSTRUCTIONS SUPPLIED WITH EACH RECEIVER AND TRANSMITTER)

|                                            |                                                                                                            | FUNCTION SELECTOR SWITCH<br><b>RCVR.</b><br>POSITION (SEE NOTE 3) |                                                              | FUNCTION SELECTOR SWITCH<br><b>XMTR.</b><br>POSITION (SEE NOTE 4)                                                   | FUNCTION SELECTOR SWITCH<br><b>ACCESS.</b><br>POSITION |
|--------------------------------------------|------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------|--------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------|
| POSITION OF<br>POSITION SELECTOR<br>SWITCH |                                                                                                            | CIRCUIT METERED IN<br>MOTOROLA RECEIVERS                          |                                                              | CIRCUIT MEASURED IN<br>MOTOROLA TRANSMITTERS                                                                        | USE METER SCALE                                        |
|                                            |                                                                                                            | METER SCALE                                                       |                                                              | IN THIS POSITION THE<br>TEST SET METER IS<br>SWITCHED TO PROVIDE<br>METERING FOR THE<br>PEAKING GENERATOR ACCESSORY |                                                        |
| 1                                          | See Alignment Chart                                                                                        | 0-50 ua                                                           | Same as Position 8                                           | 0-50 ua                                                                                                             |                                                        |
| 2                                          | See Alignment Chart                                                                                        | 0-50 ua                                                           | Osc. or Tripler<br>Except in 25-54 Mc<br>and Some 144-174 Mc | 0-50 ua                                                                                                             |                                                        |
| 3                                          | See Alignment Chart                                                                                        | 0-50 ua                                                           | Doubler Except Not Used<br>in some 25-54 Mc Xmtrs.           | 0-50 ua                                                                                                             |                                                        |
| 4                                          | Discriminator Output                                                                                       | 20-0-20 ua                                                        | Doubler or Tripler                                           | 0-50 ua                                                                                                             |                                                        |
| 5                                          | Discriminator Input                                                                                        | 0-50 ua                                                           | Doubler or Tripler                                           | 0-50 ua                                                                                                             |                                                        |
| 6                                          | See Alignment<br>Chart                                                                                     | 0-50 ua                                                           | Grid of Power<br>Amplifier                                   | 0-50 ua                                                                                                             |                                                        |
| 7                                          | Multipliers in<br>450-470 Mc and<br>890-960 Mc Rcvrs.<br>with<br>Multiplier<br>Switch in<br>Mult. Position | 0-50 ua                                                           | Power Amplifier } See<br>Plate Current } Note 2              | See<br>Alignment<br>Chart                                                                                           |                                                        |
| 8                                          |                                                                                                            | 0-50 ua                                                           | Relative Power<br>Output of 450-470 Mc<br>& 890-960 Mc Units | Relative<br>0-50 ua                                                                                                 |                                                        |
| 9                                          | B+ (when wired)                                                                                            | 0-1000 V                                                          | B+ to Power Amplifier<br>Stages                              | 0-1000 V                                                                                                            |                                                        |
| 10                                         | Filament Voltage<br>when wired (DC Only)                                                                   | 0-15 VDC                                                          | Push-to-Talk Voltage<br>with Xmtr. Unkeyed                   | 0-15 VDC                                                                                                            |                                                        |
| 11                                         | Audio Output<br>of Receiver                                                                                | See Note 1<br>0-2 VAC<br>0-2 VAC                                  | Audio Input<br>To Transmitter                                | See Note 1<br>0-2 VAC<br>0-2 VAC                                                                                    |                                                        |
| 12                                         | NONE                                                                                                       |                                                                   | Microphone<br>DC Voltage                                     | 0-30 VDC                                                                                                            |                                                        |
| 13                                         | Test Set Battery Check                                                                                     | 0-15 V                                                            | Test Set Battery Check                                       | 0-15 VDC                                                                                                            |                                                        |
| 14                                         | RF Output of<br>IF Oscillator or<br>Field Strength                                                         | Relative<br>0-50                                                  | RF Output of<br>IF Oscillator or<br>Field Strength           | Relative<br>0-50                                                                                                    |                                                        |
| 15                                         | Deviation Meter                                                                                            | 0-16 Kc<br>0-8 Kc<br>0-1.6 Kc                                     | Deviation Meter                                              | 0-16 Kc<br>0-8 Kc<br>0-1.6 Kc                                                                                       |                                                        |

### NOTES:

1. The **MULT** switch changes the range from 2 VAC full scale to .2 VAC full scale.  $\pm 10\%$   $-5^{\circ}\text{C}$  to  $+60^{\circ}\text{C}$  ( $-30\%$  at  $-30^{\circ}\text{C}$ ).
2. To obtain PA current reading, the transmitter must be keyed by the **XMTR ON** switch. The Microphone push-to-talk switch can be used for all other transmitter metering.
3. When measuring receivers, the function selector switch must be in the **RCVR** position and the metering cable connected to the test set and receiver.
4. When measuring transmitters, the function selection switch must be in the **XMTR** position and the metering cable connected to the test set and transmitter.
5. The deviation meter is not wired through the metering cable. It must be turned on and off with the switch on its own front panel.

MOTOROLA PT. NO. EPD-7603

# TYPE BNC CONNECTOR ASSEMBLY INSTRUCTIONS



EPD-1140



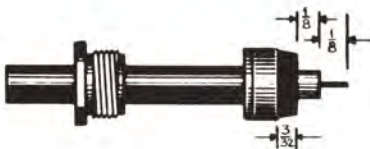
Trim jacket  $\frac{1}{4}$ " for RG-58/U,  $\frac{5}{16}$ " for RG-59/U or  $\frac{7}{16}$ " for RG-71/U.



Fray shield and strip inner dielectric  $\frac{1}{8}$ ". Tin center conductor.



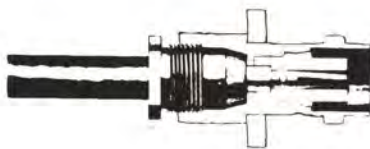
Taper braid and slide nut, washer, gasket and clamp over braid. Clamp is inserted so that its inner shoulder fits squarely against end of cable jacket.



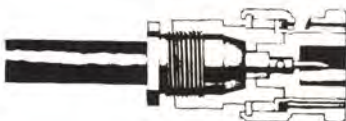
With clamp in place, comb out braid, fold back smooth as shown and trim  $\frac{3}{32}$ " from end.



Slip contact in place, butt against dielectric and solder. Remove excess solder from outside of contact. Be sure cable dielectric is not heated excessively and swollen so as to prevent dielectric from entering into connector body.

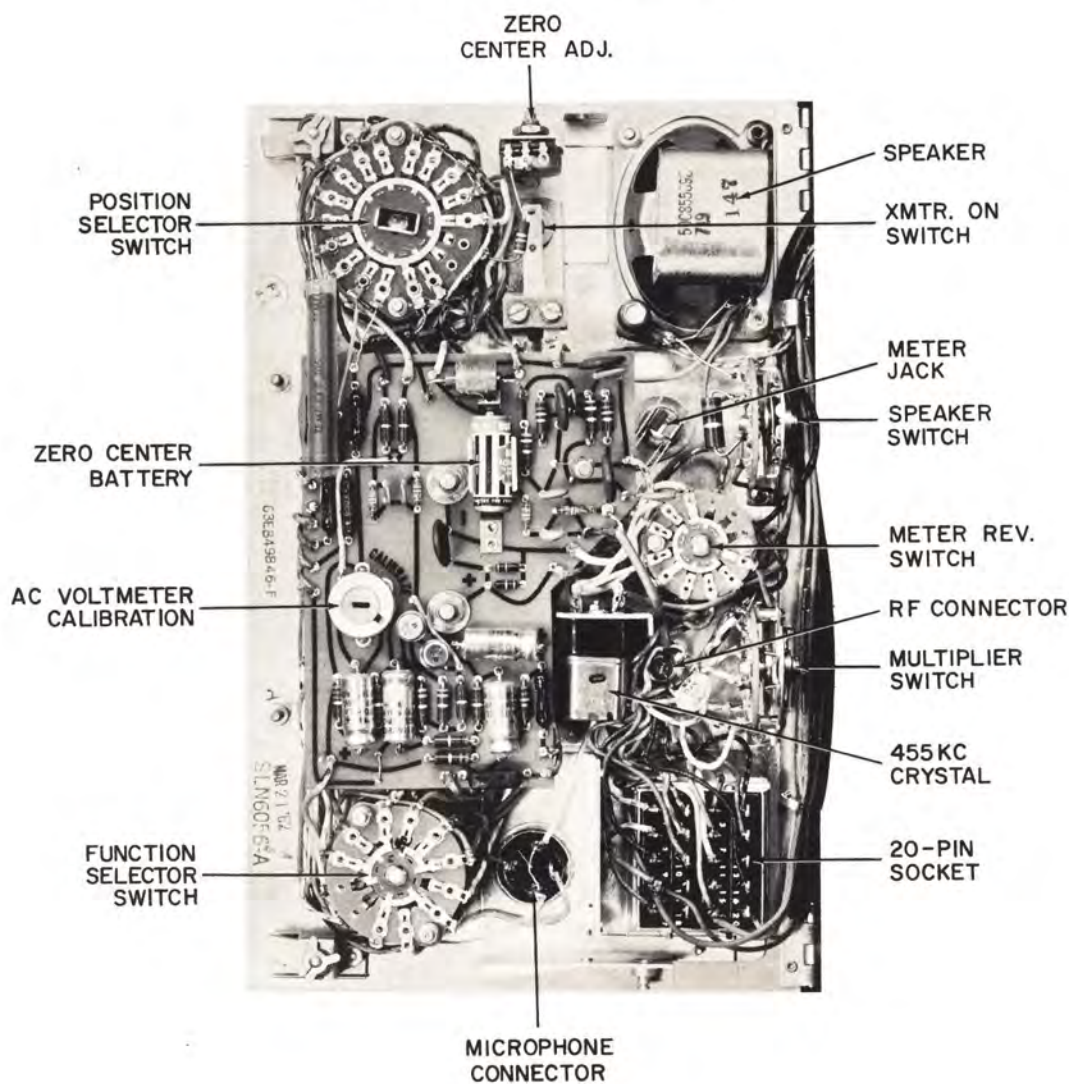


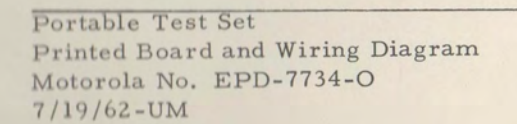
Push assembly into body as far as it will go. Slide nut into body and screw in place with wrench until tight. For this operation, hold cable and shell rigid and rotate nut.

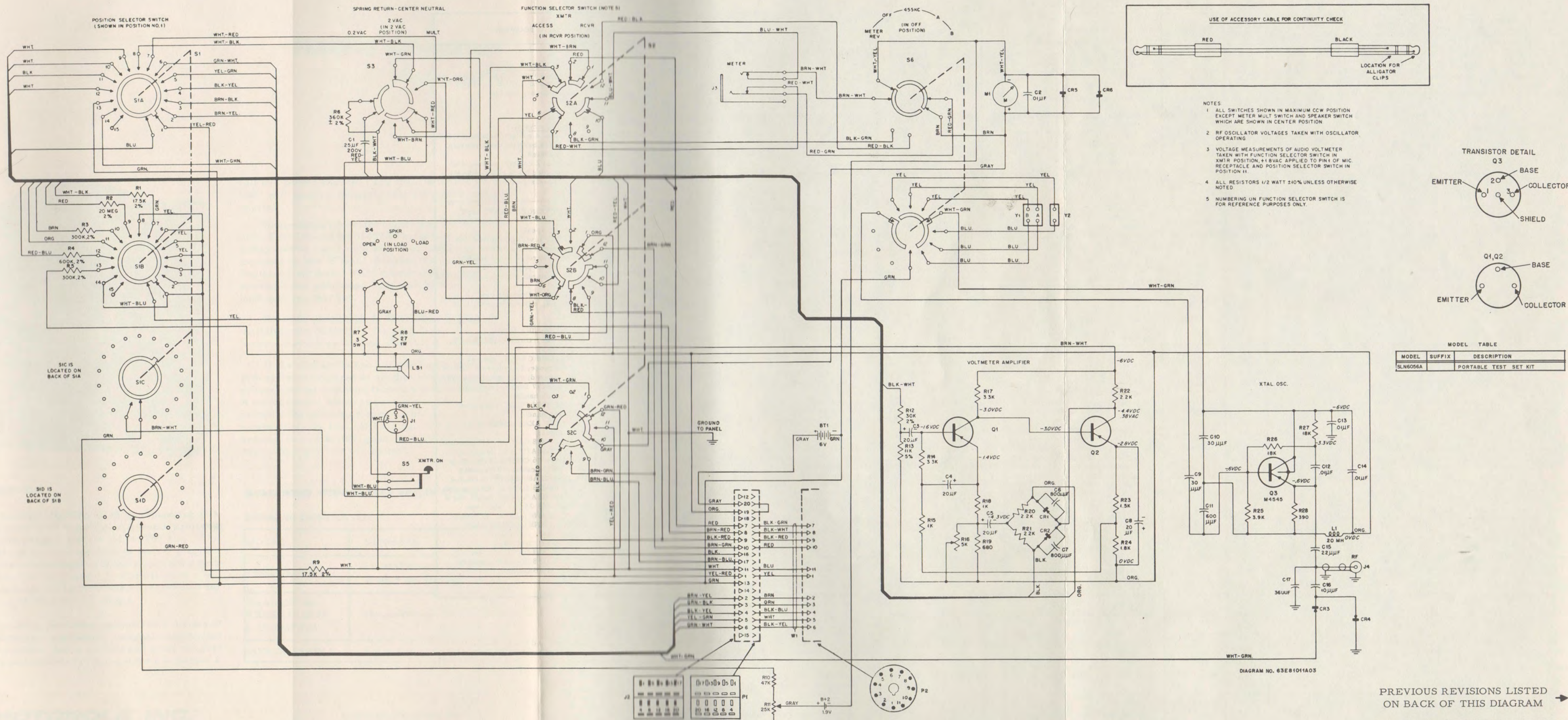




### REAR VIEW OF FRONT PANEL







PREVIOUS REVISIONS LISTED  
ON BACK OF THIS DIAGRAM

Portable Test Set  
Schematic Diagram  
Motorola No. 63E81011A03-O1  
7/19/62-UM

| REVISIONS   |                        |             |               |                 |
|-------------|------------------------|-------------|---------------|-----------------|
| DIAG. ISSUE | CHASSIS AND SUFFIX NO. | REF. SYMBOL | CHANGE        | LOCATION        |
| O1          | SLN6056A               | BT1         | WAS 60B852116 | Q1              |
|             |                        | C3          | WAS 23C855013 | Q1 BASE         |
|             |                        | M1          | WAS 72D855099 | S6 SWITCH       |
|             |                        | Q1          | WAS 48R134545 | VOLTMETER AMPL. |
|             |                        |             | ADDED NOTE    | PARTS LIST      |

PARTS LIST for Diagram 63E81011A03-O1

| REFERENCE SYMBOL | MOTOROLA PART No.           | DESCRIPTION                                                                                                                   |
|------------------|-----------------------------|-------------------------------------------------------------------------------------------------------------------------------|
| BT1              | 60B864085<br>or 60K867953   | <u>BATTERY, dry:</u><br>1-1/2 volt; "D" size cell; 4 req'd                                                                    |
| BT2              | 60B855262                   | 1-1/2 volt; "N" size cell                                                                                                     |
| C1               | 8K834384                    | <u>CAPACITOR, fixed:</u><br>metallized paper; tubular; .25 uf<br>±20%; 200 vdcw                                               |
| C2               | 21B801139                   | ceramic; disc; .01 uf; +80-20%;<br>600 vdcw                                                                                   |
| C3               | 23C844927<br>or 23C82601A03 | electrolytic; tubular; 20 uf<br>+100-10%; 25 vdcw                                                                             |
| C4               |                             | same as C3                                                                                                                    |
| C5               |                             | same as C3                                                                                                                    |
| C6               | 21B847070                   | ceramic; disc; 800 uuf ±10%;<br>600 vdcw                                                                                      |
| C7               |                             | same as C6                                                                                                                    |
| C8               |                             | same as C3                                                                                                                    |
| C9               | 21R114166                   | ceramic; disc; 30 uuf ±10%;<br>500 vdcw                                                                                       |
| C10              |                             | same as C9                                                                                                                    |
| C11              | 21K851299                   | ceramic; disc; 600 uuf ±10%;<br>600 vdcw                                                                                      |
| C12              |                             | same as C2                                                                                                                    |
| C13              |                             | same as C2                                                                                                                    |
| C14              |                             | same as C2                                                                                                                    |
| C15              | 21R124554                   | ceramic; disc; 22 uuf ±5%;<br>500 vdcw                                                                                        |
| C16              | 21R410063                   | ceramic; disc; 10 uuf ±5%;<br>500 vdcw                                                                                        |
| C17              | 21K852185                   | ceramic; disc; 36 uuf ±5%; 500 vdcw                                                                                           |
| CR1              | 48C847274                   | <u>SEMICONDUCTOR DEVICE, diode:</u> (SEE NOTE)<br>germanium                                                                   |
| CR2              |                             | same as CR1                                                                                                                   |
| CR3              |                             | same as CR1                                                                                                                   |
| CR4              |                             | same as CR1                                                                                                                   |
| CR5              | 48B857965                   | silicon                                                                                                                       |
| CR6              |                             | same as CR5                                                                                                                   |
| J1               | 9B16345                     | <u>CONNECTOR, receptacle:</u><br>female; 4 contact; polarized;<br>round molded phenolic<br>insulator; chassis mounted         |
| J2               | 28B855267                   | male; 20 contact; polarized;<br>rectangular molded black<br>phenolic insulator; saddle<br>mounted                             |
| J3               | 9B855279                    | <u>JACK, telephone:</u><br>contact arrangement of stacks,<br>2 form "B"                                                       |
| J4               | 9B855268                    | <u>CONNECTOR, receptacle:</u><br>female; single contact; round<br>molded insulator; 50 ohm<br>impedance; chassis mounted      |
| L1               | 24B801876                   | <u>COIL, RF:</u><br>choke; 20 millihenries; coded<br>BLUE dot                                                                 |
| LS1              | 50C855098                   | <u>SPEAKER, magnetic:</u><br>voice coil impedance, 3.2 ohm;<br>power rated at 3 watt; PM<br>type; 2" x 3"                     |
| M1               | 72D82534D01                 | <u>METER, multi-scale:</u><br>panel mounted; consists of<br>20-0-20, 0-50 ua; 0-1000 VDC,<br>0-15 VDC, 0-30 VDC, 0-2 VAC      |
| P1               | 9B855266                    | <u>CONNECTOR, plug:</u><br>female; 20 contact; polarized;<br>rectangular molded black<br>phenolic insulator; cable<br>mounted |

| REFERENCE SYMBOL | MOTOROLA PART No. | DESCRIPTION                                                                                                                                                                                                                                                            |
|------------------|-------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| P2               | 28B813576         | <u>CONNECTOR, plug:</u><br>male; 11 contact; polarized;<br>round molded black phenolic<br>insulator; does not include<br>1V858293 SHELL, connector<br>and handle and 41A483715<br>SPRING, connector shell<br>retainer; shell and spring<br>must be ordered separately  |
| Q1               | 48A124326         | <u>TRANSISTOR:</u> (SEE NOTE)<br>P-N-P                                                                                                                                                                                                                                 |
| Q2               |                   | same as Q1                                                                                                                                                                                                                                                             |
| Q3               | 48R134545         | P-N-P; type M4545                                                                                                                                                                                                                                                      |
| R1               | 6K855337          | <u>RESISTOR, fixed; carbon; unless otherwise stated</u><br>carbon film; 17.5K ±2%; 1/2 w;<br>ins.                                                                                                                                                                      |
| R2               | 6K892455          | carbon film; 20 megohm ±2%;<br>2 w; ins.                                                                                                                                                                                                                               |
| R3               | 6K855329          | carbon film; 300K ±2%; 1/2 w; ins.                                                                                                                                                                                                                                     |
| R4               | 6K855330          | carbon film; 600K ±2%; 1/2 w; ins.                                                                                                                                                                                                                                     |
| R5               |                   | same as R3                                                                                                                                                                                                                                                             |
| R6               | 6K855332          | carbon film; 360K ±2%; 1/2 w; ins.                                                                                                                                                                                                                                     |
| R7               | 17K82839          | wire-wound; 3 ohm ±10%; 5 w;<br>ins.                                                                                                                                                                                                                                   |
| R8               | 6R5676            | 27 ohm ±10%; 1 w; ins.                                                                                                                                                                                                                                                 |
| R9               |                   | same as R1                                                                                                                                                                                                                                                             |
| R10              | 6R6048            | 47K ±10%; 1/2 w; ins.                                                                                                                                                                                                                                                  |
| R11              | 18K848202         | variable; carbon; 25K ±20%;<br>.2 watt                                                                                                                                                                                                                                 |
| R12              | 6K855331          | carbon film; 30K ±2%; 1/2 w; ins.                                                                                                                                                                                                                                      |
| R13              | 6R115017          | 11K ±5%; 1/2 w; ins.                                                                                                                                                                                                                                                   |
| R14              | 6R5581            | 3.3K ±10%; 1/2 w; ins.                                                                                                                                                                                                                                                 |
| R15              | 6R6229            | 1K ±10%; 1/2 w; ins.                                                                                                                                                                                                                                                   |
| R16              | 18C855263         | variable; wire-wound; 5K ±20%;<br>1 w                                                                                                                                                                                                                                  |
| R17              |                   | same as R14                                                                                                                                                                                                                                                            |
| R18              |                   | same as R15                                                                                                                                                                                                                                                            |
| R19              | 6R6040            | 680 ohm ±10%; 1/2 w; ins.                                                                                                                                                                                                                                              |
| R20              | 6R6069            | 2.2K ±10%; 1/2 w; ins.                                                                                                                                                                                                                                                 |
| R21              |                   | same as R20                                                                                                                                                                                                                                                            |
| R22              |                   | same as R20                                                                                                                                                                                                                                                            |
| R23              | 6R6038            | 1.5K ±10%; 1/2 w; ins.                                                                                                                                                                                                                                                 |
| R24              | 6R2089            | 1.8K ±10%; 1/2 w; ins.                                                                                                                                                                                                                                                 |
| R25              | 6R5659            | 3.9K ±10%; 1/2 w; ins.                                                                                                                                                                                                                                                 |
| R26              | 6R5591            | 18K ±10%; 1/2 w; ins.                                                                                                                                                                                                                                                  |
| R27              |                   | same as R26                                                                                                                                                                                                                                                            |
| R28              | 6R5554            | 390 ohm ±10%; 1/2 w; ins.                                                                                                                                                                                                                                              |
| S1               | 40C855097         | <u>SWITCH,</u><br>rotary; 2 section; continuous;<br>non-shorting                                                                                                                                                                                                       |
| S2               | 40B855095         | rotary; 3 section; 3 position;<br>non-shorting                                                                                                                                                                                                                         |
| S3               | 40B855094         | lever; 1 section; 3 position;<br>non-shorting                                                                                                                                                                                                                          |
| S4               | 40B855096         | lever; 1 section; 3 position<br>shorting                                                                                                                                                                                                                               |
| S5               | 40C848230         | push; contact arrangement; 2<br>form "A"; non-locking                                                                                                                                                                                                                  |
| S6               | 40B855093         | rotary; 2 section; 5 position;<br>non-shorting                                                                                                                                                                                                                         |
| W1               | 1V858292          | <u>CABLE ASSEMBLY, special purpose:</u><br>Metering; includes:<br>30B474498 CABLE, special<br>purpose; 12 conductor;<br>rubber covered; 50" length<br>required<br>10M519 WIRE, electrical;<br>single conductor; #24 ga.<br>sol.; 1" required<br>Reference parts P1, P2 |

| REFERENCE SYMBOL                        | MOTOROLA PART No.      | DESCRIPTION                                                                                                                                                |
|-----------------------------------------|------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Y1                                      |                        | <u>CRYSTAL UNIT, quartz:</u><br>not supplied; when ordering<br>refer to TABLE 2, Page 5 for<br>frequency and type                                          |
| Y2                                      | Type AQL               | 455 kc                                                                                                                                                     |
| XY1                                     | 9K857508               | <u>SOCKET, crystal:</u><br>female; 4 contact; square molded<br>black bakelite base; chassis<br>mounted                                                     |
| XY2                                     | 9K857509               | female; 2 contact; rectangular<br>molded black bakelite base;<br>chassis mounted                                                                           |
| MISCELLANEOUS NON-REFERENCED PARTS LIST |                        |                                                                                                                                                            |
|                                         | 13A855076<br>36A855276 | GRILLE, speaker                                                                                                                                            |
|                                         | 36A855070              | BUTTON, lever; 2 required; for<br>reference parts S3, S4                                                                                                   |
|                                         | 36A855071              | KNOB, control; 2 required; for<br>reference parts S1, S2                                                                                                   |
|                                         | 55A855264<br>55K855265 | KNOB, control; for reference part S6                                                                                                                       |
|                                         | 55A855264<br>55K855265 | FASTNER, adjustable pawl; R.H.<br>FASTNER, adjustable pawl; L.H.                                                                                           |
|                                         | 58B855270<br>1V855413  | ADAPTER: UHF to BNC<br>ACCESSORY CABLE ASSEMBLY:<br>includes:<br>30A76858 CABLE, special<br>purpose; 2 conductor; rubber<br>covered; 4 ft. length required |
|                                         | 28A855277              | PLUG, telephone:<br>black handle                                                                                                                           |
|                                         | 28K855278              | PLUG, telephone:<br>red handle                                                                                                                             |
|                                         | 1V855414               | RF TEST LEAD ASSEMBLY:<br>includes:<br>30B475378 CABLE, RF: coaxial;<br>RG-58A/U; 4 ft. length req'd.                                                      |
|                                         | 28B844876              | CONNECTOR, plug:<br>single contact; 2 required                                                                                                             |
|                                         | 1V855415               | RF PROBE ASSEMBLY: includes:<br>30B475378 CABLE, RF: coaxial;<br>RG-58A/U; 1 ft. length req'd                                                              |
|                                         | 9B855269               | JACK, telephone                                                                                                                                            |
|                                         | 1V855404<br>1V855411   | METER PANEL ASSY. (Riveted)<br>METER PANEL COVER ASSY.<br>(Riveted)                                                                                        |
|                                         | 1V867350               | CASE ASSY: includes<br>16E855419 CASE, test set<br>42B861758 HOLDER, battery<br>7A82479 BRACKET                                                            |

NOTE:

Replacement transistors and diodes must be ordered by Motorola part number only for optimum performance.

AE PD-7548-O (MC 7460)

# PEAKING GENERATOR

MODEL SLN6057A



volt d-c power source. The transistorized oscillator will operate properly only with anti-resonant crystals

The peaking generator comes already mounted in the S1057A, and the S1059A Portable Test Sets. It may also be purchased as a separate item to be mounted in the TU546, S1056A, or the S1058A Portable Test Sets. When mounted in the test set housing, the generator uses the battery supply built into the test set.

Refer to paragraph 7. INSTALLATION, for installing the SLN6057A Peaking Generator in the TU546, S1056A or S1058A Portable Test Set.

If the test set is used at one location and the generator is required at another location, the generator may be removed from the test set housing. A metal cover, which is part of the generator, protects the generator components when it is removed from the test set housing. To provide operating voltages, the generator can then be connected to any 6 volt d-c battery.

## 1. DESCRIPTION

The Model SLN6057A Peaking Generator is a crystal-controlled signal source which provides r-f signals ranging from 4 mc to 960 mc. The generator is used for peaking of the r-f stages of FM communications receivers operating within the 4 to 960 mc range. It also provides normally encountered intermediate frequencies for alignment of receiver i-f stages.

The peaking generator essentially consists of a transistorized oscillator, internal and external crystal sockets, tuned circuits and front mounted controls and switches. It requires a separate 6

## GUARANTEED PERFORMANCE SPECIFICATIONS

### PEAKING GENERATOR

|                                  |                                                    |
|----------------------------------|----------------------------------------------------|
| MODEL                            | SLN6057A                                           |
| FREQUENCY                        | crystal controlled output from 4 mc through 960 mc |
| TRANSISTOR COMPLEMENT & FUNCTION | (1) oscillator                                     |
| POWER SUPPLY                     | 6 v d-c                                            |



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## 2. CONTROLS

### a. CRYSTAL

The CRYSTAL switch is a 9 position switch located on the front of the generator. Positions 1 through 8 correspond to eight numbered internal crystal positions, which permit selection of up to eight test frequencies.

The EXT. position on the switch selects the three external crystal sockets. Only one crystal should be used at a time when using the EXT. position.

An anti-resonant, ovenized transmitter control crystal may be used without using the crystal heater.

### b. SET LEVEL and ATTENUATOR

Operation of the SET LEVEL and ATTENUATOR varies the amount of oscillator current, which also controls the output level of the generator.

#### **CAUTION**

Some frequency shift may be encountered with adjustment of the SET LEVEL or ATTENUATOR

The ATTENUATOR is a smaller adjustable resistance which is useful in adjusting the output of the 890-960 mc tuned circuit to a pre-determined level and also for making fine adjustments of the SET LEVEL. Both controls are labeled from 0 to 10. This labeling enables re-setting of the controls after they have been checked against a signal generator of known accuracy or against the diode current reading indicated on the portable test set meter.

### c. FREQ. ADJUST

The FREQ. ADJUST control provides fine tuning correction (warping) of the crystal frequency. This control should be used only to "zero" the crystal frequency. It is important to note that a change in frequency may cause a change in the output level.

### d. RANGE

Operation of the RANGE switch selects a warping circuit for a range of crystal frequencies and also selects the proper output circuit to correspond to the frequency range.

Position OFF - Battery circuit is opened. This position is useful in checking quieting reference level.

Position LO - Crystals from 4 to 8 mc. This position provides a useful harmonic output up to 470 mc for alignment of receivers in the 25 to 470 mc range.

Position HI - Crystals from 9 to 9.6 mc. This position provides a useful harmonic output from 890 to 960 mc.

To eliminate any low order harmonics which may be encountered in any of the intermediate frequency bands, when using positions LO or HI, the crystals available for use with the peaking generator are specially selected to prevent low order harmonic interference. An example of this is as follows: channel frequency - 420.0 mc crystal used - 7.0 mc. If this crystal is used in the peaking generator and the receiver being tested has a first i-f of 21.0 mc, then the third harmonic of the crystal ( $3 \times 7.0 \text{ mc} = 21 \text{ mc}$ ) may interfere during the r-f alignment.

When using transmitter crystals, the possibility of i-f interference should be considered.

## 3. CALIBRATION

The peaking generator can be checked against a signal generator of known accuracy using an FM communications receiver as a tuned voltmeter.

a. Meter Discriminator and Limiter--connect the metering cable from the test set to the receiver.

b. Interconnect Signal Generator and Radio Set--connect the r-f probe from the signal generator to the antenna receptacle on the radio set.

c. Zero Signal Generator Frequency--set the signal generator to the exact receiver frequency.

d. Adjust Signal Generator Output--adjust output to approximately 1 microvolt. Note the limiter reading (Position Selector switch in position #2).

e. Replace Signal Generator with Peaking Generator--remove the signal generator cable and connect the peaking generator r-f cable to the antenna receptacle on the radio set.

f. Adjust Frequency to Exact Receiver Frequency--place the Position Selector switch in position #4. Adjust the frequency output of the peaking generator to the exact receiver frequency.

g. Adjust SET LEVEL and/or ATTENUATOR--adjust the SET LEVEL and/or ATTENUATOR for the same limiter reading as in step d. above. Re-check the FREQ. ADJUST. Record the exact position of the SET LEVEL and ATTENUATOR controls to eliminate the above procedures in subsequent receiver checking.

#### 4. OUTPUT CIRCUITS

There is an adjustable capacitor in each output circuit. One circuit is peaked at approximately 460 mc (C1 on Schematic Diagram) and needs no further adjustment. The other circuit is re-peaked between 890-960 mc (C2 on Schematic Diagram) and should be peaked for maximum output on the test frequency.

The trimmer capacitor C5, across the transistor emitter-base has been factory adjusted for maximum output and warp at 460 mc and should not require adjustment unless the transistor is replaced.

#### 5. OPERATING INSTRUCTIONS

General procedures for setting up the peaking generator for r-f peaking of an FM communications receiver are as follows:

- a. Rotate the CRYSTAL switch to select the crystal frequency to be used.
- b. Place the RANGE switch in position LO or HI depending on the crystal fundamental frequency and the output frequency desired.
- c. Adjust the SET LEVEL and the ATTENUATOR for the output level desired.
- d. Rotate the FREQ. ADJUST to warp the crystal to the test frequency.

#### NOTE

When the Function Selector switch (on the Portable Test Set) is in ACCESS. position, the oscillator can be checked by observing the test set meter reading. The normal maximum reading should not be less than 10 microamperes. The reading depends to some extent on the condition of the batteries and the crystal used. The batteries may be checked by placing the Position Selector switch on the test set to position #13 (Function Selector switch in RCVR or XMTR).

To conserve battery life when the generator is not in use, place the RANGE switch in the OFF position. The batteries are also disconnected from the peaking generator circuit when the 20-pin metering plug is not plugged into the 20-pin receptacle in the test set.

#### 6. CRYSTALS

Crystals are not supplied with the peaking generator, but are available on separate order. RF outputs ranging in frequency from 4 to 960 mc are produced from crystals which range in frequency from 4 to 9.6 mc. The frequency of the crystal required to produce the desired r-f output must be calculated from the formulas given in Table 1. In general, any anti-resonant type transmitter crystal may be used if the frequency is correct.

A maximum of 9 crystals may be plugged into the 8 internal sockets and 3 external sockets (only one of the external sockets may be used at a time because all three are connected in parallel). The 8 internal sockets and one of the external sockets (XY5) will accept ANL, AUL, or AULX type crystals. Another external socket (XY6) accepts SFMT type crystals, and the remaining external socket (XY7) takes AN type crystals. After calculating the crystal frequency by using Table 1, the crystal type may be selected from Table 2. It is usually advantageous to choose an ANL, AUL, or AULX type since these types fit in either the internal or external sockets. When ordering, give both the type and frequency of the crystal desired.

TABLE 1

Crystal Calculations for SLN6057A Peaking Generator

F<sub>c</sub> = Desired generator output frequency  
F<sub>x</sub> = Crystal Frequency required

| F <sub>c</sub> | F <sub>x</sub>        | F <sub>c</sub> | F <sub>x</sub>         | F <sub>c</sub> | F <sub>x</sub>         | F <sub>c</sub> | F <sub>x</sub>          |
|----------------|-----------------------|----------------|------------------------|----------------|------------------------|----------------|-------------------------|
| 4-8 mc         | $F_x = F_c$           | 48-54 mc       | $F_x = \frac{F_c}{8}$  | 134-141 mc     | $F_x = \frac{F_c}{19}$ | 407-423 mc     | $F_x = \frac{F_c}{54}$  |
| 8-15 mc        | $F_x = \frac{F_c}{2}$ | 54-65 mc       | $F_x = \frac{F_c}{9}$  | 141-147 mc     | $F_x = \frac{F_c}{20}$ | 423-438 mc     | $F_x = \frac{F_c}{56}$  |
| 25-30 mc       | $F_x = \frac{F_c}{4}$ | 65-72 mc       | $F_x = \frac{F_c}{10}$ | 147-154 mc     | $F_x = \frac{F_c}{21}$ | 438-452 mc     | $F_x = \frac{F_c}{58}$  |
| 30-36 mc       | $F_x = \frac{F_c}{5}$ | 72-80 mc       | $F_x = \frac{F_c}{11}$ | 154-161 mc     | $F_x = \frac{F_c}{22}$ | 452-470 mc     | $F_x = \frac{F_c}{60}$  |
| 36-42 mc       | $F_x = \frac{F_c}{6}$ | 80-90 mc       | $F_x = \frac{F_c}{12}$ | 161-174 mc     | $F_x = \frac{F_c}{23}$ | 890-920 mc     | $F_x = \frac{F_c}{97}$  |
| 42-48 mc       | $F_x = \frac{F_c}{7}$ | 127-134 mc     | $F_x = \frac{F_c}{18}$ | 393-407 mc     | $F_x = \frac{F_c}{52}$ | 920-960 mc     | $F_x = \frac{F_c}{100}$ |

TABLE 2

Crystal Type Available and Their  
Frequency Range

| <u>Crystal Frequency</u> | <u>Motorola Type</u> |
|--------------------------|----------------------|
| 2000-6000 kc             | ANL and AN           |
| 6000-10000 kc            | AUL and AULX         |
| 10000-13000 kc           | ANL and AN           |

## 7. INSTALLATION

### a. Portable Test Set

The front panel of the TU546 and the S1056A Portable Test Set has two removable panels. The open partition provided by removal of the lower panel is for mounting the peaking generator.

The front panel of the S1058A Portable Test Set has one removable panel. This is located between the Deviation Meter Panel and the meter face. The removal of this panel provides the open partition for mounting the peaking generator.

Open the front of the test set. Insert the four wires through the hole in the corner of the partition and then through the same sleeving as the battery wires. Connect the four wires from the generator to the test set as follows:

(1) Connect the BLACK-GREEN wire to the BLACK-GREEN wire on the oscillator and meter reversing switch.

(2) Connect the RED-BLACK wire to the RED-BLACK wire on the oscillator and meter reversing switch.

(3) Connect the ORANGE wire to pin #19 on the 20-pin receptacle.

(4) Connect the GREEN wire to pin #13 on the 20-pin receptacle.

b. Separate Mounting

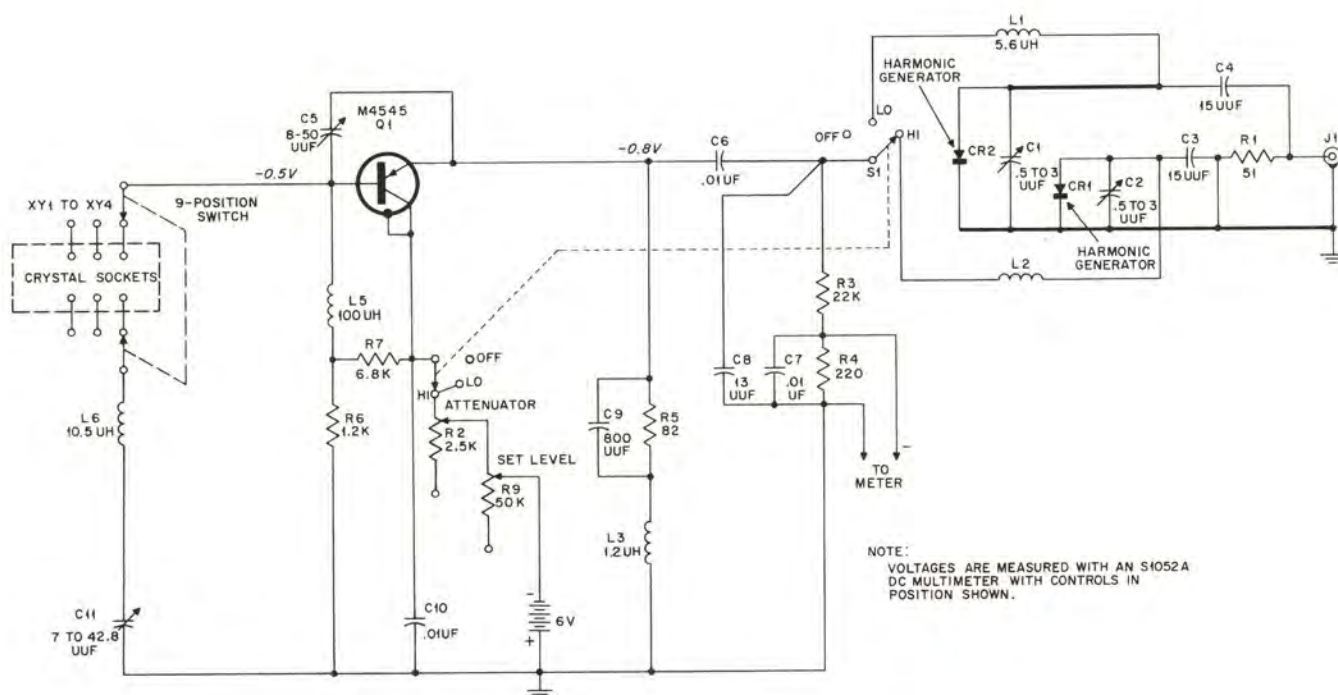
If the peaking generator is to be installed in any place other than in the portable test set housing, make the electrical connections as follows:

(1) Connect the BLACK-GREEN wire from the generator to the positive terminal of a 50 microampere meter.

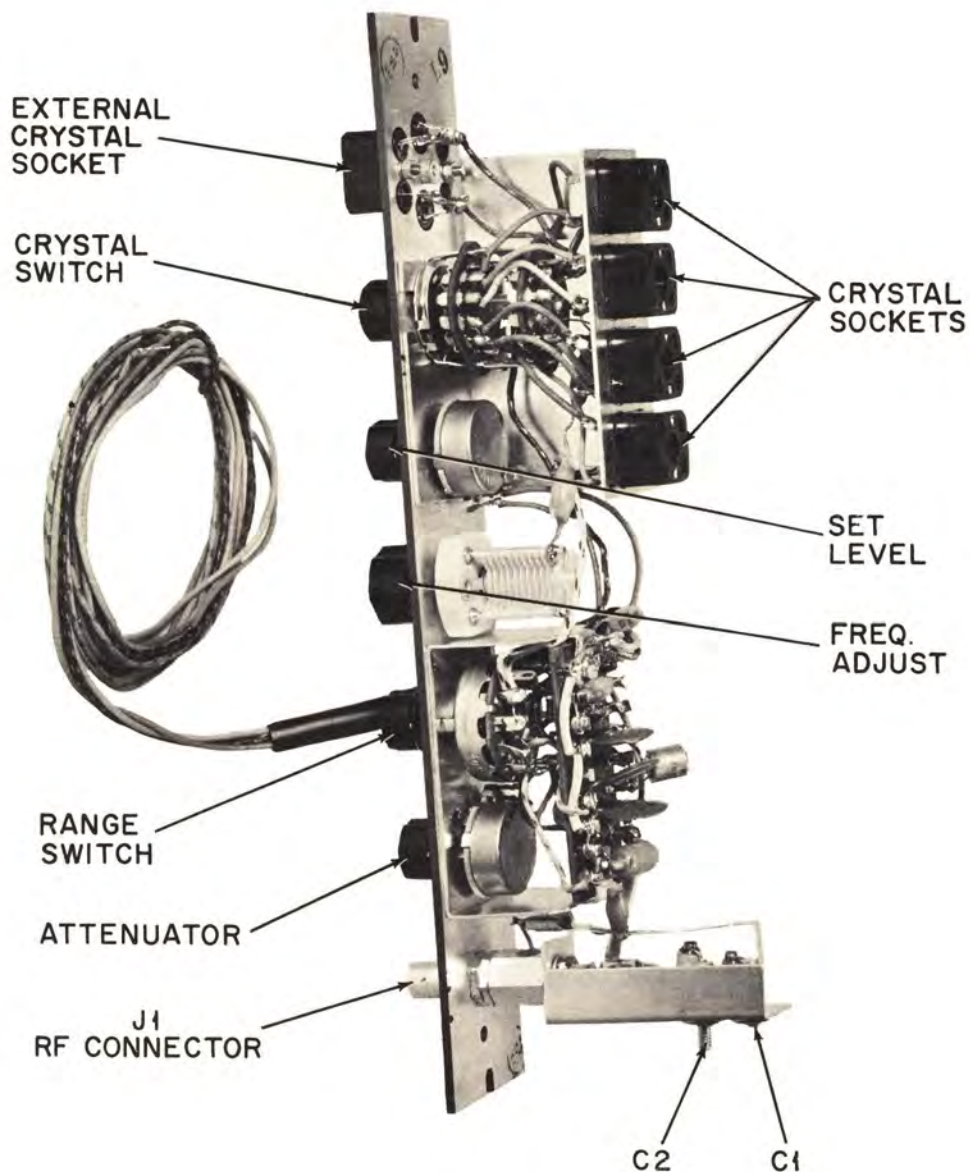
(2) Connect the RED-BLACK wire to the negative terminal of a 50 microampere meter.

(3) Connect the GREEN wire to the negative terminal of a 6 volt d-c source.

(4) Connect the ORANGE wire to the positive terminal of the 6 volt d-c source.



SLN6057A Peaking Generator  
Simplified Circuit Diagram



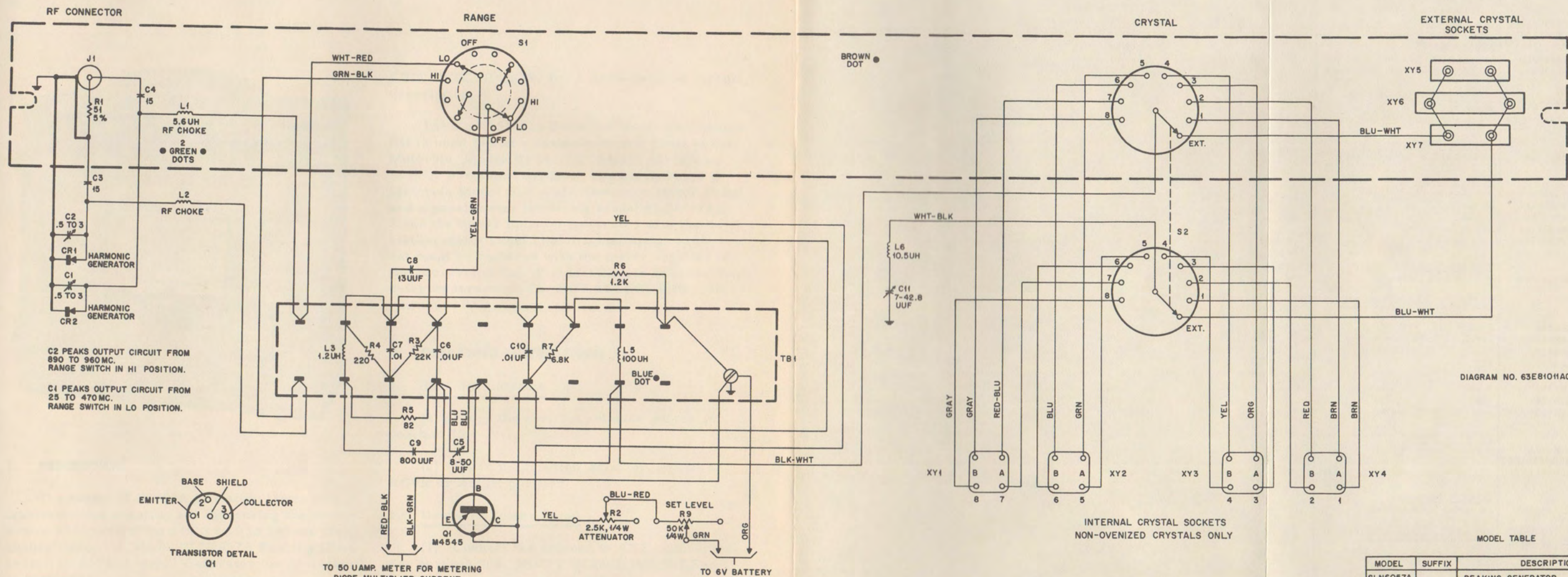


DIAGRAM NO. 63E8101A06

MODEL TABLE

| MODEL    | SUFFIX | DESCRIPTION                                                 |
|----------|--------|-------------------------------------------------------------|
| SLN6057A |        | PEAKING GENERATOR                                           |
| S1057A   |        | PORTABLE TEST SET(WITH PEAKING GENERATOR)                   |
| S1059A   |        | PORTABLE TEST SET(WITH PEAKING GENERATOR & DEVIATION METER) |

## PARTS LIST for Diagram 63E81011A06-O

| REFERENCE SYMBOL                  | MOTOROLA PART NO.                           | DESCRIPTION                                                                                                                                                             |
|-----------------------------------|---------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| C1, 2<br>C3                       | 20A858351<br>1V858438                       | <u>CAPACITOR, fixed:</u> unl stated<br>var: 0.5 uuf min. to 3 uuf max.<br>assy; incl 21K835358 CAPACI-<br>TOR, fixed: 15 uuf $\pm 10\%$ ; 500 v<br>42A858406 CLIP, mtg. |
| C4                                | 1V858439                                    | assy; incl 21K835358 CAPACI-<br>TOR, fixed: 15 uuf $\pm 10\%$ ; 500 v<br>42A858404 CLIP, mtg.                                                                           |
| C5                                | 20K840719                                   | var; 8-50 uuf                                                                                                                                                           |
| C6, 7, 10                         | 21B801139                                   | .01 uf $\pm 80-20\%$ ; 600 v                                                                                                                                            |
| C8                                | 21K865358                                   | 13 uuf $\pm 5\%$ ; 500 v                                                                                                                                                |
| C9                                | 21B847070                                   | 800 uuf $\pm 10\%$ ; 600 v                                                                                                                                              |
| C11                               | 19A475604                                   | var: 7 uuf min. to 42.8 uuf max.                                                                                                                                        |
| CR1, 2                            | 48A82616B01                                 | <u>SEMICONDUCTOR DEVICE,</u><br><u>diode:</u> SEE NOTE<br>germanium (factory selected)                                                                                  |
| J1                                | 9B855268                                    | <u>CONNECTOR, receptacle:</u><br>female; single contact; type BNC                                                                                                       |
| L1                                | 24A813564                                   | <u>COIL, RF: choke;</u><br>5.6 uh; coded GRN-GRN                                                                                                                        |
| L2                                | 24B858421                                   | 60 turns                                                                                                                                                                |
| L3                                | 24K800899                                   | 1.2 uh                                                                                                                                                                  |
| L5                                | 24A832402                                   | 100 uh; coded BLU                                                                                                                                                       |
| L6                                | 24K859163                                   | 10.5 uh                                                                                                                                                                 |
| Q1                                | 48R134545                                   | <u>TRANSISTOR: SEE NOTE</u><br>P-N-P; type M4545                                                                                                                        |
| R1                                | 6R5648                                      | <u>RESISTOR, fixed: <math>\pm 10\%</math>; 1/2 w;</u><br>unl stated<br>51 $\pm 5\%$                                                                                     |
| R2                                | 18K858468                                   | var: 2.5K $\pm 30\%$ ; 1/4 w                                                                                                                                            |
| R3                                | 6R6397                                      | 22K                                                                                                                                                                     |
| R4                                | 6R6270                                      | 220                                                                                                                                                                     |
| R5                                | 6R2035                                      | 82                                                                                                                                                                      |
| R6                                | 6R6393                                      | 1.2K                                                                                                                                                                    |
| R7                                | 6R6428                                      | 6.8K                                                                                                                                                                    |
| R9                                | 18K858469                                   | var: 50K $\pm 20\%$ ; 1/4 w                                                                                                                                             |
| S1                                | 40K801196<br>or 40B82391D01                 | <u>SWITCH, rotary:</u><br>4 pole; 3 position                                                                                                                            |
| S2                                | 40B858122                                   | 2 pole; 9 position                                                                                                                                                      |
| TB1                               | 31A835961                                   | <u>BOARD, terminal:</u><br>18 solder lug terminals                                                                                                                      |
| XY1, 2, 3, 4<br>XY5<br>XY6<br>XY7 | 9K857508<br>9K857509<br>9K82810<br>9K861367 | <u>SOCKET, crystal: female;</u><br>4 contact<br>2 contact<br>2 contact<br>2 contact                                                                                     |

## NOTE:

Replacement transistors and diodes must be ordered by  
Motorola part number only for optimum performance.

# DEVIATION METER PANEL

MODEL SLN1000A

AND

# CONVERSION KIT

MODEL S1062A



## 1. DESCRIPTION

The Model SLN1000A Deviation Meter is a transistorized receiver for measuring the deviation of FM transmitters in the 20 to 500 mc frequency range. A Model SLN6057A Peaking Generator or T1034B Signal Generator (or equivalent) is required for the local oscillator.

The deviation meter has its own internal power supply which consists of two 6-1/2-volt mercury batteries. If desired, an external power supply can be used in place of the batteries.

The unit is mounted in the S1058A and S1059A Portable Test Sets. Refer to paragraph 8. CIR-

CUIT DESCRIPTION, for a more detailed circuit description.

The Model S1062A Deviation Meter Conversion Kit is used to add a deviation meter panel to the Motorola Model TU546, TU546P, S1056A or S1057A Portable Test Set. The kit includes a Motorola Model SLN1000A Deviation Meter Panel and a panel meter (Motorola Model SLN6062A). Since the meter must be calibrated with the deviation meter panel, the original meter in the test set must be replaced with the meter supplied in the conversion kit. For installation information, refer to paragraph 11, INSTALLING THE CONVERSION KIT.

## 2. OPERATING INSTRUCTIONS

### a. Test Set Controls

(1) Place the position selector switch in position 15.

(2) Place the function selector switch in RCVR or XMTR position.

### b. Deviation Meter Panel

(1) Connect the antenna to ANT. connector. See paragraph 6, INPUT SIGNAL REQUIREMENTS.

(2) Connect earphones (1000 ohms) or an oscilloscope to the AUD. MON. jack. A phone plug is supplied for this purpose.

(3) Place the function switch in the BATT. CHK. position. Meter indication should be at or above the red line (10.5 on 16 kc deviation scale).



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# **GUARANTEED PERFORMANCE SPECIFICATIONS**

|                                                   |                   |                                                               |
|---------------------------------------------------|-------------------|---------------------------------------------------------------|
| MODEL                                             |                   | SLN1000A                                                      |
| CARRIER FREQUENCY RANGE                           |                   | 20 to 500 mc                                                  |
| DEVIATION RANGES                                  |                   | 16 kc, 8 kc & 1.6 kc full scale                               |
| ACCURACY                                          | 16 KC RANGE       | ±5% at 15 kc, ±5% of full scale otherwise                     |
|                                                   | 8 KC RANGE        | ±5% at 5 & 6.67 kc, ±5% of full scale otherwise               |
|                                                   | 1.6 KC RANGE      | ±10% of full scale                                            |
| SENSITIVITY WITH PEAKING GENERATOR                | 25-54 MC          | 1 millivolt                                                   |
|                                                   | 144-174 MC        | 3 millivolts                                                  |
|                                                   | 450-470 MC        | 20 millivolts                                                 |
| SENSITIVITY WITH .1 V SIGNAL GEN. ON FUNDAMENTALS | 25-54 MC          | 1 millivolt                                                   |
|                                                   | 144-174 MC        | 3 millivolts                                                  |
|                                                   | 450-470 MC        | 20 millivolts                                                 |
| DEVIATION READING                                 |                   | 1/2 x (sum of pos. and neg. peaks)                            |
| OPERATING TEMPERATURE RANGE                       | MERCURY BATTERIES | +10°C to +50°C                                                |
|                                                   | EXTERNAL POWER    | 0°C to +50°C                                                  |
| BATTERY LIFE                                      |                   | 40 hours with SLN6046A Mercury Battery Kit (room temperature) |

SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE

(4) Connect an external oscillator to the OSC. connector. The Motorola Model TK589 or SLN6057A Peaking Generator or Model T1034B Signal Generator or equivalent may be used.

(a) TK589 or SLN6057A Peaking Generator

1. Calculate the crystal frequency using the applicable formula in TABLE 1. and insert crystal in the appropriate socket on the peaking generator.

TABLE 1.

| F <sub>c</sub><br>(MC) | F <sub>x</sub>                  | F <sub>c</sub><br>(MC) | F <sub>x</sub>                  |
|------------------------|---------------------------------|------------------------|---------------------------------|
| 25-30                  | $F_x = \frac{F_c \pm .455}{4}$  | 134-141                | $F_x = \frac{F_c \pm .455}{19}$ |
| 30-36                  | $F_x = \frac{F_c \pm .455}{5}$  | 141-147                | $F_x = \frac{F_c \pm .455}{20}$ |
| 36-42                  | $F_x = \frac{F_c \pm .455}{6}$  | 147-154                | $F_x = \frac{F_c \pm .455}{21}$ |
| 42-48                  | $F_x = \frac{F_c \pm .455}{7}$  | 154-161                | $F_x = \frac{F_c \pm .455}{22}$ |
| 48-54                  | $F_x = \frac{F_c \pm .455}{8}$  | 161-174                | $F_x = \frac{F_c \pm .455}{23}$ |
| 54-65                  | $F_x = \frac{F_c \pm .455}{9}$  | 393-407                | $F_x = \frac{F_c \pm .455}{52}$ |
| 65-72                  | $F_x = \frac{F_c \pm .455}{10}$ | 407-423                | $F_x = \frac{F_c \pm .455}{54}$ |
| 72-80                  | $F_x = \frac{F_c \pm .455}{11}$ | 423-438                | $F_x = \frac{F_c \pm .455}{56}$ |
| 80-90                  | $F_x = \frac{F_c \pm .455}{12}$ | 438-452                | $F_x = \frac{F_c \pm .455}{58}$ |
| 127-134                | $F_x = \frac{F_c \pm .455}{18}$ | 452-470                | $F_x = \frac{F_c \pm .455}{60}$ |

F<sub>x</sub> = Crystal Frequency

F<sub>c</sub> = Transmitter Frequency

#### NOTE

When ordering crystals for the peaking generator to be used with the deviation meter, specify Motorola Type AULX and transmitter and/or crystal frequency.

2. Connect the output of the peaking generator to the OSC. connector on the deviation meter panel using the Motorola Model SKN6007A Cable Kit.

3. Adjust the SET LEVEL control for maximum output (fully clockwise).

4. Key the transmitter and adjust the FREQ. ADJUST control for zero meter indication with the function switch on the deviation meter panel in the DISC. + or DISC. - positions.

5. Place the function switch on the deviation meter panel in the LIM. position and adjust the ATTENUATOR control on the peaking generator for maximum meter indication. Maximum setting of the ATTENUATOR control is not necessarily the position of maximum harmonic output and the control should be advanced from zero for a maximum reading in the LIM. position.

(b) T1034B Signal Generator

1. Connect the output of the signal generator and the antenna to the antenna connector using a BNC "T" connector. Refer to paragraph 6, INPUT SIGNAL REQUIREMENTS.

2. Adjust the signal generator frequency to either 455 kc above or below the transmitter frequency.

3. Adjust the signal generator output attenuator for an output of approximately 30 millivolts. Key the transmitter and adjust the signal generator frequency for zero in DISC. + or DISC. -. Refer to paragraph 5, ERRONEOUS INDICATIONS.

(5) Place the function switch in the LEVEL SET position and key the transmitter (unmodulated except "Private-Line" tone in units equipped with this feature). Adjust the LEVEL SET control until the pointer is on the red line (10.5 kc on the deviation scale).

(6) Place the function switch in the DEV. position and the DEV. RANGE switch in the ZERO SET position. Adjust the ZERO SET control for zero meter indication.

(7) Place the DEV. RANGE switch in the applicable position (16KC for 15KC transmitters or 8 kc for 5 kc transmitters).

(8) Remove the "Vibrasender" reed from "Private-Line" transmitters. Key the transmitter preferably from the test set. The meter should indicate less than 0.5 kc on the 8KC range and less than 1.0 kc on the 16KC range for an unmodulated carrier. See paragraph 6., INPUT SIGNAL REQUIREMENTS.

(9) Replace the "Vibrasender" and modulate the transmitter with either the TEK-1A Tone Generator or by saying "aahhh" or "four" or any word which allows the deviation to remain constant. In "Private-Line" transmitters, the "Private-Line" deviation can then be checked in the 1.6KC range. If the deviation is not correct, refer to the instruction manual for the particular equipment being tested for information to reset it.

### 3. 960 MC TRANSMITTERS

The deviation meter is capable of measurement of transmitter deviation in units operating in the 960 mc band. These transmitters use 40 kc deviation, however, they also use multiplier stages preceding the final amplifier with a multiplication factor of 6. If deviation is measured at 1/6 the transmitter output frequency, the deviation at that frequency will be 6.67 kc. The 8 kc scale is marked at 6.67 kc for this purpose. A cable connected to the ANT. input on the deviation meter panel should be placed near the multiplier stage in the transmitter which is at 1/6 the transmitter output frequency and the same procedure as previously described can be followed.

When using the peaking generator, the "Fc" in the equations in TABLE 1. should be 1/6 the transmitter output frequency. When using the signal generator, the generator frequency should be set to 1/6 the transmitter output frequency.

### 4. ERRONEOUS INDICATIONS

It is possible to obtain an erroneous indication if the signal generator is not accurately calibrated. This response occurs at the transmitter frequency plus or minus 227.5 kc ( $1/2 \times 455$  kc) and results in a meter indication of twice the actual deviation. To avoid this, the generator output should be reduced until meter indication starts to decrease (function switch in LIM. position). The signal generator frequency should then be adjusted through a range of 500 kc above and below the transmitter frequency while watching for the presence of a stronger response. If a stronger response is located, the generator should be left at this frequency. The generator output level should then be increased until a further increase in output level results in no increase in meter indication. After completing this procedure, recheck the generator frequency by placing the function switch in the DISC. + or DISC. - positions. Readjust the generator frequency for zero meter indication if necessary.

### 5. INPUT SIGNAL REQUIREMENTS

When receiving an unmodulated carrier (no voice or "Private-Line" tone), the deviation meter should indicate less than 0.5 kc on the 8KC range, or 1.0 kc on the 16KC range to insure an accurate reading. If the indications exceed the above amounts, the received signal is either too small or too great.

The Motorola Model SLN6080A Attenuator should be used on the deviation meter when it is used within 25 feet (35 feet for 450 mc transmitters) of the transmitting antenna. When not in close proximity to the antenna, the attenuator should be removed to obtain the full sensitivity of the deviation meter.

If the transmitter to be measured is accessible, it will be necessary to remove the "Vibrasender" reed to insure that a low deviation is obtained with an unmodulated carrier.

If a "Private-Line" transmitter is inaccessible and, therefore, some distance away, a check for sufficient signal can be made by attaching a clip lead to the antenna of the deviation meter. If the limiter position reading does not increase when adding the clip lead to the antenna of the deviation meter, the signal strength is sufficient to make an accurate measurement of deviation.

### 6. AUDIO MONITORING

The "AUD. MON." jack on the deviation meter panel is used to monitor the recovered modulation. An earphone (1000 ohms) or an oscilloscope should be connected to the jack. This is necessary in order that an interfering signal can be detected. It is also useful when a signal generator is used for a local oscillator to determine approximately the proper frequency before fine adjustment is made in DISC. + or DISC. -.

### 7. EXTERNAL POWER SUPPLY

A connector is provided on the deviation meter panel to enable the unit to be powered from an external source if desired. The Motorola Model T1012A or T1064A Power Supply with the TEK-15 Ripple Filter or a 10 to 14 v d-c battery which is capable of 25 ma of current may be used.

#### CAUTION

Damage to the equipment may result if voltages in excess of the 14 v d-c are used.

The wide pin on the connector must be connected to the positive (+) terminal of the external supply and the narrow pin must be connected to the negative (-) terminal.

Use the ON-OFF switch on the deviation meter panel to turn the equipment off after use. The internal batteries will continue to power the unit if the external power is disconnected and the switch is left in the ON position. If desired, one of the

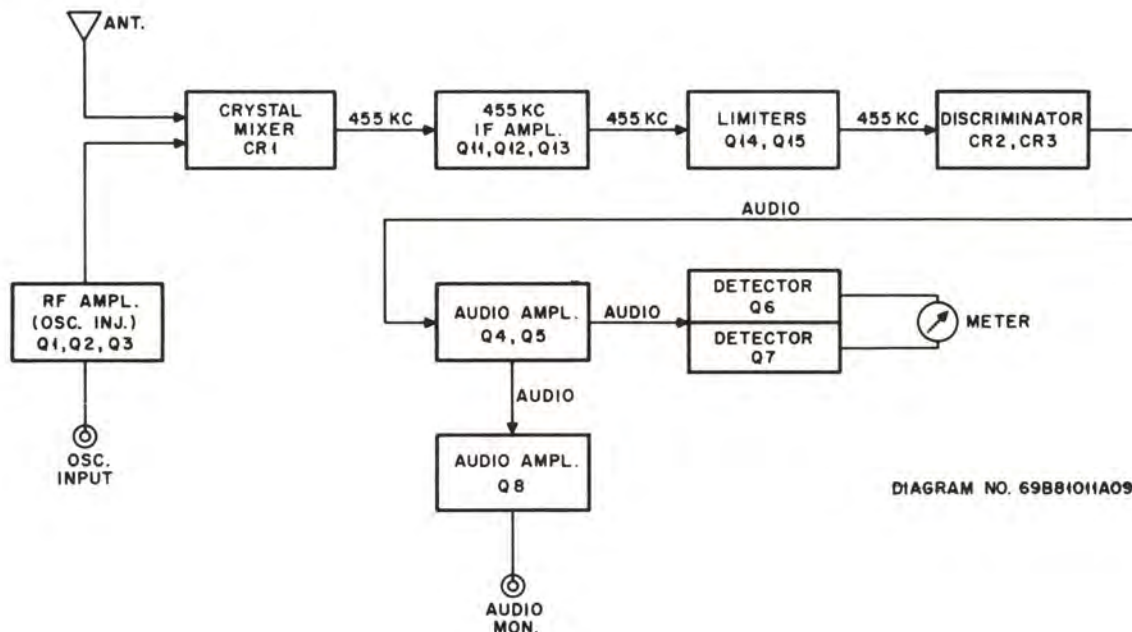


DIAGRAM NO. 69B81011A09

Deviation Meter Block Diagram

internal batteries can be removed and inserted only when the unit is to be used in the field or when an external power source is not available.

Before using an external power supply, with the internal batteries in place, put the function switch in BATT. CHK. position. Plug in the external source and note the meter reading. It should be between 45-47.5 microamperes on the 0-50 scale (second from top). If the meter indication is less than 45 microamperes, the internal batteries are powering the unit. If the meter reading is greater than 47.5 microamperes, damage to the unit may occur.

## 8. CIRCUIT DESCRIPTION

As shown on the block and schematic diagrams, the deviation meter is a single conversion FM receiver without a local oscillator. RF signals reaching the antenna enter the crystal mixer to heterodyne with the output of an external oscillator to produce a 455 kc intermediate frequency containing the original modulation. Two stages of amplification and an impedance matching stage are inserted between the oscillator input and the crystal mixer. The 455 kc signal passes through three stages of amplification and two limiters before entering the discriminator where frequency deviation is converted to an audio signal. The output from the discriminator enters a two stage audio amplifier using negative feed-

back. The feedback and temperature compensation prevent large variations in gain resulting from variations in transistor parameters and supply voltage. The output of the audio amplifier enters the detector stages where peak deviation is detected regardless of waveform. These stages have a fast charge characteristic in conjunction with a slow discharge characteristic to permit detection of voice modulation. However, due to the large peak-to-average voltage characteristics of voice modulation, sine wave modulation is the most accurate for deviation measurement. The output of the detectors is measured by a peak reading voltmeter which is calibrated to read half of the peak-to-peak deviation.

A third audio amplifier stage is connected to the output of the first two audio stages and its output is connected to a jack for monitoring purposes.

## 9. CALIBRATION

Accuracy of the instrument will be maintained with periodic calibration. This should be accomplished only by qualified personnel having adequate facilities. If desired the instrument may be returned to the factory for calibration. Return to:

Motorola Communications & Electronics, Inc.  
Parts and Service Department  
4910 W. Flournoy Street  
Chicago 44, Illinois

## 10. MAINTENANCE

This instrument should be serviced only by qualified personnel experienced in repairing instruments. If qualified personnel is not available, the instrument may be returned to the factory for servicing.

### a. Battery Replacement

(1) Remove the two screws from the extreme edges of the front panel and pull out the deviation meter panel.

(2) Loosen the screw at back of the cover under which the battery cover is secured.

(3) Remove the batteries and replace with fresh batteries with the polarity as shown.

(4) Replace battery cover.

### b. To Remove the Cover

(1) Remove the two screws at the back face of the unit.

(2) Remove one of the batteries.

(3) Loosen the two screws in the middle of the battery board.

(4) Pull back the cover.

## 11. INSTALLING THE CONVERSION KIT

The following steps outline the procedure necessary to complete the installation.

### a. Meter

Remove the existing meter and replace with meter supplied.

### b. Deviation Meter Panel

Refer to the Installation Detail while performing the following steps.

#### **NOTE**

Steps (1) through (4) apply to the Model TU546 & TU546P Portable Test Sets only.

(1) Unsolder the 17.5K precision resistor (R9) and the WHT-BLU jumper from S1B-15.

(2) Remove jumper between S1B-14 and S1B-15.

(3) Resolder R9 and the WHT-BLU jumper to S1B-14.

(4) Remove BLU-YEL wire from S1A-15 and tape the end. This wire is no longer used.

(5) Mount the SLN1000A Deviation Meter Panel in place of blank panel at top of test set. Route WHT-RED and WHT-BLK leads along existing battery cable to S1B-15 and S1A-14.

(6) Solder WHT-RED lead to S1B-15.

(7) Solder WHT-BLK lead to S1A-15.

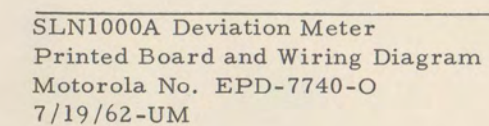
(8) Install batteries with polarity as indicated on battery mounting brackets if the unit is to be self powered. For use with an external power supply refer to information included under paragraph 8. EXTERNAL POWER SUPPLY.

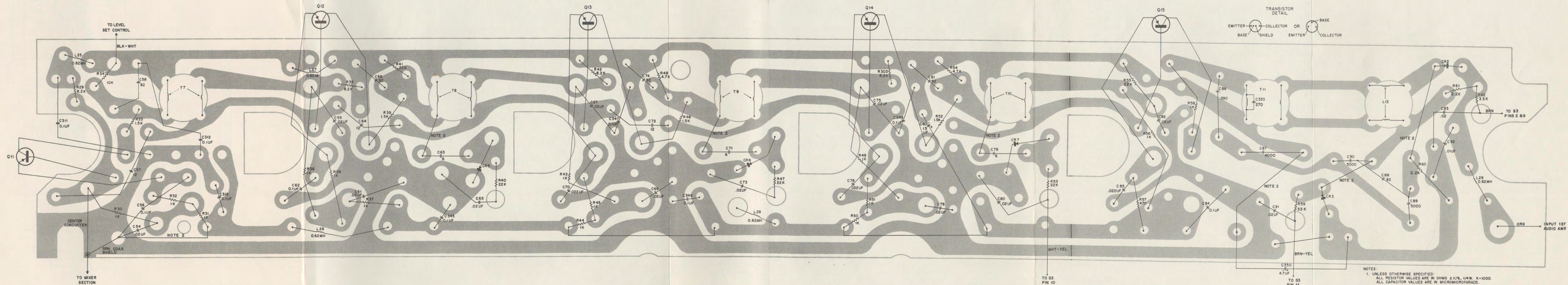
#### **WARNING**

Do not discard mercury batteries in fire as they may explode.

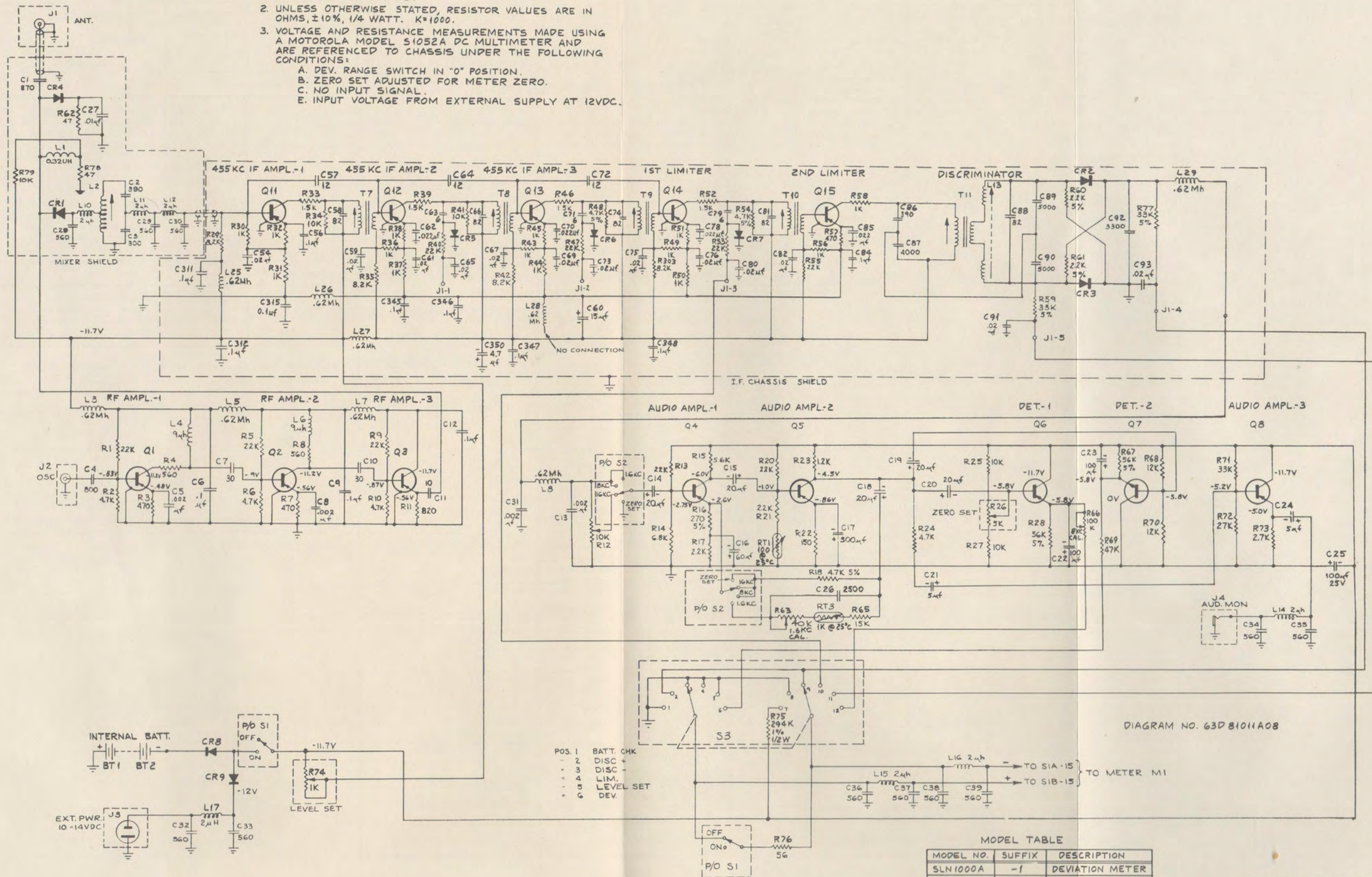


Installation Detail





- NOTES:
1. UNLESS OTHERWISE STATED, CAPACITOR VALUES ARE IN MICROMICROFARADS.
  2. UNLESS OTHERWISE STATED, RESISTOR VALUES ARE IN OHMS,  $\pm 10\%$ , 1/4 WATT. K=1000.
  3. VOLTAGE AND RESISTANCE MEASUREMENTS MADE USING A MOTOROLA MODEL 51052A DC MULTIMETER AND ARE REFERENCED TO CHASSIS UNDER THE FOLLOWING CONDITIONS:
    - A. DEV. RANGE SWITCH IN "0" POSITION.
    - B. ZERO SET ADJUSTED FOR METER ZERO.
    - C. NO INPUT SIGNAL.
    - E. INPUT VOLTAGE FROM EXTERNAL SUPPLY AT 12VDC.



PREVIOUS REVISIONS LISTED  
ON BACK OF THIS DIAGRAM

SLN1000A Deviation Meter Panel  
Schematic Diagram  
Motorola No. 63D81011A08-A  
7/19/62-UM

| REVISIONS   |                        |             |                                     |                 |
|-------------|------------------------|-------------|-------------------------------------|-----------------|
| DIAG. ISSUE | CHASSIS AND SUFFIX NO. | REF. SYMBOL | CHANGE                              | LOCATION        |
| O1          | SLN1000A               | C25         | WAS 50 uf                           | AUDIO AMPL. 2,3 |
|             |                        | L9          | REMOVED 0.62 MH                     |                 |
|             |                        | R19         | REMOVED 560 OHMS                    |                 |
|             |                        | RT2         | REMOVED 300 OHMS                    |                 |
|             |                        | R78         | WAS REF. R75                        | 455 KC INPUT    |
|             |                        | R79         | WAS REF. R76                        |                 |
|             |                        | R77         | WAS REF. R62                        |                 |
|             |                        | C62         | WAS 0.1 uf                          | Q12 EMITTER     |
|             |                        | R48, 54     | WERE ±10%                           |                 |
|             |                        | T11         | WAS 24C82684D02                     | PARTS LIST      |
|             |                        | S2          | WAS 40A890763                       |                 |
|             |                        | S3          | WAS 40K893208                       |                 |
|             |                        |             | ADDED MODELS SLN6080A AND SKN6007A  |                 |
| A           | SLN1000A-1             | C33         | RELOCATED FROM SGN6000A TO SLN6059A | PARTS LIST      |
|             |                        |             | 28B82992D01 (MALE)                  |                 |
|             |                        |             | WAS 9B82992D01 (FEMALE)             | MIXER SHIELD    |
|             |                        | CR1         | WAS 48C82583B01                     |                 |
|             |                        |             | POLARITY TRANSPOSED                 | Q5              |
|             |                        | R63         | WAS 18K861480 (100K)                |                 |
|             |                        | R64         | REMOVED 6K129226 (100K)             | MODEL TABLE     |
|             |                        |             | ADDED SLN6062A PANEL METER KIT      |                 |

PARTS LIST for Schematic Diagram 63D81011A08-A

SLN6059A Meter Amplifier Board Kit

| REFERENCE SYMBOL                                             | MOTOROLA PART No. | DESCRIPTION           |
|--------------------------------------------------------------|-------------------|-----------------------|
| <u>CAPACITOR, fixed: uuf; unless otherwise stated</u>        |                   |                       |
| C1                                                           | 21K858832         | 370 ±3%; 500 v        |
| C2                                                           | 21K859945         | 390 ±5%; 500 v        |
| C3                                                           | 21K859944         | 300 ±5%; 500 v        |
| C4                                                           | 21K840049         | 800 ±5%; 300 v        |
| C5, 8                                                        | 21K837746         | .002 uf ±10%; 500 v   |
| C6, 9, 12                                                    | 21C82372C01       | 0.1 uf ±80-20%; 28 v  |
| C7, 10                                                       | 21K848156         | 30 ±5%; 500 v         |
| C11                                                          | 21K859934         | 10 ±5%; 500 v         |
| C13, 31                                                      | 21C855384         | .002 uf ±15%; 280 v   |
| C14, 15, 18, 19, 20                                          | 23D82601A03       | 20 uf ±100-0%; 28 v   |
| C16                                                          | 23D82601A02       | 60 uf ±150-10%; 18 v  |
| C17                                                          | 23D82601A18       | 300 uf ±150-10%; 6 v  |
| C21, 24                                                      | 23D82601A11       | 5 uf ±33-10%; 28 v    |
| C22, 23, 25                                                  | 23D82601A09       | 100 uf ±150-10%; 28 v |
| <u>SEMICONDUCTOR DEVICE, diode: (SEE NOTE)</u>               |                   |                       |
| C26                                                          | 21K859773         | 2500 ±5%; 500 v       |
| C27                                                          | 21K832501         | .01 uf ±60-40%; 280 v |
| C28, 29, 30, 33                                              | 21C82187B06       | 560 ±10%; 500 v       |
| <u>SEMICONDUCTOR DEVICE, diode: (SEE NOTE)</u>               |                   |                       |
| CR1                                                          | 48D82116E01       | silicon; coded RED    |
| CR4                                                          | 48B811119         | germanium             |
| CR8, 9                                                       | 48C848523         | germanium             |
| <u>COIL, RF:</u>                                             |                   |                       |
| L1                                                           | 24A835456         | 0.32 uh               |
| L2                                                           | 24C82842D01       | inductor              |
| L3, 5, 7, 8                                                  | 24K847940         | 0.62 mh               |
| L4, 6                                                        | 24B847920         | 9 uh                  |
| L10, 11, 12, 14                                              | 24A890687         | 2 uh                  |
| <u>TRANSISTOR: (SEE NOTE)</u>                                |                   |                       |
| Q1, 2, 3                                                     | 48R869017         | P-N-P                 |
| Q4, 5, 6, 8                                                  | 48A124327         | P-N-P                 |
| Q7                                                           | 48A124362         | N-P-N                 |
| <u>RESISTOR, fixed: ±10%; 1/4 w; unless otherwise stated</u> |                   |                       |
| R1, 5, 9, 13, 20                                             | 6K128685          | 22K                   |
| R2, 6, 10, 24                                                | 6K127804          | 4.7K                  |
| R3, 7                                                        | 6K127801          | 470                   |
| R4, 8                                                        | 6K129620          | 560                   |
| R11                                                          | 6K129432          | 820                   |
| R12                                                          | 18K864068         | var; 10K              |
| R14                                                          | 6K128687          | 6.8K                  |
| R15                                                          | 6K129433          | 5.6K                  |
| R16                                                          | 6K131525          | 270 ±5%               |
| R17, 21                                                      | 6K128689          | 2.2K                  |
| R18                                                          | 6K129669          | 4.7K ±5%              |
| R22                                                          | 6K129862          | 150                   |
| R23                                                          | 6K129235          | 1.2K                  |
| R25, 27, 79                                                  | 6K129225          | 10K                   |
| R28, 67                                                      | 6K128684          | 56K ±5%               |
| R62, 78                                                      | 6K129233          | 47                    |
| R63                                                          | 18B82567D02       | var; 40K ±20%; 1/8 w  |
| R65                                                          | 6K127805          | 15K                   |
| R66                                                          | 18K861480         | var; 100K             |
| R68, 70                                                      | 6K129230          | 12K                   |
| R69                                                          | 6K128902          | 47K                   |
| R71                                                          | 6K127807          | 33K                   |
| R72                                                          | 6K127806          | 27K                   |
| R73                                                          | 6K128688          | 2.7K                  |
| <u>THERMISTOR:</u>                                           |                   |                       |
| RT1                                                          | 6B859701          | 100 ±10%; at 25°C     |
| RT3                                                          | 6B858402          | 1K ±10%; at 25°C      |

SLN6058A 455 KC IF Kit

|                                                     |             |                                                                                  |
|-----------------------------------------------------|-------------|----------------------------------------------------------------------------------|
| C54, 59, 61, 65, 67, 69, 73, 75, 76, 80, 82, 91, 93 | 21B82428B01 | <u>CAPACITOR, fixed: uuf; unless otherwise stated</u><br>.02 uf GMV ±100%; 100 v |
|-----------------------------------------------------|-------------|----------------------------------------------------------------------------------|

| REFERENCE SYMBOL                                        | MOTOROLA PART No. | DESCRIPTION                                    |
|---------------------------------------------------------|-------------------|------------------------------------------------|
| 88, 84, 311, 312, 315, 345, 346, 347, 348               | 8K844261          | 0.1 uf ±20%; 200 v                             |
| 887, 64, 72                                             | 21D82204B04       | 12 ±5%; 500 v; NP0                             |
| 888, 66, 74, 81, 88                                     | 21D82204B05       | 82 ±5%; 500 v; N2200                           |
| 860                                                     | 23K865136         | 15 uf ±20%; 25 v                               |
| 862, 70, 78, 88                                         | 8K852472          | .022 uf ±10%; 100 v                            |
| 863, 71, 79                                             | 21D82204B03       | 6 ±0.5 uuf; 500 v; NP0                         |
| 886                                                     | 21K859945         | 390 ±5%; 500 v                                 |
| 887                                                     | 21K863396         | 4000 ±1%; 500 v                                |
| 889, 90                                                 | 21K857481         | 5000 ±5%; 100 v                                |
| 892                                                     | 8K861939          | 3300 ±10%; 100 v                               |
| 8980                                                    | 23K865137         | 4.7 uf ±20%; 25 v                              |
| <u>SEMICONDUCTOR DEVICE, diode: (SEE NOTE)</u>          |                   |                                                |
| 882, 3                                                  | 48C855216         | germanium                                      |
| 885, 6, 7                                               | 48C82178A01       | germanium                                      |
| <u>COIL, RF:</u>                                        |                   |                                                |
| 813                                                     | 24K861818         | discriminator; YEL; incl 1K867236 CORE, tuning |
| 828, 26, 27, 28, 29                                     | 24K864737         | 0.62 mh; BLK-BRN                               |
| <u>TRANSISTOR: (SEE NOTE)</u>                           |                   |                                                |
| 811, 12, 13, 14, 15                                     | 48A134524         | P-N-P                                          |
| <u>RESISTOR, fixed: ±10%; 1/4 w</u>                     |                   |                                                |
| 829, 35, 42, 303                                        | 6K128686          | 8.2K                                           |
| 830, 31, 32, 36, 37, 38, 43, 44, 45, 49, 50, 51, 56, 58 | 6K127802          | 1K                                             |
| 833, 39, 46, 52                                         | 6K127803          | 1.5K                                           |
| 834, 41                                                 | 6K129225          | 10K                                            |
| 840, 47, 53, 55                                         | 6K128685          | 22K                                            |
| 848, 84                                                 | 6K129669          | 4.7K ±5%                                       |
| 857                                                     | 6K127801          | 470                                            |
| 859, 77                                                 | 6K129526          | 33K ±5%                                        |
| 860, 61                                                 | 6K129804          | 2.2K ±5%                                       |
| <u>TRANSFORMER, IF:</u>                                 |                   |                                                |
| T7, 8, 9, 10                                            | 24B859891         | GRN; incl 1K867236 CORE, tuning                |
| T11                                                     | 24C82842D02       | discriminator                                  |

SLN6046A Battery Kit

|        |           |                                           |
|--------|-----------|-------------------------------------------|
| BT1, 2 | 60B863919 | <u>BATTERY, mercury:</u><br>6.5 v; 5 cell |
|--------|-----------|-------------------------------------------|

SGN6000A Front Panel and Cover Kit

|                                                         |             |                                                 |
|---------------------------------------------------------|-------------|-------------------------------------------------|
| 832, 34, 35, 36, 37, 38, 39                             | 21C82187B06 | <u>CAPACITOR, fixed:</u><br>560 uuf ±10%; 500 v |
| <u>CONNECTOR, receptacle:</u>                           |             |                                                 |
| J1, 2                                                   | 9B855268    | female; single contact                          |
| J3                                                      | 28A812540   | male; 2 contact                                 |
| <u>JACK, phone:</u>                                     |             |                                                 |
| J4                                                      | 9B82138B01  | single contact                                  |
| <u>COIL, RF:</u>                                        |             |                                                 |
| L15, 16, 17                                             | 24A890687   | 2 uh                                            |
| <u>RESISTOR, fixed: 1/4 w; unless otherwise stated;</u> |             |                                                 |
| R26                                                     | 18B82700D01 | var; 5K                                         |
| R74                                                     | 18D82515B01 | var; 1K                                         |
| R75                                                     | 6D82475B50  | 294K ±1%; 1/2 w                                 |
| R76                                                     | 6K129860    | 56 ±10%                                         |
| <u>SWITCH:</u>                                          |             |                                                 |
| S1                                                      | 40A80246    | toggle; dpdt                                    |
| S2                                                      | 40C82830D02 | rotary; 2 pole; 4 position                      |
| S3                                                      | 40C82830D01 | rotary; 2 pole; 6 position                      |

| REFERENCE SYMBOL     | MOTOROLA PART No. | DESCRIPTION                       |
|----------------------|-------------------|-----------------------------------|
| NON-REFERENCED ITEMS |                   |                                   |
|                      | 28A82081C01       | PLUG, phone: male; single contact |
|                      | SAN6000A          | ANTENNA                           |

SLN6080A Attenuator Kit

|  |             |                                                      |
|--|-------------|------------------------------------------------------|
|  | 15A82995D01 | HOUSING, attenuator                                  |
|  | 15A82993D01 | COVER, attenuator housing                            |
|  | 9B855268    | CONNECTOR, receptacle: female; single cont; UG-657/U |
|  | 28B82992D01 | CONNECTOR, receptacle: male; single contact          |
|  | 6R114018    | RESISTOR, fixed: 10 ±5%; 1/2 w; 2 req'd.             |
|  | 6R5648      | RESISTOR, fixed: 51 ±5%; 1/2 w                       |
|  | 29R118191   | LUG, soldering                                       |
|  | 3S2236      | SCREW, machine: #4-40 x 1/8"; 8 req'd.               |

SKN6007A Cable Kit

|  |           |                                                        |
|--|-----------|--------------------------------------------------------|
|  | 28B844876 | CONNECTOR, plug: male; single cont; type BNC; 2 req'd. |
|  | 30B475378 | CABLE, RF: coaxial; RG-58A/U; 6" req'd.                |

SLN6062A Panel Meter Kit (p/o S1062A Conversion Kit only)

|  |             |                                           |
|--|-------------|-------------------------------------------|
|  | 72B82534D01 | METER, d-c: 0-50 microamp; multiple scale |
|--|-------------|-------------------------------------------|

## NOTE:

Replacement transistors and diodes must be ordered by Motorola part number only for optimum performance.

