

MOTOROLA test equipment

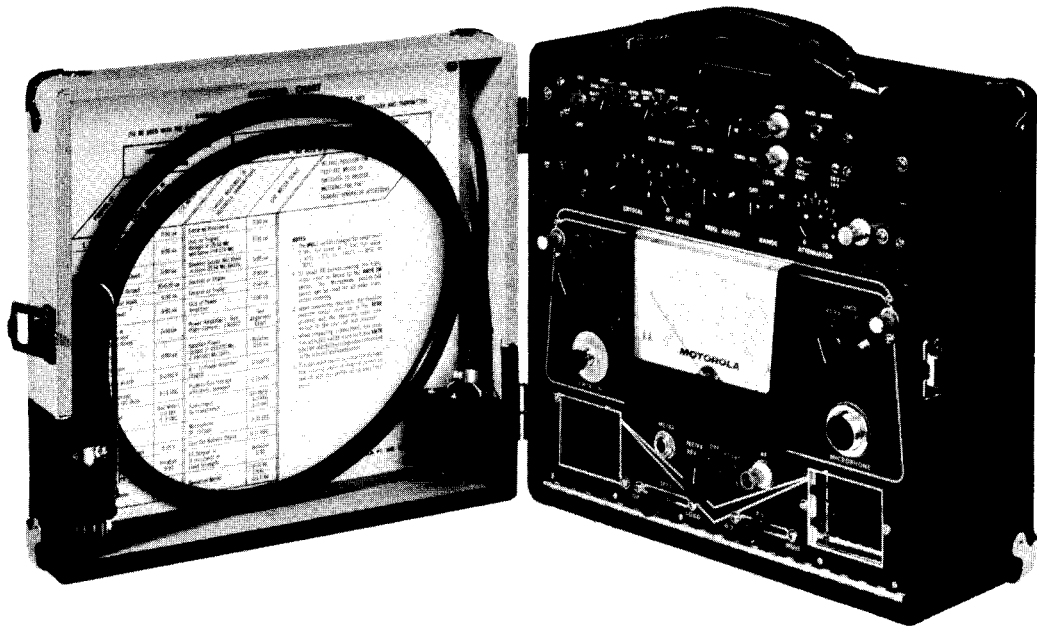
portable test set

MODELS S1056A S1057A
 S1058A S1059A

MOTOROLA

PORTABLE TEST SET

MODELS S1056A
S1057A
S1058A
S1059A



S1059A PORTABLE TEST SET



MOTOROLA INC.

ENGINEERING PUBLICATIONS

1301 E. ALGONQUIN ROAD

Communications Division

SCHAUMBURG, ILLINOIS 60172

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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 (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 Range: 0 to .2 v a-c; 0 to 2 v a-c Frequency Response: ± 1 db from 35 cps to 5000 cps Input Impedance: 2 v range 400,000 ohms; .2 v range 40,000 ohms Stability: -1 db from -5°C to $+60^{\circ}\text{C}$ -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.

A model chart is located in the front of this manual.

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. Revisions, if any, are listed on the schematic diagram.

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 installation 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.

For your contract service requirements, please contact your local Motorola representative or write to:

National Service Manager
Motorola Communications Division
4501 W. Augusta Blvd., Chicago, Illinois 60651

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.

Orders for "Vibrasender", "Vibrasponder" and "Vibrasender-sponder" units should specify the type number and frequency and should identify the owner and operator of the communications system in which these items are 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, 815	2, 834, 879	3, 059, 184	3, 204, 202	3, 306, 990	3, 387, 270
RE-26, 079	2, 883, 521	3, 061, 785	3, 205, 455	3, 307, 051	3, 400, 219
RE-26, 361	2, 888, 652	3, 070, 737	3, 218, 587	3, 307, 121	3, 409, 841
2, 626, 384	2, 899, 547	3, 070, 748	3, 223, 953	3, 323, 065	3, 414, 881
2, 637, 782	2, 901, 601	3, 083, 332	3, 233, 243	3, 324, 408	3, 416, 032
2, 650, 333	2, 912, 573	3, 087, 117	3, 234, 469	3, 327, 215	3, 424, 854
2, 688, 059	2, 918, 571	3, 087, 998	3, 247, 475	3, 328, 695	3, 424, 983
2, 691, 094	2, 924, 705	3, 087, 999	3, 250, 997	3, 328, 727	3, 430, 171
2, 691, 560	2, 925, 562	3, 091, 736	3, 250, 999	3, 333, 151	3, 431, 486
2, 699, 425	2, 938, 082	3, 094, 293	3, 256, 497	3, 333, 911	3, 437, 838
2, 705, 281	2, 963, 577	3, 101, 441	3, 263, 172	3, 334, 293	3, 437, 934
2, 731, 555	2, 966, 585	3, 119, 093	3, 273, 083	3, 335, 405	3, 441, 854
2, 738, 466	2, 974, 221	3, 126, 514	3, 275, 938	3, 336, 533	3, 447, 133
2, 740, 891	2, 984, 740	3, 128, 431	3, 281, 697	3, 341, 777	3, 448, 342
2, 743, 361	2, 994, 844	3, 129, 396	3, 284, 714	3, 345, 568	3, 449, 680
2, 759, 052	3, 009, 115	3, 131, 354	3, 289, 098	3, 345, 569	3, 453, 521
2, 759, 103	3, 014, 127	3, 149, 317	3, 292, 085	3, 345, 573	3, 454, 927
2, 777, 950	3, 027, 454	3, 175, 183	3, 293, 644	3, 348, 148	3, 458, 664
2, 799, 010	3, 027, 455	3, 175, 187	3, 300, 723	3, 355, 533	3, 465, 294
2, 808, 507	3, 039, 081	3, 175, 193	3, 304, 501	3, 355, 709	3, 469, 191
2, 809, 236	3, 041, 550	3, 183, 382	3, 304, 503	3, 369, 597	3, 471, 796
2, 830, 200	3, 048, 659	3, 191, 123	3, 305, 779	3, 370, 236	3, 471, 805
2, 833, 994	3, 048, 747			3, 373, 379	3, 473, 152

Other U.S. Patents Pending

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MODEL CHART
FOR
PORTABLE TEST SET

CODE:

- X = ONE ITEM SUPPLIED
- 2 = TWO ITEMS SUPPLIED
- 4 = FOUR ITEMS SUPPLIED

MODEL		DESCRIPTION	ITEM			DESCRIPTION	REFERENCE DIAGRAM
			SLN6056A	SLN6057A	SLN1000A		
			PORTABLE TEST SET KIT			63E81011A03	
			PEAKING GENERATOR KIT			63E81011A06	
			DEVIATION METER			63D81011A08	
			BATTERY KIT				
			BATTERY KIT				
			BLANK PANEL KIT				
			BLANK PANEL KIT				
			DEVIATION METER ANTENNA				
			ATTENUATOR KIT				
			CABLE KIT				
S1056A	PORTABLE TEST SET	X					
S1057A	PORTABLE TEST SET WITH PEAKING GENERATOR	X	X	4	X		
S1058A	PORTABLE TEST SET WITH DEVIATION METER	X	X	4	X		
S1059A	PORTABLE TEST SET WITH PEAKING GENERATOR & DEVIATION METER	XX	X	4	2	X	

EPD-8143-O

PORTABLE TEST SET

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.

NOTE

If previously supplied metering cables are to be used with this test set, add resistor R31 as shown on the test set schematic diagram. Previously supplied metering cables include: (1) W1 Metering Cable 1V858292 supplied with test set chassis stamped SLN6056A-3 or earlier; (2) Accessory Metering Cables SKN6012A and SKN6013A.

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+	A+	Audio	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+	A+	Audio	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.)

Fc = Desired test set output frequency
Fx = Crystal frequency required

<u>Fc</u>	<u>Fx</u>
290-800 kc	$Fx = Fc$
800-1600 kc	$Fx = \frac{Fc}{2}$
1600-2000 kc	$Fx = \frac{Fc}{3}$
2-13 mc	$Fx = Fc$

TABLE 2

Crystal Types Available and Their Frequency Range

<u>Crystal Frequency</u>	<u>Motorola Type</u>
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:

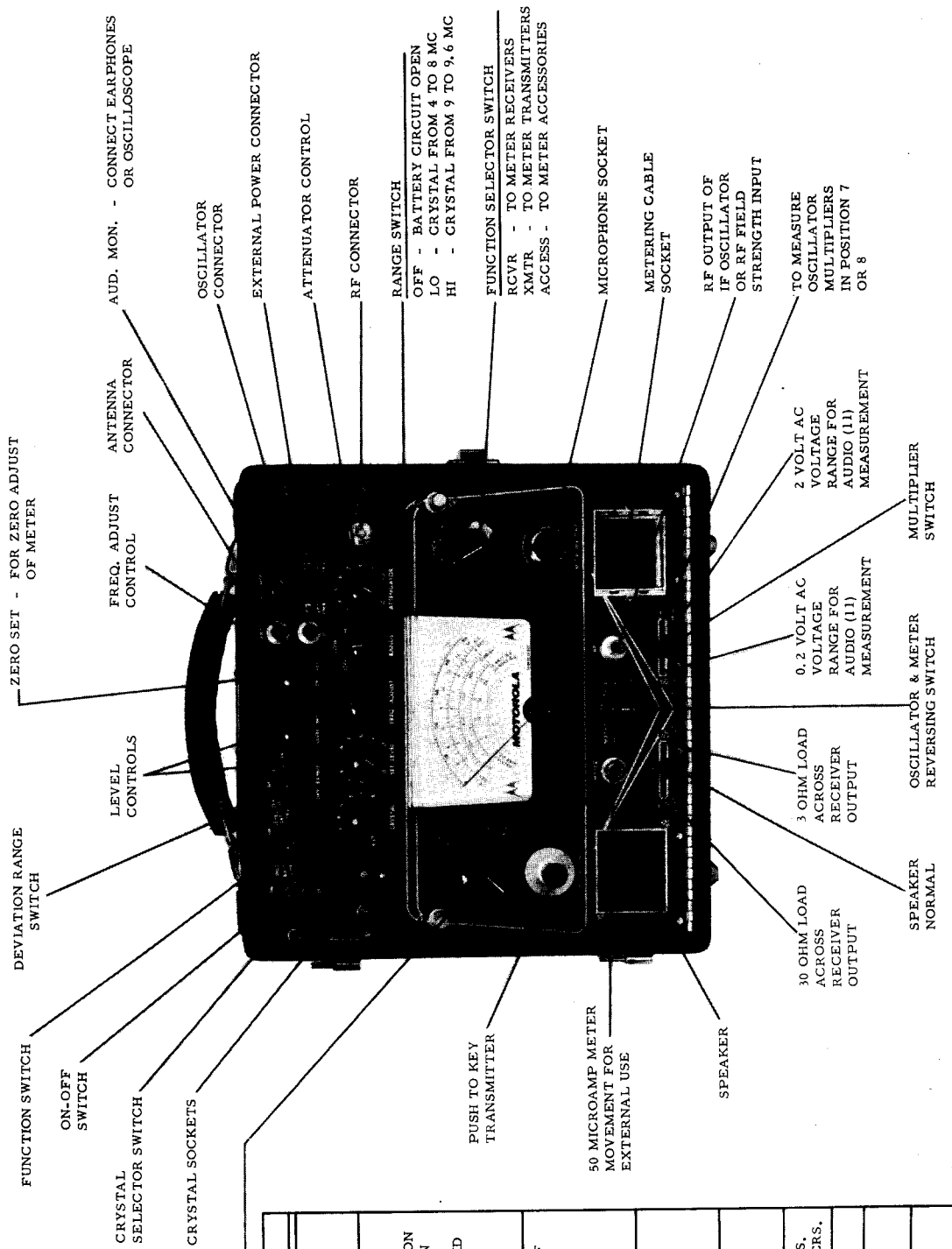
- (1) Place the Function Selector Switch in the RCVR position.
- (2) Place the Position Selector Switch in position 4.
- (3) Turn the control in the direction which moves the needle toward zero center. When the needle reaches the zero point, the adjustment is completed.

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.



POSITION SELECTOR SWITCH

POSITION	CIRCUIT MEASURED
1-6	REFER TO APPLICABLE INSTRUCTION MANUAL FOR STAGES BEING MEASURED.
7	POWER AMPLIFIER PLATE CURRENT IN TRANSMITTERS. (SEE APPLICABLE INSTRUCTION MANUAL FOR INTERPOLATION TO MILLIAMPERES) OSCILLATOR MULTIPLIER GRID IN 450-470 MC & 890-960 MC RECEIVERS. (SEE TEXT)
8	RELATIVE POWER OUTPUT OF 450-470 MC & 890-960 MC TRANSMITTERS. ALSO OSCILLATOR MULTIPLIER IN SOME 450-470 MC RECEIVERS. (SEE TEXT)
9	B+ IN TRANSMITTERS AND RECEIVERS WHEN SUCH VOLTAGE IS WIRED TO METERING SOCKET
10	A+ IN DC RECEIVERS RELAY VOLTAGE IN AC TRANSMITTERS.
11	AUDIO OUTPUT OF RECEIVERS. AUDIO INPUT OF TRANSMITTERS.
12	MIC DC IN TRANSMITTERS
13	6 VOLT BATTERY INSIDE TEST SET
14	RELATIVE RF OUTPUT OF I.F. OSCILLATOR OR RF FIELD STRENGTH INPUT

Controls Location Detail
Motorola No. BEPD-7580-O

METERING CHART

S1056A, S1057A, S1058A AND S1059A PORTABLE TEST SET

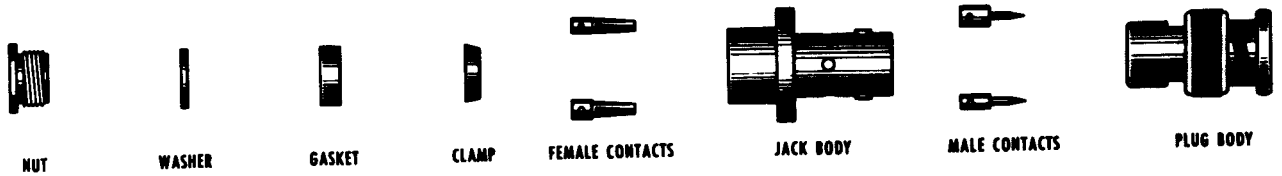
(TO BE USED WITH THE ALIGNMENT PROCEDURES DESCRIBED IN THE INSTRUCTIONS SUPPLIED WITH EACH RECEIVER AND TRANSMITTER)

		FUNCTION SELECTOR SWITCH RCVR. POSITION (SEE NOTE 3)	FUNCTION SELECTOR SWITCH XMTR. POSITION (SEE NOTE 4)	FUNCTION SELECTOR SWITCH ACCESS. POSITION
POSITION OF POSITION SELECTOR SWITCH		CIRCUIT METERED IN MOTOROLA RECEIVERS	METER SCALE	CIRCUIT MEASURED IN MOTOROLA TRANSMITTERS
		USE METER SCALE	IN THIS POSITION THE TEST SET METER IS SWITCHED TO PROVIDE METERING FOR THE 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 Except in 25-54 Mc and Some 144-174 Mc	0-50 ua
3	See Alignment Chart	0-50 ua	Doubler Except Not Used 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 Chart	0-50 ua	Grid of Power Amplifier	0-50 ua
7	Multipliers in 450-470 Mc and 890-960 Mc Rcvrs. with Multiplier Switch in Mult. Position	0-50 ua	Power Amplifier } See Plate Current } Note 2	See Alignment Chart
8		0-50 ua	Relative Power Output of 450-470 Mc & 890-960 Mc Units	Relative 0-50 ua
9	B+ (when wired)	0-1000 V	B+ to Power Amplifier Stages	0-1000 V
10	Filament Voltage when wired (DC Only)	0-15 VDC	Push-to-Talk Voltage with Xmtr. Unkeyed	0-15 VDC
11	Audio Output of Receiver	See Note 1 0-2 VAC 0-2 VAC	Audio Input To Transmitter	See Note 1 0-2 VAC 0-2 VAC
12	NONE		Microphone DC Voltage	0-30 VDC
13	Test Set Battery Check	0-15 V	Test Set Battery Check	0-15 VDC
14	RF Output of IF Oscillator or Field Strength	Relative 0-50	RF Output of IF Oscillator or Field Strength	Relative 0-50
15	Deviation Meter	0-16 Kc 0-8 Kc 0-1.6 Kc	Deviation Meter	0-16 Kc 0-8 Kc 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°C to $+60^{\circ}\text{C}$ (-30% at -30°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.

TYPE BNC CONNECTOR ASSEMBLY INSTRUCTIONS



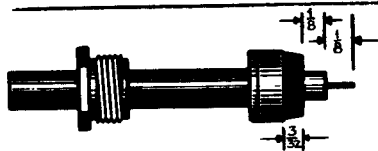
Trim jacket $\frac{1}{4}$ " for RG-58/U, $\frac{5}{16}$ " for RG-59/U or $\frac{7}{16}$ " for RG-71/U.



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



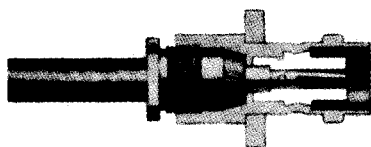
Taper braid and slide nut, washer, gasket and clamp over braid. Clamp is inserted so that its inner shoulder fits squarely against end of cable jacket.



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.

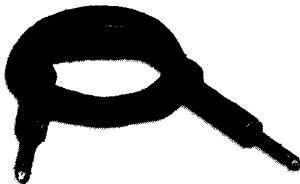




RF PROBE EXTENSION CABLE



RF PROBE CABLE

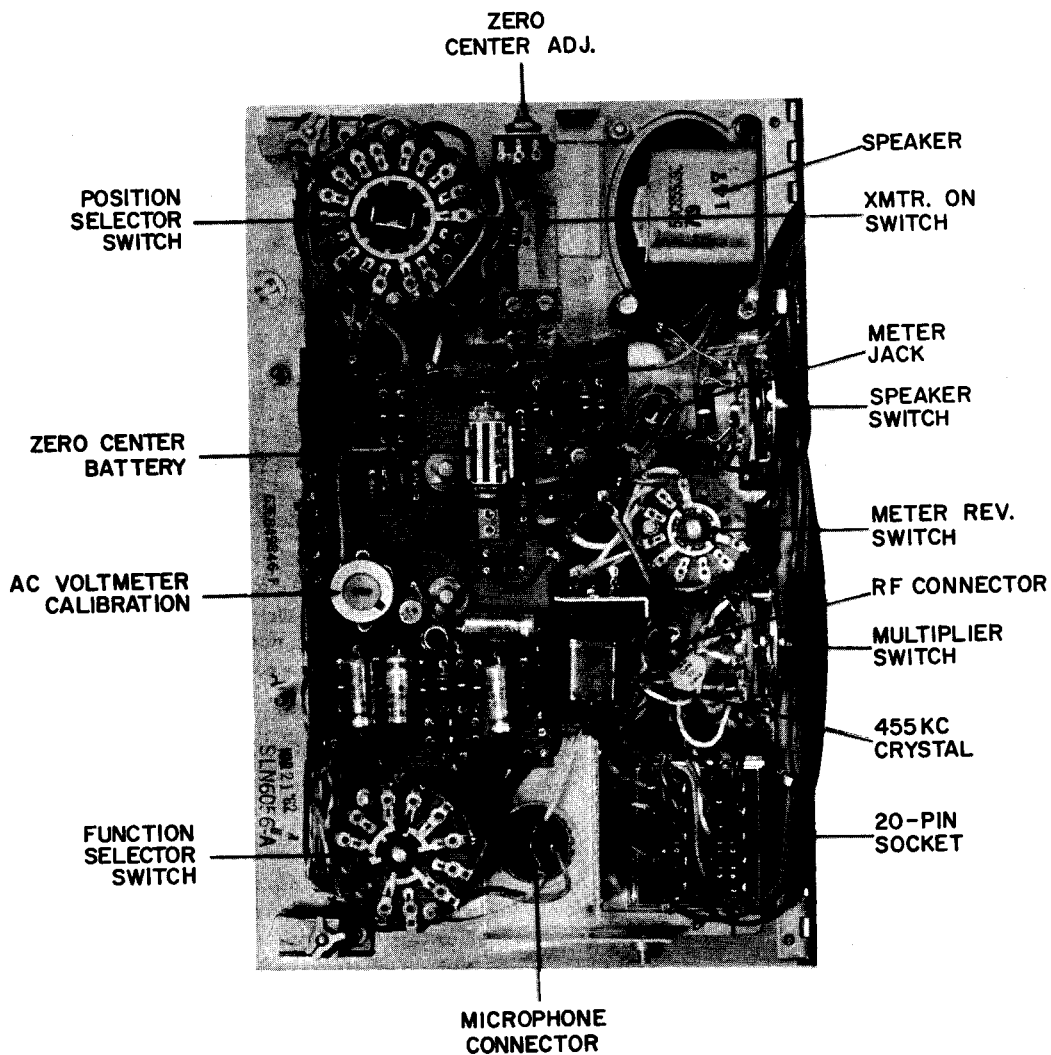


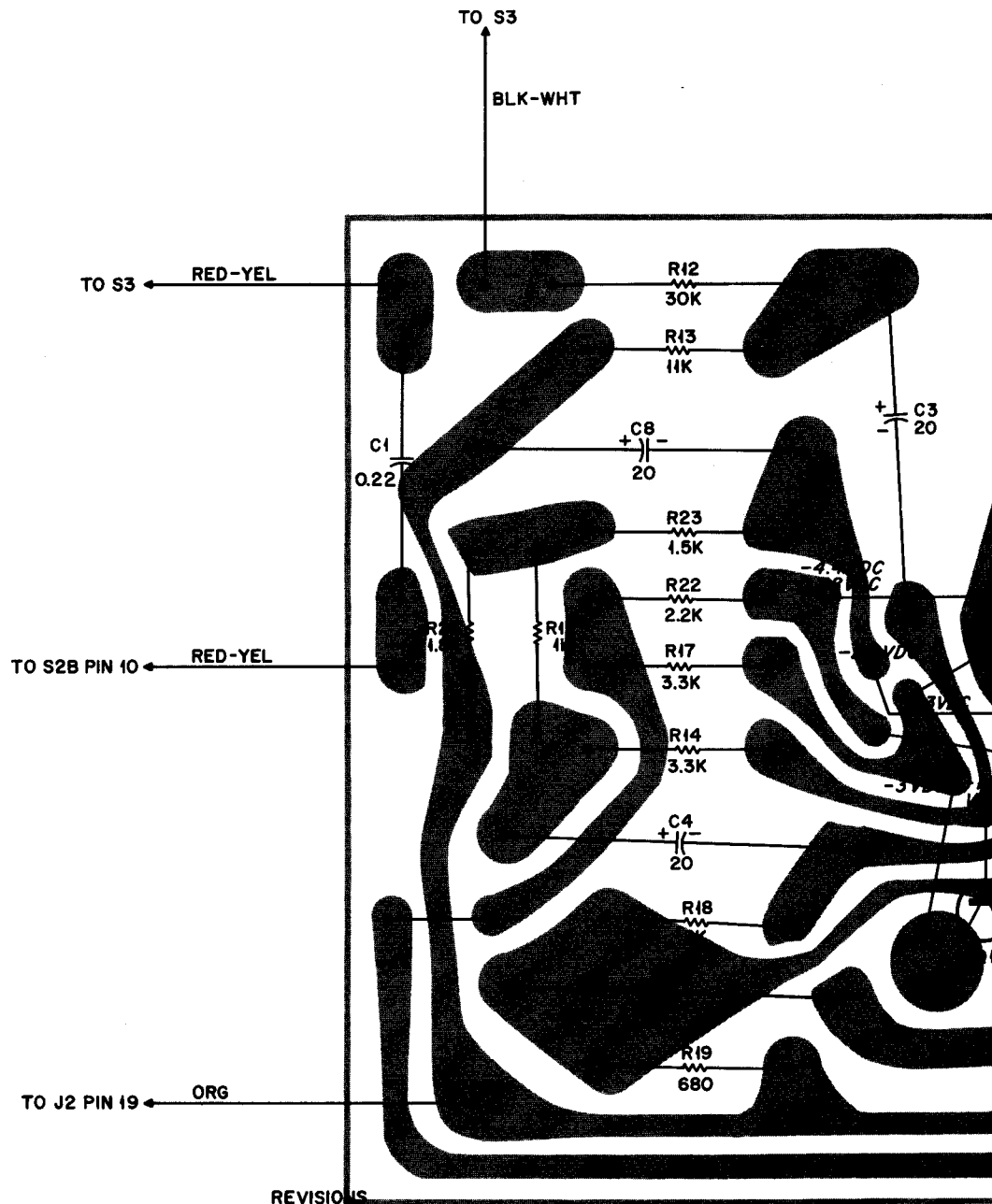
ACCESSORY CABLE



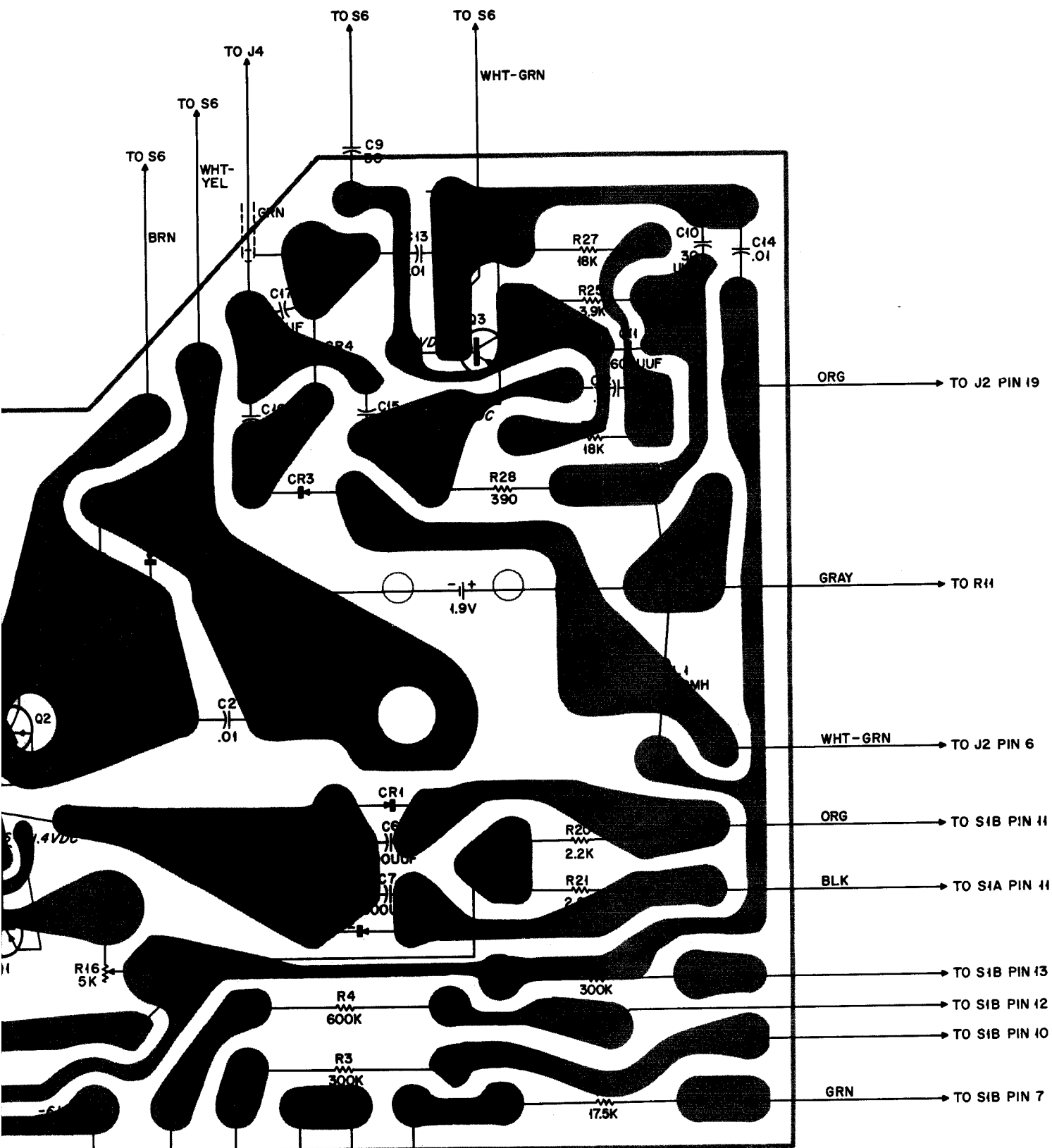
ADAPTER FOR RF PROBE EXTENSION CABLE

REAR VIEW OF FRONT PANEL





DIAG. ISSUE	BOARD AND SUFFIX NO.	REF. SYMBOL	CHANGE	LOCATION
A	SLN6056A-2	C1	WAS 8K834384	UPPER LEFT OF BOARD



BD-EEPD-7732-0
 OL-EEPD-7733-A

BRN-WHT
 TO S1C

RED-BLU
 TO S1

BRN
 TO S2B
 PIN 6

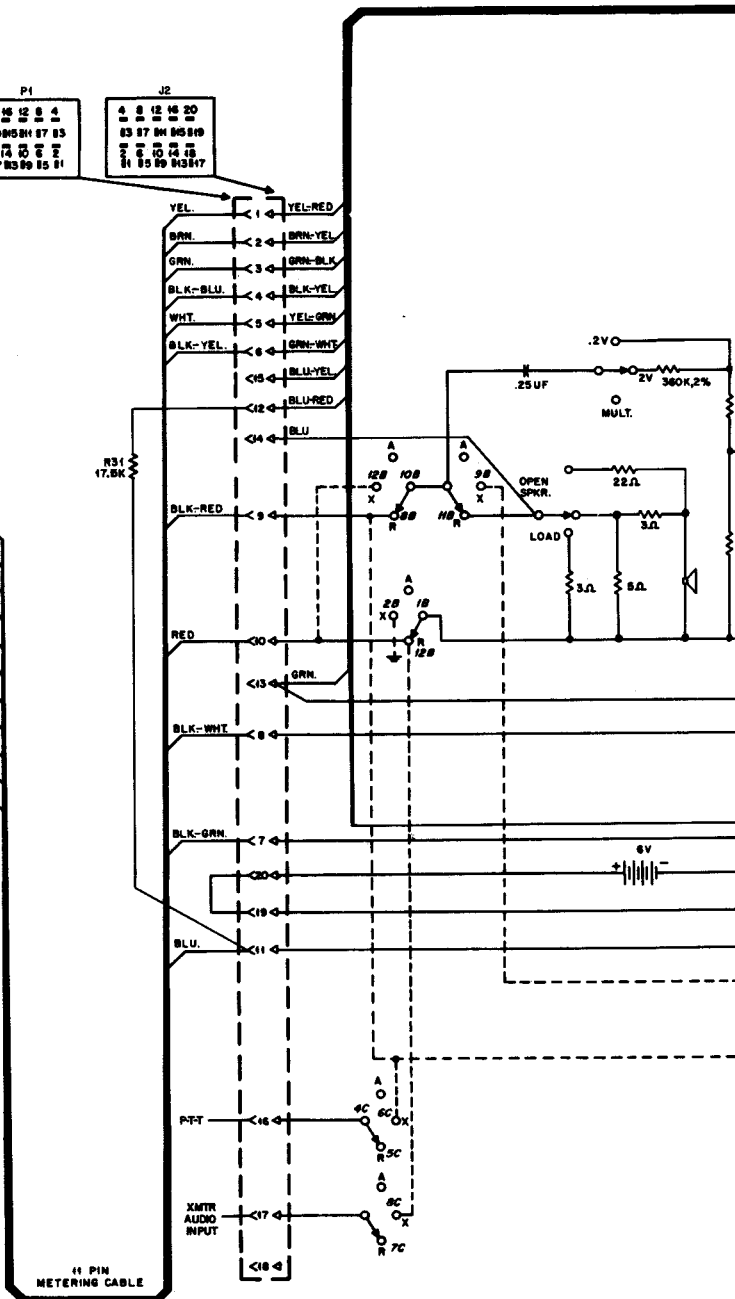
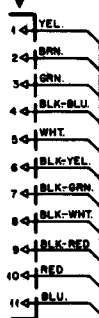
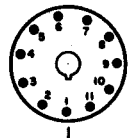
RED
 TO J2
 PIN 7

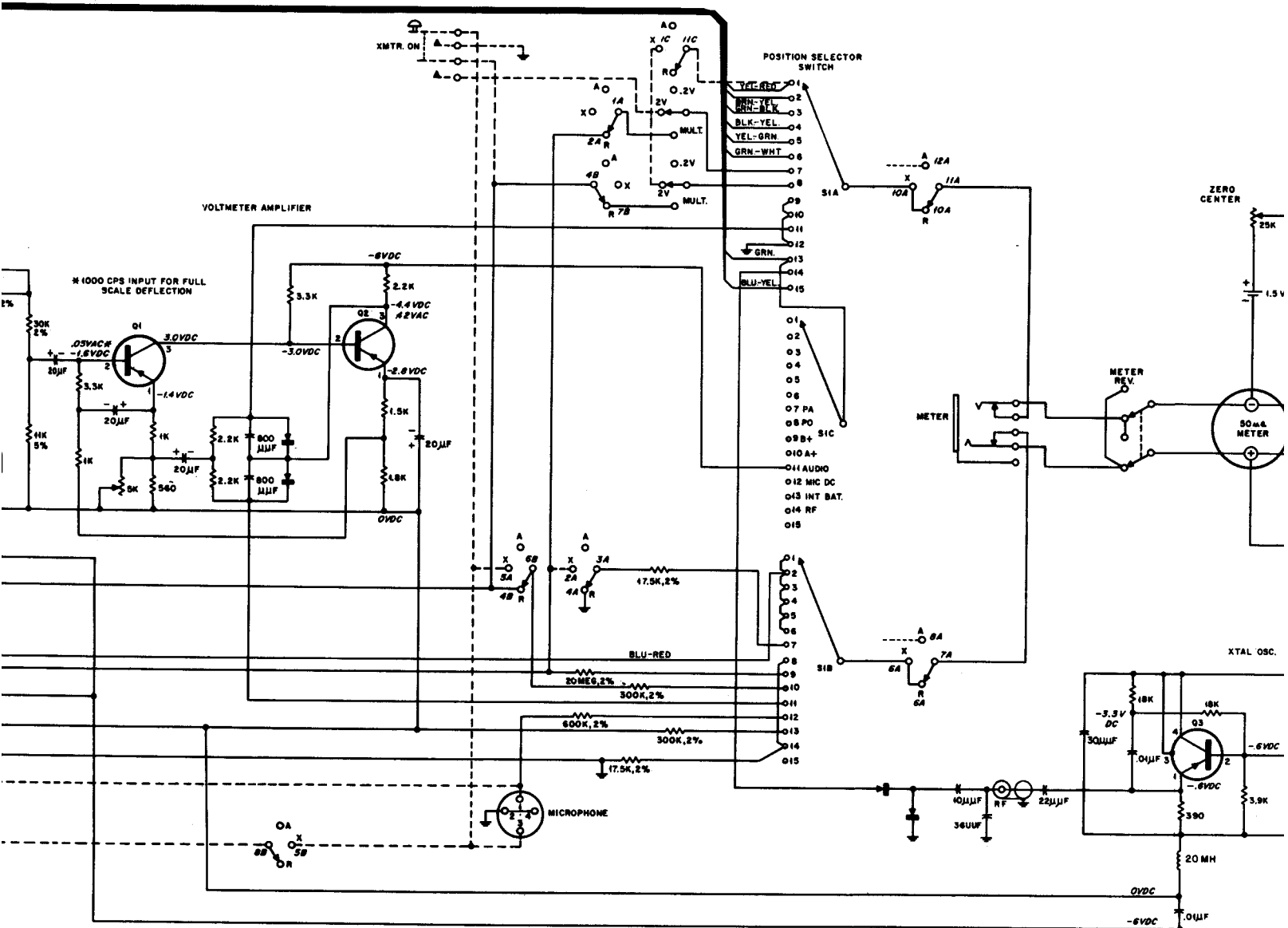
R2
 20M
 2W
 TO S1B
 PIN 9

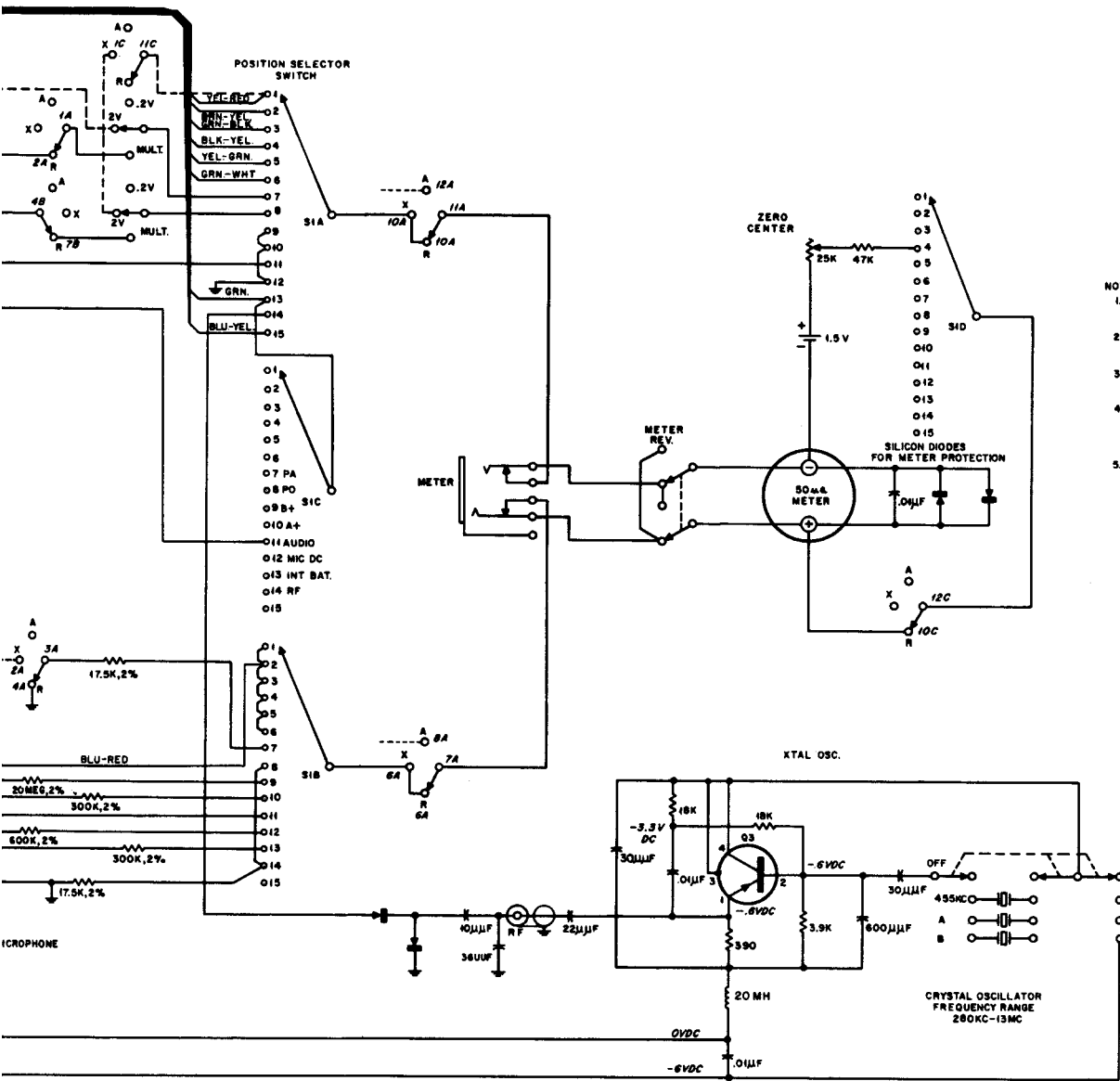
WHT-BLK
 TO S2A
 PIN 3

Portable Test Set
 Printed Board and Wiring Diagram
 Motorola No. EPD-7734-A

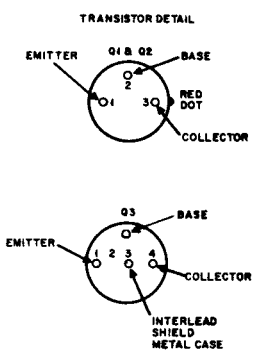
P1				J2					
20	16	12	8	4	4	8	12	16	20
0905041	07	03			03	07	04	05	019
05	01	02			02	06	10	14	18
070309	15	01			01	05	09	13	17







- NOTES:
1. FUNCTION SELECTOR SWITCH (RCVR. XMTR. ACCESS) SHOWN IN RCVR. POSITION.
 2. DASHED LINES INDICATE CIRCUITRY WHEN FUNCTION SELECTOR SWITCH IS IN XMTR. POSITION.
 3. RF OSCILLATOR VOLTAGES TAKEN WITH OSCILLATOR OPERATING.
 4. MEASUREMENTS OF AUDIO VOLTMETER TAKEN WITH FUNCTION SELECTOR SWITCH IN XMTR. POSITION; 20 VAC APPLIED TO PIN 1 OF MICROPHONE RECEPTACLE AND SWITCH 1 IN POSITION 1.
 5. REFERENCE NUMBERS ON R-X-A SWITCH REFER TO WAFER SWITCH SECTIONS OF THE FUNCTION SELECTOR SWITCH ON CIRCUIT DIAGRAM 63E8N04A03. 6A REFERS TO WAFER SECTION S2A, TERMINAL 6.

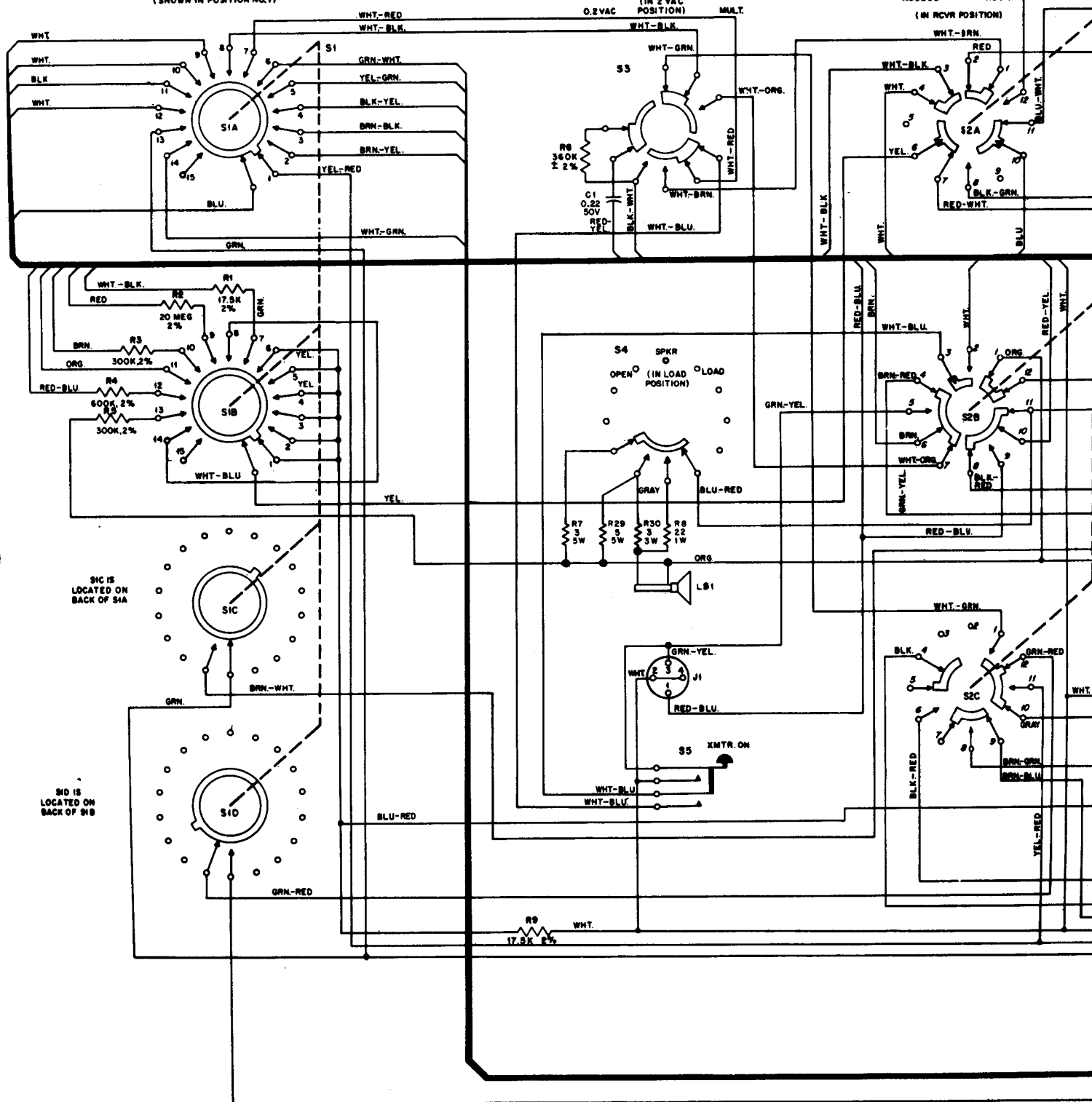


E E P D - 7 5 7 9 - D

POSITION SELECTOR SWITCH
(SHOWN IN POSITION NO.1)

SPRING RETURN-CENTER NEUTRAL

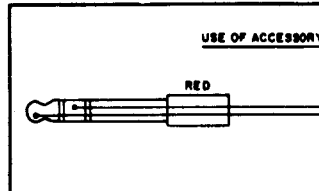
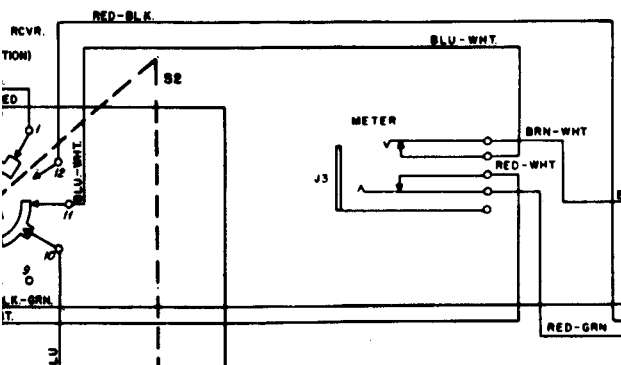
FUNCTION SELECTOR SWITCH (NOTE 5)



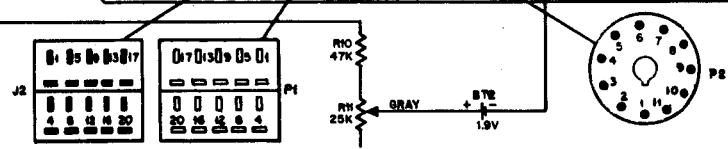
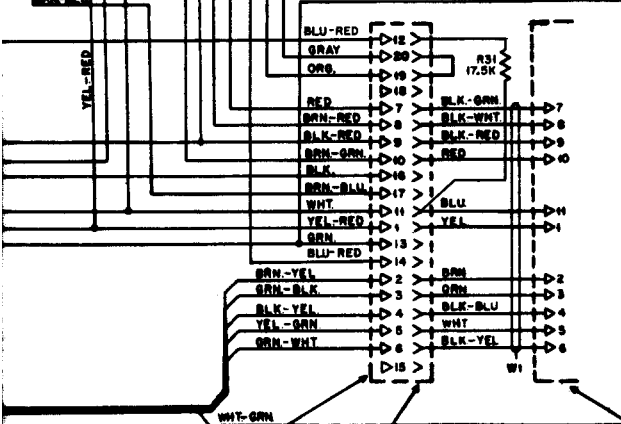
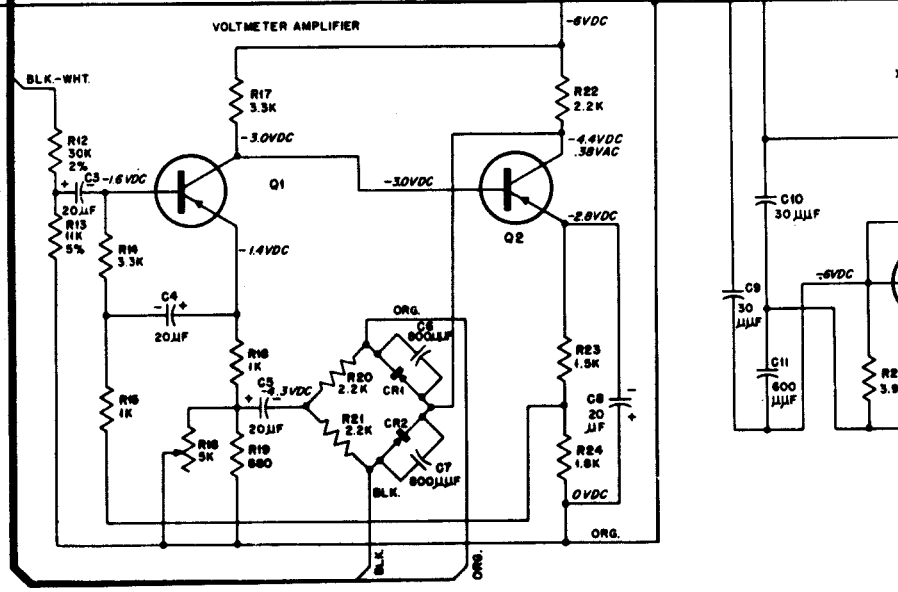
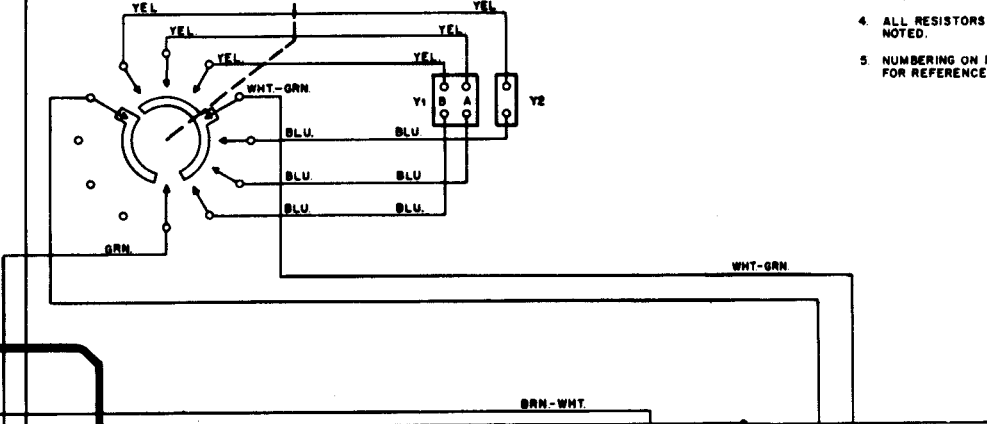
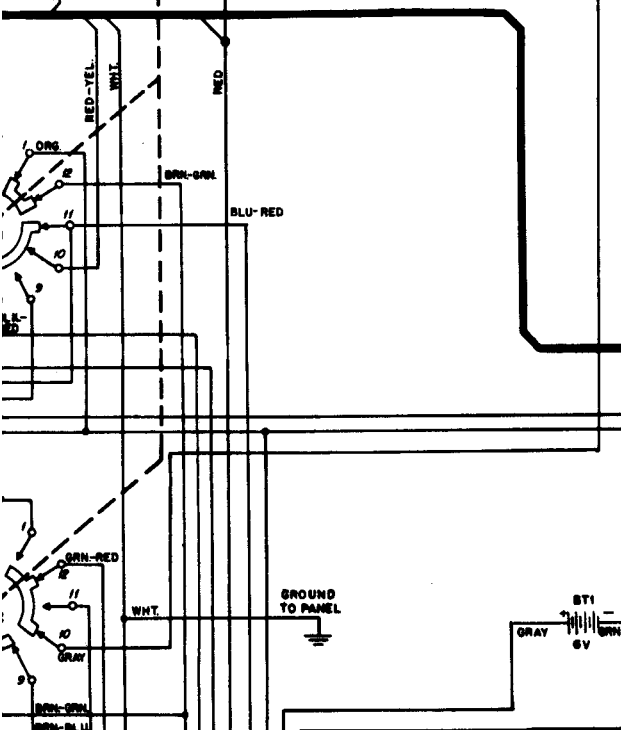
S1C IS
LOCATED ON
BACK OF S1A

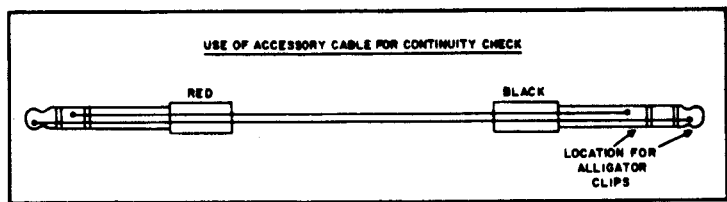
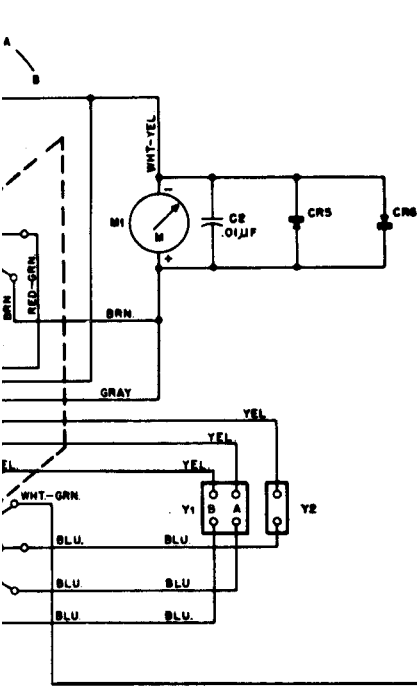
S1D IS
LOCATED ON
BACK OF S1B

SWITCH (NOTES)

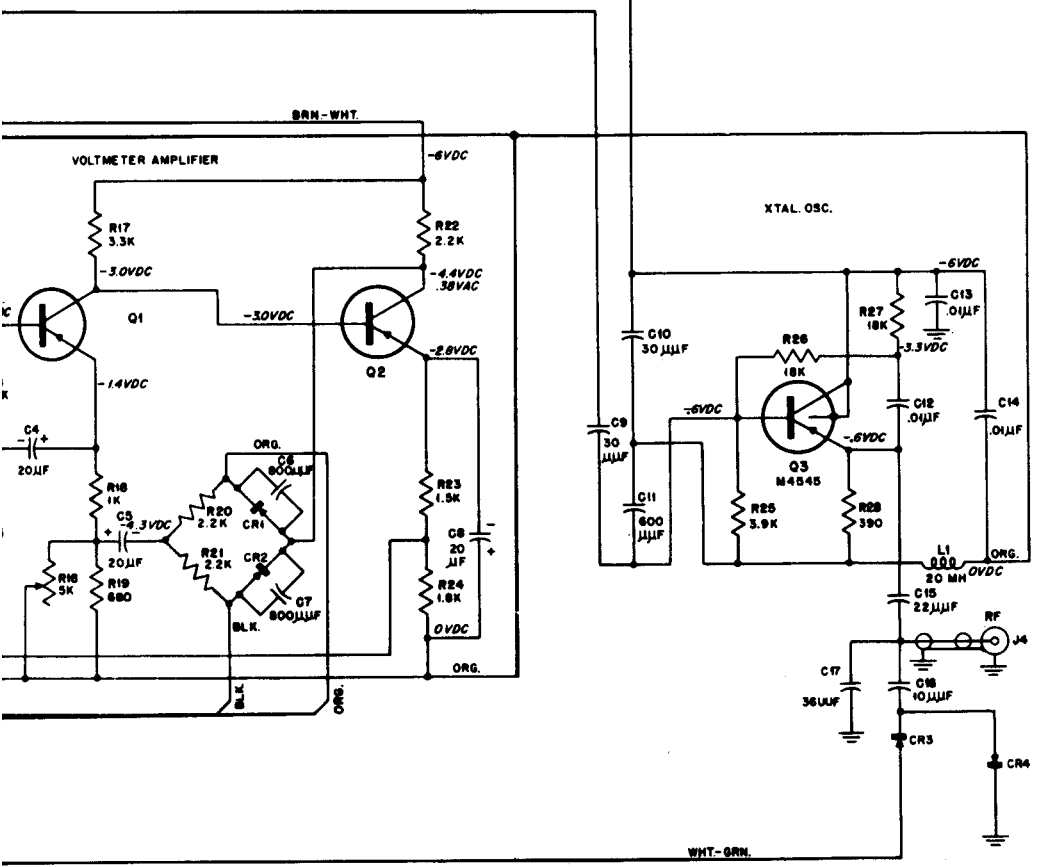
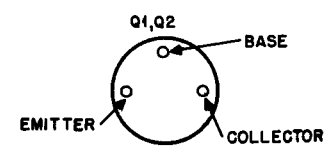
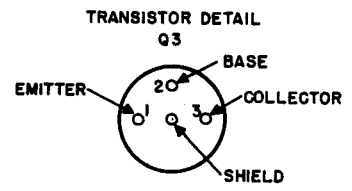


- NOTES:
- 1 ALL SWITCHES S1 EXCEPT METER M WHICH ARE SHOWN OPERATING.
 2. RF OSCILLATOR POSITION II.
 3. VOLTAGE MEASUREMENT TAKEN WITH FUNCTION SWITCH IN POSITION I, RECEPTACLE AND POSITION II.
 4. ALL RESISTORS NOTED.
 5. NUMBERING ON PANEL FOR REFERENCE.





- NOTES:**
1. ALL SWITCHES SHOWN IN MAXIMUM CCW POSITION EXCEPT METER MULT SWITCH AND SPEAKER SWITCH WHICH ARE SHOWN IN CENTER POSITION.
 2. RF OSCILLATOR VOLTAGES TAKEN WITH OSCILLATOR OPERATING.
 3. VOLTAGE MEASUREMENTS OF AUDIO VOLTMETER TAKEN WITH FUNCTION SELECTOR SWITCH IN XMTR. POSITION, +1.8VAC APPLIED TO PIN 1 OF MIC. RECEPTACLE AND POSITION SELECTOR SWITCH IN POSITION II.
 4. ALL RESISTORS 1/2 WATT ±10% UNLESS OTHERWISE NOTED.
 5. NUMBERING ON FUNCTION SELECTOR SWITCH IS FOR REFERENCE PURPOSES ONLY.



MODEL TABLE

MODEL	SUFFIX	DESCRIPTION
SLN8068A	4	PORTABLE TEST SET KIT
SLN8068A		BATTERY KIT

DIAGRAM NO. 63E81011A03-D

PREVIOUS REVISIONS AND PARTS LIST SHOWN ON BACK OF THIS DIAGRAM

Portable Test Set
Schematic Diagram
Motorola No. 63E81011A03-D

PARTS LIST for Schematic Diagram 63E81011A03-D
SLN6056A Portable Test Set

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
O2	SLN6056A	BT1	REMOVED FROM MODEL SLN6056A TEST SET KIT	PARTS LIST
	SLN6082A	BT1	BATTERY KIT ADDED	
O3	SLN6082A	BT1	ADDED ALTERNATE PART 60B82455G01	PARTS LIST
A	SLN6056A-1	R8	WAS 6R5676	S4 SWITCH
		R29	ADDED	
		R30	ADDED	
B	SLN6056A-2	C1	WAS 8K834384	S3 SWITCH
C	SLN6056A-3		ADD BLU-RED LEAD	J2-14
			ADD BLU-YEL LEAD	J2-12
D	SLN6056A-4	R31	ADDED 17.5K	P-1-12
			REMOVE JUMPER BETWEEN S1B-6 AND S1B-8	

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
BT2	60B855262	<u>BATTERY, dry:</u> 1-1/2 volt; "N" size cell
C1	8D82905G12	<u>CAPACITOR, fixed:</u> mylar .22 ±10%; 50 v ±20%; 200 v
C2, 12, 13, 14	21B801139	ceramic; disc; .01 uf +80-20%; 600 v
C3, 4, 5, 8	23C844927 or 23C82601A03	Electrolytic; tubular; 20 uf +100-10%; 25 v
C6, 7	21B847070	ceramic; disc; 800 uuf ±10%; 600 v
C9, 10	21R114166	ceramic; disc; 30 uuf ±10%; 500 v
C11	21K851299	ceramic; disc; 600 uuf ±10%; 600 v
C15	21R124554	ceramic; disc; 22 uuf ±5%; 500 v
C16	21R410063	ceramic; disc; 10 uuf ±5%; 500 v
C17	21K852185	ceramic; disc; 36 uuf ±5%; 500 v
CR1, 2, 3, 4 CR5, 6	48C847274 48B857965	<u>SEMICONDUCTOR DEVICE,</u> <u>diode:</u> (SEE NOTE) germanium silicon
J1	9B16345	<u>CONNECTOR, receptacle:</u> female; 4 cont; polarized round molded phenolic insulator chassis mounted
J2	28B855267	male; 20 cont; polarized; rect. molded black phenolic insulator; saddle mounted
J3	9B855279	<u>JACK, telephone:</u> contact arrangement of stacks, 2 form "B"
J4	9B855268	<u>CONNECTOR, receptacle:</u> female; single cont.; round molded insulator 50 ohm imped. chassis mounted
L1	24B801876	<u>COIL, RF:</u> choke; 20 mh; coded BLUE dot
LS1	50C855098	<u>SPEAKER, magnetic:</u> voice coil imped. 3.2 ohm; 3 w PM type; 2" x 3"
M1	72D82534D01	<u>METER, multi-scale:</u> panel mounted; c/o 20-0-20, 0-50 ua; 0-1000 v dc; 0-15 v dc; 0-30 v dc; 0-2 v ac
P1	9B855266	<u>CONNECTOR, plug:</u> female; 20 cont; polarized; rect. molded black phenolic insul; cable mounted
P2	28B813576	male; 11 cont; polarized; round molded black phenolic insulator; does not incl; 1V858293 SHELL, con. & handle & 41A483715, SPRING, con shell ret; shell & spring must be ordered separate- ly
Q1, 2 Q3	48A124326 48R134545	<u>TRANSISTOR:</u> (SEE NOTE) P-N-P P-N-P; type M4545
R1, 9 R2 R3, 5 R4 R6 R7 R8 R10 R11 R12 R13 R14, 17 R15, 18 R16	6K855337 6K892455 6K855329 6K855330 6K855332 17K82839 6R488026 6R6048 18K848202 6K855331 6R115017 6R5581 6R6229 18C855263	<u>RESISTOR, fixed: carbon;</u> unl stated 17.5K ±2%; 1/2 w 20 megohm ±2%; 2 w 300K ±2%; 1/2 w 600K ±2%; 1/2 w 360K ±2%; 1/2 w wire-wound; 3 ohm; ±10%; 5 w 22 ohm ±10%; 1 w 47K ±10%; 1/2 w var; 25K ±20%; .2 w 30K ±2%; 1/2 w 11K ±5%; 1/2 w 3.3K ±10%; 1/2 w 1K ±10%; 1/2 w var; wire-wound; 5K ±20%; 1 w

PARTS LIST for Schematic Diagram 63E81011A03-D

SLN6056A Portable Test Set

LOCATION	REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
Q1			
Q1 BASE			
S6 SWITCH			
VOLTMETER AMPL.			
PARTS LIST			
PARTS LIST			
PARTS LIST			
S4 SWITCH			
S3 SWITCH			
J2-14			
J2-12			
P-1-12			
	B T2	60B855262	<u>BATTERY, dry:</u> 1-1/2 volt; "N" size cell
	C1	8D82905G12	<u>CAPACITOR, fixed:</u> mylar .22 ±10%; 50 v ±20%; 200 v
	C2, 12, 13, 14	21B801139	ceramic; disc; .01 uf +80-20%; 600 v
	C3, 4, 5, 8	23C844927 or 23C82601A03	Electrolytic; tubular; 20 uf +100-10%; 25 v
	C6, 7	21B847070	ceramic; disc; 800 uuf ±10%; 600 v
	C9, 10	21R114166	ceramic; disc; 30 uuf ±10%; 500 v
	C11	21K851299	ceramic; disc; 600 uuf ±10%; 600 v
	C15	21R124554	ceramic; disc; 22 uuf ±5%; 500 v
	C16	21R410063	ceramic; disc; 10 uuf ±5%; 500 v
	C17	21K852185	ceramic; disc; 36 uuf ±5%; 500 v
	CR1, 2, 3, 4 CR5, 6	48C847274 48B857965	<u>SEMICONDUCTOR DEVICE, diode:</u> (SEE NOTE) germanium silicon
	J1	9B16345	<u>CONNECTOR, receptacle:</u> female; 4 cont; polarized round molded phenolic insulator chassis mounted
	J2	28B855267	male; 20 cont; polarized; rect. molded black phenolic insulator; saddle mounted
	J3	9B855279	<u>JACK, telephone:</u> contact arrangement of stacks, 2 form "B"
	J4	9B855268	<u>CONNECTOR, receptacle:</u> female; single cont.; round molded insulator 50 ohm imped. chassis mounted
	L1	24B801876	<u>COIL, RF:</u> choke; 20 mh; coded BLUE dot
	LS1	50C855098	<u>SPEAKER, magnetic:</u> voice coil imped. 3.2 ohm; 3 w PM type; 2" x 3"
	M1	72D82534D01	<u>METER, multi-scale:</u> panel mounted; c/o 20-0-20, 0-50 ua; 0-1000 v dc; 0-15 v dc; 0-30 v dc; 0-2 v ac
	P1	9B855266	<u>CONNECTOR, plug:</u> female; 20 cont; polarized; rect. molded black phenolic insul; cable mounted
	P2	28B813576	male; 11 cont; polarized; round molded black phenolic insulator; does not incl; 1V858293 SHELL, con. & handle & 41A483715, SPRING, con shell ret; shell & spring must be ordered separate- ly
	Q1, 2 Q3	48A124326 48R134545	<u>TRANSISTOR:</u> (SEE NOTE) P-N-P P-N-P; type M4545
	R1, 9 R2 R3, 5 R4 R6 R7 R8 R10 R11 R12 R13 R14, 17 R15, 18 R16	6K855337 6K892455 6K855329 6K855330 6K855332 17K82839 6R488026 6R6048 18K848202 6K855331 6R115017 6R5581 6R6229 18C855263	<u>RESISTOR, fixed: carbon;</u> unl stated 17.5K ±2%; 1/2 w 20 megohm ±2%; 2 w 300K ±2%; 1/2 w 600K ±2%; 1/2 w 360K ±2%; 1/2 w wire-wound; 3 ohm; ±10%; 5 w 22 ohm ±10%; 1 w 47K ±10%; 1/2 w var; 25K ±20%; .2 w 30K ±2%; 1/2 w 11K ±5%; 1/2 w 3.3K ±10%; 1/2 w 1K ±10%; 1/2 w var; wire-wound; 5K ±20%; 1 w

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
R19	6R6040	680 ohm ±10%; 1/2 w
R20, 21, 22	6R6069	2.2K ±10%; 1/2 w
R23	6R6038	1.5K ±10%; 1/2 w
R24	6R2089	1.8K ±10%; 1/2 w
R25	6R5659	3.9K ±10%; 1/2 w
R26, 27	6R5591	18K ±10%; 1/2 w
R28	6R5554	390 ohm ±10%; 1/2 w
R29	17K852457	wire-wound; 5 ohm ±10%; 5 w
R30	17K863951	wire-wound; 3 ohm ±10%; 3 w
R31	6K855337	17.5K ±5%; 1/2 w
S1	40C855097	<u>SWITCH, rotary:</u> 2 sect; cont; non-shorting
S2	40B855095	3 sect; 3 posi; non-shorting
S6	40B855093	2 sect; 5 posi; non-shorting
S3	40B855094	<u>SWITCH, lever:</u> 1 sect; 3 posi; non-shorting
S4	40B855096	1 sect; 3 posi; shorting
S5	40C848230	<u>SWITCH, push:</u> cont; 2 form "A"; non-locking
W1	1V858292	<u>CABLE ASSEMBLY, special purpose</u> incl; 30B474498 CABLE, 12 cond; rubber covered; 50" length req'd; 10M519 WIRE, elec; single cond #24 ga. sol.; 1" req'd Ref parts P1, P2)
Y1		<u>CRYSTAL UNIT, quartz:</u> Not supp; when ordering refer to Table 2, pg. 5 for freq. & type 455 kc
Y2	Type AQL	
XY1	9K857508	<u>SOCKET, crystal;</u> female; 4 cont; sq. molded black bakelite base; chassis mounted
XY2	9K857509	female; 2 cont; rect. molded black bakelite base; chassis mounted
NON-REFERENCED ITEMS		
	13A855076 36A855276	GRILLE, speaker BUTTON, lever, 2 req'd; for ref. parts S3, S4
	36A855070	KNOB, control; 2 req'd; for ref parts S1, S2
	36A855071	KNOB, control; for ref. part S6
	55A855264	FASTENER, adjustable pawl R.H.
	55K855265	FASTENER, adjustable pawl L.H.
	58B855270	ADAPTER: UHF to BNC
	1V855413	ACCESSORY CABLE ASSEMBLY: Incl: 30A76858 CABLE, special purpose; 2 cond; rubber covered; 4 ft. length req'd; 28A855277 PLUG, telephone black handle 28K855278 PLUG, telephone red handle
	1V855414	RF TEST LEAD ASSEMBLY: incl; 30B475378 CABLE, RF: coaxial RG-58A/U; 4 ft length req'd; 28B844876 CONNECTOR, plug: single cont. 2 req'd
	1V855415	RF PROBE ASSEMBLY; incl; 30B475378 CABLE, RF; coaxial RG-58A/U; 1 ft. length req'd; 9B855269 JACK, telephone
	1V855404	METER PANEL ASSY. (Riveted)
	1V855411	METER PANEL COVER ASSY.: (Riveted)
	1V867350	CASE ASSY.: Incl. 16E855419 CASE, test set; 42B861758 HOLDER, battery; 7A82479 BRACKET

SLN6082A Battery Kit

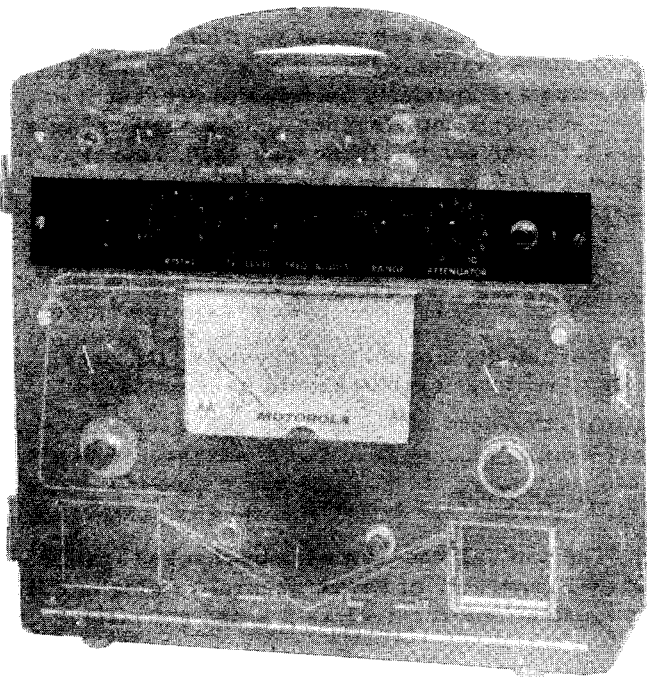
BT1	60B864085 or 60K867953 or 60B82455G01	<u>BATTERY, dry:</u> 1-1/2 v; "D" size cell; 4 req'd
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NOTE:

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

PEAKING GENERATOR

MODEL SLN6057A



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

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.

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_c = Desired generator output frequency
 F_x = Crystal Frequency required

F _c	F _x	F _c	F _x	F _c	F _x	F _c	F _x
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

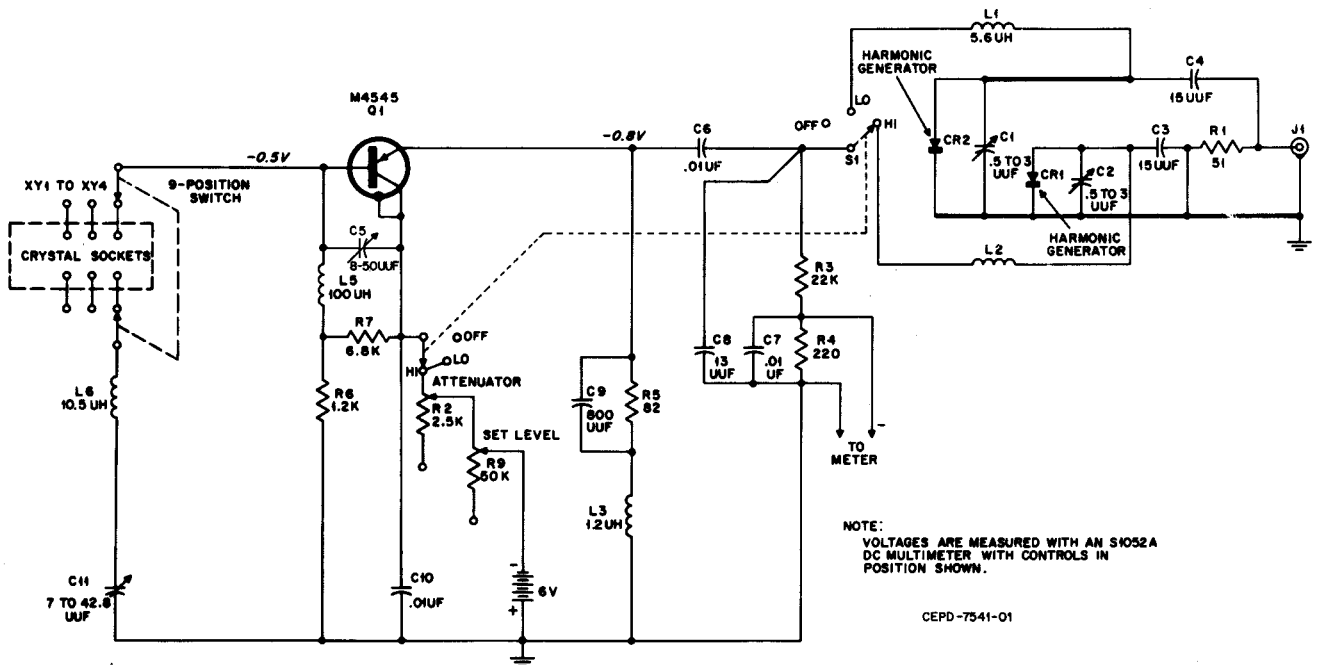
If the peaking generator is to be installed in any place other than in the portable test set housing, make the electrical connections as follows:

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

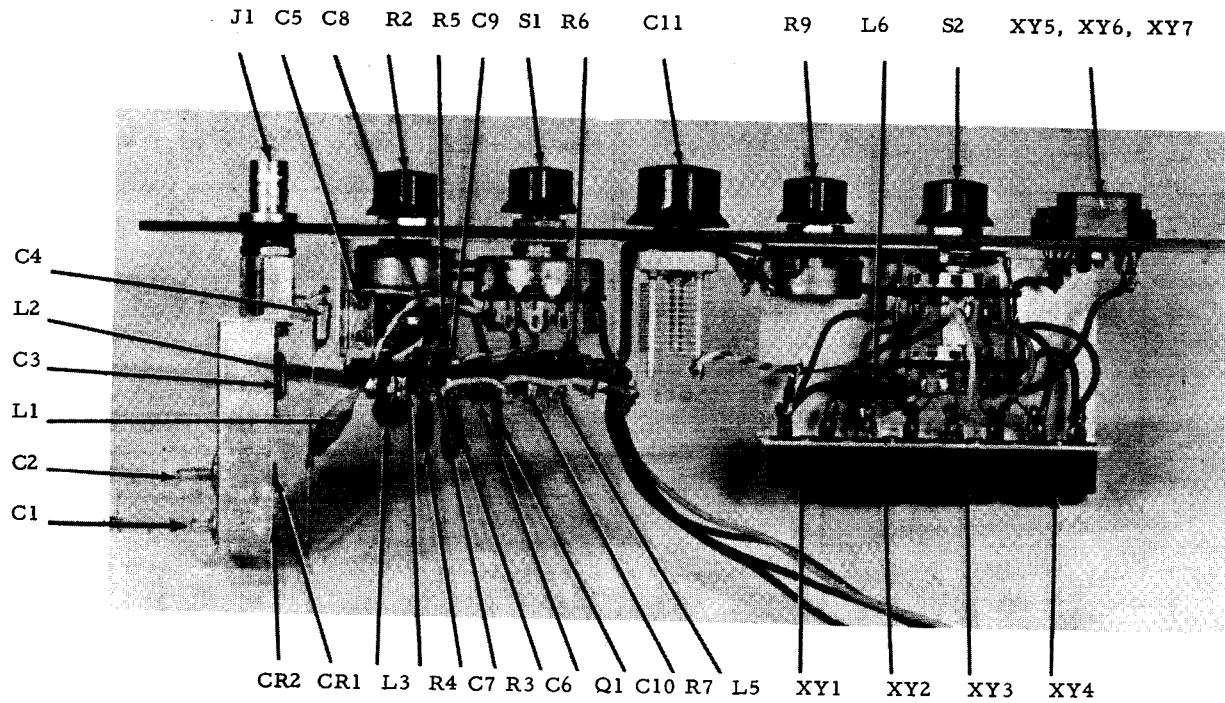
(2) Connect the RED-BLACK wire to the negative terminal of a 50 microampere meter.

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

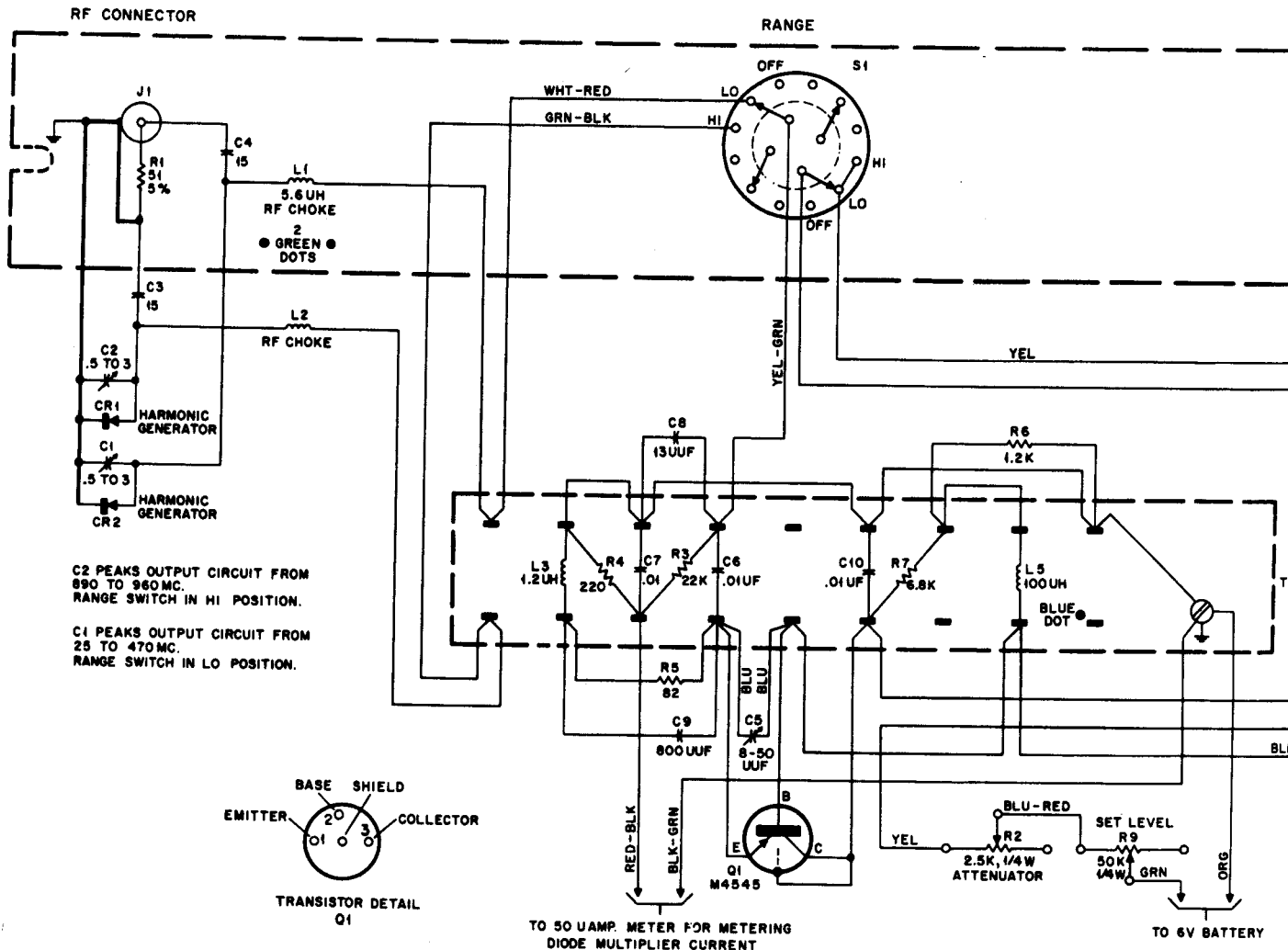
(4) Connect the ORANGE wire to the positive terminal of the 6 volt d-c source.



SLN6057A Peaking Generator
Simplified Circuit Diagram



MODEL SLN6057A
PEAKING GENERATOR



C2 PEAKS OUTPUT CIRCUIT FROM 890 TO 960 MC. RANGE SWITCH IN HI POSITION.

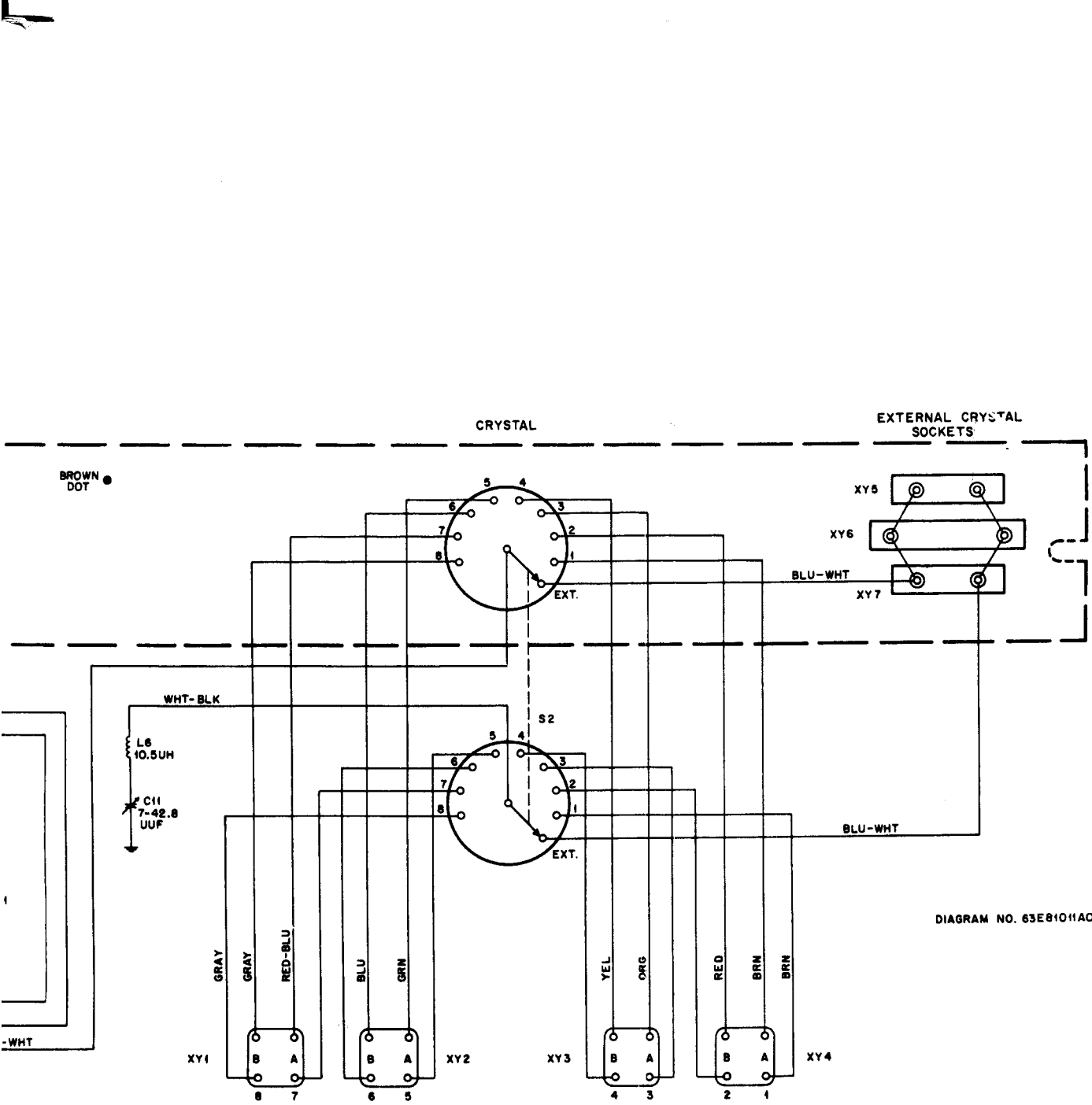
C1 PEAKS OUTPUT CIRCUIT FROM 25 TO 470 MC. RANGE SWITCH IN LO POSITION.

IF USED WITH TU546, S1056A OR S1058A TEST SET:

- (1) CONNECT BLK-GRN TO BLK-GRN WIRE ON METER REV. SWITCH (S6).
- (2) CONNECT RED-BLK TO RED-BLK WIRE ON METER REV. SWITCH (S6).

IF USED WITH TU546, S1056A

- (1) CONNECT ORG TO ON 20-PIN RECEPTOR
- (2) CONNECT GRN TO ON 20-PIN RECEPTOR



INTERNAL CRYSTAL SOCKETS
NON-OVENIZED CRYSTALS ONLY

DIAGRAM NO. 63E81011A06

MODEL TABLE

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

- NOTES:
1. VOLTAGE READINGS TAKEN WITH ATTENUATOR AND SET LEVEL CONTROLS FULLY CLOCKWISE.
 2. ALL RESISTORS ARE INDICATED IN OHMS, 1/2W, UNLESS OTHERWISE STATED.
 3. ALL CAPACITORS ARE INDICATED IN MICROMICROFARADS UNLESS OTHERWISE STATED.

FOR S1058A TEST SET:
PIN NO. 19
ACLE.
PIN NO. 13
ACLE.

PARTS LIST for Diagram 63E81011A06-O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
C1, 2 C3	20A858351 1V858438	<u>CAPACITOR, fixed:</u> unl stated var: 0.5 uuf min. to 3 uuf max. assy; incl 21K835358 CAPACI- TOR, fixed: 15 uuf $\pm 10\%$; 500 v 42A858406 CLIP, mtg.
C4	1V858439	assy; incl 21K835358 CAPACI- TOR, fixed: 15 uuf $\pm 10\%$; 500 v 42A858404 CLIP, mtg.
C5	20K840719	var; 8-50 uuf
C6, 7, 10	21B801139	.01 uf +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> <u>diode:</u> SEE NOTE germanium (factory selected)
J1	9B855268	<u>CONNECTOR, receptacle:</u> female; single contact; type BNC
L1	24A813564	<u>COIL, RF: choke;</u> 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> P-N-P; type M4545
R1	6R5648	<u>RESISTOR, fixed: $\pm 10\%$; 1/2 w;</u> unl stated 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	<u>SWITCH, rotary:</u> 4 pole; 3 position
S2	or 40B82391D01 40B858122	2 pole; 9 position
TB1	31A835961	<u>BOARD, terminal:</u> 18 solder lug terminals
XY1, 2, 3, 4 XY5 XY6 XY7	9K857508 9K857509 9K82810 9K861367	<u>SOCKET, crystal: female;</u> 4 contact 2 contact 2 contact 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 T1034C or T1035A 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 5, 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 (for "Private-Line" tones up to 400 cps)
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 T1034C or T1035A 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 _c (MC)	F _x	F _c (MC)	F _x
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_x = Crystal Frequency

F_c = 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) T1034C or T1035A 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 5, 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 4, 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 5., 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

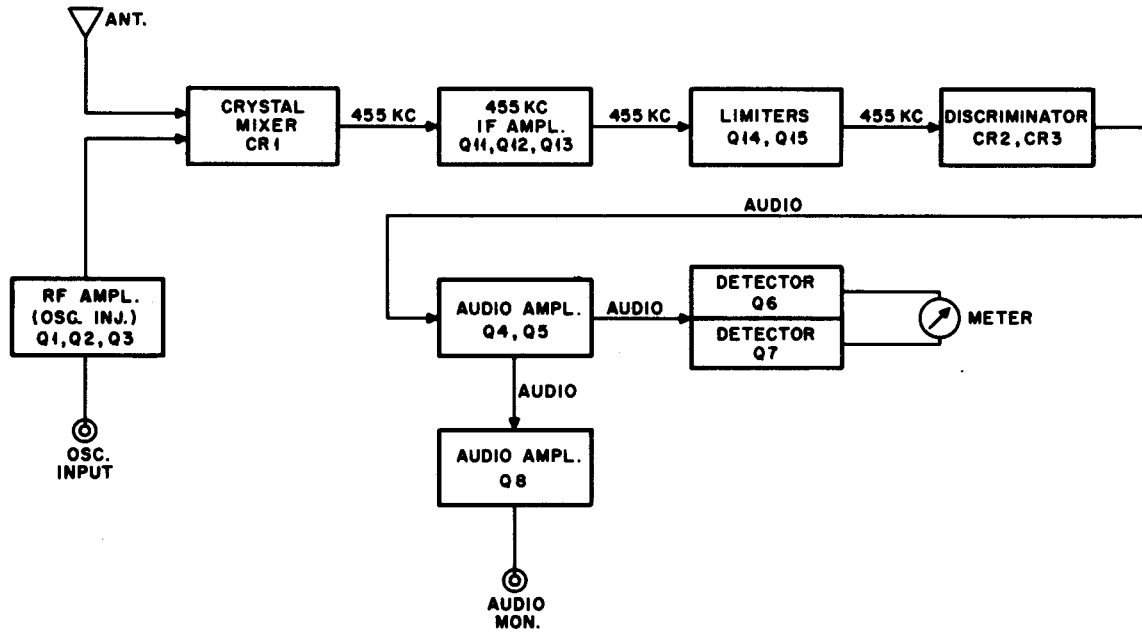
A connector is provided on the deviation meter panel to enable the unit to be powered from an external source if desired. The Motorola Model T1012A or T1064A Power Supply with the TEK-15 Ripple Filter or a 10 to 14 v d-c battery which is capable of 25 ma of current may be used.

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



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
1313 E. Algonquin Road
Schaumburg, Illinois 60172

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.

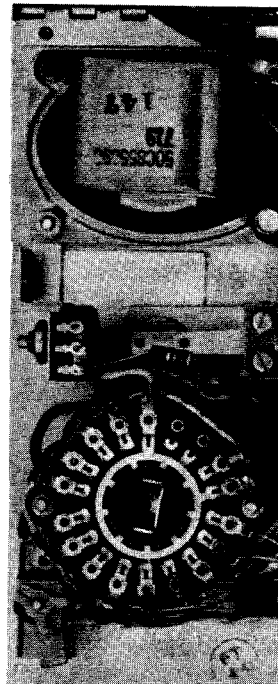
(6) Solder WHT-RED lead to S1B-15.

(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.



S1B-15
(TOP WAFER)

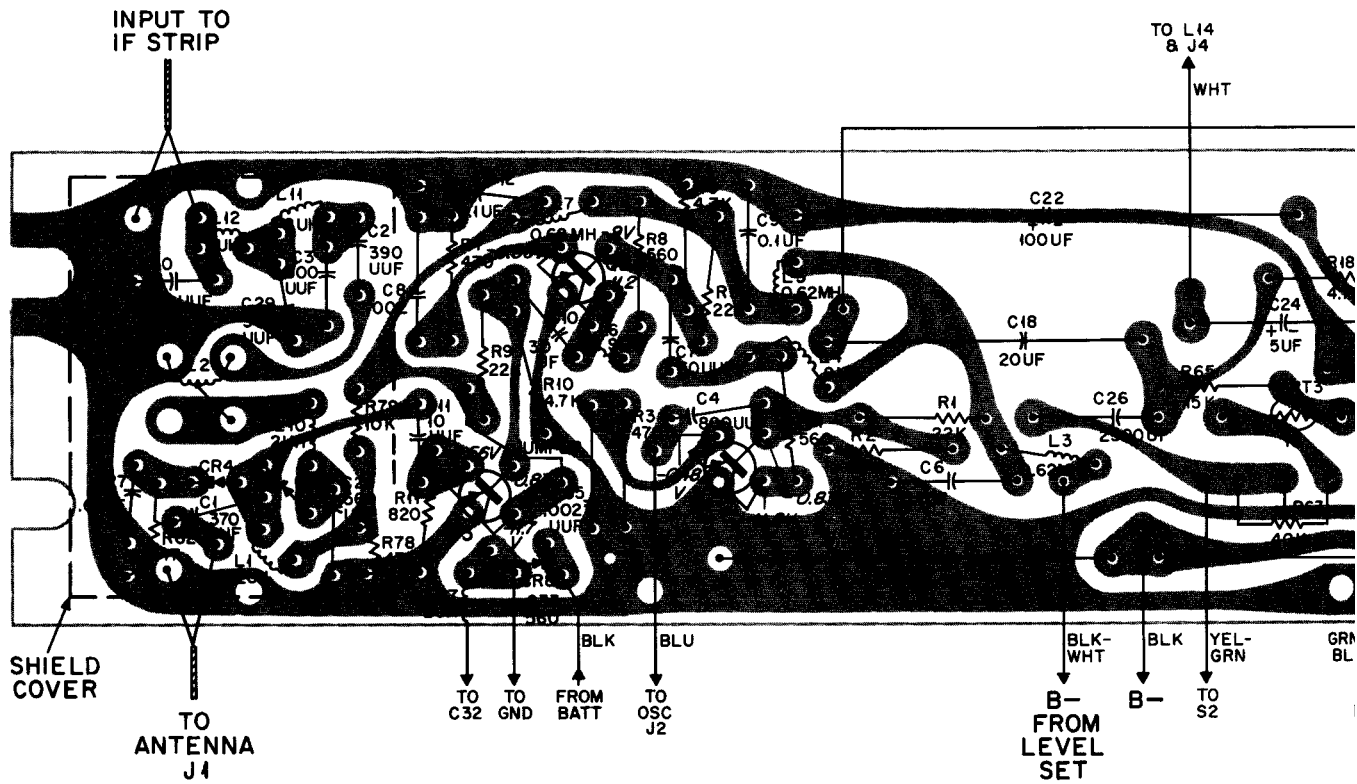
S1A-15
(LOWER WAFER)

S1B-14
(TOP WAFER)

Installation Detail

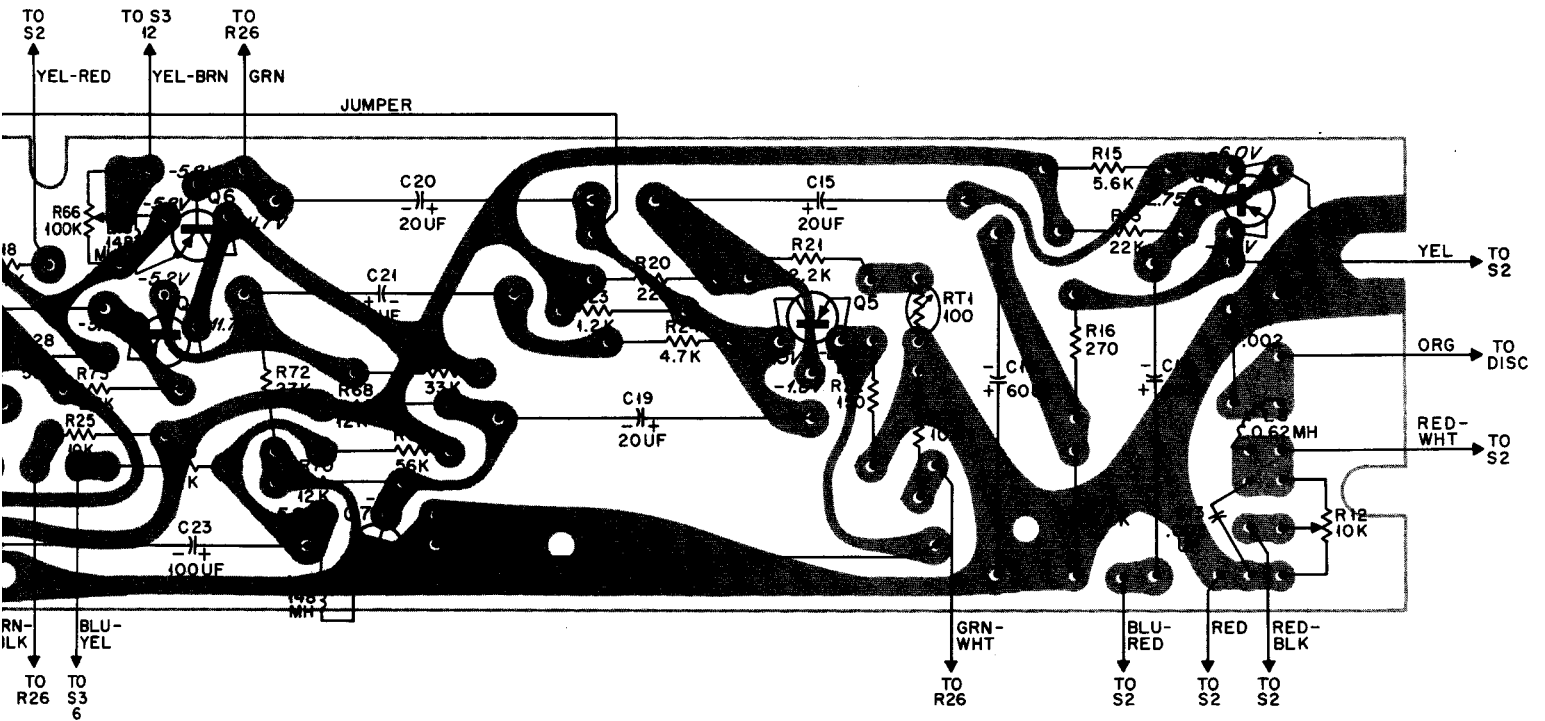
DEPD-7739-C

DEPD-7738-A

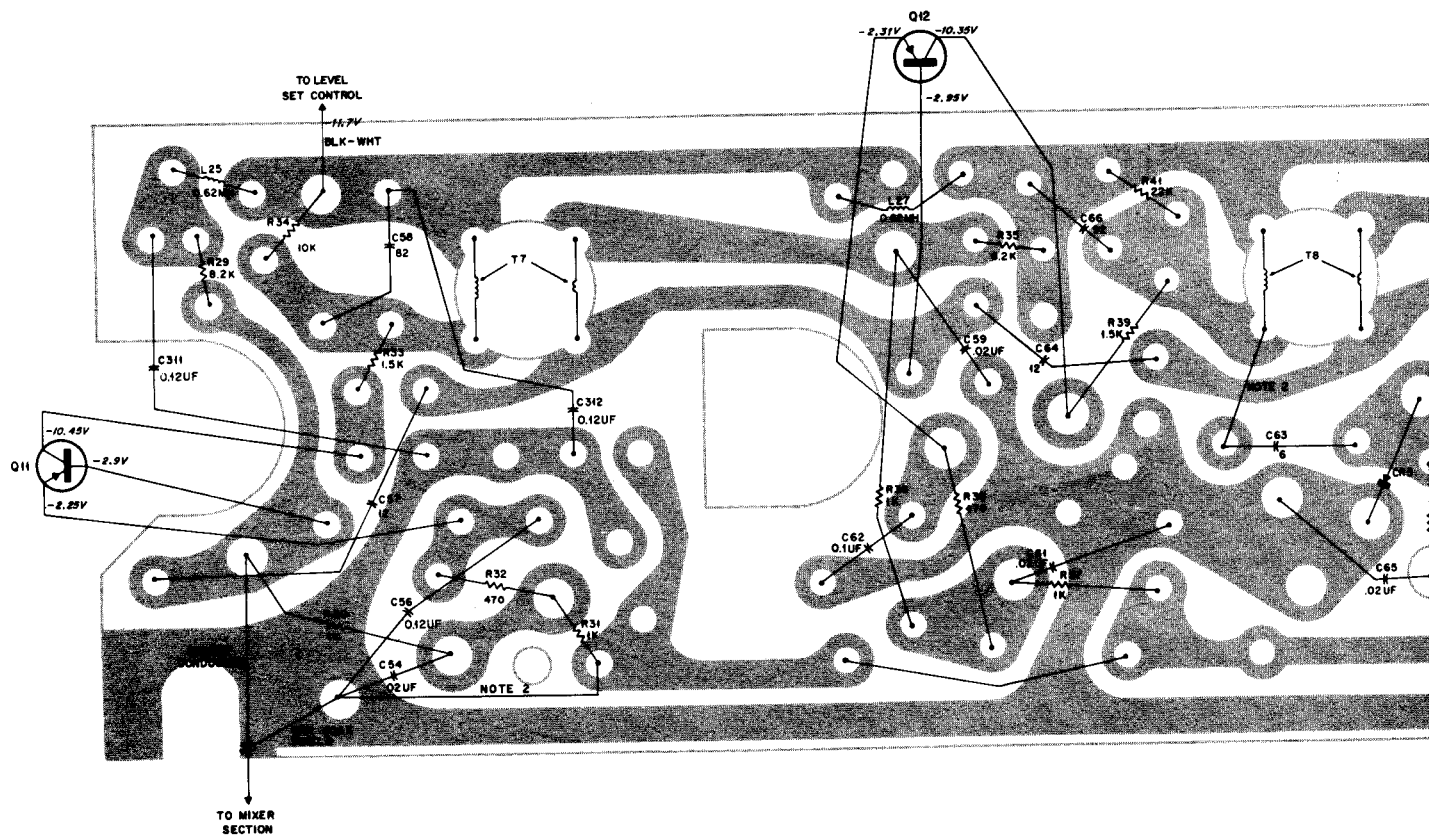


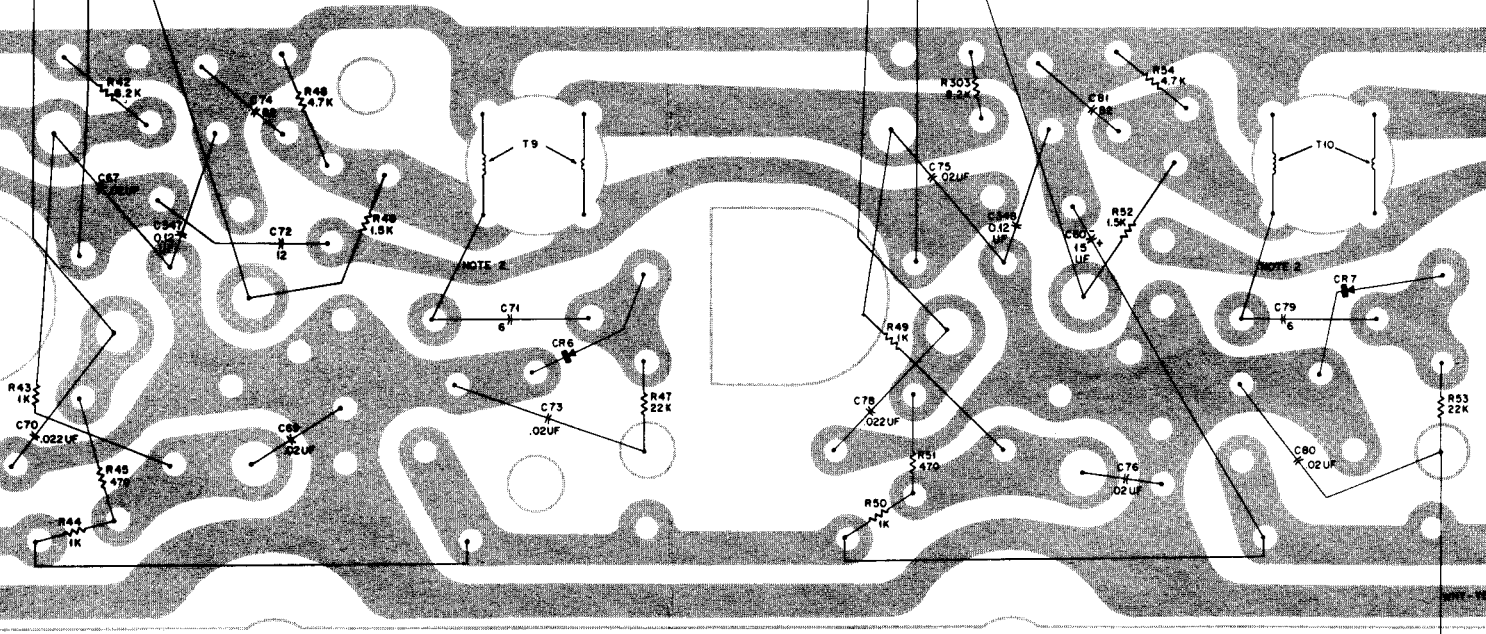
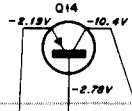
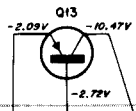
REVISIONS

DIAG. ISSUE	BOARD AND SUFFIX NO.	REF. SYMBOL	CHANGE	LOCATION
A	SLN6059A-2	Q7	WAS SHOWN AS TYPE P-N-P	Q7
			VOLTAGE ADDED	Q1-Q8
B	SLN6059A-3	L18, 19	ADD 24C82190C01 0.148 MH	Q6 AND Q7 EMITTER
C		L6, R8	WERE TRANSPOSED	Q2 COLLECTOR



Meter Amplifier Board
 Model SLN6059A-3
 Printed Board and Wiring Diagram
 Motorola No. EPD-7740-C



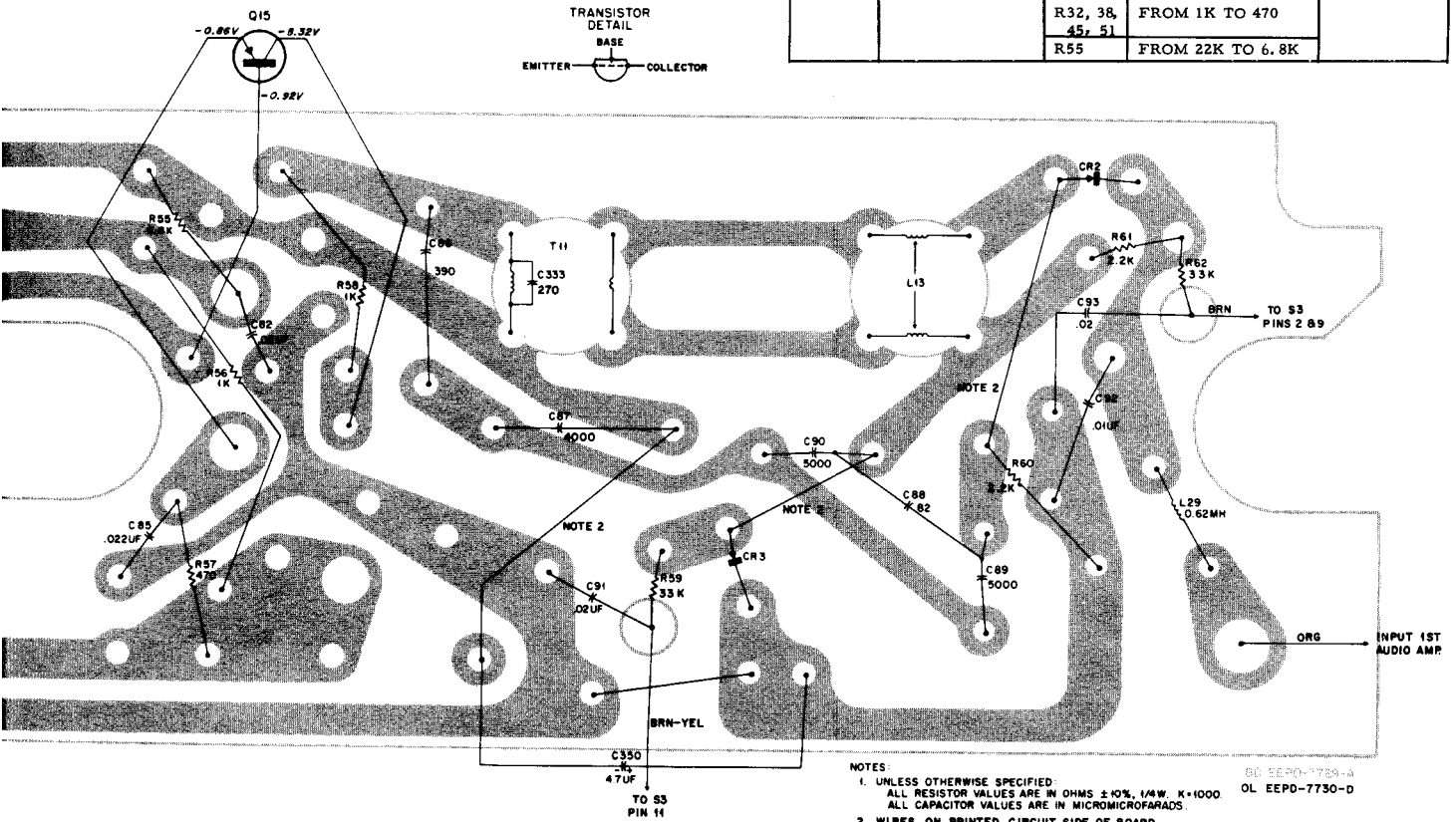


NOTE 2

TO S3
PIN 10

REVISIONS

DIAG. ISSUE	BOARD AND SUFFIX NO.	REF. SYMBOL	CHANGE	LOCATION
A	SLN6058A		VOLTAGES ADDED	Q11-Q15
B	SLN6058-1	C315	REMOVED 8K844261, 0.1 uf WAS CONNECTED BETWEEN JUNCTIONS R31, L26 AND C311, C312	Q11 CIRCUIT
		L26	REMOVED 24K864737 0.62 mh, WAS CONNECTED BETWEEN JUNCTIONS OF R31, C315, AND R37, C345	Q12 CIRCUIT
		C345	REMOVED 8K844261 0.1 uf WAS CONNECTED BETWEEN JUNCTIONS OF L26, R37 AND C65, CR5	
		C346	REMOVED 8K844261 0.1 uf WAS CONNECTED BETWEEN JUNCTIONS OF R44, R50 AND C69, C73	Q13 CIRCUIT
		L28	REMOVED 24K864737 0.62 mh, ONE END CONNECTED AT JUNCTION OF R44 AND R50; OTHER END NOT CONNECTED	
		C84	REMOVED 8K844261 0.1 uf WAS CONNECTED BETWEEN JUNCTIONS OF R56, R57 AND C82, C91	Q15 CIRCUIT
		C	SLN6058A2	C56, 311, 312 C347 C348
D	SLN6058A-3	Q11 THRU Q15	WERE AS SHOWN BELOW:	Q11 THRU Q15
		<p>TRANSISTOR DETAIL</p>		
		R32, 38, 45, 51	FROM 1K TO 470	
		R55	FROM 22K TO 6.8K	

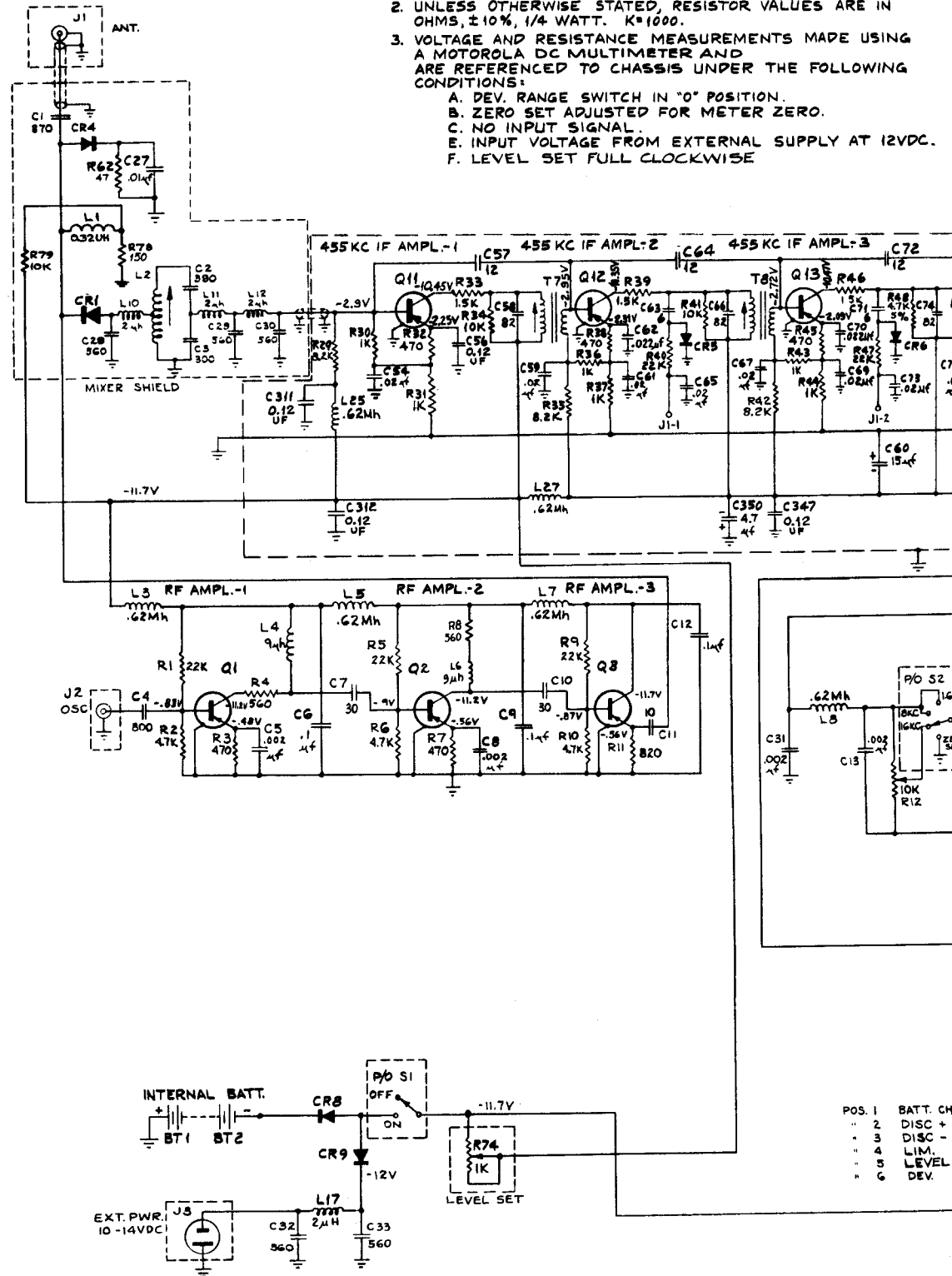


- NOTES:
- UNLESS OTHERWISE SPECIFIED:
ALL RESISTOR VALUES ARE IN OHMS ±10%, 1/4W, K=1000
ALL CAPACITOR VALUES ARE IN MICROMICROFARADS.
 - WIRES ON PRINTED CIRCUIT SIDE OF BOARD.
 - VOLTAGES REFERENCED TO CHASSIS GROUND. MEASUREMENTS MADE IN DEVIATION UNIT WITH NO SIGNAL INPUT. LEVEL SET FULL CLOCKWISE.

80 EPD-7730-4
OL EEPD-7730-D

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 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.
 - D. INPUT VOLTAGE FROM EXTERNAL SUPPLY AT 12VDC.
 - F. LEVEL SET FULL CLOCKWISE



POS.	BATT. CH.
1	BATT. CH.
2	DISC +
3	DISC -
4	LIM.
5	LEVEL
6	DEV.

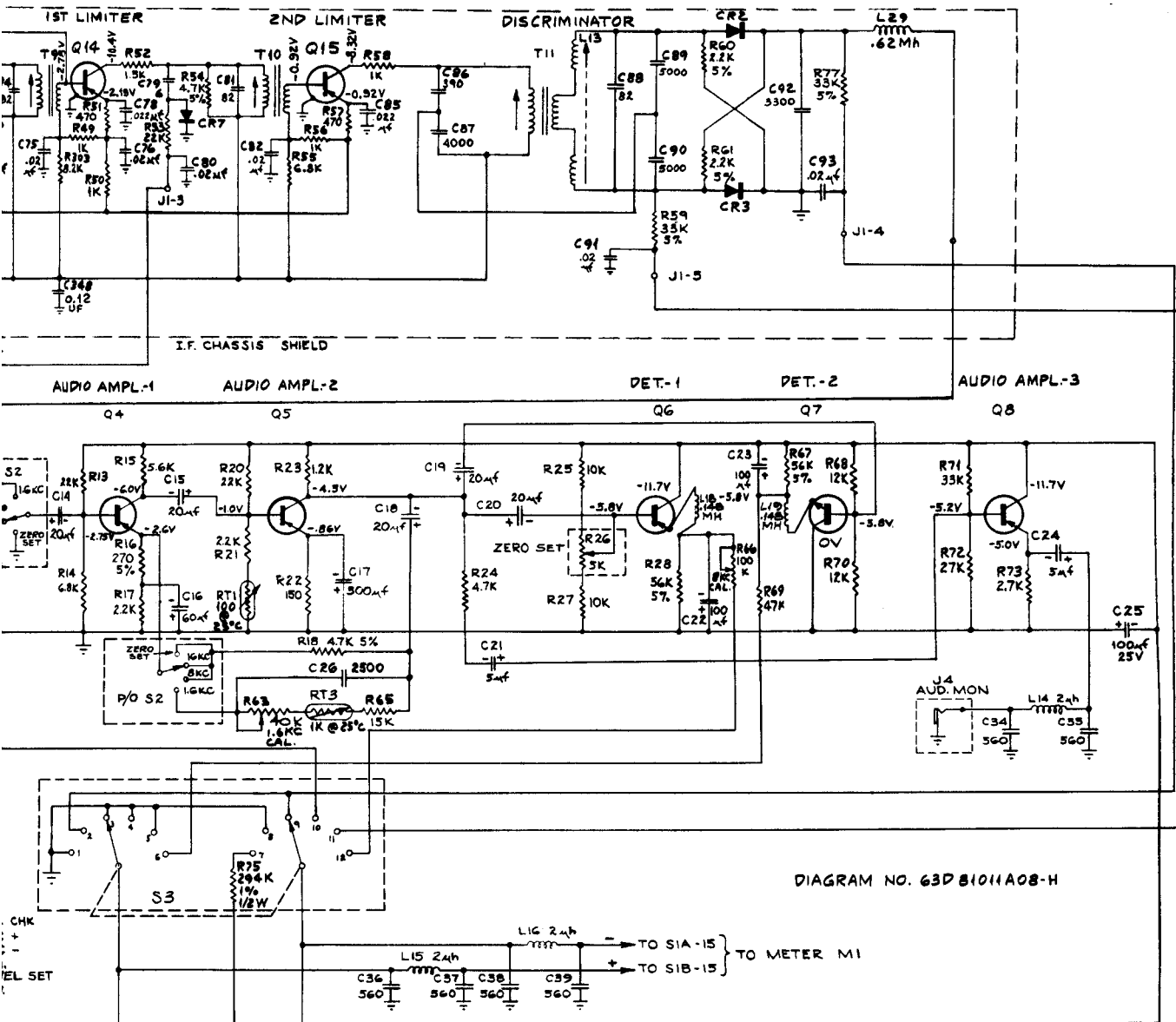


DIAGRAM NO. 63D81011A08-H

MODEL TABLE

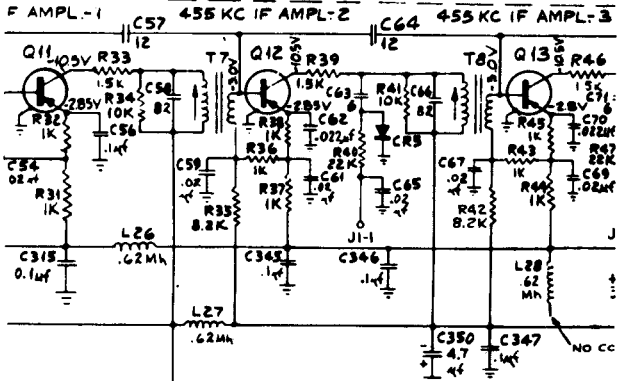
MODEL NO.	SUFFIX	DESCRIPTION
SLN1000A	5	DEVIATION METER
SLN6002A		PANEL METER KIT (P/O 31062A CONVERSION KIT)
SLN6046A	1	BATTERY KIT
SLN6058A	3	455KC IF KIT

PREVIOUS REVISIONS SHOWN
ON BACK OF THIS DIAGRAM

SLN1000A Deviation Meter Panel
Schematic Diagram
Motorola No. 63D81011A08-H

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		
					DISCRIMINATOR OUTPUT
		C62	WAS 0.1 uf		
		R48, 54	WERE ±10%	PARTS LIST	
		T11	WAS 24C82684D02		
		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)		
		CR1	WAS 48C82583B01	MIXER SHIELD	
			POLARITY TRANSPOSED		
		R63	WAS 18K861480 (100K)	Q5	
		R64	REMOVED 6K129226 (100K)		
	ADDED SLN6062A PANEL METER KIT	MODEL TABLE			
A1			ADDED SAN6000A ANTENNA COMPONENTS	PARTS LIST	
B	SLN1000A-2		METER AMPL. EYELETTED CIRCUIT BOARD REPLACED WITH A PRINTED CIRCUIT BOARD		
D		C84	REMOVED 0.1 uf WAS CONNECTED FROM JUNCTION OF R56, 57 TO GROUND	Q15 EMITTER	
		C315, 345, 346, L26, 28	REMOVED; CIRCUIT WAS AS SHOWN BELOW	455 KC IF AMPLIFIER CIRCUITRY	



SLN6059A Meter Amplifier Board Kit

REFERENCE SYMBOL	MOTOROLA PART No.	DESCRIPTION
C1	21K858832	CAPACITOR, fixed: uuf; unless otherwise stated 370 ±3%; 500 v 390 ±5%; 500 v 300 ±5%; 500 v 800 ±5%; 300 v 21K837746 0.02 uf ±10%; 500 v 0.1 uf +80-20%; 25 v 30 ±5%; 500 v 10 ±5%; 500 v .002 uf ±15%; 250 v 20 uf +100-0%; 25 v 60 uf +150-10%; 15 v 300 uf +150-10%; 6 v 5 uf +33-10%; 25 v 100 uf +150-10%; 25 v
C2	21K859945	
C3	21K859944	
C4	21K840049	
C5, 8	21K837746	
C6, 9, 12	21C82372C01	
C7, 10	21K848156	
C11	21K859934	
C13, 31	21C855384	
C14, 15, 18, 19, 20	23D82601A03	
C16	23D82601A02	
C17	23D82601A18	
C21, 24	23D82601A11	
C22, 23, 25	23D82601A09	
C26	21K859773	2500 ±5%; 500 v
C27	21K832501	.01 uf +60-40%; 250 v
C28, 29, 30, 33	21C82187B06	560 ±10%; 500 v
CR1	48D82116E02	SEMICONDUCTOR DEVICE, diode: (SEE NOTE) silicon germanium germanium
CR4	48B811119	
CR8, 9	48C848523	
L1	24A835456	COIL, RF: 0.32 uh inductor 0.62 mh 9 uh 2 uh 0.148 mh
L2	24C82842D01	
L3, 5, 7, 8	24K847940	
L4, 6	24B847920	
L10, 11, 12, 14	24A890687	
L18, 19	24C82190C07	
Q1, 2, 3	48R869017	TRANSISTOR: (SEE NOTE) P-N-P P-N-P N-P-N
Q4, 5, 6, 8	48A124327	
Q7	48A124362	
R1, 5, 9, 13, 20	6K128685	RESISTOR, fixed: ±10%; 1/4 w; unless otherwise stated 22K 4.7K 470 560 820 var; 10K 6.8K 5.6K 270 ±5% 2.2K 4.7K ±5% 150 1.2K 10K 56K ±5% 47 var; 40K ±20%; 1/8 w 15K var; 100K 12K 47K 33K 27K 2.7K
R2, 6, 10, 24	6K127804	
R3, 7	6K127801	
R4, 8	6K129620	
R11	6K129432	
R12	18K864068	
R14	6K128687	
R15	6K129433	
R16	6K131525	
R17, 21	6K128689	
R18	6K129669	
R22, 78	6K129862	
R23	6K129235	
R25, 27, 79	6K129225	
R28, 67	6K128684	
R62	6K129233	
R63	18B82567D02	
R65	6K127805	
R66	18K861480	
R68, 70	6K129230	
R69	6K128902	
R71	6K127807	
R72	6K127806	
R73	6K128688	
RT1	6B859701	THERMISTOR: 100 ±10%; at 25°C 1K ±10%; at 25°C
RT3	6B858402	

SLN6058A 455 KC IF Kit

C54, 59, 61, 65, 67, 69, 73, 75, 76, 80, 82, 91, 93	21B82428B01	CAPACITOR, fixed: uuf; unless otherwise stated .02 uf GMV +100%; 100 v
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RE 5
C56
312
C57
C58
81,
C60
C62
85
C63
C86
C87
C89
C92
C95
CR2
CR5
L13
L25
Q1,
14,
R29,
303
R30,
37,
50,
R12,
R13,
R14,
R40,
R48,
R55
R57
R59,
R60,
SLN60
BT1,
SGN60
C32,
36,
J1, 2
J3
J4
L15,
R26
R74
R75
R76
S1
S2
S3

REFERENCE SYMBOL	MOTOROLA PART No.	DESCRIPTION
56, 311, 12, 347, 348	8K868890	0.12 uf ±10%; 100 v
57, 64, 72	21D82204B04	12 ±5%; 500 v; NP0
58, 66, 74, 1, 88	21D82204B05	82 ±5%; 500 v; N2200
60	23K865136	15 uf ±20%; 25 v
62, 70, 78, 5	8K852472	022 uf ±10%; 100 v
63, 71, 79	21D82204B03	6 ±0.5 uuf; 500 v; NP0
86	21K859945	390 ±5%; 500 v
87	21K863396	4000 ±1%; 500 v
89, 90	21K857481	5000 ±5%; 100 v
92	8K861939	3300 ±10%; 100 v
350	23K865137	4.7 uf ±20%; 25 v
		<u>SEMICONDUCTOR DEVICE,</u> diode: (SEE NOTE) germanium germanium
R2, 3	48C855216	
R5, 6, 7	48C82178A01	
		<u>COIL, RF:</u> discriminator; YEL; incl 1K867236 CORE, tuning 0.62 mh; BLK-BRN
13	24K861818	
25, 27, 29	24K864737	
		<u>TRANSISTOR: (SEE NOTE)</u> P-N-P; type M9571
11, 12, 13, 15	48R869571	
		<u>RESISTOR, fixed: ±10%; 1/4 w</u> 8.2K
29, 35, 42, 13	6K128686	
30, 31, 36, 7, 43, 44, 49, 1, 56, 58	6K127802	1K
32, 38, 45, 51	6S127801	470
33, 39, 46, 52	6K127803	1.5K
44, 41	6K129225	10K
40, 47, 53, 18, 54	6K128685	22K
55	6K129669	4.7K ±5%
57	6S128687	6.8K
59, 77	6K127801	470
60, 61	6K129526	33K ±5%
	6K129804	2.2K ±5%
7, 8, 9, 10	24B859891	<u>TRANSFORMER, IF:</u> GRN; incl 1K867236 CORE, tuning discriminator
11	24C82842D02	

76046A Battery Kit

REFERENCE SYMBOL	MOTOROLA PART No.	DESCRIPTION
R1, 2	60B863919	<u>BATTERY, mercury:</u> 6.5 v; 5 cell; 1000 milliamp hrs @ 10 ma max drain

76000A Front Panel and Cover Kit

REFERENCE SYMBOL	MOTOROLA PART No.	DESCRIPTION
2, 34, 35, 37, 38, 39	21C82187B06	<u>CAPACITOR, fixed:</u> 560 uuf ±10%; 500 v
		<u>CONNECTOR, receptacle:</u> female; single contact male; 2 contact
	9B855268 28A812540	
	9B82138B01	<u>JACK, phone:</u> single contact
15, 16, 17	24A890687	<u>COIL, RF:</u> 2 uh
		<u>RESISTOR, fixed: 1/4 w; unless</u> otherwise stated; var; 5K var; 1K 294K ±1%; 1/2 w 56 ±10%
16	18B82700D01	
14	18D82515B01	
15	6D82475B50	
16	6K129860	
	40A80246 40C82160H01 40C82160H02	<u>SWITCH:</u> toggle; dpdt rotary; 2 pole; 4 pos; non-shorting rotary; 2 pole; 6 pos; non-shorting

SLN6080A Attenuator Kit

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
	15A82995D01 15A82993D01 9B855268	HOUSING, attenuator COVER, attenuator housing 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 3S2236	LUG, soldering SCREW, machine: #4-40 x 1/8"; 8 req'd.

SKN6007A Cable Kit

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
	28B844876	CONNECTOR, plug; male; single cont; type BNC; 2 req'd.
	30B475378	CABLE, RF: coaxial; RG-58A/U; 6" req'd.
	28A8201C01	PLUG, phone: male; single contact

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

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
	72B82534D01	METER, d-c: 0-50 microamp; multiple scale

SAN6000A Antenna

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
	28B82872D02	CONNECTOR, receptacle: male single contact
	43A82839D01 1V80724A05	SPACER, insulator ANTENNA ROD AND BALL ASSY.

NOTE:

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

