MOTOROLA

Transistorized

CONSOLETTE BASE STATION

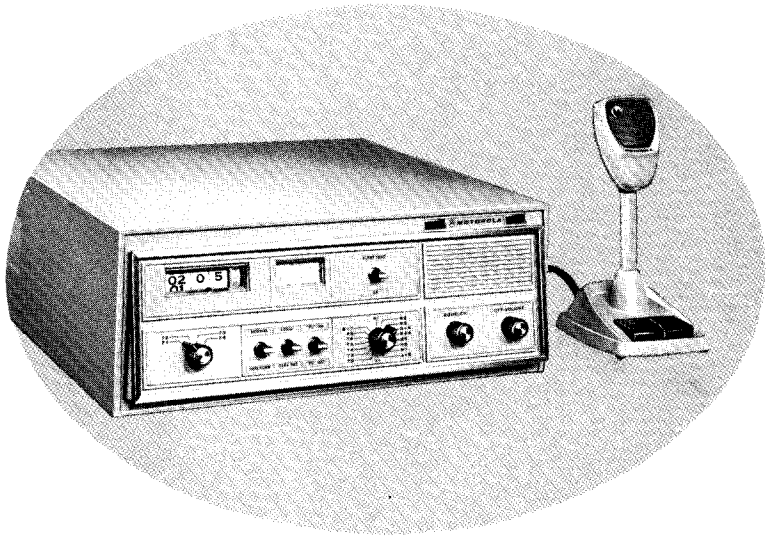
FM Two-Way Radio

WITH "SENSITRON" RECEIVER

0.15-15W/30W RF POWER

450-470 MHz

117 VAC



THIS MANUAL HAS BEEN
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PRINTED IN U. S. A.

68P81005E15-C

MOTOROLA

INSTRUCTION MANUAL REVISION SMR-893F
REPLACES SMR-862

GENERAL

This revision outlines changes that have occurred since the printing of your instruction manual. Use this information to correct your manual.

INSTRUCTION MANUAL AFFECTED:

68P81005E15-C 450-470 MHz "Consolette" Base Station

REVISION DETAILS

Schem. Diag. No.	Model and New Suffix	Circuit Bd. Detail	Circuitry Change
63P81005E39	TLE6156A-4	PEPD-18603	None

Ref. Sym.	Action	Part No.	Description
C107	Change to	21C82450B08	CAPACITOR, fixed: 1.2 pF ±5%; 500 V
R170	Change to	6S128683	RESISTOR, fixed: 150K ±5%; 1/4 W

On page vii, replace the model chart with the following chart:

MOTOROLA

MODEL CHART

TRANSISTORIZED CONSOLETTE BASE STATION

CODE:

[X] = ONE ITEM SUPPLIED PER RADIO SET.

◪ = QUANTITY SUPPLIED DEPENDENT UPON NUMBER OF OPERATING FREQUENCIES.

MODEL DESIGNATIONS APPEARING ON THE EQUIPMENT CHASSIS OR IN THE MODEL NUMBER COLUMN OF THIS CHART DO NOT REFLECT FACTORY-INSTALLED ACCESSORY ITEMS.

*REPRESENTS A SERIES OF MODELS AND NOT A SPECIFIC MODEL. THE SPECIFIC MODEL, AS STAMPED ON THE CHASSIS, IS DETERMINED BY ITS APPLICATION.

ITEM	DESCRIPTION	MODEL	NUMBER OF FREQUENCIES	RF OUTPUT POWER (WATTS)	CHANNEL SPACING
		CARRIER SQUELCH MODELS			
		L34MHB-1104AM	1	0.15 TO 15	25 kHz
		L34MHB-1104BM	1	0.15 TO 15	25 kHz
		L44MHB-1100AM	1	30	25 kHz
		L44MHB-1100BM	1	30	25 kHz
		L44MHB-1190AM	4	30	25 kHz
		L44MHB-1190BM	4	30	25 kHz
		"PRIVATE-LINE" TONE-CODED SQUELCH MODELS			
		L34MHB-3104AM	1	0.15 TO 15	25 kHz
		L34MHB-3104BM	1	0.15 TO 15	25 kHz
		L44MHB-3100AM	1	30	25 kHz
		L44MHB-3100BM	1	30	25 kHz
		L44MHB-3190AM	4	30	25 kHz
		L44MHB-3190BM	4	30	25 kHz
*TTE1160AA	TRANSMITTER	X X X X X X X X X X X X X X			
*TRE1180AB	RECEIVER (CARRIER SQUELCH, 1-FREQ.)	X X X X			
*TRE1180AD	RECEIVER (CARRIER SQUELCH, 4-FREQ.)	X X			
*TRE1180AF	RECEIVER ("PRIVATE-LINE", 1-FREQ.)	X X X X			
*TRE1180AH	RECEIVER ("PRIVATE-LINE", 4-FREQ.)	X X			
TLN4133A	CHASSIS ASSEMBLY	X X X X X X X X			
TLN4133B	CHASSIS ASSEMBLY	X X X X X X X X			
THN6073A	CABINET	X X X X X X X X			
THN6073B	CABINET	X X X X X X X X			
TLN8999A	TUNING TOOLS	X X X X X X X X X X X X X X			
TLN1296A	MULTIPLE FREQUENCY KIT	X X X X			
TLN8530A	CHANNEL ELEMENT BOARD (4-FREQUENCY)	X X X X			
TLN8998A	CHANNEL ELEMENT BOARD (1-FREQUENCY)	X X X X			
TLN8660A	POWER SUPPLY	X X X X X X X X X X X X X X			
TMN1000A	DESK MICROPHONE (CARRIER SQUELCH)	X X X X X X X X X X X X X X			
TMN1001A	DESK MICROPHONE ("PRIVATE-LINE")	X X X X X X X X X X X X X X			
TLN6824A	"VIBRASENDER" RESONANT REED	X X X X X X X X X X X X X X			
TLN8381A	"VIBRASPONDER" RESONANT REED	X X X X X X X X X X X X X X			
TLN8970A	VARIABLE POWER KIT	X X X X X X X X X X X X X X			
TLN8622A	"PRIVATE-LINE" KIT	X X X X X X X X X X X X X X			
TLN8271A	"PRIVATE-LINE" OSCILLATOR AND DELAY BOARD	X X X X X X X X X X X X X X			
TLN1087A	CHANNEL ELEMENT (TRANSMITTER)	X X X X ◪ ◪ X X X X ◪ ◪			
CER106B	CHANNEL ELEMENT (RECEIVER)	X X X X ◪ ◪ X X X X ◪ ◪			

MOTOROLA

CARRIER AND DUAL SQUELCH

TRANSISTORIZED CONSOLETTE BASE STATION WITH "SENSITRON" RECEIVER

FM TWO-WAY RADIO
0.15 TO 15 W/30 W RF POWER
406-420, 450-470 MHz
117 VAC

Note: The use of the word "TRANSISTORIZED" is misleading. To be sure, the receiver is fully transistorized, but the transmitter actually contains five vacuum tubes.

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6/12/70-UP

68P81005E15
Issue - C

SPECIFICATIONS

GENERAL

AC INPUT REQUIREMENTS (117 V AC)	STANDBY	.425 amperes
	TRANSMIT	3.10 amperes (30-watt models) 2.75 amperes (15-watt models)
FREQUENCY RANGE		450-470 MHz
METERING		A single scale, 0-50 microampere meter with 20,000 ohms equivalent series resistance or Motorola portable test set can be used to measure all circuits essential to tuning and checking.
DIMENSIONS		6-1/4" high x 16-3/4" wide x 16-3/8" long overall
WEIGHT		Approximately 51 lbs. (shipping weight including accessories: approximately 55 lbs.)

RECEIVER

CHANNEL SPACING		25 kHz
SELECTIVITY	-EIA SINAD	-90 dB at ±25 kHz
EIA SINAD INTERMODULATION		-80 dB
EIA MODULATION ACCEPTANCE		±7 kHz minimum
SENSITIVITY	-20 DB QUIETING	0.50 microvolt
	EIA SINAD	0.35 microvolt
FREQUENCY STABILITY		Channel element maintains oscillator frequency within ±.0005% (±0.0002% receiver stability with optional channel element) of reference frequency from -30°C to +60°C ambient (+25°C reference) and ±0.00015% with a 15% primary voltage deviation.
SPURIOUS & IMAGE REJECTION		more than 100 dB
SQUELCH		Carrier Squelch: noise compensated type, adjustable sensitivity: threshold sensitivity of 0.25 microvolt or less (Patent No. 2343115 other patents pending). "Private-Line" Tone-Coded Squelch: also includes a tone-operated squelch circuit with a fixed sensitivity of 0.25 microvolt or less (Patent No. 2688059).
AUDIO OUTPUT		5 watts to a 3-ohm load measured at the receiver output at less than 5% distortion.
AUDIO RESPONSE		+1, -8 dB of 6 dB/octave de-emphasis characteristic from 300 to 3000 Hz.

TRANSMITTER

RF POWER OUTPUT	0.15 to 15 watts & 30 watts
OUTPUT IMPEDANCE	50 ohms
SPURIOUS & HARMONIC EMISSION	Spurious emission more than 90 dB below carrier. Harmonic emission more than 80 dB below carrier. (Per EIA spec, RS152A, par. 3)
FREQUENCY STABILITY	Channel element maintains oscillator frequency within ±0.0002% of reference frequency from -30°C to +60°C ambient (+25°C ref) and ±0.00015% with 15% primary voltage deviation.
MODULATION	16F3: ±5 kHz for 100% at 1000 Hz
AUDIO SENSITIVITY	0.165 volt ±3 dB for 2/3 max. deviation at 1000 Hz
FM NOISE	-45 dB below 2/3 system deviation at 1000 Hz
AUDIO RESPONSE	+1, -3 dB of 6 dB/octave pre-emphasis characteristic from 300 to 3000 Hz
AUDIO DISTORTION	Less than 3% at 1000 Hz; 2/3 system deviation

SPECIFICATIONS SUBJECT TO CHANGE WITH NOTICE

FCC LICENSE DESIGNATION:

CC4072C - 0.15 TO 15 WATT STATIONS
CC4048C - 30 WATT STATIONS

EPS-3982-O

(Pages iii and iv are omitted as irrelevant)

CONTENTS

SECTION PAGE

SERVICE DIAGRAMS

OPTIONAL ACCESSORIES

DESK MICROPHONE pages appear at the back of this manual.

MOTOROLA

MODEL CHART

TRANSISTORIZED CONSOLETTE BASE STATION

CODE:

[X] = ONE ITEM SUPPLIED PER RADIO SET.

◪ = QUANTITY SUPPLIED DEPENDENT UPON NUMBER OF OPERATING FREQUENCIES.

MODEL DESIGNATIONS APPEARING ON THE EQUIPMENT CHASSIS OR IN THE MODEL NUMBER COLUMN OF THIS CHART DO NOT REFLECT FACTORY-INSTALLED ACCESSORY ITEMS.

*REPRESENTS A SERIES OF MODELS AND NOT A SPECIFIC MODEL. THE SPECIFIC MODEL, AS STAMPED ON THE CHASSIS, IS DETERMINED BY ITS APPLICATION.

ITEM	DESCRIPTION	CARRIER SQUELCH MODELS						"PRIVATE-LINE" TONE-CODED SQUELCH MODELS					
	MODEL	L34MHB-1104AM	L34MHB-1104BM	L44MHB-1100AM	L44MHB-1100BM	L44MHB-1190AM	L44MHB-1190BM	L34MHB-3104AM	L34MHB-3104BM	L44MHB-3100AM	L44MHB-3100BM	L44MHB-3190AM	L44MHB-3190BM
	NUMBER OF FREQUENCIES	1	1	1	1	4	4	1	1	1	1	4	4
	RF OUTPUT POWER (WATTS)	0.15 TO 15	0.15 TO 15	30	30	30	30	0.15 TO 15	0.15 TO 15	30	30	30	30
	CHANNEL SPACING	25 kHz	25 kHz	25 kHz	25 kHz	25 kHz	25 kHz	25 kHz	25 kHz	25 kHz	25 kHz	25 kHz	25 kHz
*TTE1160AA	TRANSMITTER	X	X	X	X	X	X	X	X	X	X	X	X
*TRE1180AB	RECEIVER (CARRIER SQUELCH, 1-FREQ.)	X	X	X	X								
*TRE1180AD	RECEIVER (CARRIER SQUELCH, 4-FREQ.)					X	X						
*TRE1180AF	RECEIVER ("PRIVATE-LINE", 1-FREQ.)							X	X	X			
*TRE1180AH	RECEIVER ("PRIVATE-LINE", 4-FREQ.)											X	X
TLN4133A	CHASSIS ASSEMBLY	X		X		X		X		X		X	
TLN4133B	CHASSIS ASSEMBLY		X		X		X		X		X		X
THN6073A	CABINET	X		X		X		X		X		X	
THN6073B	CABINET		X		X		X		X		X		X
TLN8999A	TUNING TOOLS	X	X	X	X	X	X	X	X	X	X	X	X
TLN1296A	MULTIPLE FREQUENCY KIT					X	X					X	X
TLN8530A	CHANNEL ELEMENT BOARD (4-FREQUENCY)					X	X					X	X
TLN8998A	CHANNEL ELEMENT BOARD (1-FREQUENCY)	X	X	X	X			X	X	X	X		
TLN8660A	POWER SUPPLY	X	X	X	X	X	X	X	X	X	X	X	X
TMN1000A	DESK MICROPHONE (CARRIER SQUELCH)	X	X	X	X	X	X						
TMN1001A	DESK MICROPHONE ("PRIVATE-LINE")							X	X	X	X	X	X
TLN6824A	"VIBRASENDER" RESONANT REED							X	X	X	X	X	X
TLN8381A	"VIBRASPONDER" RESONANT REED							X	X	X	X	X	X
TLN8970A	VARIABLE POWER KIT	X	X					X	X				
TLN8622A	"PRIVATE-LINE" KIT							X	X	X	X	X	X
TLN8271A	"PRIVATE-LINE" OSCILLATOR AND DELAY BOARD							X	X	X	X	X	X
TLN1087A	CHANNEL ELEMENT (TRANSMITTER)	X	X	X	X	◪	◪	X	X	X	X	◪	◪
TLN1086A	CHANNEL ELEMENT (RECEIVER)												
CER106B	CHANNEL ELEMENT (RECEIVER)	X	X	X	X			X	X	X	X		

EPS-3953-O

DESCRIPTION

1. INTRODUCTION

The Transistorized Consolette Base Station is a compact FM two-way radio used primarily for local control operation. The station consists of a transmitter, receiver, power supply and control panel housed in a desk top steel cabinet. The compact design of the cabinet requires minimum space for installation. A control panel on the front of the cabinet has all the necessary controls for local operation of the station. The rear of the cabinet is equipped with an antenna connector, a terminal board for external connections and a key lock. These stations operate in the 450-470 MHz frequency range with a fixed rf output of 30 watts or a variable output from 0.15 to 15 watts.

The Consolette stations are available in a variety of models as shown in the Model Chart at the front of this manual. They include carrier and "Private-Line" tone-coded squelch, and single or multiple frequency operation.

These stations employ completely transistorized receivers, exciters and power supplies. Only the driver and final amplifier stages in the transmitter use tubes. The advantages of the transistor--low current requirements, reliability, light weight, compact size and low maintenance requirements--are fully utilized. Current demands are low since the use of tubes is minimized and unheated, temperature compensated, plug-in, oscillator modules (channel elements) are used for frequency control. In addition, blowers and their related maintenance problems are eliminated by the use of a heat sink on the transmitter final amplifier stages.

The station cabinet facilitates ease of maintenance and is easily removed from the chassis by loosening two thumb-screws at the rear of the cabinet. The receiver and transmitter chassis are pivoted on swivel brackets to permit tilting to a vertical position for access to either front or back sides. All external connections are made at a terminal board at the rear of the chassis and need not be disturbed for removal of the cabinet.

2. BASIC TYPES OF STATIONS

There are two basic types of Motorola Consolette base radios, carrier squelch models and "Private-Line" tone-coded squelch models. Carrier squelch base stations use receiver incorporating a noise squelch circuit which eliminates disturbing background noise when no transmissions are being received.

The use of the "Private-Line" tone-coded squelch models improves radio communications especially when operating under crowded channel conditions. Several "Private-Line" networks can use the same rf carrier frequency in the same area. Receivers will accept only the messages transmitted by units in the same net. The speaker will remain quiet during all other transmissions; personnel will not have to listen to transmissions originating outside their "Private-Line" network.

"Private-Line" transmitters are modulated by a continuous sub-audible tone in addition to the voice modulation. The receivers accept only signals which are modulated with the correct tone and reject all others unless the "Private-Line" squelch circuit is disabled. At that time, the noise operated squelch circuit is placed in operation and all on-frequency signals are heard. When the "Private-Line" squelch circuit is activated, the noise squelch circuit is out of operation.

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3. CONTROL FACILITIES

Three modes of control are available with the consolette base stations, they are:

a. Local Control

This is the normal mode of operation for the base station; all controls are mounted on the front panel.

b. Extended Local Control Option

In this mode of operation, a desk set is connected to the base station via a control cable which is available in lengths up to 100 feet. The base station may be controlled either at the front panel or from the desk set. (Refer to the Optional Accessories section for requirements.)

c. Remote Control Option

The remote control option necessitates the use of a remote control adapter and a remote control console. The remote control console is located at a point distant from the base station. Control of the base station is accomplished by applying various dc line currents to the remote control adapter via the control line from the remote control console. (Refer to the Optional Accessories section for requirements.)

4. DESCRIPTION OF ITEMS

a. Carrier Squelch Receivers

The completely transistorized receivers in these stations are crystal controlled dual conversion models. They provide five watts of audio power at the speaker in local control operation. RF preselectors and a sealed, life-time guaranteed "Permakay" Ⓡ filter in the i-f stages determine the excellent bandwidth and selectivity characteristics of the receivers. Temperature compensated, plug-in crystal oscillator modules (channel elements) provide excellent frequency stability without the use of crystal ovens. Disturbing noise during periods when no messages are being received is eliminated by noise actuated squelch circuitry.

b. Dual Squelch Receivers

Dual squelch receivers are used in "Private-Line" tone-coded squelch stations. The receivers are identical to carrier squelch models except that dual squelch models incorporate two types of squelch circuits (noise-operated and tone-operated). The noise-operated squelch circuit is identical to the one used in carrier squelch models. The tone-operated circuit will only unsquelch the receiver when a specific "Private-Line" tone is received.

c. Transmitter

The 450-470 MHz band transmitter provides 30 watts of fixed rf power, or five predetermined levels from 0.15 to 15 watts of rf power, depending upon the model. Circuits include an unheated, temperature-compensated crystal oscillator module (channel element), transistorized audio amplifier and "Instantaneous Deviation Control" (IDC) circuit, varactor phase modulator, completely transistorized exciter (frequency multipliers and amplifiers), and tube-type driver and power amplifier stages. The output frequency is 36 times the crystal frequency. A high level of harmonic frequency attenuation is achieved in a harmonic filter at the transmitter output.

d. Chassis Assembly (Power Supply and Control Panel)

This chassis assembly contains the base station power supply, control panel and miscellaneous components not mounted on the receiver or transmitter chassis assemblies. The power supply provides all voltages necessary for the operation of the station. A terminal board is located at the rear of the chassis and provides a convenient means of connecting the remote control adapter, microphone or other external connections required for specific applications. The station high-voltage fuses and antenna connector are located at the rear of the unit near the terminal board; the low-voltage fuses are mounted (in clips) on the chassis top side under the receiver. An ac line cord is provided for connecting primary power to the station. The "Private-Line" tone generator is also mounted on this chassis ("Private-Line" tone-coded squelch models only), as well as some components of the optional "add-to" kits.

A basic control panel consists of a volume-on-off control, power-on and transmit indicator lights, a frequency select switch (multi-frequency models only) and a "PL" on-off switch ("Private-Line" tone-coded squelch models only). Refer to the Optional Accessories section of this manual for the various "add-to" items available for these units.

e. Microphones

Note: The microphone manual is included at the back of this manual.

The Motorola TMN1000A and TMN1001A Desk Microphones are recommended for use with these stations. They are uni-directional

microphones with built in transistorized amplifiers. The TMN1000A has a TRANSMIT paddle switch; the TMN1001A has an additional paddle switch to disable the "Private-Line" receiver squelch in PL systems. Each transmit switch has a normally closed contact which may be used to break the local speaker lead when transmitting to enable use of the transmit-monitor feature. This feature, which requires the use of a TLN1215B Intercom Kit, allows all T1370A Local Control Desks Sets and T1373A Wallmount Local Control Units to monitor the transmit audio of the base station in addition to the receiver and intercom audio.

The TMN6041A and TMN6042A Microphones may still be used with these stations but do not include transmit-monitor capability.

5. OPTIONAL ACCESSORIES

The following accessories are available as add-to items for the specific units noted in their description. The kits are briefly described here to indicate availability and application. When an accessory item is ordered, complete installation and operation instructions are included with the kit.

a. Metering Kits

(1) TLN8623A Meter Kit

This kit is available for local control stations and provides metering of the transmitter and receiver circuitry directly from the control panel. A 0-50 microampere meter and an eighteen-poistion rotary switch are used for metering. The meter and switch permit measurement and selection of critical test points in all receiver and transmitter circuits. The specific circuits to be measured are connected to the meter via receptacles on the receiver and transmitter chassis. The meter is mounted on the front panel and is held in place by a clip which is supplied with the meter kit. The rotary switch is mounted on the front panel frame which is in turn fastened to the front panel.

(2) TLN1219A VU Metering Kit

The VU meter kit provides a relative indication of the speech level input to the transmitter exciter. It is equipped with a variable attenuator to connect it to the exciter audio output from a microphone or remote control line. The kit consists of a VU meter and circuit board. The meter is mounted in the front panel space normally occupied by the dc meter (part of the TLN8623A Meter Kit) so that either the VU meter or the dc meter may be used, but not both. The circuit board, which includes the variable attenuator, is mounted on the chassis below the receiver.

b. Clock Kits

The Motorola TLN8625A and TLN8661A Clock Kits are available for both the local and extended local control base stations. Each is of the cyclometer type and operates on 117 volts ac.

MODEL	TYPE
TLN8661A	12-hour
TLN8625A	24-hour

c. TLN1216A Alert Tone Kit

The TLN1216A Alert Tone Kit provides a 1000-cycle tone that can be used as a signal prior to actual voice transmission or as a test tone when adjusting the deviation of a transmitter. The kit consists of a transistorized oscillator, a switch, the cabling required for circuit interconnections and the hardware for mounting to the front panel.

d. TLN8711A Single-Tone Oscillator

This kit includes an oscillator which provides a selective tone source for mobile radio units in a single-tone controlled two-way communication system. The oscillator generates a fixed frequency, short duration, or continuous audio tone when the radio transmitter is keyed. This tone modulates the carrier and is transmitted to the associated receiver stations on the same rf channel.

The oscillator may be used to tone-alert a receiving station to a pertinent incoming call. Or, the associated receiver station may incorporate a tone decoder unit, which when activated by reception of the single-tone, will complete the audio output circuit. Thus, only the receiver for which the call was intended will receive the message. Also a tone-decoder-equipped receiver, when activated, will energize an external control circuit for repeater or alarm systems. The TLN8711A Single-Tone Oscillator provides up to five tones which may be individually selected.

The Model TLN1339A Multiple-Frequency Single-Tone Encoder is the same as the previously mentioned single-tone encoder except that a continuous audio tone is not generated.

e. Intercom Amplifier Kit

The Motorola TLN1215A Intercom Amplifier Kit permits intercommunication between the base station and the remote control console, between the base station and a desk set, or between two or more desk sets connected in parallel with the base station, without actuation of the transmitter. The kit consists of a transistorized amplifier, the cable for circuit interconnections, the mounting hardware, and the supervisory and intercom switch (mounted

on the front panel). The intercom also has a "squelch-priority" feature which disables the intercom any time an on-frequency carrier is received by the base station receiver.

When Motorola desk sets are used with the station, the addition of a speaker pad permits individual audio level control at the panel and desk set speakers.

The Model TLN1215B Intercom Kit is the same as the TLN1215A Intercom Kit except it provides for transmit-monitor operation when used with the TMN1000A Series Microphones.

f. T1370A Desk Set (Extended Local Control)

The T1370A Desk Set consists of a desk-type telephone set with a built-in speaker, a dynamic microphone cartridge containing a transistorized pre-amplifier, a rubber-covered coil cord, and an indicator light which illuminates when this or a paralleled desk set is using the transmitter. The T1370A Desk Set contains a power supply which operates from a 117 v ac source to power the indicator lamp and its circuitry. This desk set may be used with carrier squelch or with "Private-Line" tone-coded squelch models.

This control unit is the equivalent of the T1370A Desk Set in a wallmount telephone package. The wallmount version does not include a 120 v ac power supply.

g. TLN1126A Remote Control Chassis ("Private-Line" Tone-Coded Squelch Stations)

The TLN1126A Remote Control Chassis permits remote control of a "Private-Line" tone-coded squelch station via a two- or four-wire audio control line. This unit contains relays, a line matching transformer on a small, compact chassis and a "Private-Line" disabling feature. The chassis is used with a Motorola T1360A series Remote Control Console, a T1375A series Remote Control Desk Set, or their equivalents.

h. TLN1127A Remote Control Chassis (Carrier Squelch Stations)

The TLN1127A (single-frequency) Remote Control Chassis permits remote control of a carrier squelch station via a two- or four-wire audio/control line. These units contain relays and a line matching transformer on a small, compact chassis. They are used with a Motorola T1360A series Remote Control Console, a T1375A series Remote Control Desk Set, or their equivalents.

i. T1251B "Quik-Call" Console

The Motorola "Quik-Call" console is a completely self-contained desk-top unit used to originate coded tone signals for use in a Motorola Selective Signalling System or equivalent.

Used with the Consolette base station, the Model T1251B "Quik-Call" console provides a fast and accurate means of selectively calling a station located within a radio network without using air time to set up the call. Using this unique system, the speaker at the reception point is silent until called via the coded tone signal on a specific carrier frequency. Each "coded" signal is transmitted during the first two to three seconds of the initial transmission to the called station. Thus, the receiver being called is changed from a standby to operating condition almost immediately. This silent standby condition relieves the operator of listening to all the interference and chatter on the channel in order to receive pertinent messages.

j. TLN8718A Junction Box Kit

This kit contains the hardware for interconnecting control facilities to the Consolette Base Station when the extended local control and/or the remote control options are used. (Refer to the Typical Systems Application Section of this manual for details.)

k. TLN8627A Wall Mounting Kit

The TLN8627A Wall Mounting Kit is available for use with all models of the Consolette base stations. When mounted on a wall, the base station is vertically oriented and is operated in the extended local or remote control mode.

l. Additional Accessories

Many other accessories are available for these stations for particular applications. See your local Motorola representative for complete details.

6. TYPICAL SYSTEM APPLICATIONS

The Consolette Base Station radio, used with its many add-to kits and accessories, features versatility. Items may be added as required to extend the function of the base station to accommodate particular requirements. This section describes just a few of the typical system applications to which the base station may be adapted.

a. System 1
(Refer to Figure 1)

This system is the basic Consolette radio installed on a desk top and using a microphone at the desk position for locally controlling the radio. The Consolette location is the operating position and the control point for the system. A "basic model" Consolette is used for this purpose.

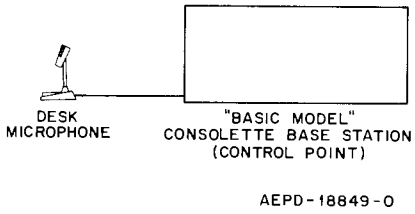
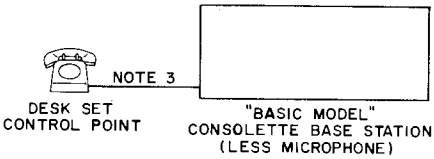


Figure 1.

b. System 2
(Refer to Figure 2)

This system provides for the operation of the Consolette in an extended-local mode, in those cases where the Consolette cannot be located on the desk top. In such a system, the Consolette is placed within 100 feet of the operating position and controlled by a Motorola desk set. The desk set is connected to the radio via a cable and becomes the control point; it also contains the necessary "transmitter-on" light. The equipment required for such a system is: (1) "basic model" Consolette less microphone, (2) desk set, (3) interconnecting cable kit and (4) wall mount brackets for the Consolette (optional).



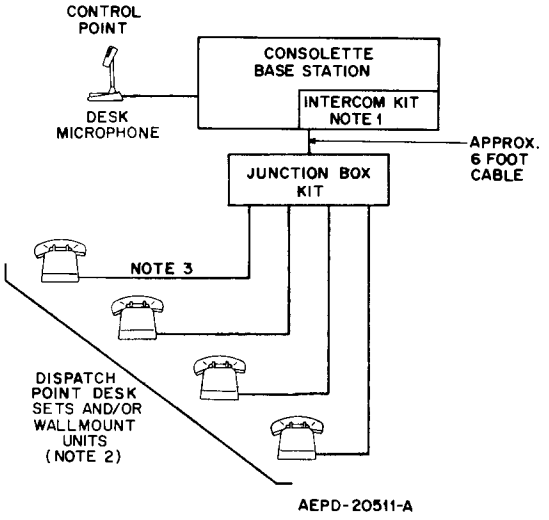
NOTES:
1. NO MICROPHONE USED IN THIS SYSTEM.
2. WALL MOUNT AVAILABLE AS OPTION.
3. MAXIMUM CABLE LENGTH TO DESK SET: 100 FEET.
4. CHANGE AUDIO HOT LEAD FROM SPEAKER TO TB10-6 TO CONNECT DESK SET AUDIO.
5. SPEAKER DISABLED UNLESS A SPEAKER PAD OR INTERCOM IS ADDED.

Figure 2.

c. System 3
(Refer to Figure 3)

The system shown in Figure 3 has one control point with desk set extensions which serve as dispatch points. The consolette station, in this case, is the control point and has complete supervision over transmissions from the dispatch points. In addition, all dispatch points may communicate with one another and with the control point operator without activating the radio transmitter by using an intercom kit (installed in the consolette station). The desk sets at the dispatch points are connected to the consolette station via a junction box.

When a TMN1000A or TMN1001A Microphone and a TLN1215B Intercom Kit are used, the entire system can be set up to utilize the transmit-monitor feature of the microphones. This is the only system shown in this book in which the transmit-monitor feature may be used. When using this feature the local microphone cannot be connected to the junction box.



NOTES:
1. WHEN DISPATCH POINTS ARE USED, AN INTERCOM KIT MUST BE INSTALLED.
2. UP TO A COMBINED TOTAL OF SIX DISPATCH POINTS MAY BE USED.
3. MAXIMUM CABLE LENGTHS TO DISPATCH POINTS: 100 FEET.

Figure 3.

d. System 4
(Refer to Figure 4)

This system provides for those who may want to license two control points for operation at a place of business during the day (primary control point) and transfer of the operation to a home during the evening (alternate control point). Operation of the radio system may be accomplished from only one or the other of the control points at a given time. A switch is provided in the junction box kit which permits transfer of the control point. This protects the location not in use from being operated by unauthorized personnel when that location is unattended. The equipment for this system consists of: (1) "basic model" consolette station with microphone and intercom kit, (2) a remote adapter (remote control chassis), (3) a junction box kit, and (4) a DC remote control desk set or a DC remote control console.

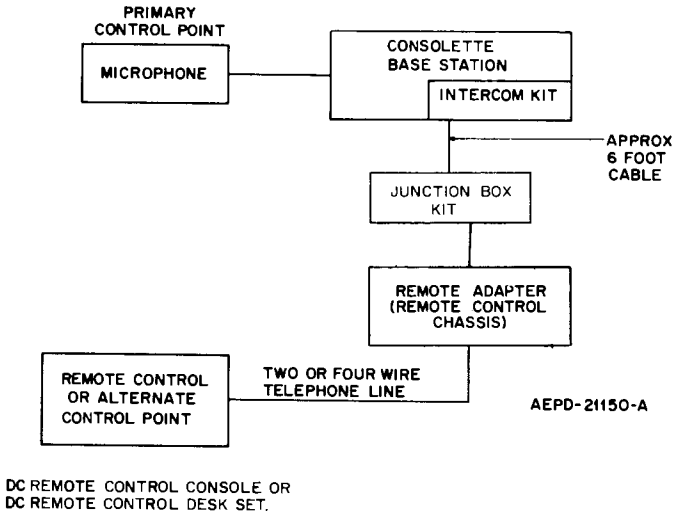
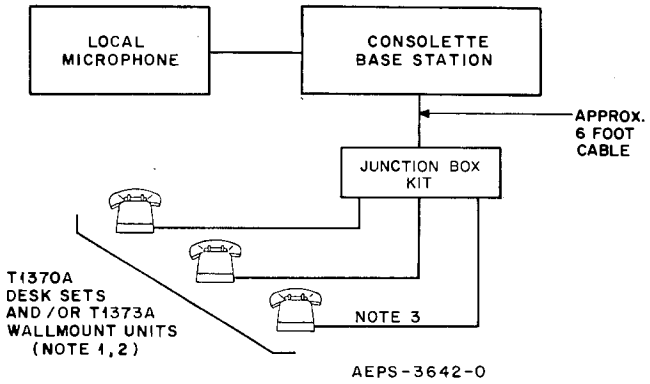


Figure 4.

e. System 5
(Refer to Figure 5)

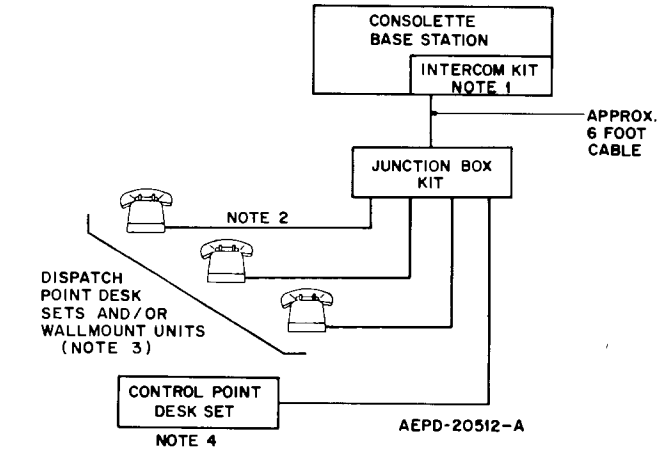
This system provides for use of up to six local control units without an intercom kit. In this system, each local control unit must be licensed by the FCC as a control point as none of the units can monitor the transmit audio of any of the other units. Intercommunication between units or with radio equipment is not possible. (All units can monitor only receiver audio.) Equipment required for this system is; (1) "basic model" consolette station (local microphone is optional), (2) a junction box kit, and (3) local control units and cable kits as desired.



NOTES:
1. UP TO A COMBINED TOTAL OF SIX DESK SETS AND/OR WALLMOUNT UNITS MAY BE USED.
2. EACH UNIT MUST BE LICENSED AS A CONTROL POINT.
3. MAXIMUM CABLE LENGTHS OF 100 FEET.

f. System 6
(Refer to Figure 6)

This system enables a desk set to become the control point for the system with the Consolette radio located remotely or wall-mounted (option). The control point desk set includes a switch to disable all dispatch points from controlling the transmitter. Equipment required for this system is (1) Consolette with intercom kit, (2) local control units as required for dispatch points, (3) control point desk set, (4) up to 100 feet of cabling from each desk set to the consolette location, and (5) a junction box kit.



NOTES:
1. WHEN DISPATCH POINTS ARE USED, AN INTERCOM KIT MUST BE INSTALLED. REFER TO APPLICABLE MANUAL FOR MONITOR KIT MODEL NUMBER.
2. MAXIMUM CABLE LENGTHS TO DESK SETS: 100 FEET.
3. MAXIMUM OF SIX DISPATCH POINTS MAY BE USED.
4. AT THE CONTROL POINT A SUPERVISORY DESK SET OR COMPA STATION CONTROL PANEL MAY BE USED.

Figure 6.

7. LOCAL CONTROL STATIONS FUNCTIONAL DESCRIPTION

(Refer to Figure 7)

a. Power Application

The primary input voltage (117 volts ac) is connected to TB4-2 and TB4-4 at the lower rear section of the base station chassis. When the on-off control (part of the OFF-VOLUME control) is turned on, the power supply is activated and the green (power on) indicator on the control panel lights. At this time, voltage is applied to the following circuits:

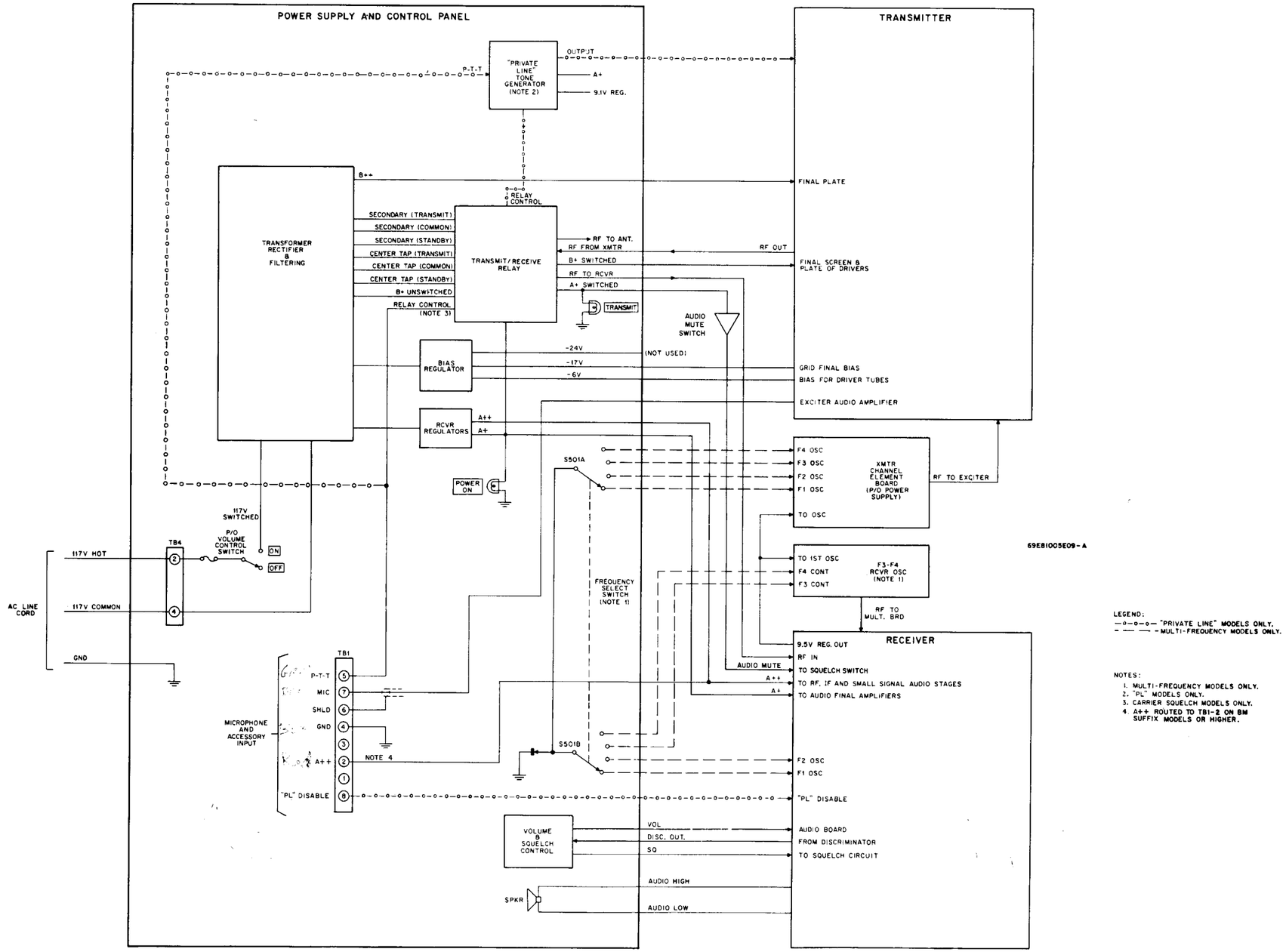


Figure 7.
Functional Diagram

(Page 1-8 is blank)

(1) The receiver.

(2) The tone generator circuit in the power supply ("Private-Line" models only).

(3) The exciter stages in the transmitter.

(4) Bias and filament voltage to the driver and final power amplifier stages in the transmitter.

(5) B++ voltage to the plate of the final amplifier tube. A regulated +9.1 volts dc (derived from the receiver A++ voltage) is applied to:

(a) Receiver channel element(s).

(b) Transmitter IDC circuit and modulator bias.

(6) A+ to the transmit/receive relay coil and A+, +9.1 volts, and B+ to the transmit/receive relay contacts.

b. Frequency Selection (Multi-Frequency Models Only)

(1) The appropriate oscillator in the receiver is activated when a ground is supplied by the frequency select switch on the control panel.

(2) A ground is also supplied to the desired oscillator in the transmitter by the frequency select switch, however, the oscillator is not activated until the transmitter/receive relay is energized.

c. Transmitter-Turn-On

When the push-to-talk switch on the microphone is pressed:

(1) The receiver is muted by supplying a ground to the switch stage in the squelch circuit through the audio and mute delay circuit. (The receiver operating voltages are not removed during transmission.)

(2) The transmit/receive relay is energized and performs the following switching functions:

(a) Switches the high-voltage secondary windings from a standby set to the set which supplies the normal transmitter voltages. This action causes the B+ and the B++ voltages to be raised.

(b) Applies B+ to the plate of the driver tubes and to the driver and final amplifier screen grids.

(c) Switches the antenna from the receiver to the transmitter.

(d) Applies A+ to the red transmit indicator on the control panel causing it to light and also, through a resistor, to the receiver "PL" decoder ("PL" mute function) to prevent the receiver squelch from opening during transmission ("PL" models only).

(e) Applies +9.1 volts to the transmitter channel element(s) to activate the oscillator.

d. Transmitter Turn-Off

When the push-to-talk switch is released, the following takes place:

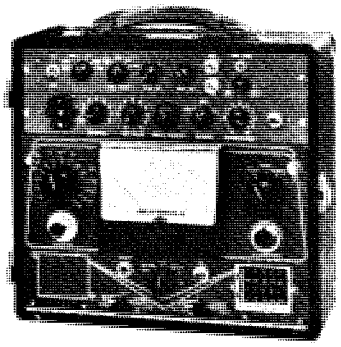
(1) The red transmit lamp on the control panel goes out.

(2) All circuits revert to their original state. In "Private-Line" tone-coded squelch models, the power supply (and therefore the transmitter) is held on for 150 milliseconds while a reverse phase "Private-Line" tone is transmitted. This phase shift permits the "Vibrasponder" resonant reed in the listening receiver to be damped rapidly and the receiver returned to a squelched condition. The time delay is controlled by circuitry on the "PL" tone generator.

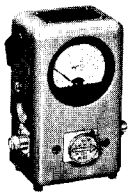
e. "Private-Line" Disable ("Private-Line" Tone-Coded Squelch Models Only)

When the "Private-Line" switch on the control panel is placed in its OFF position, a ground is removed from the dual squelch receiver permitting the noise-operated squelch circuit to operate.

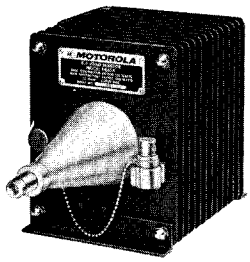
RECOMMENDED TEST EQUIPMENT



S1059A*
Portable Test Set

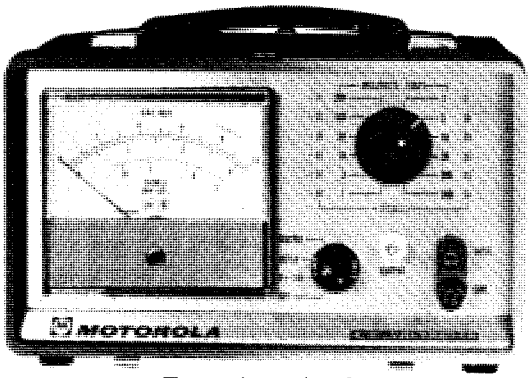


"Thruline"
Wattmeter

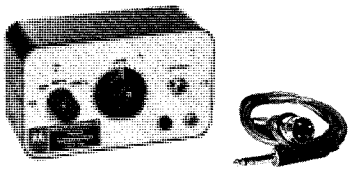


T1013A
RF Load Resistor

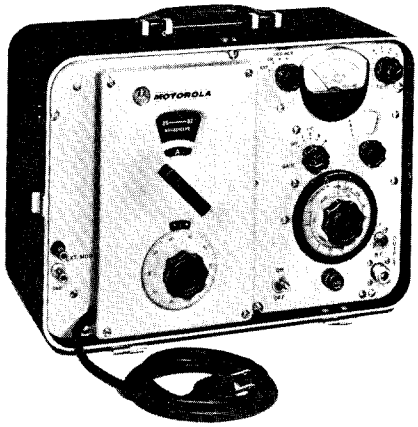
Transistorized
DC Multimeter



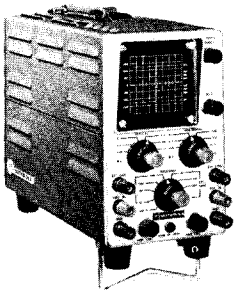
Transistorized
AC Voltmeter



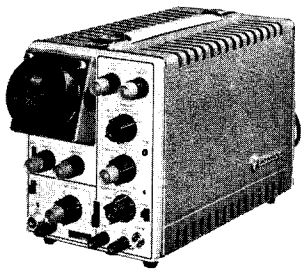
TEK-1A
Transistorized Tone
Generator



T1034C
Signal Generator

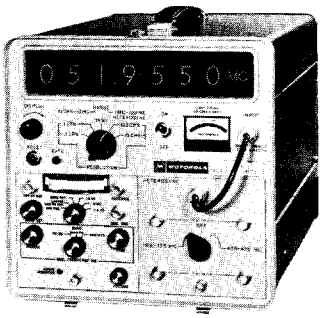


T1015A
General Purpose
Oscilloscope



T1014B
Precision Wideband
Oscilloscope

T1130A Series
FM Station Monitor



S1075B
Digital Frequency Meter

*Order TKN6025A Cable Adapter also.

INSTALLATION AND OPERATION

IMPORTANT

FCC regulations state that:

1. Radio transmitters may be tuned or adjusted only by persons holding a 1st or 2nd class commercial radiotelephone operator's license or by personnel working under their immediate supervision.

2. The rf power output of a radio transmitter shall be no more than that required for satisfactory technical operation considering the area to be covered and local conditions.

3. Frequency, deviation and power of a base station transmitter must be checked before it is placed in service and rechecked every year thereafter.

REMEMBER

The efficiency of the equipment depends upon a good installation.

1. INSPECTION

Inspect the equipment thoroughly as soon as possible after delivery. If any part of the equipment has been damaged in transit, report the extent of damage to the transportation company immediately.

2. ANTENNA AND TRANSMISSION LINE CONSIDERATIONS

The antenna and transmission line kit are not included with the base station since each installation requires special attention. Consult your nearest Motorola representative for antenna and transmission line requirements. Installation of the antenna should be made prior to the installation of the base station. Follow the instructions included with the antenna and transmission line kits.

3. INSTALLATION OF CABINET

a. Unpacking

(1) Follow unpacking instructions printed on the inside flap of the packing carton.

(2) Remove the foam blocks from either side of the station cabinet.

(3) Remove the envelope containing the keys from the front panel.

(4) Remove the accessories from the shipping carton.

b. Location

The cabinet should be located on a solid, level surface convenient to the 117 volt ac power source and the transmission line. Allow space for ventilation at the sides of the cabinet. The transmission line should be kept as short as possible to minimize line losses.

The cabinet of the local control model base station should be located at a level where the controls on the panel are convenient to the operator.

c. AC Power

(1) Power Requirements

All stations require a 15-ampere, 120-volt, 60 cps ac power input. This circuit should be installed in accordance with local electrical codes.

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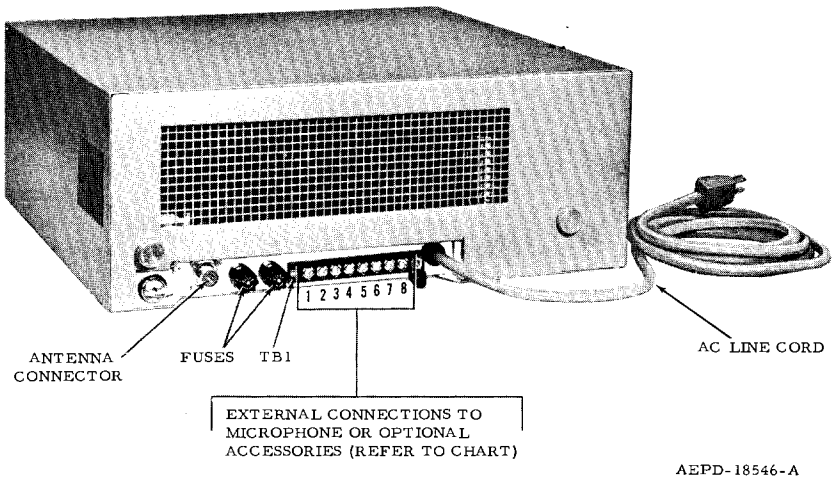


Figure 1.
Control Line Connection Detail

ACCESSORY ITEM FUNCTION	CONNECT TO TB1-
Intercom Audio Shield (Local or Remote Option Only)	1
Intercom Audio (Local or Remote Option Only)	2
Audio Hot (Local or Remote Option Only)	3
Ground	4
Push-To-Talk	5
Exciter Audio Shield	6
Exciter Audio	7
PL Disable	8

CONSOLETTE TERMINAL FUNCTIONS	TERMINAL NUMBER
Desk Set Mic Hi	TB1-1
A++	TB1-2
3-Ohm Audio Hi	TB1-3
Ground	TB1-4
P-T-T	TB1-5
Mic Lo	TB1-6
Mic Hi	TB1-7
PL Disable	TB1-8
Desk Set P-T-T	TB1-1*
3-Ohm Audio Lo	TB1-2*
3-Ohm Audio Mute	TB1-3*

*Part of terminal board on TLN1215B Intercom Kit

The primary ac power line may be installed prior to installation of the cabinet and terminated near the location chosen for the cabinet.

(2) Power Connection

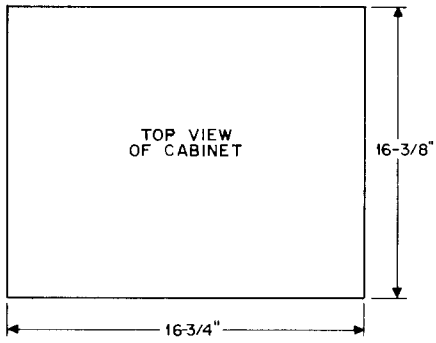
A three-wire ac line cord is provided with the station. Connect the line cord to the ac convenience outlet.

d. Installing the Microphone

Connect the microphone as shown in the following chart (refer to Figure 1).

TMN6041A AND TMN6042A
MICROPHONE CONNECTIONS

WIRE COLOR	TERMINAL NO.
WHT (TMN6041A only)	8
RED	7
BLK	6
GRN	5
SHLD	4



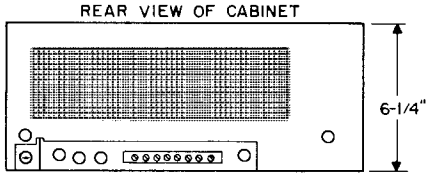


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Figure 2. Cabinet Dimension Detail

MICROPHONE CONNECTIONS

TMN1000A		TMN1001A	
Wire Color	Terminal Board	Wire Color	Terminal Board
Red	TB1-7	Red	TB1-7
Blk	TB1-6	Blk	TB1-6
Shld	TB1-4	Shld	TB1-4
Grn	TB1-5	Grn	TB1-5
Wht	No connection	Wht	TB1-8
Yel	TB1-2*	Yel	TB1-2*
Brn	TB1-3*	Brn	TB1-3*

*P/O TLN1215B Intercom Kit Terminal Board. Yel and Brn Leads are connected only when the TLN1215B Intercom Kit is used.

The following table shows the connection changes between Models TMN1000A, TMN1001A and TMN1000A, TMN1001A suffix -1.

FUNCTION	TMN1000A TMN1001A	TMN1000A-1 TMN1001A-1
MIC-HI	RED	BROWN
MIC-LO	BLACK	SHIELD
P-T-T	GREEN	GREEN
GND	SHIELD	BLACK
"PL" DISABLE	WHITE	WHITE
3-OHM AUDIO HI	YELLOW	YELLOW
3-OHM AUDIO MUTE	BROWN	RED

e. Desk Sets

When using a desk set with the Consolette Base Station, remove the yellow push-on terminal from the speaker and connect it to terminal 4 of TB10. This disables the speaker (except when a speaker pad kit or intercom kit is used).

T1370A and T1373A Local Control Unit Connections

Single control unit used with consolette without intercom kit		
Control Unit TB#	Function	Consolette TB#
T1	Desk Set Mic Hi	TB1-7
T4	Desk Set Mic Lo	TB1-6
T2	Desk Set P-T-T	TB1-5
T7	Ground	TB1-4
T6	3-Ohm Audio Hi	TB1-3
T8	PL Disable	TB1-8
T9*	A++	TB1-2

Multiple control units used with consolette with intercom kit		
Control Unit TB#	Function	Consolette TB#
T1	Desk Set Mic Hi	TB1-1
T4	Desk Set Mic Lo	TB1-6
T2	Desk Set P-T-T	TB1-1**
T7	Ground	TB1-4
T6	3-Ohm Audio Hi	TB1-3
T8	PL Disable	TB1-8
T9*	A++	TB1-2

*T1373A Wallmount Local Control Unit Only.
**P/O TLN1215B Intercom Kit Terminal Board.

NOTE

For multiple control unit connections to consolettes without the intercom kit refer to the TLN1218B Junction Box instruction manual.

4. INITIAL ADJUSTMENTS AND PRE-OPERATIONAL CHECKS

The transmitter and receiver were accurately aligned at the factory before the station was shipped. However, the equipment should be checked before actual operation since it may have been mishandled during transit. In addition, certain adjustments such as remote control levels must be made after the installation is completed because each installation exhibits different characteristics. FCC regulations also require that transmitter frequency, power and deviation be checked before the station is placed in operation. Perform all steps of the PRE-OPERATIONAL AND ROUTINE ADJUSTMENT CHECK LIST (in the MAINTENANCE section of this manual) in sequence.

5. OPERATING INSTRUCTIONS

TO RECEIVE

MULTI-FREQ. MODELS ONLY	Place the frequency selector switch in the desired position.
ALL MODELS	Place the ON-OFF switch in the ON position or turn the OFF-VOLUME control clockwise. The green power on lamp will light to indicate the "standby" condition. The receiver is in full operation.

TO HEAR ALL ON-FREQUENCY SIGNALS

"PRIVATE-LINE" TONE-CODED SQUELCH MODELS ONLY	Place the "PL" ON-OFF switch in the "PL" OFF position.
ALL MODELS	Turn the SQUELCH control to the full counterclockwise position. Turn the VOLUME control clockwise until noise is heard. Adjust the SQUELCH control by turning it slowly clockwise until the noise is just squelched (cuts out). Set the VOLUME control to the desired listening level with a received signal.

TO HEAR "PRIVATE-LINE" SIGNALS ONLY

"PRIVATE-LINE" TONE-CODED SQUELCH MODELS	Place the "PL" ON-OFF switch in the "PL" ON position. Set the VOLUME control to the desired listening level with a received signal.

TO TRANSMIT

ALL MODELS	Proceed as previously described under "TO RECEIVE" and "TO HEAR ALL ON-FREQUENCY SIGNALS". This allows the operator to monitor the channel and prevent unnecessary interruptions of another "on-frequency" station. If the channel is clear, press the push-to-talk button on the microphone and speak clearly and distinctly into the microphone in a normal or loud voice. THE TRANSMITTER CANNOT BE OVER-MODULATED BY SPEAKING LOUDLY. The red transmit lamp will go on indicating the transmitter is on the air.

TO TURN EQUIPMENT OFF

ALL MODELS	Turn the VOLUME control counter-clockwise until a "click" is heard. The green power on indicator will go out.

1. DESCRIPTION

This section contains procedures that should be performed at the time of installation and periodically thereafter. Immediately following this paragraph is a list of recommended checks.

2. RECOMMENDED CHECKS

At the time of installation and periodically thereafter, perform all steps of the following PRE-OPERATIONAL AND ROUTINE ADJUSTMENT CHECK LIST. Keep individual records of each unit. Deterioration in performance and the need for realignment can readily be determined by comparing records of previous checks.

Additional checks as listed below may be beneficial:

a. Check primary voltage.

b. Check all accessories; such as cables, microphones, pilot lights, etc.

c. Check the antenna system.

3. CHASSIS ACCESS FOR SERVICING

The Consolette cabinet may be removed from its chassis by performing the following steps:

a. Cabinet Removal (Figure 1)

(1) Unlock the cabinet with the key provided.

(2) Unscrew the two thumb screws at the rear of the cabinet.

(3) Grasp the cabinet about midway from front to rear and slide away from the front panel until the cabinet clears the latch (approximately three inches) and lift away.

b. Tilting Receiver for Servicing (Figure 2)

(1) Loosen the hex-head bolts on either side of the receiver assembly.

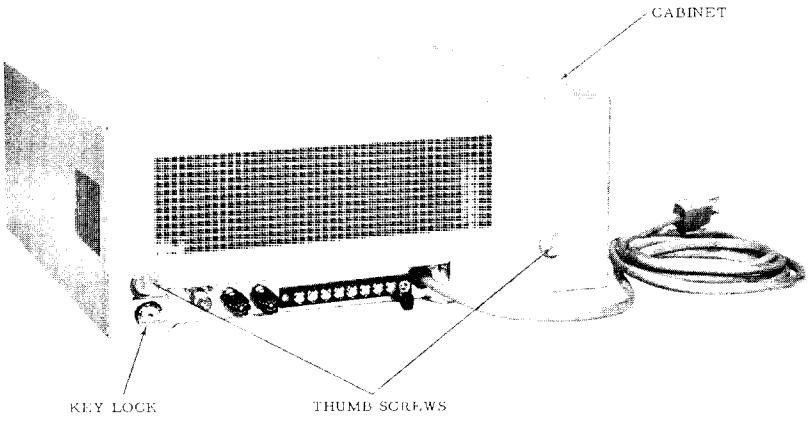

Figure 1.
Removal of Cabinet

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PRE-OPERATIONAL AND ROUTINE ADJUSTMENT CHECK LIST

UNIT	STEP	CHECK	REFER TO	LOCATION
RECEIVER	1	Compare meter readings with the minimum values in the RECEIVER ALIGNMENT PROCEDURE. Realign if necessary.	RECEIVER ALIGNMENT PROCEDURE, typical stage measurements - no signal.	ALIGNMENT CHARTS section
	2	Measure signal level required for 20 dB quieting.	RECEIVER ALIGNMENT PROCEDURE, 20 dB quieting.	ALIGNMENT CHARTS section
	3	Set the SQUELCH control and measure level required to open squelch threshold.	RECEIVER ALIGNMENT PROCEDURE, squelch setting and measuring squelch sensitivity.	
TRANSMITTER	4	Compare meter readings with minimum values in the TRANSMITTER ALIGNMENT PROCEDURE. Realign if necessary.	TRANSMITTER ALIGNMENT PROCEDURE, final meter readings.	
SYSTEM ADJUSTMENTS	5	Measure power output of transmitter if required.	TRANSMITTER ALIGNMENT PROCEDURE.	
	6	Measure transmitter frequency and adjust if necessary.	TRANSMITTER ALIGNMENT PROCEDURE, oscillator frequency adjustment.	
	7	Measure transmitter voice channel for proper deviation. Adjust "IDC" if necessary.	IDC ADJUSTMENT PROCEDURE.	
	8	Measure tone deviation for "Private-Line" transmitters.	IDC ADJUSTMENT PROCEDURE.	
	9	Net receiver on frequency.	RECEIVER ALIGNMENT PROCEDURE.	
	*10	Measure and adjust audio input to transmitter.	Refer to the ADJUSTMENT PROCEDURE of the APPLICABLE REMOTE CONTROL CHASSIS INSTRUCTIONS.	
	*11	Measure and adjust audio output from receivers to line.		
	*12	Measure dc control line currents.		
	*13	Check proper operation of all remotely controlled functions.		

*Remote Control Installations Only.

(2) Tilt receiver up and back until the hex-head bolts rest in the slots of the swivel brackets.

(3) Tighten hex-head bolts, if desired, to secure chassis in place during servicing.

c. Tilting Transmitter for Servicing (Figure 2)

The transmitter is tilted for service in the same manner as the receiver.

d. Dropping Front Panel for Servicing (Figure 2)

(1) Remove the bottom cover as described in paragraph e. following.

(2) Four bolts secure the front panel to the chassis, two on each side. They are located at the bottom of the triangular support at each side of the front panel. Loosen the two bolts nearest the front panel and remove the other two completely.

(3) Tilt the front panel down and away from the chassis for access to chassis and front panel components.

e. Removal of Chassis Bottom Cover (Figure 3)

Before removing the bottom cover, remove the cabinet and position the chassis with the side opposite the transformer nearest the table top.

(1) Remove the five hex-head bolts in the bottom cover.

(2) Remove cover.

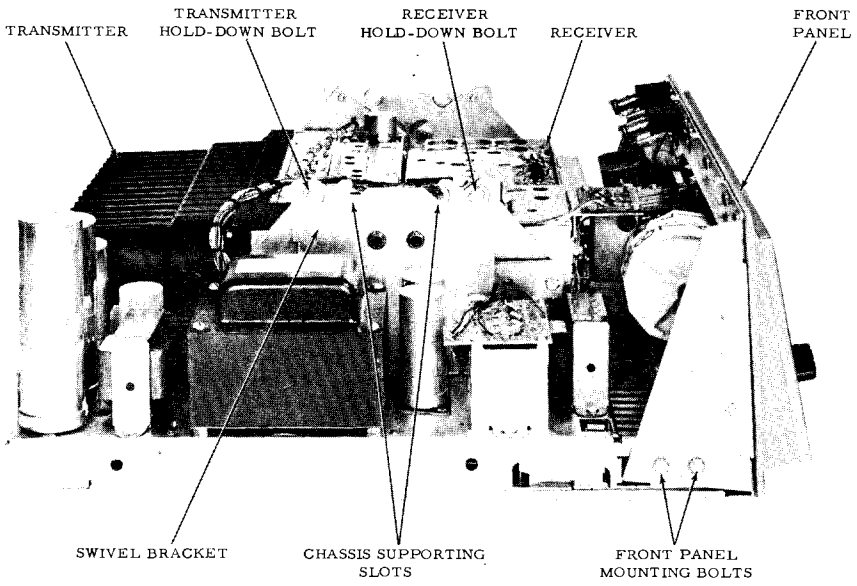

Figure 2.
Chassis Access for Servicing

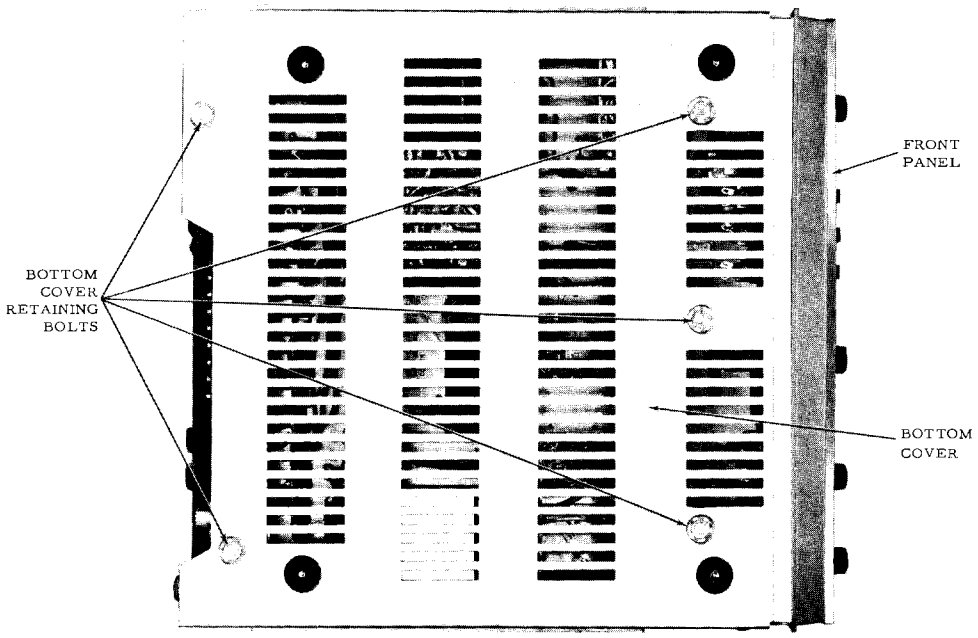

Figure 3.
Removal of Bottom Cover

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1. DESCRIPTION

The transmitter consists of one (or more) crystal-controlled oscillators, a phase-modulator, several amplification and frequency multiplication stages and a final power amplifier stage. The fundamental crystal frequency is multiplied 36 times to provide the final rf amplifier output frequency. This transmitter is available in single- or multiple-frequency, wide- or split-channel models. It operates in the 450-470 MHz frequency range with a fixed rf power output of 30 watts, or a stepped variable output of 0.15 to 15 watts.

The Transmitter Block Diagram, Figure 1, shows the stage-by-stage signal flow and operating frequencies.

2. CIRCUIT DESCRIPTION

a. Microphone and Pre-Amplifier Circuit

The microphone cartridge and pre-amplifier act as a variable voltage generator producing an output voltage which varies with both frequency and intensity as the sound waves strike the diaphragm.

b. Deviation Limiting Circuit

In the incoming signal from the microphone, the wavefront slope depends upon both amplitude, and frequency. The overall effect of the deviation limiting circuit is to place a barrier upon the maximum wavefront slope which can pass into the modulator.

The deviation limiting circuit consists of components for pre-emphasizing (6 dB/octave characteristic), amplifying and limiting, and then de-emphasizing the modulation signal. The amplifier stage clips both positive and negative peaks when they exceed the pre-determined clipping level. The audio wave passes through a low-pass filter to the "Instantaneous Deviation Control" (IDC) control. Except for slope limiting, the output waveform of the deviation limiting circuit is identical to the input waveform. The amplifier and deviation limiting circuit limits deviation by controlling the maximum

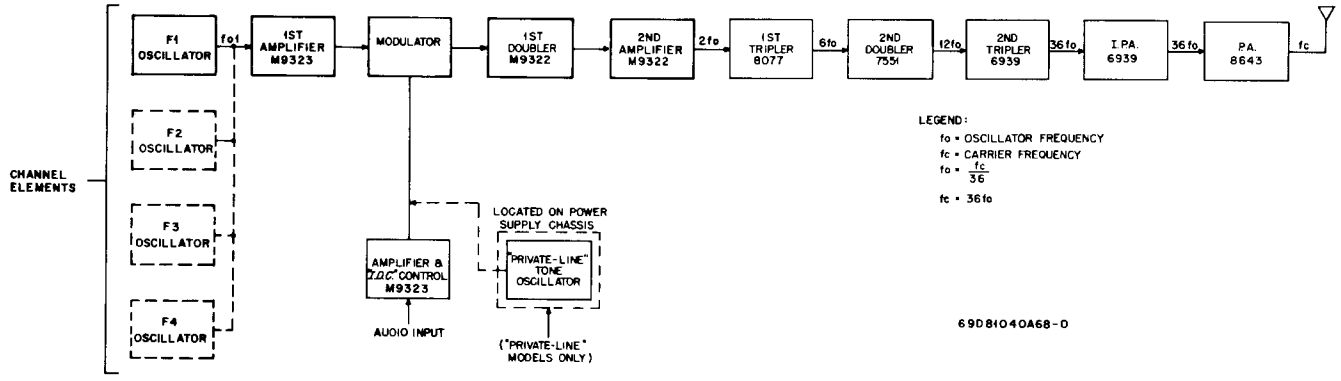

Figure 1. Transmitter Block Diagram

slope of the signal wavefront which reaches the modulator. This controls transmitter maximum deviation, since the modulator frequency shift is proportional to the slope of the audio input waveform.

c. Oscillator (Channel Element)

Since the crystals in the channel elements are unheated, each transistor oscillator circuit is individually compensated for frequency stability over the entire temperature range. The entire assembly is housed in a factory sealed, plug-in unit. For multiple-frequency radios, separate oscillator circuits are incorporated. The frequency selector completes the dc ground path for the desired oscillator. Each of the oscillators is supplied with a 9.1- or 9.6-volt regulated voltage when the transmit relay is activated.

Variable "warp" capacitors are mounted in the base of the channel element and are accessible through the circuit board. Each oscillator operates on a specific frequency in the 12.5 to 13.056 MHz range.

d. Modulator

The audio output of the deviation limiting circuit is applied to the modulator which phase modulates the output of the oscillator. The tuning elements of the modulator tank circuits are varactors. The capacitance of these special back biased diodes is a function of the potential across them. The audio signal is applied to the varactors which changes this potential at an audio rate and varies the capacitance in the modulator tank circuit. This changes the phase angle of the rf signal producing modulation.

e. Multipliers and Amplifiers

The modulator output is applied to the 1st doubler where the signals are amplifier and doubled in frequency. They are further amplified and tripled in frequency in the 1st tripler, doubled again in the 2nd doubler and tripled in the 2nd tripler. The intermediate power amplifier stage develops the required signal power to drive the power amplifier to its rated rf power output. The signals reaching the final amplifier have been multiplied 36 times from the original frequency generated by the oscillator.

f. Transmitter Power

Power for operation of the transmitter is supplied by the power supply in the base station. The necessary voltages for the operation of the tubes and transistors is connected to the transmitter by a cable from the power supply.

3. SERVICE AIDS

Complete removal of the printed circuit boards for access to components is not always necessary.

The following steps outline procedures to prepare various parts of the transmitter for servicing. Observe standard servicing practices such as tagging of leads and identification of connecting points. Refer to the SERVICE DIAGRAMS section in this manual for lead identification and routing.

NOTE

The letters and numbers that appear in the boxes near the photographs, indicate corresponding steps in the following paragraphs. Example: b. (1) in Figure 2 indicates the location of items discussed in sub-paragraph "b. (1)".

a. 1st Tripler, 2nd Doubler, 2nd Tripler and I.P.A. Tubes (Figure 2)

Loosen four captive screws and remove rear heat sink.

b. Power Amplifier Tube (Figures 2 & 3)

(1) Loosen four captive screws and remove rear heat sink.

(2) Remove mounting screw.

(3) Lift up on plate tank circuit.

(4) Release hold down spring at left of tube (as viewed in the figure) and remove tube.

c. Access to Bottom of Exciter Board (Figure 4)

Remove four screws and slide exciter bottom cover out.

d. Access to Bottom of Power Amplifier Section (Figure 4)

Remove four screws and lift off power amplifier cover.

e. Removal of Harmonic Filter (Figures 2 & 3)

(1) Loosen four captive screws and remove rear heat sink.

(2) Remove input lead to harmonic filter from antenna at the connector. (The connector is on the chassis assembly directly beneath the transmitter.)

(3) Remove screw and spread apart chassis to allow room for removal of coaxial connector.

(4) Remove harmonic filter output lead.

(5) Remove two mounting screws and lift out harmonic filter.

f. Access to IDC Filter Board (Figure 4)

(1) Remove four screws and slide exciter bottom cover out.

(2) Remove one screw and fold out board.

g. Access to Top of Exciter Board (Figure 5)

Remove six screws and slide exciter top cover out.

h. Channel Element Board

Removal of the transmitter channel element board is described in the CHASSIS ASSEMBLY section of this manual.

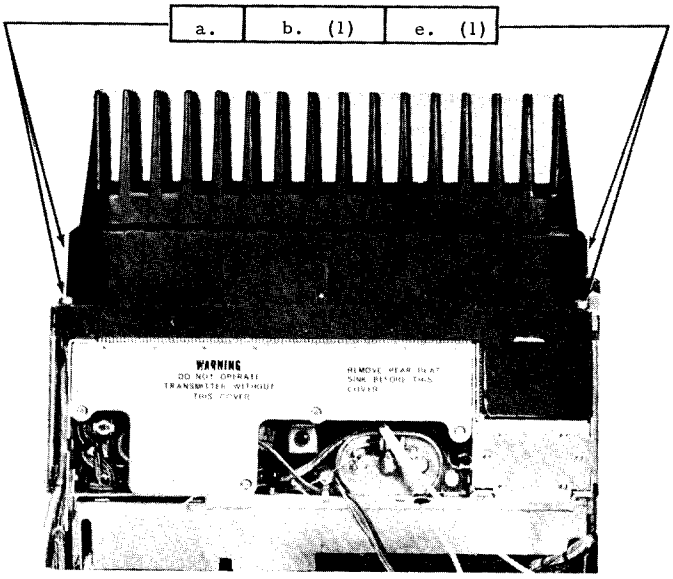

Figure 2.

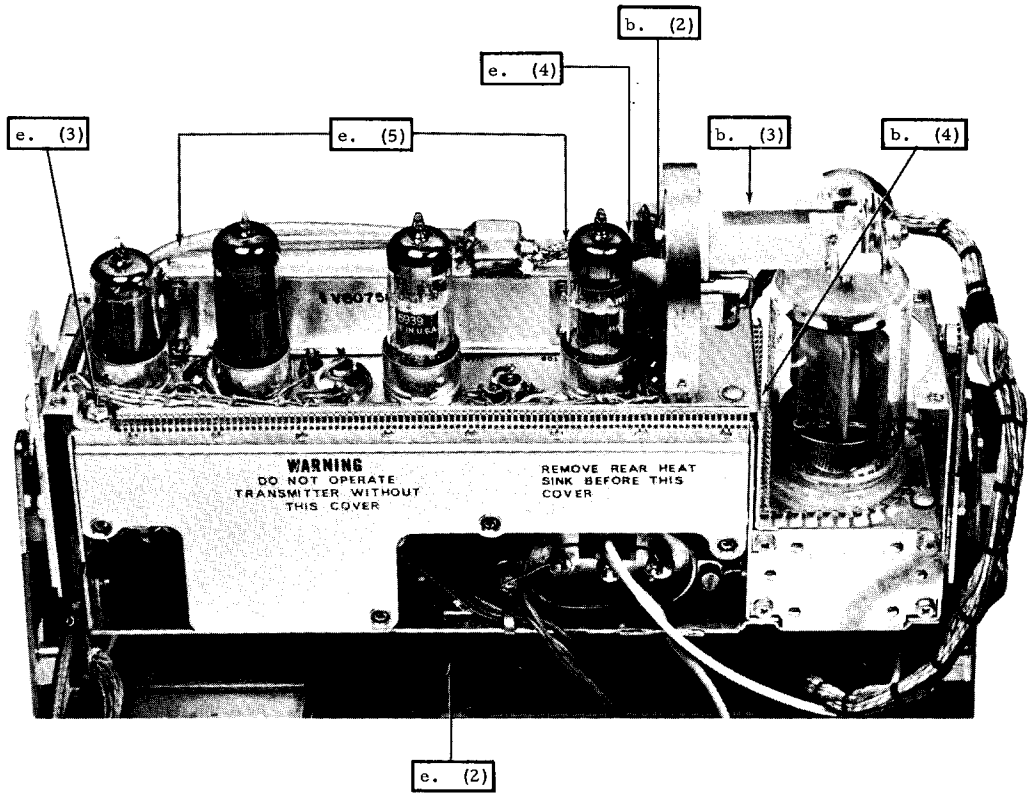

Figure 3.

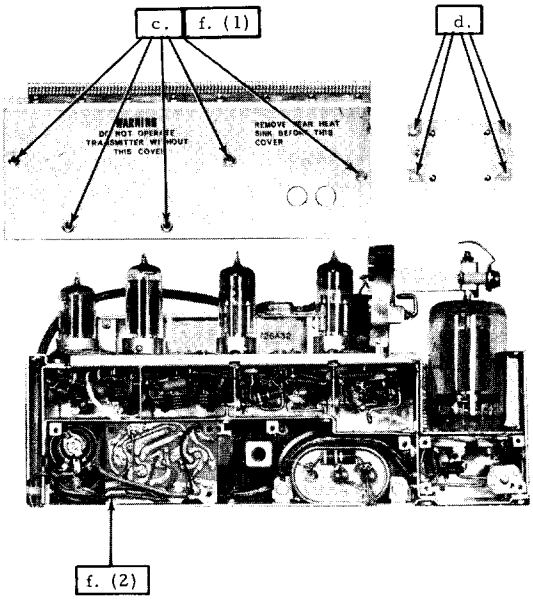

Figure 4.

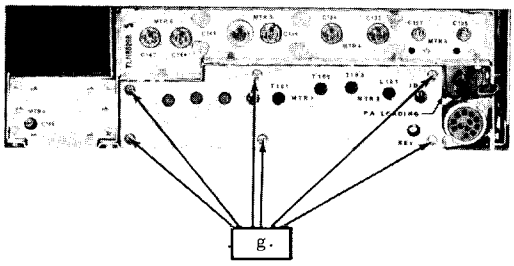

Figure 5.

1. DESCRIPTION

MODEL TABLE

MODEL SERIES	DESCRIPTION	CHANNEL SPACING
TRE1180AB	One-Frequency Carrier Squelch	25 kHz
TRE1180AD	One-Frequency Tone-Coded Squelch	25 kHz
TRE1180AF	Four-Frequency Carrier Squelch	25 kHz
TRE1180AH	Four-Frequency Tone-Coded Squelch	25 kHz

These receivers are fully transistorized, dual-conversion superheterodyne units that receive FM signals from one to four crystal-controlled frequencies in the 450-470 MHz range. Multi-frequency receivers are the same as one-frequency units except for additional first oscillators and control circuits. Only one frequency can be received at a time. The operating channel is selected by a frequency selector switch. Five watts of audio output to a 3.2-ohm speaker (with less than 5% distortion) is provided by a push-pull power output stage. A 12-pin metering receptacle is provided for test and alignment purposes.

2. CIRCUIT DESCRIPTION

a. RF Preselector

The rf signal received at the antenna is routed to the preselector stage via the antenna relay. The preselector has a flat acceptance bandwidth and a steep skirt response to provide rapid attenuation of signals outside the accepted bandwidth. Capacitive and magnetic coupling are used to couple the signal through the resonant cavity aperatures. The preselector contains six low-loss, highly selective, helical resonant cavities (L1 through L6).

b. First Oscillator-Multiplier

The first oscillator circuit may contain up to four channel elements. Oscillator selection is accomplished by grounding the appropriate circuit (F1, F2, F3 or F4) in the control head. On single-frequency units, the oscillator stage is permanently grounded and the control head does not contain a frequency selector switch.

The channel element is a factory-sealed, temperature-compensated, plug-in module with an oscillator using an unheated crystal in a Colpitts circuit. The output of the oscillator is tuned to the third harmonic by a double-tuned circuit (L14 and L15) on the multiplier board. A variable "warp" capacitor, mounted in the channel element base, is accessible through an opening in the circuit board for fine frequency adjustment.

The third harmonic of the crystal-frequency is applied to a 1st doubler circuit (Q5) producing an output of six times the crystal frequency. The second and third doublers (Q6 and Q7) raise the frequency to 24 times the crystal frequency prior to injection to the 1st mixer stage. Coils L14 and L15 are tuned to the third harmonic of the fundamental crystal frequency; L16 is tuned to six times the crystal frequency; L17 and L18 are tuned to 12 times the fundamental frequency; L19, L20, and L21 (hi-Q aperature tuned coils) are tuned to 24 times the crystal frequency.

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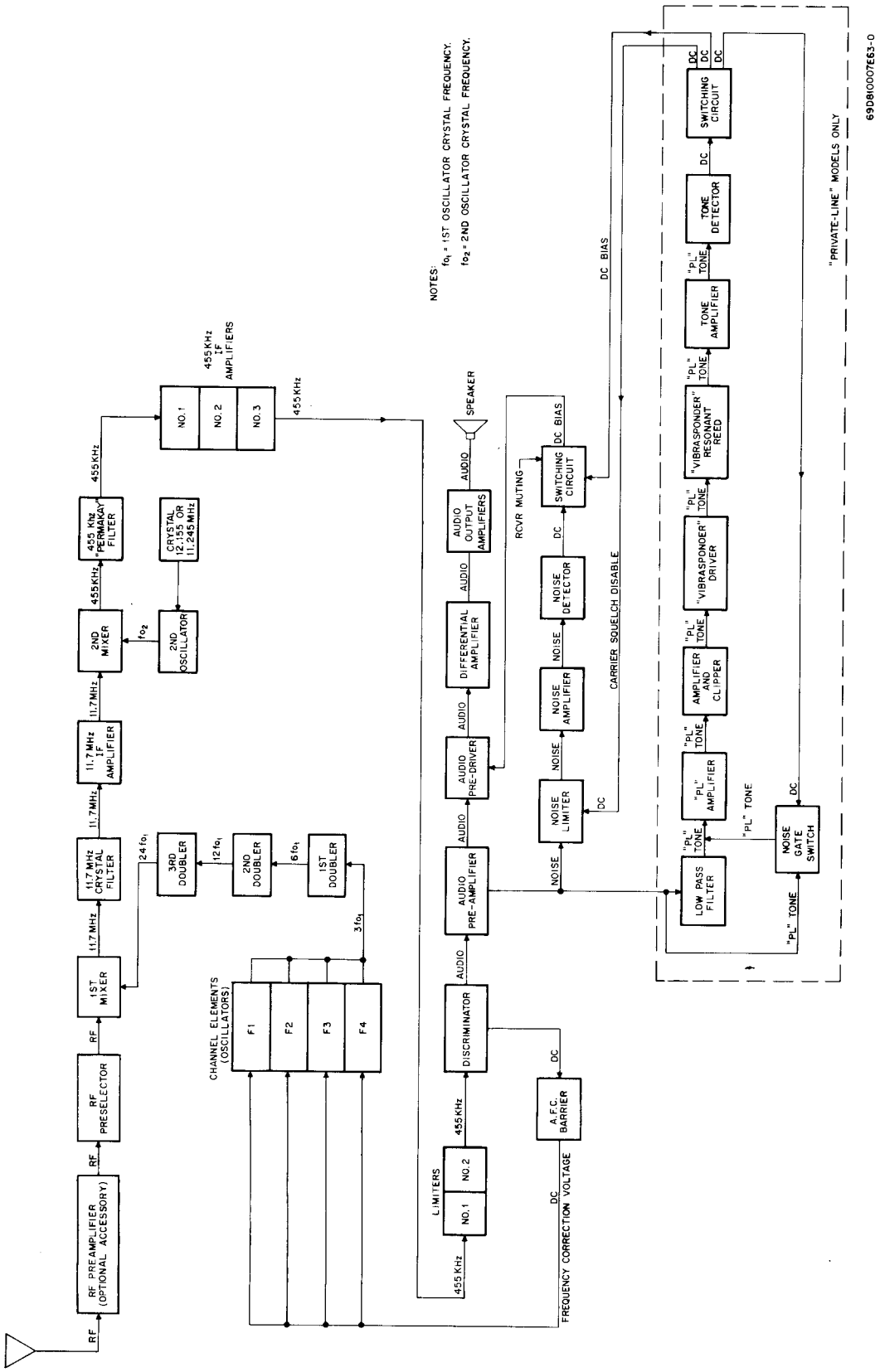


Figure 1.
Receiver Block Diagram

Oscillator noise and harmonics are attenuated by coils L19 through L21 before the injection signal is applied to the source lead of field-effect transistor Q1 (first mixer stage).

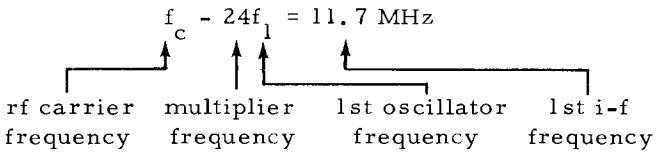
c. Voltage Regulator-Current Regulator

This stage provides a constant voltage and current input to the oscillator, multiplier and modulator circuits for high injection stability.

d. First Mixer

Signals from the rf preselector and multiplier circuits are applied to the first mixer transistor (Q1). This N-channel field-effect transistor functions as a depletion-mode device. The elements of the FET are: the gate (G) which controls the electrostatic field in the channel through which electrons must flow (similar to the grid of a vacuum tube); the source (S) which is similar to the cathode; and the drain (D) which is similar to the plate.

As the dc drain-source voltage is applied, current flows in the channel of Q1 and through resistor R1. The current flowing through resistor R1 develops a reverse bias voltage for Q1 between the source and gate elements. This reverse bias permits Q1 to operate below the "pinch off" current of the FET. In this square law operating region, heterodyne action occurs to produce an intermediate frequency (i-f) of 11.7 MHz.



e. First Intermediate Frequency (High IF) Circuit

The output from the 1st mixer (Q1) is coupled through a crystal filter to a common emitter high i-f amplifier circuit (Q2). Resonant circuit L8, two crystals (Y1 and Y2), and tuned transformer T1 are used in a crystal filter circuit. This provides highly selective filtering for high i-f interference rejection.

The output of the i-f amplifier is coupled to the base of the second mixer circuit (Q3) through a highly selective triple-tuned network consisting of T2, L10, and L11.

f. Second Oscillator

The second oscillator (Q4) provides the injection signal for the 2nd mixer and is controlled by an 11.245 or 12.155 MHz crystal (Y3).

g. Second Mixer

The second mixer circuit (Q3) heterodynes the second oscillator signal with the high i-f frequency to produce a difference frequency of 455 kHz. This difference frequency passes through a "Permakay" filter which rejects all other frequencies.

The second i-f frequency can be calculated as follows:

12.155 MHz (2nd osc. freq.)
-11.700 MHz (1st i-f freq.)
.455 MHz (455 kHz)

OR

11.700 MHz (1st i-f freq.)
-11.245 MHz (2nd osc. freq.)
.455 MHz (455 kHz)

h. 455 kHz "Permakay" Filter

Filter Z1, located between the output of the 2nd mixer stage (Q3) and the input to the 1st 455 kHz amplifier stage (Q301), is the major factor in determining the bandwidth and selectivity of the receiver. It greatly attenuates all signals below and above a predetermined bandpass. The filter is permanently sealed in polystyrene and is unconditionally guaranteed for the life of the receiver provided the seal is not broken and the housing is not tamped with.

i. 455 kHz IF Amplifier

The output of the 455 kHz filter is coupled to the base of the 1st 455 kHz amplifier (Q301). Three 455 kHz i-f amplifiers are used (Q301), Q302 and Q303), each with approximately 30 dB gain.

j. Limiter Stages

Two limiter stages (Q304 and Q305) are used to improve the signal-to-noise ratio. These stages remove amplitude variations from the received signal. The limiters are in full saturation at all times (weak signals, strong signals, or

receiver noise). When the 1st limiter (Q304) receives the negative alternation of the incoming signal, the base is driven negative with respect to the emitter; consequently, the base-emitter junction is reverse biased, causing the collector current to decrease. On the positive half of the incoming signal, the base-emitter junction is forward biased, causing the collector current to increase to maximum. The operation of the second limiter stage is essentially the same as the first limiter except for phase reversal. Q304 and Q305 operate between cut-off and saturation, removing amplitude variations from received signals.

k. Discriminator

The discriminator circuit translates frequency variations of the 455 kHz signal into audio information.

Operation of the circuit is dependent upon a 90° phase shift which occurs (at resonance) between the primary and secondary voltages of the tuned transformer (T3). As a signal is applied to the discriminator, the resonant circuit phase shift appears capacitive or inductive depending upon the frequency applied to diodes CR303 and CR304 (early versions used transistors Q306 and Q307 functioning as diodes). These diodes produce a null (zero volts) at the output of the discriminator at resonance.

An unmodulated input signal at exactly 455 kHz produces a null (zero volts) at the output of the discriminator. When modulation is applied, the i-f signal varies in frequency (at the audio rate) above and below 455 kHz. A positive or negative voltage is produced at the output of the discriminator for deviation above or below 455 kHz, resulting in an audio signal at that point (see Figure 2). The discriminator output is developed at the cathode of CR303 (collector of Q306) with respect to the cathode of CR304 (collector Q307) (ground). The audio signal is coupled from the output of the discriminator through filter choke L302 to the preamplifier on the audio & squelch circuit board.

l. Automatic Frequency Control (AFC)

The Automatic Frequency Control circuit (afc) provides automatic frequency adjustment to compensate for carrier frequency or receiver frequency drift.

When an off-frequency condition is detected by the discriminator, a dc error voltage is produced. This positive or negative error voltage is filtered by R329, R30, C326, C51 and C49. The filtered correction voltage is applied to the channel element to adjust the oscillator frequency in the direction of the received carrier frequency. A diode barrier circuit (CR4 and CR5) protects the receiver from being "pulled" onto the adjacent channel.

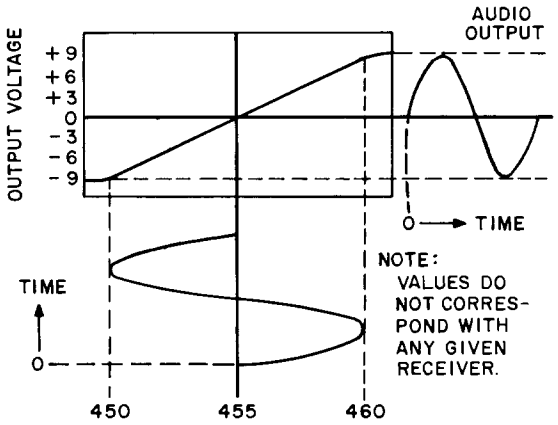


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Figure 2.

m. Audio Stages

The output of the discriminator is capacitively coupled to preamplifier stage Q341. This stage provides a 4 dB gain with a low output impedance. The collector output is applied to (1) the receiver volume and squelch controls and (2) the "Private-Line" decoder (PL models). In "Private-Line" models, the audio signal from the volume control is routed to a filter which removes the PL tone from the audio signal before it is applied to predriver stage Q342. In the unsquelched state, the stage is forward biased and in the squelched condition, a reverse bias exists between the emitter and the base. When a signal is received, Q342 is forward biased to allow signals to pass to differential drivers Q343 and Q344.

A differential amplifier with one transistor in a common base and another in a common emitter configuration is used. Common emitter stage Q343 drives common base amplifier Q344 in a push-pull operation.

The power amplifier (audio output) consists of a pair of transistors in a push-pull arrangement to provide 5 watts of audio power to a 3.2-ohm speaker.

n. Noise Actuated Squelch Circuit

The squelch circuit eliminates disturbing noise which would otherwise be heard at the

speaker during intervals between received messages. Refer to the Block Diagram of Figure 3. Noise from the audio preamplifier is applied to the noise limiter via the squelch control which is followed by a noise amplifier and a noise detector stage. The dc output of the noise detector controls a switching stage which turns the predriver stage on or off.

When a signal is received, the absence of noise causes the switching transistor (Q350) to stop conducting, which allows the predriver stage to conduct. The receiver squelch action occurs as a result of emitter-base bias of the predriver stage. Forward bias allows the audio signal to pass through the audio amplifier stages and the speaker (unsquelched).

The operation of switch transistor Q350 depends upon the base voltage. Noise coming from the squelch control provides forward bias for the switch transistor. In the absence of noise, switch Q350 does not conduct. When the switch transistor is not conducting, the current through R384 is small, as a result, the voltage appearing at the emitter of Q342 becomes more positive (higher than the base voltage); the transistor becomes forward biased and the stage operates normally (unsquelched).

Noise voltages normally present in the receiver have sufficient amplitude to drive the noise limiter stages to saturation and produce full conduction at the noise detector. Thus, squelch action is positive. Carrier squelch or noise-actuated squelch sensitivity is adjustable. The squelch control, located between the output of the audio preamplifier and the input to the noise limiter, determines the noise level into the limiter and the conduction level at the detector.

o. Tone-Coded Squelch Circuit

The "Private-Line" (PL) decoder circuit consists of a low-pass filter network, a high-gain amplifier, an amplifier/clipper, a "Vibrasponder" driver stage, a "Vibrasponder" resonant reed, an output amplifier, a detector, an output switch stage, and a noise gate switch.

The output from the audio preamplifier is connected to the low-pass filter network, which passes frequencies below 300 Hz. The low-frequency signals (PL tone) are amplified by Q751 and coupled to the input of the amplifier/clipper Q752. The output of the amplifier/clipper is applied to the "Vibrasponder" driver stage to drive the resonant reed. After being detected and amplified, the PL tone energizes the resonant reed. If a different tone is present, or if no tone is present, the reed will not respond due to its highly selective design. The output from the "Vibrasponder" driver is applied to the resonant reed coil through an emitter-follower circuit. The reed is permanently tuned and sealed at the factory.

The reed vibrates in response to the incoming tone signal. The vibrating reed produces a

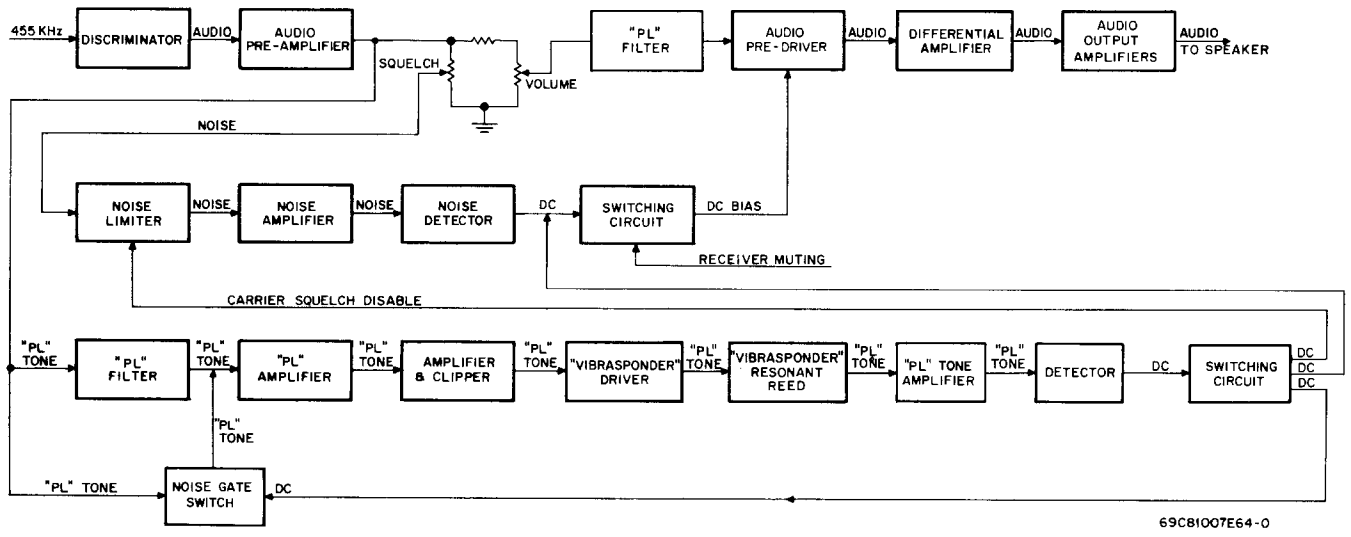


Figure 3.
Squelch Circuit Block Diagram

sinusoidal output which is amplified by Q754 and detected by Q755. The detected output is applied to the output switch (Q756) which provides a dc voltage that reverse biases the squelch switching transistor (Q350), turning if off.

The low-pass PL filter is paralleled by a high pass filter circuit to keep low frequency noise from activating the "Vibrasponder" resonant reed detector circuit. When the proper tone signal is received and the audio pre-driver stage is turned on, the high-pass path is shorted to ground through the noise switch (Q757).

In "Private-Line" operation, the squelch control is not used and the setting of it does not affect the "Private-Line" squelch circuit. With the PL selector switch in the ON position, only the tone-coded squelch circuit is in operation. When the carrier squelch circuit is disconnected from the audio preamplifier, the squelch switching transistor (Q350) receives its control voltages from the output switch (Q756). Switch Q350 is forward biased until a proper tone-coded signal is received. Switch Q756 then provides a positive voltage to Q350. This reverse biases Q350. With less current through the emitter resistor (R384), forward bias is applied to the pre-driver stage (Q342), allowing it to conduct and pass the audio signal to the speaker.

The PL squelch circuit is operative at all times. The PL switch on the control head actually switches the noise squelch circuit in or out. With the PL switch in the ON position, ground is applied through a resistor to the base of the switching transistor. The ground inhibits the noise-actuated squelch circuitry and the noise detector will not disable the switching transistor to permit audio to reach the speaker. Only an output from the "Private-Line" decoder will operate the switching transistor.

With the PL switch in the OFF position, ground is removed from the resistor permitting the switching transistor to operate from the noise-actuated or "Private-Line" tone-coded squelch circuits.

3. SERVICE AIDS

a. Improper Receiver Operation

(1) General

When the transmitter functions, but the receiver operates improperly or not at all, the trouble will normally be in the receiver or the antenna circuit. Malfunctions in the receiver can be localized by connecting a Motorola portable test set to the receiver metering receptacle and making stage measurements. The meter readings may be compared to the values listed in the charts, but preferable, a log of readings should be maintained for reference. Each new set of readings should then be compared to previous readings. An abrupt change in a meter reading indicates a circuit failure while a gradual change in a reading may indicate an impending failure which can be corrected before operation becomes marginal.

(2) Performance Checks

The following checks give an indication of overall receiver performance. The checks may be used in troubleshooting to determine the need for repairs or alignment and should always be performed upon completion of servicing to determine that proper operation of the receiver is fully restored.

Insert a carrier signal directly into the antenna input jack and make the following checks:

NOTE

If the signal is injected through a 6 dB pad, subtract 6 dB from the attenuator reading for the actual signal level.

(a) 20 dB quieting sensitivity: 0.5 microvolt or less. Set the PL switch to the OFF position. The remainder of the procedure is given in the RECEIVER ALIGNMENT PROCEDURE in this manual.

(b) "Private-Line" Squelch Sensitivity: 0.25 microvolt or less.

Set the PL switch to the ON position. Set the VOLUME control to midposition. Externally modulate the rf output of the signal generator with a "Private-Line" tone of the proper frequency to unsquelch the receiver at ±0.5 to 1 kHz deviation. The "Private-Line" tone can be generated by using a Motorola SLN6221A Transistorized "Private-Line" Tone Generator and the "Vibrasender" resonant reed from the power supply of the radio set or by using a Motorola S1067A Transistorized Audio Oscillator and adjusting it to the "Private-Line" tone frequency. The tone frequency to be used in indicated on the "Vibrasponder" resonant reed in the receiver. Inject a 1000 Hz tone at 0.4 volt rms into the audio board at the "input from the discriminator" point (GRN-RED lead from the discriminator). Set the signal generator output

level to zero and increase the level until the receiver unsquelches (tone is heard in the speaker). Make a reading from the attenuator of the signal generator. No more than 0.25 microvolt should be required to cause the tone to be heard.

(c) Squelch Threshold Sensitivity: 0.25 microvolt or less.

Set the PL switch to the OFF position. With no signal input, set the VOLUME control to midposition and the SQUELCH control so the noise just quiets (squelch threshold). Modulate the rf output of the signal generator with a 1000 Hz tone to produce a deviation of ±3.3 kHz. Set the signal generator output to zero and increase the level until the tone is heard in the speaker. Make a reading from the attenuator of the signal generator. No more than 0.25 microvolt should be required to cause the tone.

(d) Full Squelch Sensitivity: 1.2 microvolts or less.

Set the SQUELCH control fully clockwise and apply an input signal as in the previous step. No more than 1.2 microvolts should be required to produce the tone.

(3) Test Set Readings

Connect a Motorola Portable Test Set and TKN6025A Adapter Cable to the receiver metering receptacle and set the function selector switch to the RCVR position. With no signal input, typical readings are as shown in Table 1.

TABLE 1.

Receiver Metering Readings (No Signal Applied)

Meter Position	Stage	Typical Reading (Microamps)
1	455 kHz IF Amp (Q302)	2.0
2	455 kHz IF Amp (Q303)	23
4	Discriminator Output	±2
5	Base of 1st Dblr. (Q5)	25
6	Base of 2nd Dblr. (Q6)	18

NOTE

On multi-frequency models, check the test set readings on each frequency.

(4) Oscillator Checks

(a) 1st Oscillator

1. Connect a Motorola Portable Test Set to the receiver metering receptacle. Check position 5 (oscillator activity). If there is no reading of a low reading (18 uA minimum reading) proceed to step 2. If the reading is normal proceed to step 3.

2. Measure the rf voltage with a Motorola Solid-State DC Multimeter with rf probe at pin 1 of the channel element. A normal reading of approximately 1.7 volts rf should be obtained. Make voltage and resistance checks to locate the defective component.

3. Measure the rf voltage with a Motorola Solid-Stage DC Multimeter with rf probe at the source of the 1st mixer Q1. A reading of at least 0.3 volt rf should be obtained. Make voltage and resistance checks to locate the defective component.

(b) 2nd Oscillator

Measure the rf voltage with a Motorola Transistorized DC Multimeter at the emitter of the 2nd oscillator (Q4) or the base of the 2nd mixer (Q3). A reading of 0.10 volt rf should be obtained. Make voltage and resistance checks to locate the defective component.

(5) Stage Gain Measurements

Simple troubleshooting procedures such as transistor substitution into a suspected stage may tell little about the source of trouble. Because transistors are current devices with negative temperature coefficients, damage can occur when soldering or unsoldering. A different approach to troubleshooting transistorized circuits must be used. The defective section must first be isolated through stage gain measurement, before any attempt is made to locate and replace the defective component. When the defective section has been isolated, the defective stage can be determined by voltage and resistance checks which can also isolate the defective component.

A typical stage-by-stage checkout follows. Individual stage gains may vary somewhat from the typical values given if overall gain is maintained.

The amplifiers must be kept out of saturation for a true presentation of gain. Do not use signal levels higher than indicated in the following procedures.

(a) RF Deck

1. Connect the portable test set to the receiver metering receptacle, place the function selector in the RCVR position, and place the selector switch in position.

2. Using the FM signal generator and TEK-10 RF Probe, inject a carrier frequency signal at the rf input receptacle of the receiver chassis. Adjust the signal generator output level for a reading of 10 microamperes on the test set meter. Note the signal level in dB on the attenuator of the signal generator.

3. Move the TEK-10 RF Probe to the output of the rf deck (drain of Q1) and inject a carrier frequency signal. Increase the output level of the signal generator until the test set meter again reads 10 uA. Note the attenuator settings in dB.

4. The apparent gain should be at least 55 dB; that is the reading in step 3. should be at least 55 dB greater than the reading in step 2.

NOTE

If a reading cannot be obtained on the test set meter, inject a 455 kHz signal into the 3rd 455 kHz amplifier so that a reading is obtained and into each stage progressing toward the antenna until the defective stage is found.

(b) 11.7 MHz IF Circuit

1. Connect the signal generator to the rf input receptacle of the receiver chassis. Set the signal generator to the receiver frequency.

2. Place the TEK-7A RF/DC Alignment Meter switch in the .5 V RF position and the probe RF/DC switch in the RF position.

OR

Use a Motorola Solid-State DC Multimeter with an rf probe and place the range selector switch in the .3 VOLT position.

3. Place the rf probe of the meter at the input to the 11.7 MHz i-f circuit board (WHT lead to L8) and adjust the signal generator output level for an indication of 5 uA (.05 volt) on the alignment meter, or 0.3 volt if a dc multimeter is used. Note the setting of the attenuator in dB on the signal generator.

4. Move the rf probe of the meter to the output of the 11.7 MHz i-f circuit board (BRN) lead from collector of Q3 and again adjust the signal generator for an indication of 5 uA on the alignment meter, or 0.3 volt on the multimeter. Again note the setting of the attenuator in dB.

5. The gain should be at least 16 dB; that is the reading in step 3. should be at least 16 dB greater than the reading in step 4. If the gain is low, the following steps may be performed to further isolate the trouble.

6. Using the same procedure that was used in steps 1. through 4. move the rf probe to each of the following points and readjust the output level of the signal generator for an alignment meter indication of 5 uA or multimeter indication of 0.3 volt at each point. Take readings from the attenuator of the signal generator.

Point of Measurement	Typical Gain or Loss
Base of 11.7 MHz IF Amplifier Q2	12 dB less than input to circuit board
Collector of 11.7 MHz IF Amplifier Q2	8 dB greater than base of Q2
Collector of 2nd Mixer Q3	20 dB greater than collector of Q2

(c) 455 kHz "Permakay" Filter

1. Set up the signal generator and the alignment meter or dc multimeter as described for the 11.7 MHz IF Circuit in the preceding paragraph.

2. Place the rf probe at the input to the 455 kHz i-f filter (BRN lead to the i-f circuit board) and adjust the signal generator level for an indication of 5 uA on the alignment meter or 0.3 volt on the dc multimeter. Note the setting of the attenuator in dB.

3. Move the rf probe of the meter to the output of the 455 kHz i-f filter and readjust the signal generator so that the meter gives the same indication as in step 2. Again note the setting of the attenuator in dB.

4. The gain should be at least 15 dB; that is the reading in step 2. should be at least 15 dB greater than the reading in

step 3. If the gain is abnormally low, the filter is defective.

(d) 455 kHz IF Amplifiers 1 and 2

1. Leave the signal generator connected to the rf input receptacle of the receiver chassis and adjusted to the receiver carrier frequency.

2. If the TEK-7A RF/DC Alignment Meter is used, set the range selector switch to the 5 V RF position and the switch on the probe to the RF position. If the Solid-State DC Multimeter and rf probe are used, set the range selector switch to the 1 VOLT position.

3. Place the rf probe of the meter at the input to the 455 kHz i-f amplifier circuit board (BRN lead at the base of Q301) and adjust the level of the signal generator for 5 uA (0.5 volt) on the alignment meter or 0.5 volt on the multimeter. Note the setting of the attenuator in dB.

4. Move the rf probe of the meter to the base of 455 kHz i-f amplifier #3 (Q303) and readjust the signal generator level so that the meter gives the same indication as in the preceding step.

5. The gain should be at least 53 dB; that is, the reading in step 3. should be at least 53 dB greater than the reading in step 4. If the gain is low, the individual gain of each stage may be checked as given in the following step.

6. Move the rf probe to the base of 455 kHz i-f amplifier #2 Q302 and readjust the signal generator for the same indication on the meter that was obtained in steps 3. and 4. The gain of Q301 should be 26 dB; that is, the reading should be 28 dB less than the reading in step 3. The gain of Q302 should be 27 dB, that is, the reading for this step should be 27 dB greater than the reading in step 4.

(e) 455 kHz IF Amplifier 3 and Limiters

Due to the saturation condition of the remaining 455 kHz i-f stages, further stage gain measurements are not applicable. Measurements may be made with a Motorola Solid-State AC Voltmeter or equivalent. Typical readings with no receiver signal input are as follows:

3rd 455 kHz i-f amplifier collector (Q303)	1.5 V ac
1st 455 kHz i-f limiter collector (Q304)	1.6 V ac
2nd 455 kHz i-f limiter collector (Q305)	5.5 V ac

(f) Audio Circuit Checks

1. Connect the TEK-11 Audio Adapter between the portable test set and the TKN6025A Adapter Cable, then connect the adapter cable to the receiver metering receptacle. Place the function selector switch in the RCVR position, and the selector switch in position 11.

2. Set the VOLUME control on the control unit to minimum (full counterclockwise) and the PL switch to the OFF position ("Private-Line" Models).

3. Inject a 1000 Hz tone from a Motorola TEK-1A Transistorized Tone Generator at the "input from discriminator" lead to the audio and squelch circuit board (GRN-RED lead from 455 kHz i-f amplifier circuit board). Set the tone generator for 0.4 volt rms output.

4. Inject a carrier signal from the FM signal generator into the receiver antenna receptacle and set "on-frequency". Set the attenuator at 1000 microvolts. (This step quiets the noise for audio measurement only.)

5. Turn the VOLUME control clockwise until the test set meter reads at least 30 uA (5 watts of audio power). The OPEN-SPKR-LOAD switch on the test set must be in the LOAD position and the TEK-11 Audio Adapter must be used to prevent driving the meter off-scale.

6. If 5 watts of audio output cannot be obtained, signal level readings may be taken at each stage of the audio and squelch circuit to isolate the trouble to a defective stage. Readings may be taken with a Motorola Solid-State AC Voltmeter, or equivalent, with a 1000 Hz tone input at 0.4 volt as described in step 3. With this input, and maximum VOLUME setting, the minimum signal level at each stage in the circuit is shown in Table 2.

NOTE

Normally, signal levels will be significantly higher than the minimum levels shown. Final audio output will often be over 8 watts.

TABLE 2.
TYPICAL RECEIVER AUDIO READINGS

METERING POINT	TYPICAL READING*
Base of preamplifier Q341	100 mV
Collector of preamplifier Q341	700 mV
Center arm of volume control (GRN lead connections of audio and squelch circuit board)	320 mV
Base of pre-driver Q342	100 mV
Collector of pre-driver Q342	700 mV
Base of differential amplifier Q343	100 mV
Base of differential amplifier Q344	56 mV
Collector of differential amplifiers Q343, Q344	3 V (each)
Base of output amplifiers Q345, Q346 (WHT-BLU and WHT-BRN connections)	0.55 V (each)
Collector of output amplifiers Q345, Q346	10 V (each)
Across speaker or secondary of T351	5.0 V

*Signal injection 0.4 V @ 1000 Hz at input to audio board.
Volume control setting @ maximum.
Receiver in full squelch and 1000 microvolts unmodulated signal.

TABLE 3.
TYPICAL CARRIER SQUELCH CIRCUIT READINGS

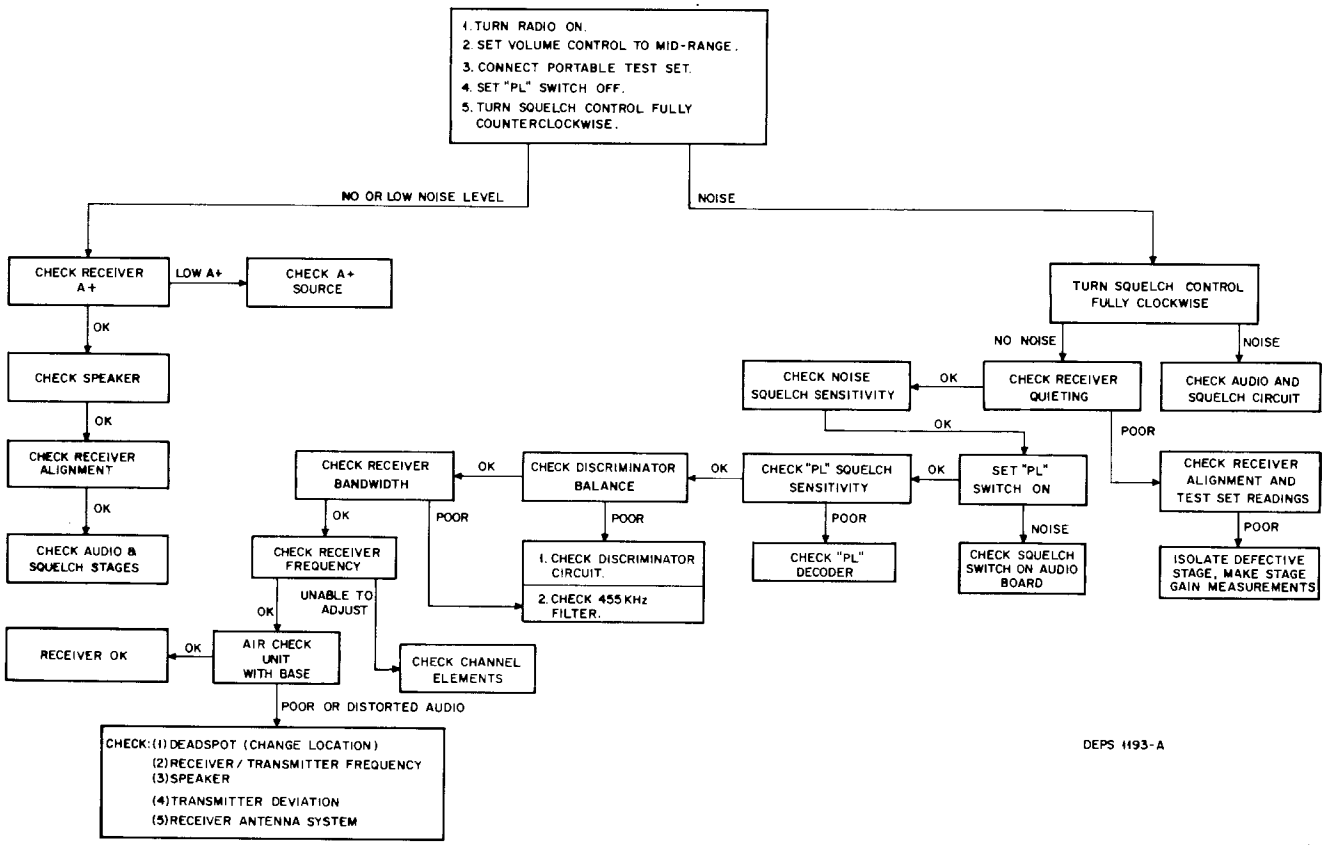
METERING POINT	TYPICAL READING
Input to audio board (GRN-RED lead from 455 kHz i-f board)	0.5 to 1 V ac
Base of limiter Q347	0.35 to 0.70 V ac
Collector of limiter Q347	3 V ac
Base of noise amplifier Q348	0.6 V ac
Collector of noise amplifier Q348	2.8 V ac
Base of noise detector Q349	0.7 V USQ -- 1.3 V FSQ
Collector of noise detector (Q349)	10.5 V USQ -- 4.8 V FSQ
Base of switch Q350	10.5 V USQ -- 4.9 V FSQ
Emitter of switch Q350	7.9 V USQ -- 5.6 V FSQ

USQ = Receiver Unsquelched.
FSQ = Receiver Fully Squelched.

(g) Squelch Circuit Checks

If a "Private-Line" tone-coded squelch model is being checked, set the PL switch to OFF. (Additional checks for "Private-Line" tone-coded squelch models are given under "PRIVATE-LINE" MAINTENANCE.)

On all sets, turn the SQUELCH control fully clockwise to completely squelch the receiver. With no rf signal input, make the measurements as listed in Table 3. to determine whether or not the stages are operating properly and to isolate any malfunction in the circuit. If the receiver does not have sufficient noise to obtain the first reading, it may be necessary to connect the antenna to the receiver. Make the ac voltage measurements with a Motorola Solid-State AC Voltmeter, or equivalent, and dc voltage measurements with a Motorola Solid-State DC Multimeter or equivalent.



RECEIVER TROUBLESHOOTING CHART

(6) Receiver Balance

Check receiver balance. Shift the signal generator frequency above and below the carrier frequency while monitoring the portable test set meter on position 4. The meter should swing equal distances above and below the zero center reading for equal shifts in frequency.

(7) Receiver Audio

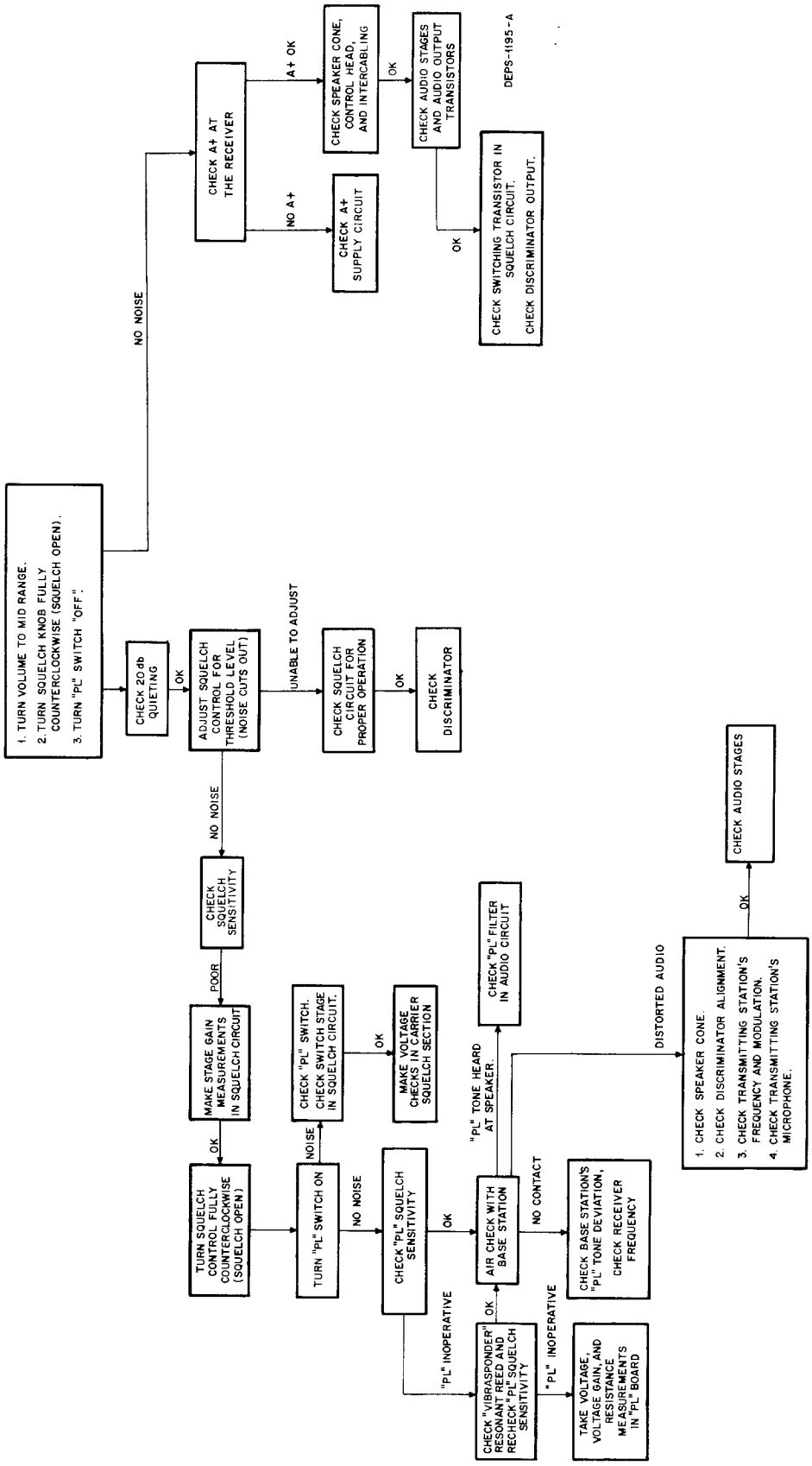
Check the receiver audio section. With the VOLUME control at maximum and the carrier signal modulated with 1000 Hz tone at 2/3 rated system deviation (3.3 kHz), there should be at least 5 watts audio output (5 volts ac across the speaker).

Individual stages can be checked by injecting an audio signal and measuring signal voltages at each stage. Set the receiver VOLUME control to maximum and the SQUELCH control fully counterclockwise (unsquelched). On "Private-Line" tone-coded squelch models, also set the PL switch to OFF. Inject a 1000 Hz tone at 0.4 volt rms into the audio board (input from discriminator). The Motorola TEK-1A Transistorized Tone Generator is ideal for generating this tone.

b. Removal of Circuit Boards

Complete removal of the printed circuit boards for access to components is not always necessary. For instance, the audio board in the receiver may be partially disconnected and folded out.

Figures 4 through 7 give procedures for access to components on the receiver circuit boards. Observe standard servicing practices such as tagging of leads and identification of connecting points. Refer to the schematic diagram and circuit board details for lead identification and routing. For access to all receiver circuit boards mounted on the top side of the radio set, remove the receiver cover shield. Six screws mount this shield.



AUDIO AND SQUELCH CIRCUIT TROUBLESHOOTING CHART

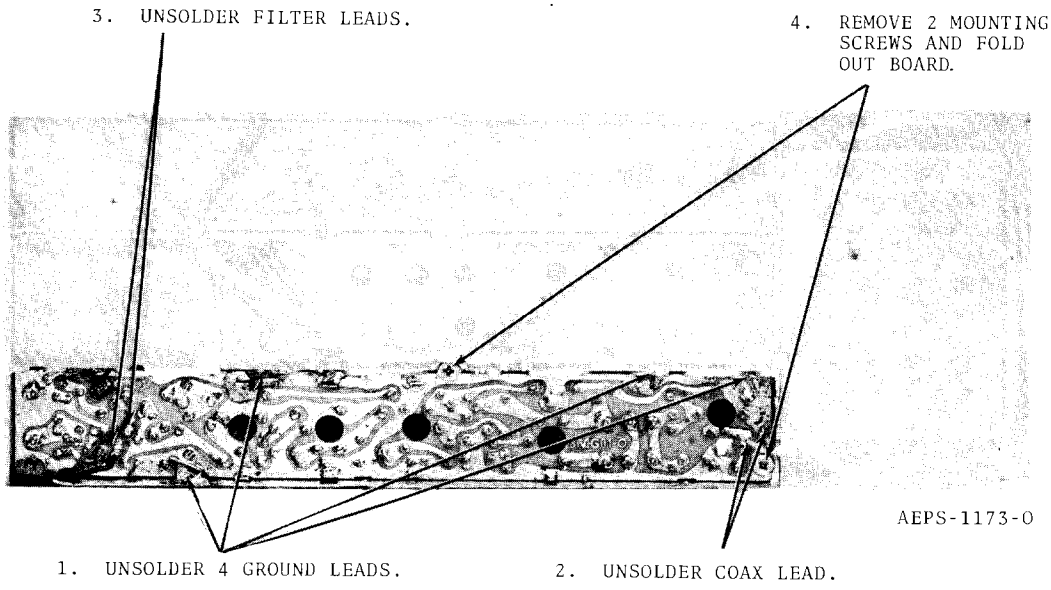


Figure 4.
Access to 11.7 MHz IF & 2nd Oscillator Board

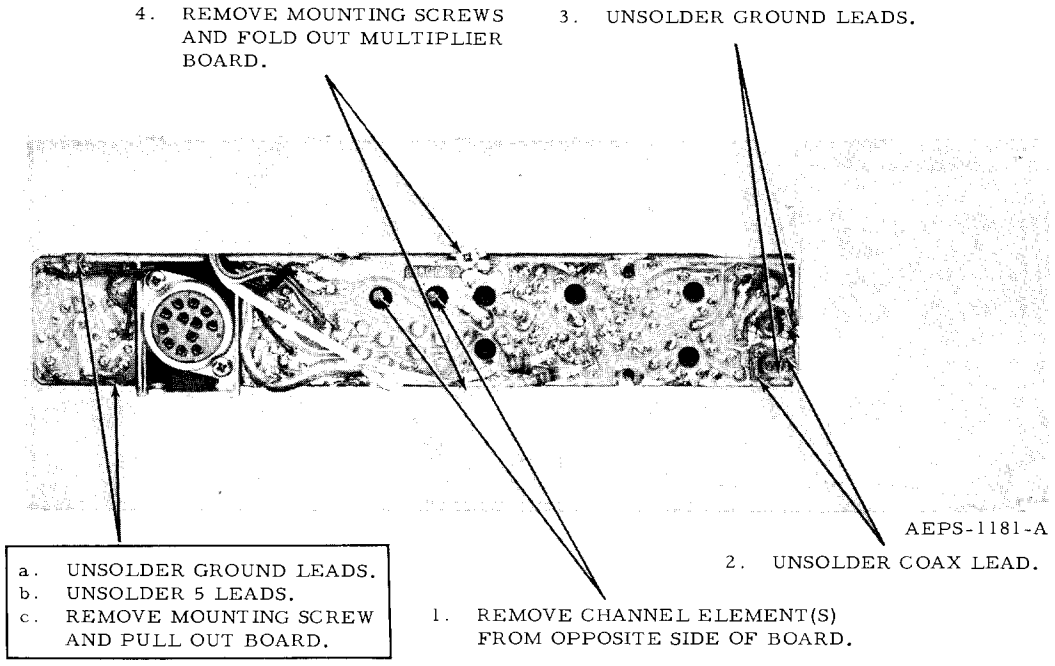


Figure 5.
Access to Multiplier and Regulator Boards

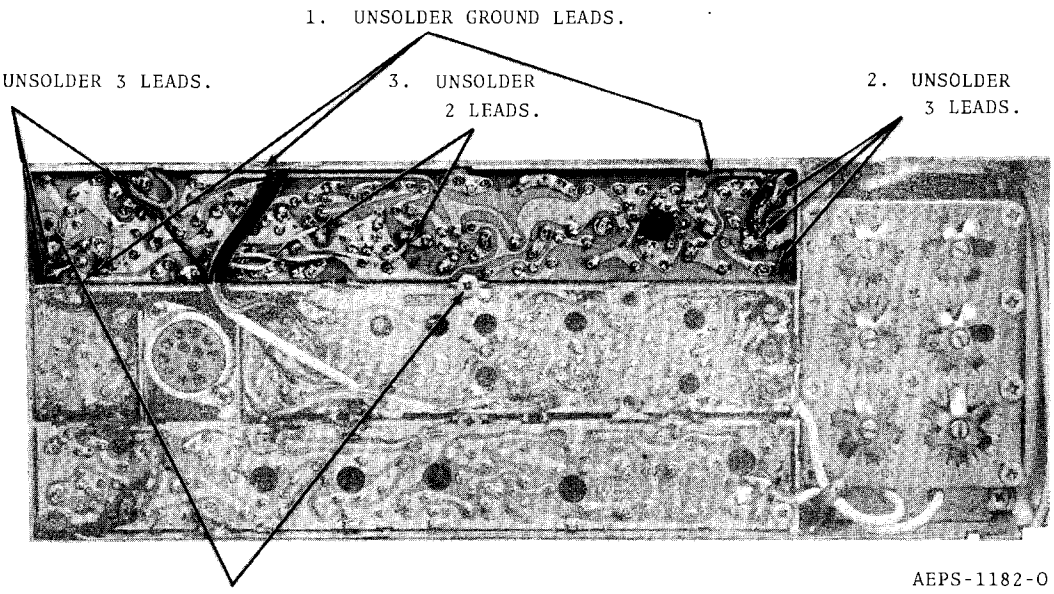


Figure 6.
Access to 455 kHz IF Circuit Board

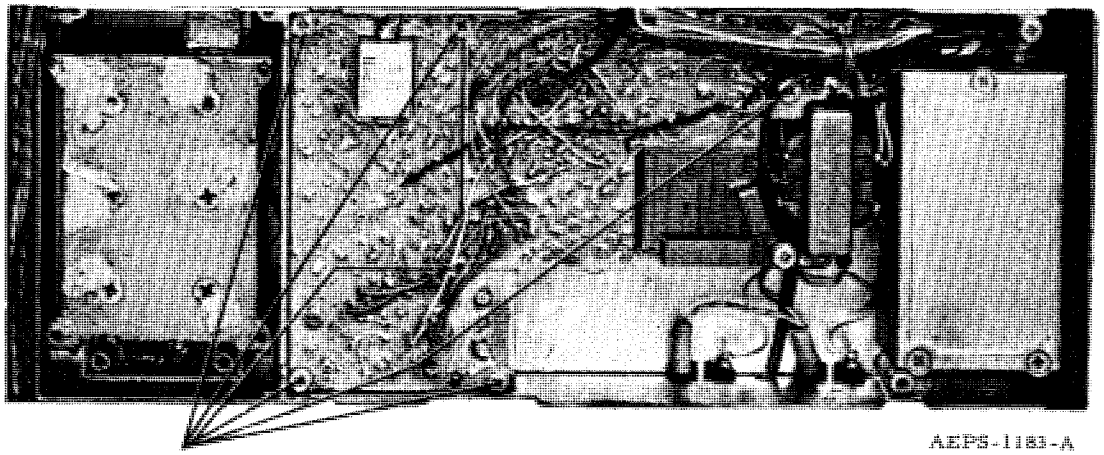


Figure 7.
Access to Audio & Squelch and "Private-Line" Decoder Circuit Board

CHASSIS ASSEMBLY

MODEL TLN8676A

1. INTRODUCTION

The Consolette base station chassis is the basic framework for mounting of the power supply, the "PL" tone generator, the transmitter channel element board and the control panel. This chassis assembly provides the swivel brackets for mounting the receiver and transmitter as well as mounting provisions for miscellaneous power supply components, control panel components and terminal boards for intercabling purposes. This section of the manual describes the power supply, "PL" tone generator and the control panel. (Operation of the transmitter channel element circuitry is described in the TRANSMITTER section of this manual; see Figure 2 for location of the channel element board.)

2. POWER SUPPLY

a. Description

The power supply provides all voltages required for the operation of the base station. In addition, it contains the majority of the base station intercabling.

The power supply is completely solid-state and provides extreme reliability and stability. It provides B+, B++, -24.5, +13.8 (A++) and +13.2 (A+) volts dc for operation of the transmitter, receiver, control circuitry, and accessories. The power supply also provides 12.6 volts ac for the transmitter filaments.

b. Circuit Theory

(1) General

Power transformer T201 is the source for all voltages developed in the power supply. Secondary winding A is the source for the transmitter B+ and B++ voltages, respectively. The B+ and B++ outputs differ in the high- and low-power models (30- and 15-watt models, respectively) and are derived from different secondary winding A taps. These tap connections are made at the factory and are shown in the following table.

Application	B+ Voltage		B++ Voltage	Power Amplifier Filter Input Power
	Tap On Secondary A	Output Voltage	Output Voltage	
15 Watt Stations	5, 8 and 9 (Standby)	255	510	60 W
	4, 7 and 9 (Transmit)	260	400	
30 Watt Stations	5, 8 and 9 (Standby)	255	510	120 W
	3, 6 and 9 (Transmit)	260	630	

(2) Low Voltage Power

When 117 Vac is applied to the primary of T201, the voltage from secondary winding C is applied to two independent full-wave rectifiers combined in a bridge configuration. One rectifier, consisting of CR209 and CR211, supplies -35 Vdc to series regulator Q201 after being filtered by capacitor C208. Zener diode CR213 establishes a reference voltage at the base of Q201, the -24 volt regulator. An increase or decrease in line voltage causes a corresponding increase or decrease in the voltage drop across the collector-emitter junction of transistor Q201. This action maintains the output voltage at a constant level. The regulated output voltage is taken at the emitter of Q201 and

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applied to a divider network consisting of R220, R221 and R222. Three negative voltages are supplied in this power supply, however, only the -17 and -6 V dc outputs are used. The -24 V dc output is not used in this application.

The second rectifier, consisting of CR210 and CR212 supplies +35 Vdc which is filtered by C209A and applied to series regulators Q202, Q203 and Q204. Transistor Q205 provides regulation of both A++ and A+ output voltages as follows:

If the line voltage increases, the dc output voltage of the power supply increases. The increase in output voltage increases the bias voltage on Q205 which causes the current through the transistor to increase. The increase in conduction of Q205 decreases the bias to Q204 which decreases its emitter current and subsequently the base current of Q203. Less base current in Q203 causes an increase in the collector-to-emitter voltage across Q203 and Q202 which decreases the output voltages proportionately. A decrease in line voltage will have the opposite effect. Diode CR214 provides compensation for any change in the base-to-emitter voltage of transistor Q205 with temperature.

(3) Filament Voltages

Filament voltage of 12.6 V ac is supplied to the transmitter from winding B of T201. One side of the winding is grounded on the transmitter chassis.

(4) High Voltage Supply

When 117 V ac is applied to T201, the output of secondary winding A is applied to the bridge rectifier consisting of CR201, CR202, CR203, CR204, CR205, CR206, CR207 and CR208. The output voltage depends on the taps selected as shown on the application table in preceding paragraph (1). Tap selection is accomplished when the transmit/receive relay is energized. This action raises the B+ and B++ voltages to their normal values for transmitter operation. B++ is taken at the output of the bridge rectifier and applied to the top stack (L201, C201 and C204) of the pi filter. B+ is taken at the center tap of T201 through relay K201 and applied to the bottom stack of the pi filter (L202, C202A, C202B and C203). The B++ is applied to the power amplifier plate and the B+ is applied to the power amplifier tube screen and driver plates.

c. Troubleshooting

Use standard troubleshooting techniques to isolate a power supply malfunction to a particular stage. When an inoperative stage has been located, compare the voltage readings to those shown on the power supply schematic diagram and in the troubleshooting chart to determine the faulty component. Refer to Figures 1, 2 and 3 for component location.

The Motorola Transistorized DC Multimeter and the Motorola T1014B Precision Oscilloscope are recommended for troubleshooting this equipment.

TROUBLESHOOTING CHART

SYMPTOM	PROCEDURE
No output from power supply	Check F201
No B++	1. Check F202 (15 W models only) 2. Check F201 3. Check CR201 and CR208 4. If B++ is low, check dc resistance of L201
No B+	1. Check F202 (Except 15 W models) 2. Check CR201 and CR208 3. If B+ is low, check dc resistance of L202
No -17 or -6 V outputs	1. Check Q201 emitter, base and collector voltages 2. Check F203 3. Check CR209 and CR211
-24 V line is less than -22 V or greater than -27 V	1. Check collector-to-emitter voltage of Q201 2. Check CR209 and CR211 3. Check CR213 anode and cathode voltage
A+ or A++ low or high	1. Readjust R231 2. Check Q205 collector voltage 3. Check Q202, Q203 and Q204 voltages 4. Check for external short circuit
No 13.8 V output (A++)	1. Check F204 2. Check CR210 and CR212 3. Check Q203, Q204 and Q205 voltages 4. Check for external short circuit
No 13.2 V output (A+)	1. Check F204 2. Check voltages on Q202 emitter, base and collector 3. Check A++ 13.8 V output 4. Check for external short circuit

3. "PRIVATE-LINE" TONE GENERATOR

a. Description

The "PL" tone generator consists of a transistorized two-stage oscillator and "reverse-burst" switching circuitry. The frequency determining element of the oscillator is a Motorola "Vibrasender" resonant reed (an electro-mechanical equivalent of a parallel-tuned high-Q tank circuit). The oscillator operates continuously when the radio set is turned on. It is located on the bottom side of the chassis as shown in Figure 3.

b. Circuit Theory

The oscillator circuit is made up of Q704, Q705, the "Vibrasender" resonant reed and the bias circuitry. The tone output is taken from the collector of Q705 or from resistor R724 in the emitter circuit of Q705. The selection of these two paths is determined by diodes CR710 and CR711. When the transmitter is keyed, the push-to-talk lead is connected to ground. The diode bridge (comprised of CR701, CR702, CR703 and CR704) causes Q701 to turn on. When this happens, CR710 becomes reverse biased and CR709 is forward biased through R728, R730 and R731. The tone oscillator output is now taken from R724. When the push-to-talk button is released, Q701 is turned off and CR710 is now forward biased through R725, and R729. Diode CR709 becomes reverse biased and the tone output is now taken from the collector of Q705. The 180° phase shift between the two tone paths gives a "reverse-burst" of tone just after the push-to-talk button is released. This tone prevents "squelch tail" from occurring in the receiver by quickly damping the "Vibrasponder" resonant reed. Even though the push-to-talk button is released, the transmitter remains "on" for approximately 150 milliseconds so that the "reverse-burst" of tone may be transmitted. This delay is accomplished by Q702 and Q703 which comprise the "reverse-burst" switching circuitry. When the transmitter is keyed, Q701 and Q703 are immediately turned on. Q703 supplies current to the transmit-receive relay which turns on the power supply. When the push-to-talk button is released, Q701 and Q702 are turned off but Q702 turns on again after capacitor C701 is discahrged through R704 and R705. It should be noted that during the discharge time (approximately 150 milliseconds) Q702 is off and Q703 is on. Finally, as Q702 is turned on, Q703 is turned off. This action removes the voltage from the relay which turns off the power supply and the transmitter.

4. CONTROL PANEL

a. Description

The control panel provides all controls required for operation of local and extended local control base stations.

A basic panel consists of the following controls:

Volume Control/On-Off Switch
Squelch Control
Power On-Off Indicator
Transmit Indicator
Frequency Select Switch (Multiple-Frequency Models Only)
"Private-Line" Disable Switch ("Private-Line" Models Only)

A number of optional "add-to" items are available for these control units. Refer to the DESCRIPTION section of this manual for a listing of these items.

b. Circuit Theory

(1) Power On-Off

When switch S503 (part of the volume control) is turned on, 117 volts ac is applied to the power supply. At the same time, the power on indicator lights.

The receiver is placed in operation immediately upon application of primary voltage to the power supply. The transmitter remains off until the microphone push-to-talk switch is pressed.

(2) Volume and Squelch Controls

These controls perform the functions standard to communications receivers, that is, controlling receiver volume and noise level.

(3) Push-To-Talk Operation

When the P-T-T switch on the microphone is pressed, a ground is applied to the transmit/receive relay K201. This action causes K201 to energize to the transmit condition.

(4) Transmitter Turn-Off

When the microphone P-T-T switch is released, the ground is removed from transmit/receive relay K201, the relay de-energizes and all

BASIC JUMPER CONNECTIONS FOR FOUR-FREQUENCY RADIO SETS

NO. OF FREQS.		JUMPERS				JUMPERS				RCVR CHAN ELEMENT LOCATION				XMTR CHAN ELEMENT LOCATION			
XMIT	RCV	R1	R2	R3	R4	T1	T2	T3	T4	1	2	3	4	1	2	3	4
1	4	○	○	○	○	●	●	●	●	X	X	X	X	X			
2	4	○	○	○	○	○	●	●	●	X	X	X	X	X	X		
3	4	○	○	○	○	○	○	●	●	X	X	X	X	X	X	X	
4	4	○	○	○	○	○	○	○	○	X	X	X	X	X	X	X	X
1	3	○	○	●	●	●	●	●	●	X	X	X		X			
2	3	○	○	●	●	○	●	●	●	X	X	X		X	X		
3	3	○	○	●	●	○	○	●	●	X	X	X		X	X	X	
4	3	○	○	●	●	○	○	○	○	X	X	X		X	X	X	X
1	2	○	●	●	●	●	●	●	●	X	X			X			
2	2	○	●	●	●	○	●	●	●	X	X			X	X		
3	2	○	●	●	●	○	○	●	●	X	X			X	X	X	
4	2	○	●	●	●	○	○	○	○	X	X			X	X	X	X
1	1	●	●	●	●	●	●	●	●	X				X			
2	1	●	●	●	●	○	●	●	●	X				X	X		
3	1	●	●	●	●	○	○	●	●	X				X	X	X	
4	1	●	●	●	●	○	○	○	○	X				X	X	X	X

NOTES:

1. R1, R2, R3, R4, T1, T2, T3 AND T4 ARE THE LOCATIONS OF JUMPER POINTS.
2. WHEN CHANGING CHANNEL ELEMENT COMPLEMENT, JUMPERS MUST BE ADDED OR REMOVED FROM FREQUENCY SELECTOR SWITCH. THE DASHED LINES IN THE PRECEDING TABLE INDICATE REMOVED JUMPERS, AND THE SOLID LINES INDICATE JUMPERS THAT MUST BE PRESENT FOR THE SPECIFIC CHANNEL ELEMENT COMPLEMENTS.

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circuits revert to their standby condition (on "Private-Line" models, the transmit/receive relay is controlled by transistor Q703 of the "Private-Line" tone generator).

(5) "Private-Line" Disable Switch

This switch is provided to disable the receiver "Private-Line" squelch circuit. In the "PL" OFF position, all on-frequency signals will be heard. When placed in the "PL" ON position, only signals coded with the proper tone will be heard.

Transistor Q501 is normally conducting with forward bias provided by a positive voltage applied through R501 and R502. When the manual switch is placed in the "PL" OFF position, a ground is applied to the base of Q501, cutting it off. Its collector becomes an open circuit which de-activates the "Private-Line" squelch circuit and allows all on-frequency signals to be heard.

(6) Non-Standard Frequency Selection (Multiple-Frequency Models)

NOTE

FCC approval must be obtained before adding or changing frequencies.

Radio sets having less than four transmitting and/or receiving frequencies are possible by using less than the full complement of channel elements. For example, a radio set may have two transmitting frequencies and four receiving frequencies (C2-R4) operation). On such radio sets, jumpers are added at appropriate points on the FREQUENCY SELECTOR switch to permit alternate frequency operation on the positions without channel elements. For example, a C2-R4 radio set can be jumpered so that one of the two available transmitting frequencies can be transmitted in each position of the F1-F2-F3-F4 frequency selector switch. The basic jumper connections for each type of operation are listed in the accompanying

table. However, a large number of variations are possible for each type of operation by changing the positions of the channel elements and changing the jumper connections. As an example, the basic jumper connections for C1-R4 operation provide transmission of the C1 frequency in all four positions of the frequency selector switch. If another form of C1-R4 operation is desired, such as transmit and receive on the F2 and F4 positions and receive only on the F1 and F3 positions, the basic jumper connections cannot be used. Proper jumper connections and location of channel elements for this and all types of operation can be calculated from the following procedures and typical examples.

To receive the same frequency on more than one position of the frequency selector switch, jumper the corresponding switch terminals together.

EXAMPLE 1

Condition Desired:

452.750 MHz on F1 and F4 positions
452.800 MHz on F2 position
452.850 MHz on F3 position

Procedure:

Jumper point R1 (refer to the switch detail S501A & S501B shown on the power supply schematic diagram part of the overall base station schematic diagram) to point R4 on the switch. Plug the 452.750 MHz channel element into the receiver F1 position. No channel element is used in the receiver F4 position. Plug the 452.800 and 452.850 channel elements in the F2 and F3 positions respectively.

EXAMPLE 2

Consition Desired:

452.750 MHz on F1 and F3
452.850 MHz on F2 and F4

Procedure:

Jumper point R1 to R3 and plug the 452.750 MHz channel element into the receiver F1 position and none into the F3 position. Jumper point R2 to R4 and plug the 452.850 MHz channel element into the receiver F2 position and none into the F4 position.

To transmit the same frequency on more than one position of the frequency selector switch, jumper the corresponding switch terminals together.

EXAMPLE 3

Condition Desired:

452.750 MHz on F1
452.800 MHz on F2 and F4
452.850 MHz on F3

Procedure:

Jumper point T2 to T4 on the switch. Plug the 452.800 MHz channel element into the transmitter F2 position. No channel element is used in the transmitter F4 position. The transmitter F1 and F3 channel elements are installed in the normal manner.

5. SERVICE AIDS

a. General

Complete removal of the printed circuit boards for access to the components is not always necessary. In most cases, the board can be folded away from the chassis to expose the components.

The following figures and paragraphs give procedures for removing the circuit boards and transistors. If it is necessary to disconnect leads from the circuit board, observe standard servicing procedures such as tagging leads and identifying connecting points.

NOTE

The letters and numbers that appear in the boxes near the photographs indicate corresponding steps in the following paragraphs. Example: [5. d.] in Figure 2 indicates the location of items discussed in sub-paragraph "5. d.".

b. Power Supply Circuit Board

For access to the components on this board, remove the four mounting screws shown in Figure 3. Fold the board out of the radio set chassis.

c. "Private-Line" Tone Generator Board

Remove the five mounting screws shown in Figure 3 and lift the circuit board out of the radio set chassis.

d. Transistor Removal

The transistors mounted on the chassis are removed by removing the two mounting screws on the transistor. When removing transistors Q202

and Q203 pull the transistors out of their sockets. When removing transistor Q201, unsolder its leads from terminal board TB9. Refer to Figure 2 for transistor location and to Terminal Board Location and Pin Assignment Detail EPD-18625 in the cabling and functional diagrams section of this manual for location of terminal boards.

e. Transmitter Channel Element and Board Removal

(1) Remove the channel element board by unscrewing the four screws and lifting the board away from the chassis. See Figure 4 for details.

(2) To remove the transmitter channel elements only, loosen the quarter-turn retaining stud securing the mounting bracket and lift out the entire assembly. Pull out the desired channel element. See Figure 4 for the location of the retaining stud.

f. Fuses

(1) Fuses F201 and F202 are accessible from the rear of the base station chassis. See the control line connection diagram in the INSTALLATION & OPERATION section of the manual for fuse location.

(2) Fuses F203 and F204 are installed in clips on the radio set chassis. Loosen two screws securing the receiver to the swivel bracket and rotate the receiver away for fuse accessibility. See Figure 2 for fuse locations.

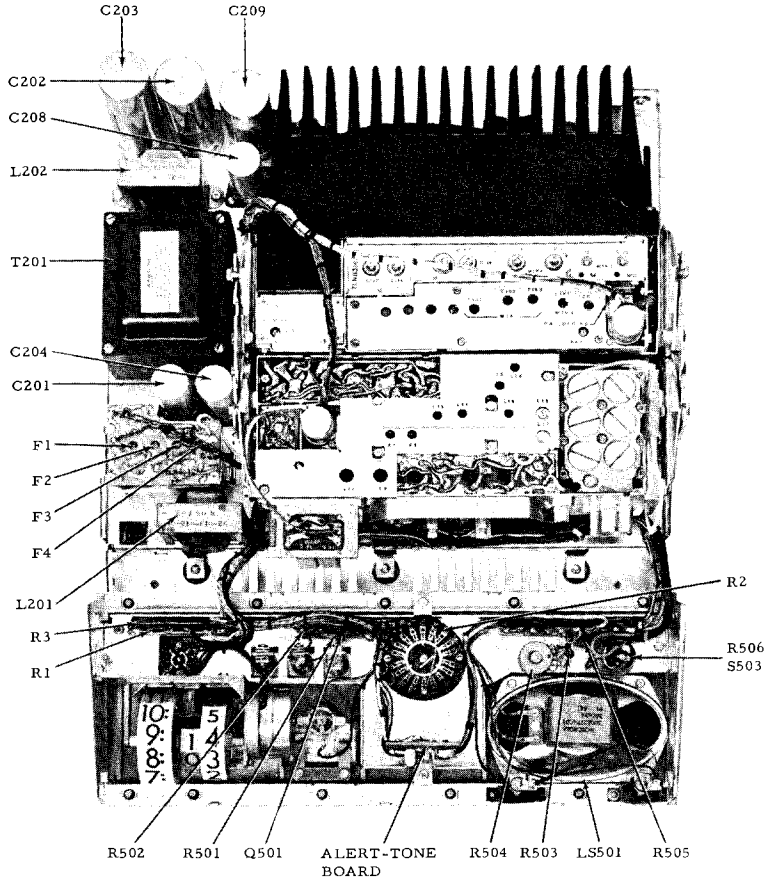


Figure 1.
Miscellaneous Components
Location Detail
(Top View of Chassis with Front Panel
Folded Out)

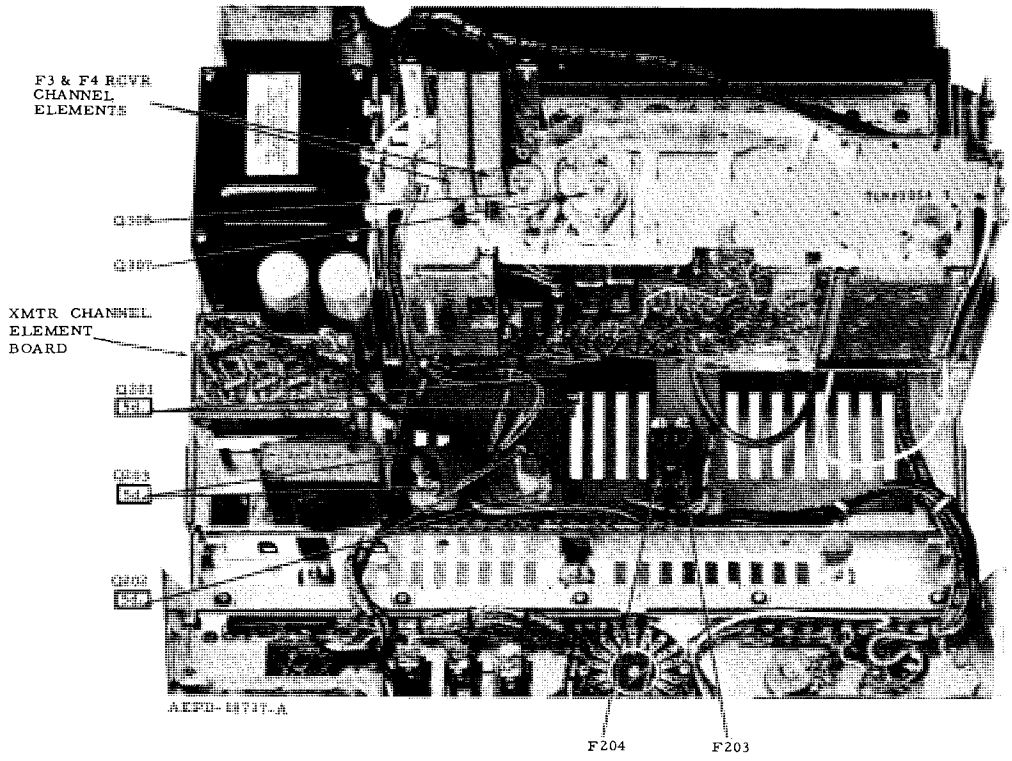


Figure 2.
Miscellaneous Components Location Detail
(Top View of Chassis with Receiver Tilted Up)

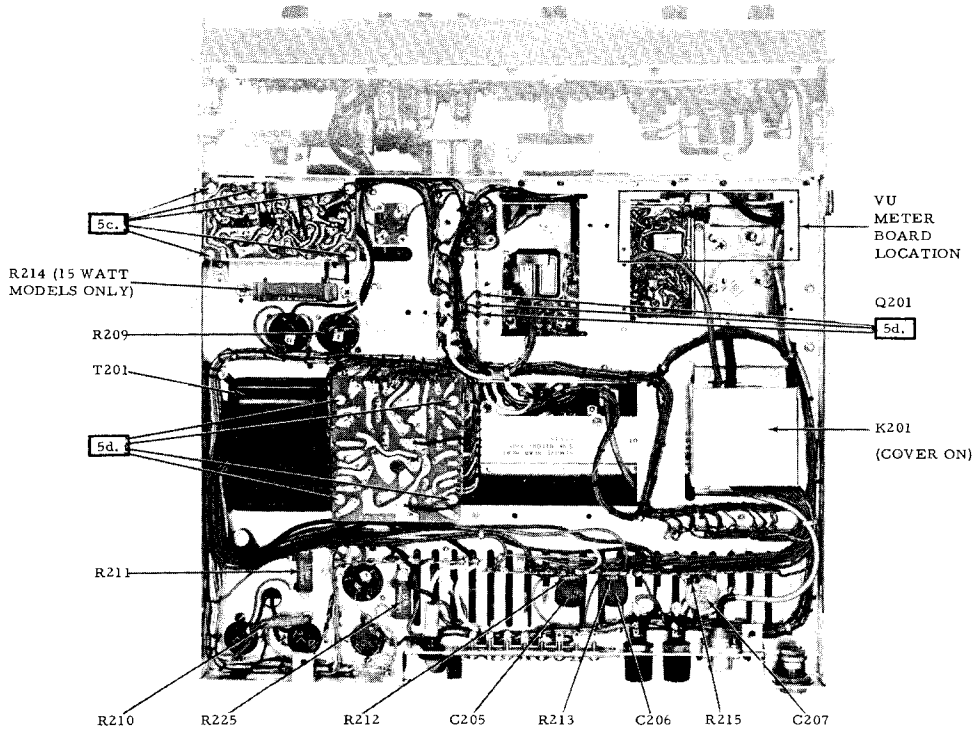


Figure 3.
Miscellaneous Components Location Detail
(Bottom View of Chassis, Cover Removed)

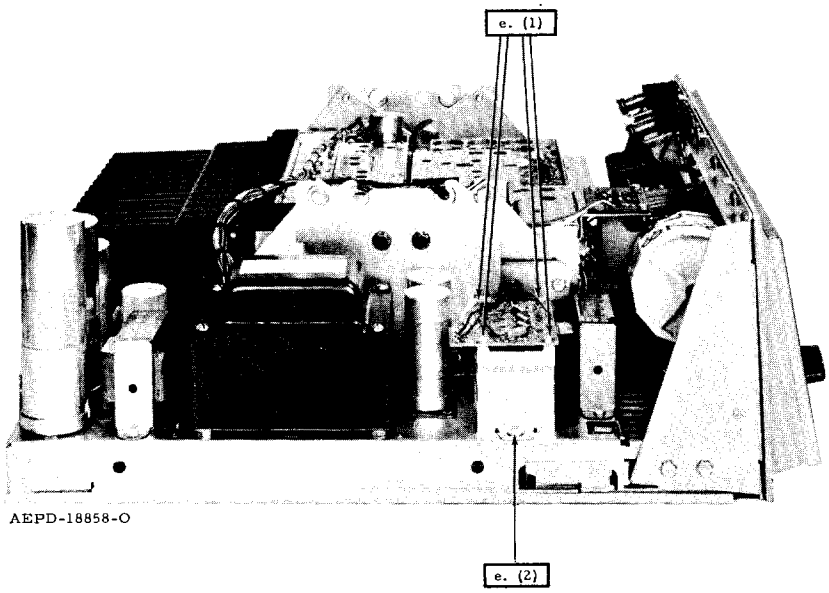


Figure 4.
Transmitter Channel Element
Assembly Removal

TRANSMITTER PRE-ALIGNMENT NOTES

A. EXCERPTS FROM FCC REGULATIONS

FCC regulations state that:

1. Radio transmitters may be tuned or adjusted only by persons holding a 1st or 2nd class commercial radiotelephone operator's license or by personnel working under their immediate supervision.
2. The rf power output of a radio transmitter shall be no more than that required for satisfactory technical operation considering the area to be covered and the local conditions.
3. Frequency and deviation of a transmitter must be checked before it is placed in service and rechecked once each year thereafter.

B. TEST EQUIPMENT REQUIRED

1. Motorola Model S1056A-9A Portable Test Set with a Motorola Model TKN6025A Adapter Cable (available on separate order). A 0-50 microampere meter with 20,000 ohms equivalent series resistance may be used if a test set is not available.
2. Motorola Model TLN6845A Tuning Tool Kit.
3. Bird Model 43 "Thruline" RF Wattmeter and Motorola Model T1013A RF Load Resistor or equivalent.
4. Field strength meter.
5. Motorola Model S1075B Digital Frequency Meter.

C. HOW TO SET UP THE S1056-9A PORTABLE TEST SET

1. Set function selector switch to XMTR position.
2. Place the oscillator and meter reversing switch in the OFF position.
3. Connect the 20-pin meter cable plug to the test set; connect the adapter cable to the cable coming from the test set; connect the other end of the adapter cable to the transmitter metering socket. When the test set is not being used, disconnect the 20-pin metering cable to conserve internal battery life. The plug on the cable acts as an on-off switch completing the battery circuit.

D. HOW TO KEY THE TRANSMITTER

Key the transmitter with the XMTR ON switch on the test set or with a microphone plugged into the test set. The transmitter may also be keyed by shorting the KEY contact to ground.

CAUTION

Do not key the transmitter for more than a few seconds at a time until it is properly tuned. Plate current is excessive in untuned stages and may cause damage. Turn on the transmitter for brief periods while reading the meter and making the adjustments.

E. FREQUENCY CALCULATIONS

crystal frequency in MHz $\longrightarrow f_o = \frac{f_c}{36}$ carrier frequency in MHz

F. "IDC" CONTROL SETTING
(Transmitter Deviation)

Refer to the IDC Adjustment Procedure in the accompanying manual for setting of the IDC control.

G. PRELIMINARY ADJUSTMENTS

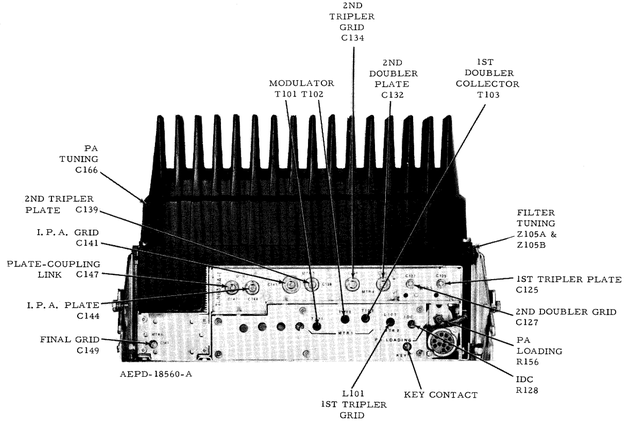
1. Connect the rf wattmeter in series with the dummy load to the antenna receptacle.
2. Turn the equipment on and allow at least one minute for warm-up.

H. TRANSMITTER ADJUSTMENT

STEP	ADJUSTMENT	TEST SET SWITCH POSITION	STAGE AND TUNING PROCEDURE
1	PA LOADING R156 POWER SWITCH S300	---	Set PA LOADING to minimum position. (Fully counter-clockwise). Set POWER switch to position 1.
2	----	None	OSCILLATOR: FCC regulations require a periodic frequency check. If the check is due at this time, follow the OSCILLATOR FREQUENCY ADJUSTMENT procedure on this sheet; OTHERWISE NO ADJUSTMENT SHOULD BE MADE.
3	T101 T102 T103	---	Use hex end of tuning tool A. Set slugs to extreme counter-clockwise position. (Top of slug just visible above coil form.) Turn slugs in T101 and T102 clockwise about five turns. Turn slug in T103 about thirteen turns.
4	T101 T102 T103	1	MODULATOR 1ST DOUBLER COLLECTOR: Use hex end of tuning tool A. Tune T101 and T102 carefully for peak reading on meter. Tune T103 for peak meter reading.
5	L101	2	1ST TRIPLER GRID: Use hex end of tuning tool A. Tune L101 for peak meter reading. There may be two positions which give peak reading. Use the one that gives the highest reading on meter position 2.
6	C125 C127	3	1ST TRIPLER PLATE-2ND DOUBLER GRID: Use the blade end of tuning tool A. Tune C125, then C127 for a peak meter reading. Repeat. (With no signal at the grid of the stage being metered, the meter will read fixed bias.)
7	C132 C134	4	2ND DOUBLER PLATE-2ND TRIPLER GRID: Use blade end of tuning tool C. Tune C132, then C134 for a peak meter reading. Repeat. (With no signal at the grid of the stage being metered, the meter will read fixed bias.)
8	C139 C141	5	2ND TRIPLER PLATE-I. P. A. GRID: Use blade end of tuning tool C. Tune C139, then C141 for a peak meter reading. Repeat. (With no signal at the grid of the stage being metered, the meter will read fixed bias.)
9	C144 C147 C149	6	I. P. A. PLATE-COUPLING LINK-FINAL GRID: Use blade end of tuning tool C. Tune C144, then C147, then C149 for a peak meter reading. Repeat. (With no signal at the grid of the stage being metered, the meter will read fixed bias.)
10	PA TUNING C166	---	PA PLATE: Use blade end of tuning tool A. Adjust PA TUNING for peak rf output. Loosen transmitter hold-down bolts and lift transmitter for access to capacitor C166. The final power amplifier plate tank capacitor (C166) must be retuned after the transmitter has been keyed for at least two minutes. The capacitor is tuned for peak power output, and then detuned 1 watt by turning the capacitor shaft clockwise, i.e., in toward the final tube. Use rf wattmeter or field strength meter. If a field strength meter is used, it should be detuned 2% of at least a three quarter scale reading on the field strength meter by the same method.
11	FILTER TUNING Z105	---	HARMONIC FILTER: Use slotted end of tuning tool B. Tune FILTER TUNING adjustments Z105A and Z105B for maximum power output. Repeat PA TUNING and repeat tuning Z105A and Z105B.

H. TRANSMITTER ADJUSTMENT (Cont'd)

STEP	ADJUSTMENT	TEST SET SWITCH POSITION	STAGE AND TUNING PROCEDURE
12	PA LOADING R156 POWER SWITCH S300	---	FINALIZING ADJUSTMENTS: Use blade end of tuning tool A. Carefully repeak all adjustments, steps 3-11. Calculate the dc power input as follows: $P_{in} = I_p \times E_p$. I_p is PA position reading (0-50 uA scale) times 10,000. E_p is position 9 reading (0-1000 V dc scale) on the test set. The final plate power input is controlled by the PA LOADING rheostat. If Pin exceeds 60 watts in the 15-watt model, reduce I_p by adjusting PA LOADING rheostat. Repeak Z105A and Z105B after the PA LOADING adjustment. DO NOT ADJUST PA LOADING RHEOSTAT FOR MORE THAN 60 WATTS INPUT TO FINAL.
13	POWER SWITCH S300	---	Set POWER switch for desired output level as shown: POSITION / WATTS 1 / 15 2 / 5 3 / 1.5 4 / 0.5 5 / 0.15
14	PA LOADING R156	---	Trim adjust the power output in the desired output range with PA LOADING control (R156) to the desired output level.



ALIGNMENT CONTINUED ON REVERSE SIDE

TUNING TOOLS

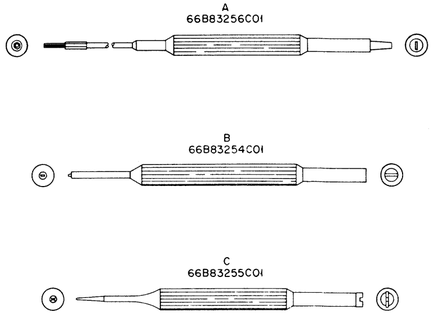
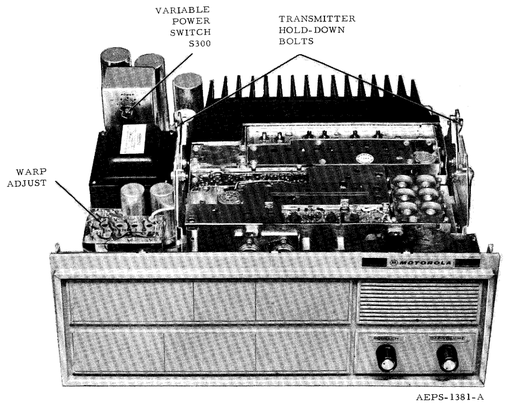


DIAGRAM NO. BEPD-13524-0



AEPS-1381-A

I. FINAL METER READINGS

1. Each time a transmitter is aligned or tested, final meter readings should be made and entered in a logbook.
2. All readings given in the table below are minimum except PA which is maximum. DO NOT exceed the value given for the PA current. This is the maximum plate current to which the unit can be safely tuned. Multiply the microampere scale reading by 10 to obtain actual PA plate current in milliamperes.
3. Readings 1 through 6 are purely relative and do not give actual current or voltage measurement. Readings 7 and 9 are typical values.
4. Meter readings are obtained with 117 V ac input at the transformer primary.

CIRCUIT METERED	1st Doubler Collector	1st Trip-ler Grid	2nd Doubler Grid	2nd Trip-ler Grid	I. P. A. Grid	PA Grid	PA Plate Current	PA Plate Voltage	Power Output (Watts)	Power Switch Position
TEST SET SWITCH POSITION*	1	2	3	4	5	6	7	9		
METER READING	15	15	10	15	15	18	13	460	15	1
							10	230	5	2
							7	150	1.5	3
							5	120	0.5	4
							2	100	0.15	5

*PO position reads same as position 1; do not use for power output.

J. OSCILLATOR FREQUENCY ADJUSTMENT

1. TEMPERATURE COMPENSATION

The channel element oscillator for split-channel transmitters is pre-adjusted at the factory to operate within ±0.0002% of the assigned channel frequency from -30°C (-22°F) to +60°C (140°F). The reference point is 25°C (77°F) at which the transmitter oscillator frequency is set exactly on the assigned channel frequency. AT TEMPERATURES OTHER THAN 25°C THE OSCILLATOR WILL NOT OPERATE EXACTLY ON THE ASSIGNED FREQUENCY. The Channel Element Oscillator Temperature Correction Curve gives the frequency offset required for a given channel element at a given temperature.

For example, if the temperature of the channel element is +40°C, an oscillator with a C channel element should be warped down 0.6 parts per million (ppm) or 280 Hz from the assigned center frequency; at +10°C, it should be warped up 0.3 ppm or 140 Hz from the assigned frequency. The letter of the channel element is stamped on the edge of the housing. The amount of correction required at a given temperature is expressed both in ppm and in Hz (at 460 MHz) on the correction curve. This correction in Hz can be used for any carrier frequency in the 450-470 MHz range. A correction of 280 Hz is expressed in megahertz as 280 x 0.000001 = 0.000280 MHz. Thus, if the curve shows that the oscillator should be warped down 0.6 ppm and the assigned frequency is 465.025 MHz, the oscillator should operate at 465.02500 MHz less 0.000279 MHz or 465.02472 MHz. THE OSCILLATOR MUST BE SET ON THE FREQUENCY SPECIFIED BY THE CORRECTION CURVE FOR A GIVEN TEMPERATURE TO BE WITHIN FCC FREQUENCY SPECIFICATIONS OVER THE ENTIRE TEMPERATURE RANGE.

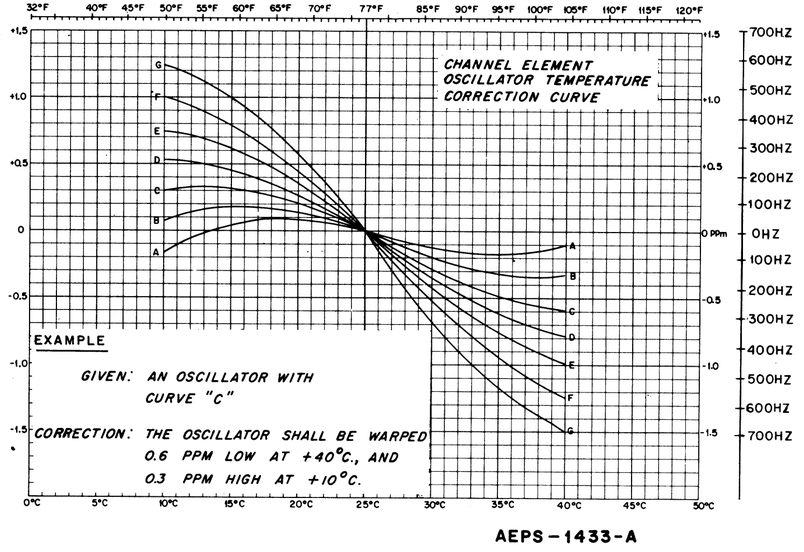
NOTE

The best accuracy in setting frequency is obtained with the channel element temperature near 25°C. In any case, the frequency should not be adjusted if the temperature of the channel element is not between +10°C (50°F) and +40°C (104°F).

The channel element temperature can be measured with a surface-type thermometer. A sufficient time must be allowed for the temperature to stabilize. Stabilization (as indicated by the thermometer reading remaining constant) will usually take place in 15-30 minutes or less. The temperature to use with the Oscillator Temperature Correction Curve will be the channel element temperature plus 1°C (or 2°F).

2. ADJUSTMENT PROCEDURE

a. Connect the heterodyne OUTPUT to the INPUT of the S1075B Digital Frequency Meter.
b. Set the heterodyne selector switch to the 405-475 MHz position.
c. Set the Frequency Meter selector switch to either the 100 Hz or the 10 Hz position. With 10 Hz resolution, the first digit of the frequency readout will not appear on the display.
d. Attach the antenna of the frequency meter to the appropriate 405-470 MHz input on the heterodyne unit, depending on the rf output of the transmitter under test.
e. Read the frequency indication displayed on the digital readout.
f. Adjust the channel element frequency warp adjustment until the digital meter reads the proper frequency as determined in the preceding explanation of temperature compensation.



AEPS-1433-A

Oscillator Temperature Correction Curve

TRANSMITTER PRE-ALIGNMENT NOTES

A. EXCERPTS FROM FCC REGULATIONS

FCC regulations state that:

1. Radio transmitters may be tuned or adjusted only by persons holding a 1st or 2nd class commercial radiotelephone operator's license or by personnel working under their immediate supervision.
2. The rf power output of a radio transmitter shall be no more than that required for satisfactory technical operation considering the area to be covered and the local conditions.
3. Frequency and deviation of a transmitter must be checked before it is placed in service and re-checked once each year thereafter.

B. TEST EQUIPMENT REQUIRED

1. Motorola Model S1056A-9A Portable Test Set with a Motorola Model TKN6025A Adapter Cable (available on separate order). A 0-50 microampere meter with 20,000 ohms equivalent series resistance may be used if a test set is not available.
2. Motorola Model TLN6845A Tuning Tool Kit.
3. Bird Model 43 "Thruline" RF Wattmeter and Motorola Model T1013A RF Load Resistor or equivalent.
4. Field strength meter.

C. HOW TO SET UP THE S1056-9A PORTABLE TEST SET

1. Set function selector switch to XMTR position.
2. Place the oscillator and meter reversing switch in the OFF position.
3. Connect the 20-pin meter cable plug to the test set; connect the adapter cable to the cable coming from the test set; connect the other end of the adapter cable to the transmitter metering socket. When the test set is not being used, disconnect the 20-pin metering cable to conserve internal battery life. The plug on the cable acts as an on-off switch completing the battery circuit.

D. HOW TO KEY THE TRANSMITTER

Key the transmitter with the XMTR ON switch on the test set or with a microphone plugged into the test set. The transmitter may also be keyed by shorting the KEY contact to ground.

CAUTION

Do not key the transmitter for more than a few seconds at a time until it is properly tuned. Plate current is excessive in untuned stages and may cause damage. Turn on the transmitter for brief periods while reading the meter and making the adjustments.

E. FREQUENCY CALCULATIONS

crystal frequency in MHz → $f_o = \frac{f_c}{36}$ ← carrier frequency in MHz

F. "IDC" CONTROL SETTING
(Transmitter Deviation)

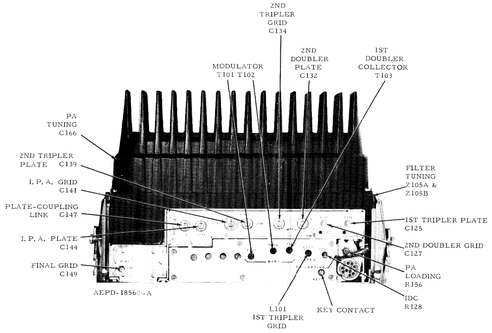
Refer to the reverse side of the Transmitter Alignment Procedure for setting of the IDC control.

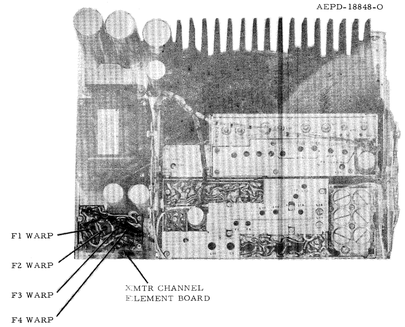
G. PRELIMINARY ADJUSTMENTS

1. Connect the rf wattmeter in series with the dummy load to the antenna receptacle.
2. Turn the equipment on and allow at least one minute for warm-up.

H. TRANSMITTER ADJUSTMENT

STEP	ADJUSTMENT	TEST SET SWITCH POSITION	STAGE AND TUNING PROCEDURE
1	PA LOADING R156	---	Set the PA LOADING potentiometer to minimum position (fully counterclockwise).
2	----	None	OSCILLATOR: FCC regulations require a periodic frequency check. If the check is due at this time, follow the OSCILLATOR FREQUENCY ADJUSTMENT procedure on this sheet; OTHERWISE NO ADJUSTMENT SHOULD BE MADE.
3	T101 T102 T103	---	Use hex end of tuning tool A. Set slugs to extreme counterclockwise position. (Top of slug just visible above coil form.) Turn slugs in T101 and T102 clockwise about five turns. Turn slug in T103 about thirteen turns.
4	T101 T102 T103	1	MODULATOR 1ST DOUBLER COLLECTOR: Use hex end of tuning tool A. Tune T101 and T102 carefully for peak reading on meter. Tune T103 for peak meter reading.
5	L101	2	1ST TRIPLER GRID: Use hex end of tuning tool A. Tune L101 for peak meter reading. There may be two positions which give peak reading. Use the one that gives the highest reading on meter position 2.
6	C125 C127	3	1ST TRIPLER PLATE--2ND DOUBLER GRID: Use the blade end of tuning tool A. Tune C125, then C127 for a peak meter reading. Repeat. (With no signal at the grid of the stage being metered, the meter will read fixed bias.)
7	C132 C134	4	2ND DOUBLER PLATE--2ND TRIPLER GRID: Use blade end of tuning tool C. Tune C132, then C134 for a peak meter reading. Repeat. (With no signal at the grid of the stage being metered, the meter will read fixed bias.)
8	C139 C141	5	2ND TRIPLER PLATE--I.P.A. GRID: Use blade end of tuning tool C. Tune C139, then C141 for a peak meter reading. Repeat. (With no signal at the grid of the stage being metered, the meter will read fixed bias.)
9	C144 C147 C149	6	I.P.A. PLATE--COUPLING LINK--FINAL GRID: Use blade end of tuning tool C. Tune C144, then C147, then C149 for a peak meter reading. Repeat. (With no signal at the grid of the stage being metered, the meter will read fixed bias.)
10	PA TUNING C166	---	PA PLATE: Use blade end of tuning tool A. Adjust PA TUNING for peak rf output. The final power amplifier plate tank capacitor (C166) must be retuned after the transmitter has been keyed for at least two minutes. The capacitor is tuned for peak power output, and then detuned 1 watt by turning the capacitor shaft clockwise, i.e., in toward the final tube. Use rf wattmeter or field strength meter. If a field strength meter is used, it should be detuned 2% of at least a three-quarter scale reading on the field strength meter by the same method.
11	FILTER TUNING Z105	---	HARMONIC FILTER: Use slotted end of tuning tool B. Tune FILTER TUNING adjustments Z105A and Z105B for maximum power output. Repeat PA TUNING and repeat tuning Z105A and Z105B.
12	PA LOADING R156	---	FINALIZING ADJUSTMENTS: Use blade end of tuning tool A. Carefully repeak all adjustments, steps 3-11. Calculate the dc power input as follows: $P_{in} = I_p \times E_p$. I_p is PA position reading (0-50 uA scale) times 10,000. E_p is position 9 reading (0-1000 V dc scale) on the test set. The final plate power input is controlled by the PA LOADING rheostat. If P_{in} exceeds 120 watts in 30-watt models, reduce I_p by adjusting PA LOADING rheostat. Repeak Z105A and Z105B after the PA LOADING adjustment. DO NOT ADJUST PA LOADING RHEOSTAT FOR MORE THAN 120 WATTS INPUT TO FINAL (30-watt radios).





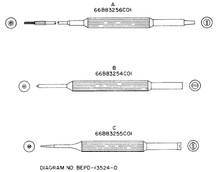
I. FINAL METER READINGS

1. Each time a transmitter is aligned or tested, final meter readings should be made and entered in a logbook.
2. All readings given in the table below are minimum except PA which is maximum. DO NOT exceed the value given for the PA current. This is the maximum plate current to which the unit can be safely tuned. Multiply the microampere scale reading by 10 to obtain actual PA plate current in milliamperes.
3. Readings 1 through 6 are purely relative and do not give actual current or voltage measurement.
4. Meter readings are obtained with 117 V ac input at the transformer primary.

CIRCUIT METERED	1st Doubler Collector	1st Tripler Grid	2nd Doubler Grid	2nd Tripler Grid	I.P.A. Grid	PA Grid	PA Plate Current	PA Plate Voltage	Power Output
SWITCH POSITION*	1	2	3	4	5	6	7	9	
METER READING	15	15	10	15	15	18	20	600	30 watts

*PO position reads same as position 1; do not use for power output.

TUNING TOOLS



J. OSCILLATOR FREQUENCY ADJUSTMENT

Setting the oscillator "on-frequency" is the only oscillator adjustment necessary. Do this as follows:

1. Allow the channel element temperature to stabilize at 25°C (77°F).
2. Use the Motorola Model S1075B Frequency Meter as a frequency standard. Set up the equipment for frequency measurement as described in the test equipment manual.
3. Key the transmitter with no modulation. Disconnect the microphone and key the transmitter with the portable test set or the KEY contact. On "Private-Line" tone-coded squelch models, disable the "Private-Line" tone generator by removing the "Vibrasender" resonant reed.
4. Adjust the F1 "WARP" capacitor for an "on-frequency" indication on the frequency standard. For multiple-frequency models, adjust the F2, F3 and F4 "WARP" capacitors (frequency switch in corresponding position).

1. INTRODUCTION

Accuracy of test equipment is of prime importance to any user of radio communications equipment; but of equal importance is a knowledge of the characteristics of the measuring equipment under various conditions. The Motorola T1130A Series Station Monitor provides sufficient sensitivity and accuracy under conditions of variable environmental temperature, line voltage, and r-f input signal level to measure deviation with sinewave modulation in any wideband equipment. Like most meter-type measuring devices, the T1130A responds differently to different waveforms and is used only to calibrate an oscilloscope for measurement of the clipped and integrated waveform resulting from deviation control by Motorola's "IDC" circuit.

The Motorola S1079A Deviation Monitor/Frequency Synthesizer (used with the high resolution S1075B Digital Frequency Meter to constitute Model S1078A) provides a highly accurate means of measuring frequency deviation directly from the r-f output of the transmitter. The peak-reading deviation meter used in this unit has the high sensitivity necessary for measuring the low deviation of split-channel transmitters. It is also provided with sensitivity ranges appropriate for wideband measurements.

2. PROCEDURE WITH PEAK-READING DEVIATION MONITOR (Split-Channel or Wideband Equipment)

a. Test Equipment Required

(1) Motorola S1078A Digital Frequency Meter with Deviation Monitor/Frequency Synthesizer (or equivalent).

(2) Motorola Transistorized AC Voltmeter (or equivalent)

(3) Motorola Model TEK-1A Transistorized Tone Generator, 1000 Hz

(4) Motorola Model S1056A-9A or TU546 Series Portable Test Set (necessary for "Private-Line" models only)

b. Setting Up Test Equipment

(1) To monitor transmissions for deviation adjustment, the antenna provided with the Digital Frequency Meter should be connected to the ANTENNA input of the Deviation Monitor/Frequency Synthesizer and placed within a few feet of the transmitter.

(2) Place the function switch on the Deviation Monitor/Frequency Synthesizer in the SET OSC. position.

(3) Set the local oscillator 500 kHz above or below the assigned carrier frequency of the transmitter. The frequency of the local oscillator will appear on the digital readout.

(4) Place the function switch in the LIMITER 500 KC OUT position. Key the transmitter and observe the limiter reading on the front panel meter. If the meter pointer is above the red markings at 6/3 kHz, the antenna input is adequate.

(5) Move the function switch to ZERO SET and zero the front panel meter.

(6) To measure deviation, set the function switch to the appropriate (16 KC, 8 KC, or 1.6 KC) position. When in the 1.6 KC position, the transmitter should remain keyed to prevent noise from pinning the meter.

c. Measurement and Setting of Transmitter Deviation

(1) For "Private-Line" transmitters, the tone deviation should be checked before the total modulation deviation is measured. This may be read on the deviation meter directly by keying the transmitter. DO NOT USE A LIVE MICROPHONE FOR CHECKING "PRIVATE-LINE" TONE DEVIATION. The deviation of the "Private-Line" tone should be 0.5 to 1.0 kHz for split-channel models or 1.0 to 2.0 kHz for wideband models.

(2) Feed a 1000 Hz test tone into the transmitter audio input. Adjust the signal to 1 volt. A 0.33 uF capacitor should be placed in series with the tone generator output. An audio oscillator should be used for generation of this tone. The Motorola TEK-1A Transistorized Tone Generator is excellent for this purpose.

(3) With this input signal level, adjust the IDC control on the transmitter to provide a deviation reading of ±5 kHz (split-channel) or ±15 kHz (wideband) on the front panel meter.

3. PROCEDURE WITH CALIBRATED OSCILLOSCOPE (Wideband Equipment Only)

a. Test Equipment Required

(1) Motorola T1130A Series Station Monitor or equivalent.

NOTE

For 406-420 MHz applications a special version of the Motorola FM Station Monitor must be used. This equipment is available on special order only. For further details, consult your Motorola representative.

(2) Motorola Transistorized AC Voltmeter (or equivalent)

(3) Motorola Model TEK-1A Transistorized Tone Generator, 1000 Hz (or equivalent)

(4) Motorola Model T1015A General Purpose Oscilloscope or Model T1014B Wide Band Oscilloscope

(5) Motorola Model S1056A-9A or TU546 Series Portable Test Set for "Private-Line" transmitters

b. Setting Up Test Equipment

When using the T1130A Series Station Monitor with 420-470 mc transmitters, place the monitor antenna within a few feet of the transmitter. This enables the monitor receiver to pick up r-f from the stage preceding the final tripler, which is within the frequency range of the monitor receiver. As a result, the maximum frequency deviation measured with be ±5 kHz (read on the 0-10 kHz scale), which is one-third of the actual deviation of ±15 kHz. It should be noted that calibration of the oscilloscope, as mentioned in the following paragraphs, takes this into consideration.

c. Oscilloscope Calibration

The first step in the measurement of the transmitter deviation is to calibrate the oscilloscope. This can be done by using the transmitter which is to be measured.

Proceed as follows:

(1) If the transmitter is a part of "Private-Line" station remove the "Vibrasender" resonant reed from its socket.

(2) Connect the oscilloscope to the monitor oscilloscope terminals, and set up the monitor controls in accordance with the monitor instruction manual.

(3) Turn the IDC control on the transmitter chassis to the full clockwise position.

(4) Feed a 1000 Hz test tone into the transmitter audio input. Modulate the transmitter with this tone so adjusted that the deviation as read on the FM monitor deviation meter is ±2 kHz. An audio oscillator must be used for generation of this tone, since a sinusoidal waveform is very important. The Motorola TEK-1A Transistorized Tone Generator is excellent for this purpose.

(5) Adjust the vertical gain of the oscilloscope so that the total recovered (peak-to-peak) audio pattern occupies some convenient height, e.g., four small squares, as shown in figure 1.

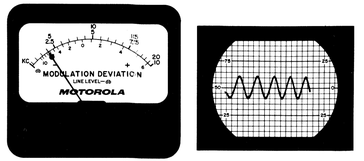


Figure 1.
Oscilloscope Calibration of Transmitter

Having calibrated the oscilloscope, there is no further need for the modulation deviation meter. Ignore its reading from this point on. It has already performed its important function of calibrating the oscilloscope.

With the oscilloscope calibrated as indicated, a recovered signal which occupies 10 squares (peak-to-peak) is equivalent to ±5 kHz deviation at the stage preceding the final tripler.

d. Measurement and Setting of Transmitter Deviation (Carrier-Squelch Models)

Once the oscilloscope has been calibrated the transmitter deviation can be properly adjusted by the following method.

(1) Adjust the signal applied to the transmitter audio input to 1 volt.

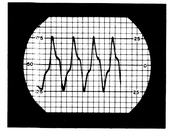


Figure 2.
15 kHz Peak Deviation as seen on the Oscilloscope
(NOTE: Waveform is clipped fully)

(2) With this input signal level, adjust the IDC control on the transmitter to provide a 10-square peak-to-peak recovered signal on the oscilloscope. This is equivalent to ±5 kHz deviation (preceding the tripler; see figure 2) or ±15 kHz deviation of the actual carrier.

e. Measurement and Setting of Transmitter Deviation ("Private-Line" Models)

Once the oscilloscope has been calibrated, the transmitted deviation can be properly adjusted by the following method.

(1) Replace the "Vibrasender" resonant reed in its socket and check the "Private-Line" tone deviation. This may be read directly from the oscilloscope by pressing the transmitter push-to-talk switch on the test set. DO NOT USE A "LIVE" MICROPHONE FOR CHECKING "PRIVATE-LINE" TONE DEVIATION. The tone deviation should be (±) 0.33 to 0.66 kHz (preceding the tripler) or 1 to 2 kHz deviation of the actual carrier.

NOTE

Due to a slight increase in discriminator response at the lower frequencies, the oscilloscope will read high, thus, as indication of 0.9 to 1.8 squares (peak-to-peak) is equivalent to (±) 0.33 to 0.66 kHz deviation preceding the tripler or 1 to 2 kHz deviation of the actual carrier. This slight variation is only important when checking the tone deviation. When setting maximum transmitter deviation as described below, it may be ignored.

(2) Adjust the 1000 Hz input signal to the transmitter audio input to 1 volt.

(3) With this input signal level, adjust the IDC control on the transmitter to provide a 10-square (maximum limit) peak-to-peak recovered signal on the oscilloscope. This is equivalent to ±5 kHz deviation (preceding the tripler; see figure 3) or ±15 kHz deviation of the actual carrier.

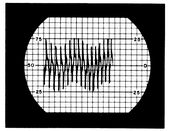


Figure 3.
15 kHz Peak Deviation for
Combined "PL" Tone and 1000 Hz Modulation

4. EMERGENCY MEASUREMENT OF DEVIATION

If an audio oscillator is not available, a loud sustained whistle of approximately 1000 Hz can be used for a rough measurement of deviation. If this rough check indicates the need for resetting deviation, do so only under controlled conditions, using a 1000 Hz tone as previously indicated. The calibration of the oscilloscope should always be performed with a steady controlled signal. Do not attempt to calibrate the oscilloscope with a sustained whistle as waveform distortion will prevent an accurate calibration.

5. OTHER MEANS FOR MEASUREMENT OF DEVIATION

Another accurate means of measuring transmitter deviation is to use the Motorola T1021B Frequency Meter and the Motorola S1058A or S1059A Test Set (with deviation meter) for measuring deviation. These units, properly used, permit the accurate measurement and setting of transmitter deviation from a peak-reading meter, which is unaffected by waveform. An oscilloscope is not required with these instruments. With these devices, the transmitter deviation can be measured accurately even with voice modulation.

6. DEVIATION CONSIDERATIONS

The foregoing procedure will insure that the transmitter will comply with FCC requirements for maximum deviation.

The importance of the correct deviation setting can not be overemphasized. Optimum system performance demands accurate deviation setting, both from the standpoint that overdeviation will interfere with the user on the adjacent channel, and underdeviation may reduce system range.

RECEIVER ALIGNMENT PROCEDURE

A. TEST EQUIPMENT REQUIRED

1. Motorola Model S1056A-9A Portable Test Set with a Motorola Model TKN6025A Adapter Cable (available on separate order) must be used. A 0-50 microampere meter with 20,000 ohms equivalent series resistance may be used if a test set is not available.
2. Motorola Model S1318A Signal Generator, or equivalent.
3. Motorola Model TLN4194A Tuning Tool Kit. A small screwdriver may be used for some of the alignments.
4. Motorola Model T1012A Power Supply (or equivalent).

B. HOW TO SET UP THE S1056A-9A PORTABLE TEST SET

1. Set function selector switch to RCVR position.
2. Switch on 455 kHz crystal oscillator.
3. Connect the 20-pin meter cable plug to the test set; connect the adapter cable to the cable coming from the test set; connect the other end of the adapter cable to the receiver metering socket. When the test set is not in use; disconnect the 20-pin metering cable to conserve internal battery life. The plug on the cable acts as a turn-off switch completing the battery circuit.
4. Connect the rf extension cable to the test set; connect the rf probe cable to the rf extension cable.

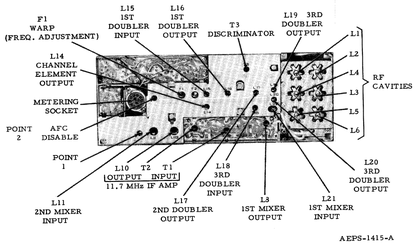
C. HOW TO SET UP THE SIGNAL GENERATOR FOR RF ALIGNMENT

1. Set up the signal generator according to the instructions supplied with the unit.
2. Connect the signal generator cable to the antenna input.
3. Turn the generator output up to maximum.
4. Keep the test set in position 4.
5. Rotate the signal generator dial back and forth near the assigned rf carrier frequency. Watch the test set meter. The pointer should swing above and below the zero reading as the dial is rotated. Set the dial for exact zero meter reading. Be sure the generator frequency is kept at zero meter reading.

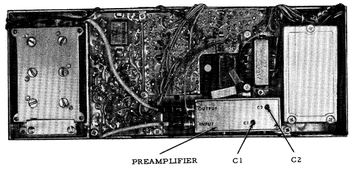
D. HOW TO MEASURE 20 DB QUIETING SENSITIVITY

Procedure

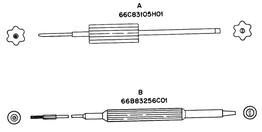
1. Turn on the signal generator and allow it to warm up for at least one hour.
2. Connect the meter cable from the test set to the receiver meter receptacle on the chassis.
3. Set the RCVR-XMTR-ACCESS switch to the RCVR position. Set the position selector to position 4.
4. Connect the signal generator output through a 6 dB pad to the ANT jack on the radio set.
5. Turn up the generator output and rotate the generator dial back and forth near the assigned rf carrier frequency. The test set meter pointer should swing above and below the zero mark as the generator dial is rotated. Set the dial for exact zero reading.
6. Reduce the signal generator output to zero (i.e., no signal input). Set the position selector switch to position 11 (AUDIO).
7. Unsquelch the receiver by turning the SQUELCH control fully counterclockwise.
8. Adjust the VOLUME control, located on the control head, for a 1.0 volt reading on the test set meter.
9. Now, turn up the signal generator output until the test set meter reading drops to 0.1 volt. Note the setting of the signal generator output control. This value (less 6 dB for the attenuation of the pad) in microvolts is the 20 dB quieting sensitivity for the receiver and should be .5 microvolt or less (.25 microvolt or less with preamplifier).



AEPS-1415-A



AEPS-3106-O



8EPS-1311-O

E. TEST SET SELECTOR SWITCH POSITIONS

S1056A SERIES TEST SET POSITION	1	2	4	5	6	11
TYPICAL NO SIGNAL READING WITH RECEIVER ALIGNED	8 uA or more (with preamp) 2 uA or more (without preamp)	26 uA	±2 uA	20 uA	13 uA	---
CIRCUIT METERED	455 kHz IF AMP #1	455 kHz IF AMP #3	DISCRIM-INATOR ZERO	1ST OSCIL-LATOR ACTIVITY	MULTIPLIERS	AUDIO OUTPUT

F. FREQUENCY CALCULATIONS

$$f_o = \frac{f_c - 11.7\ \text{MHz}}{24}$$

where f_o = 1st oscillator crystal frequency

f_c = carrier frequency

G. RECEIVER ALIGNMENT

STEP	ADJUSTMENT	TEST SET SWITCH POSITION	STAGE AND TUNING PROCEDURE
1	T3	1 and 4	Discriminator - Set up the test set as described in paragraph B. Adjust T3 so that the slug is close to the center of the coil. Insert a 2 pF capacitor in series with the rf probe. Place the rf probe on the base of the second mixer (POINT 1). Use a signal input to produce an indication on meter position 1, between 10 uA and 15 uA. Adjust T3 for an absolute zero on the "0" center (top) scale with the switch in position 4. Use screwdriver end of tuning tool A. This is a critical adjustment and should be exactly on zero. Remove the rf probe.
2	L14, L15, L16, L17, L18, L19, L20, L21	5, 6 and 1	Multiplier - On multi-frequency models place the frequency selector switch in the F1 position. Use small hex ended tuning tool B. Adjust all coils so that the slugs are very close to the top of the coil (i.e. near the board). Adjust coils L15 and L14 (in that order) for maximum indication on meter position 5. Repeak coils L15 and L14. Adjust L16 for maximum indication on meter position 6. Adjust coils L17 and L18 for a minimum indication on meter 6. Adjust L19 for a small peak indication on meter position 6. Set up the signal generator as described in paragraph C. Apply as much signal as is required at carrier frequency for an indication of 5 uA on meter position 1. Align coils L21, L20, L19, L18 and L17 (in that order) for maximum indication on meter position 1. Use screwdriver end of tuning tool A for coils L19, L20, L21.

G. RECEIVER ALIGNMENT (Cont'd)

STEP	ADJUSTMENT	TEST SET SWITCH POSITION	STAGE AND TUNING PROCEDURE
3*	C1, C2	1	RF Preamplifier - Adjust C2 and C1 in that order on the rf preamplifier for maximum meter indication in position 1. Use screwdriver end of tuning tool B.
4	L1 thru L6	1	RF Deck - Use a screwdriver to preset L1 thru L6 by turning the tuning screws counterclockwise (away from the top plate) until approximately 1/2 inch above the top plate (3/8 inch for frequencies below 460 MHz). Increase the output of the signal generator until an indication of 5 uA is observed on meter position 1. Tune L1 thru L6 (in that order) for maximum indication on meter position 1. (Decrease the signal generator output level back to an indication of 5 uA on meter position 1 each time the current rises to 15 uA.) Repeak L1 thru L6.
5	L8, T1, T2, L10, L11	1 and 4	11.7 MHz IF - Readjust carrier frequency for an exact zero reading on meter position 4. Use a signal input of approximately 15 uA on meter position 1. Use large hex ended tuning tool B. Detune L8 and T1 by turning slugs counterclockwise to the top of coil forms (near the board). Tune L11, L10 and T2 (in that order) for a maximum indication on meter position 1. Repeak L11, L10 and T2. (Do not attempt to repeak these coils during the subsequent adjustments.) Peak L8 and T1 (in that order) for maximum indication on meter position 1. Repeak L8 and T1 two times. NOTE It is very important that L8 be tuned before T1. Tune by maximum meter indication, not by audio noise.
6	L1 thru L6, L16 thru L21	1 and 6	Detune L16 approximately 5 uA on meter position 1. Tune L17, L18, L19, L20, L21 for a maximum indication on meter #1. Retune L16 for peak on meter position 6. Repeak L1 thru L6 (in that order) for maximum indication on meter position 1. Reduce generator output to 20 dB quieting level. Retune L6 and L21 for best quieting.
7*	C1, C2	1 and 11	RF Preamplifier - Increase the signal generator output for a small indication in meter position 1 (5-10 uA). Repeak C2 for maximum meter indication in meter position 1. Reduce the signal generator output to 20 dB quieting level and retouch C1 and L1 for best quieting sensitivity.
8	F1, F2, F3, F4	1, 2, 4	On-Frequency Adjustment - Transmit a carrier from the transmitter which the receiver is normally intended to receive. RCVR test positions 1 should indicate a rise when the transmitter is keyed. If necessary, connect the antenna to the radio set. Check the meter reading in test position 4. Disable the afc to the shield. Zero indicates an on-frequency condition. Set the F1 "warping" capacitor for exact zero meter reading on the F1 frequency. On multiple frequency models, set the additional warp capacitors for zero meter reading on each position of the frequency selector switch. DO NOT READJUST COILS L14 AND L15.

*Skip this step unless the radio set is equipped with an optional RF Preamplifier.

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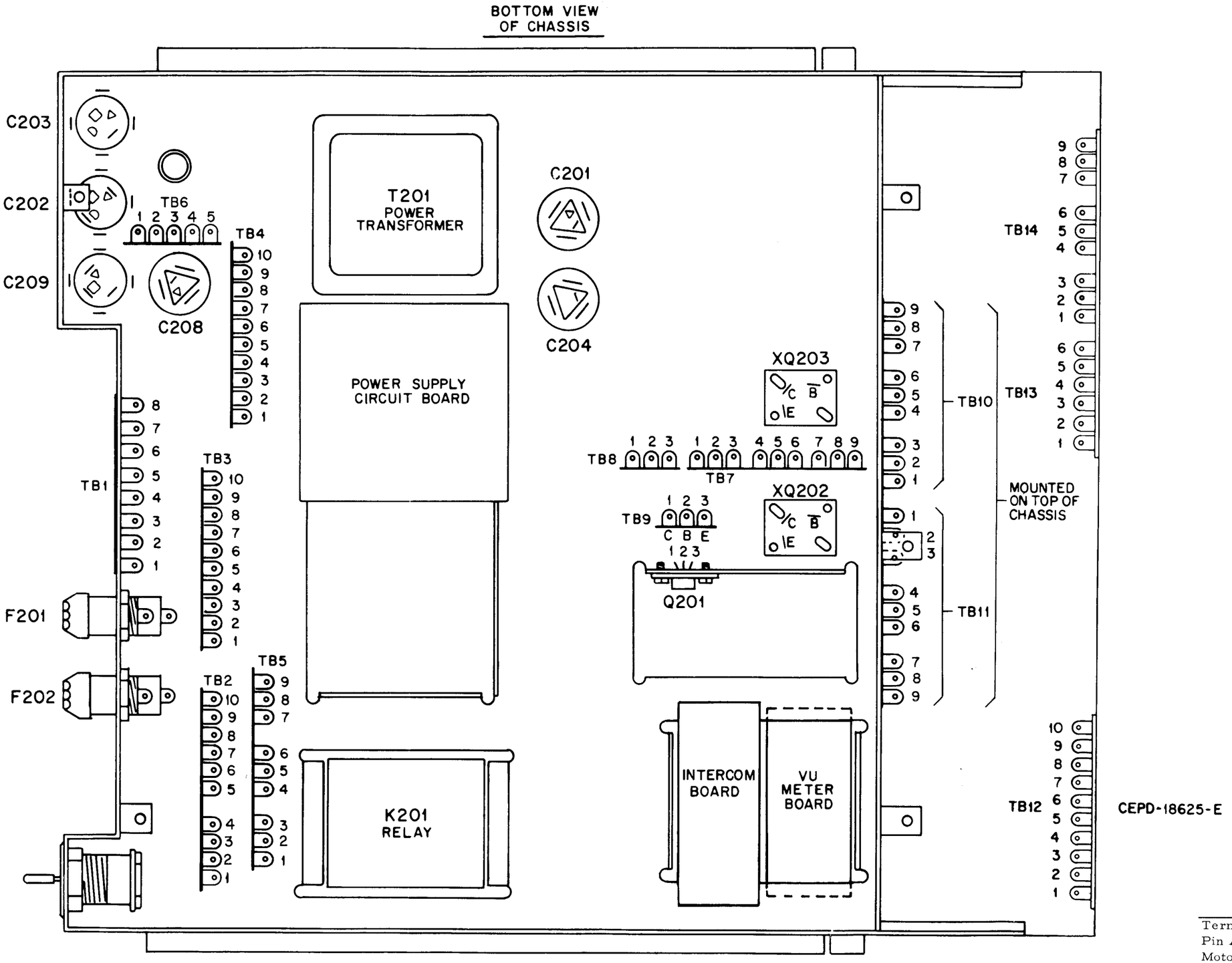

Terminal Board Location and
Pin Assignment Detail
Motorola No. CEPD-18625-E
6/12/70-UP

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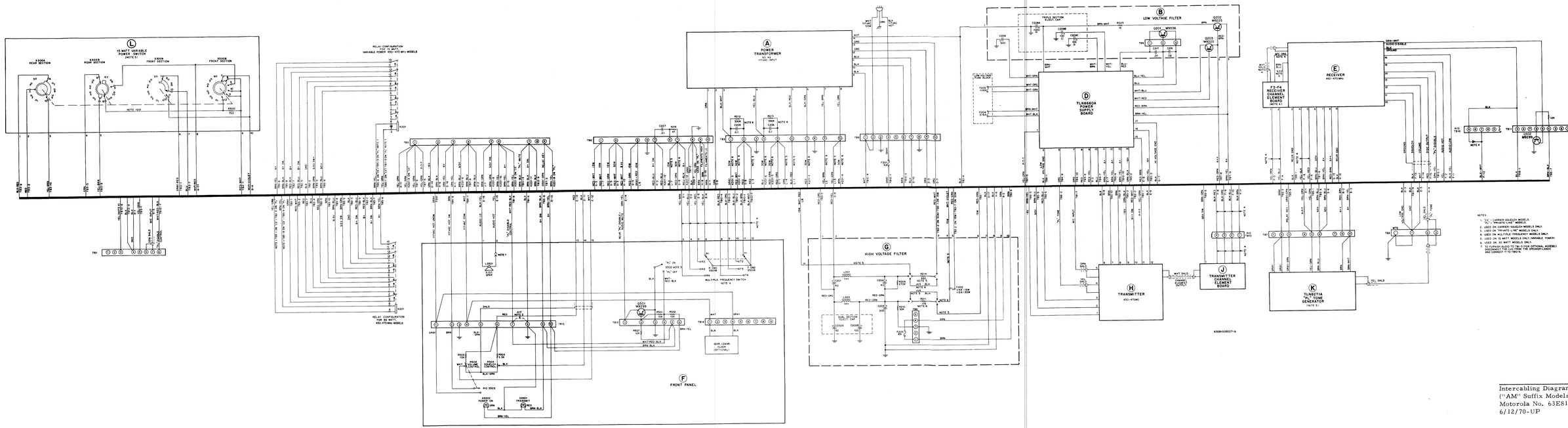
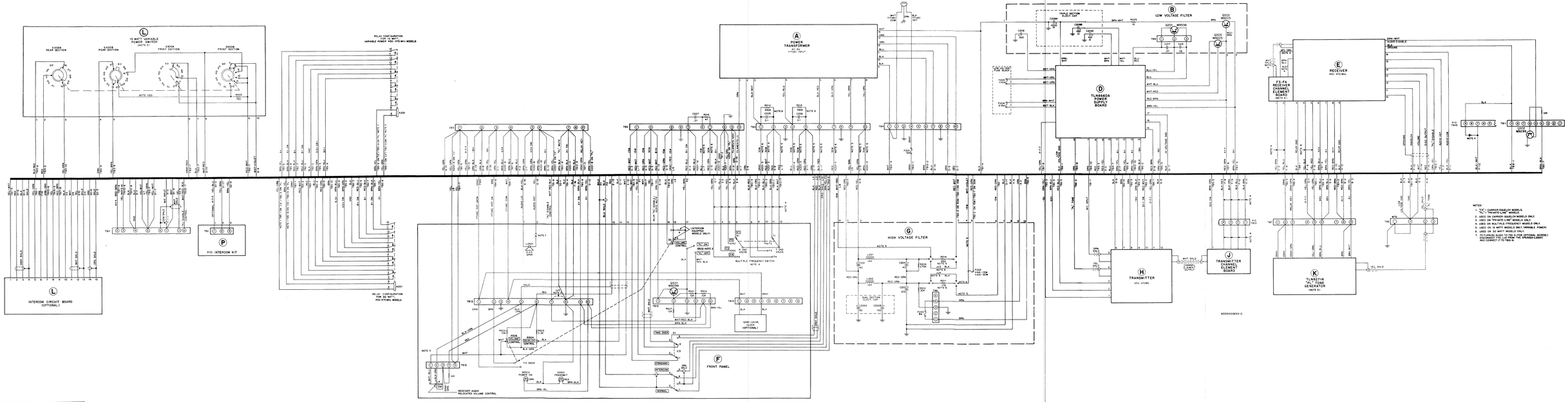
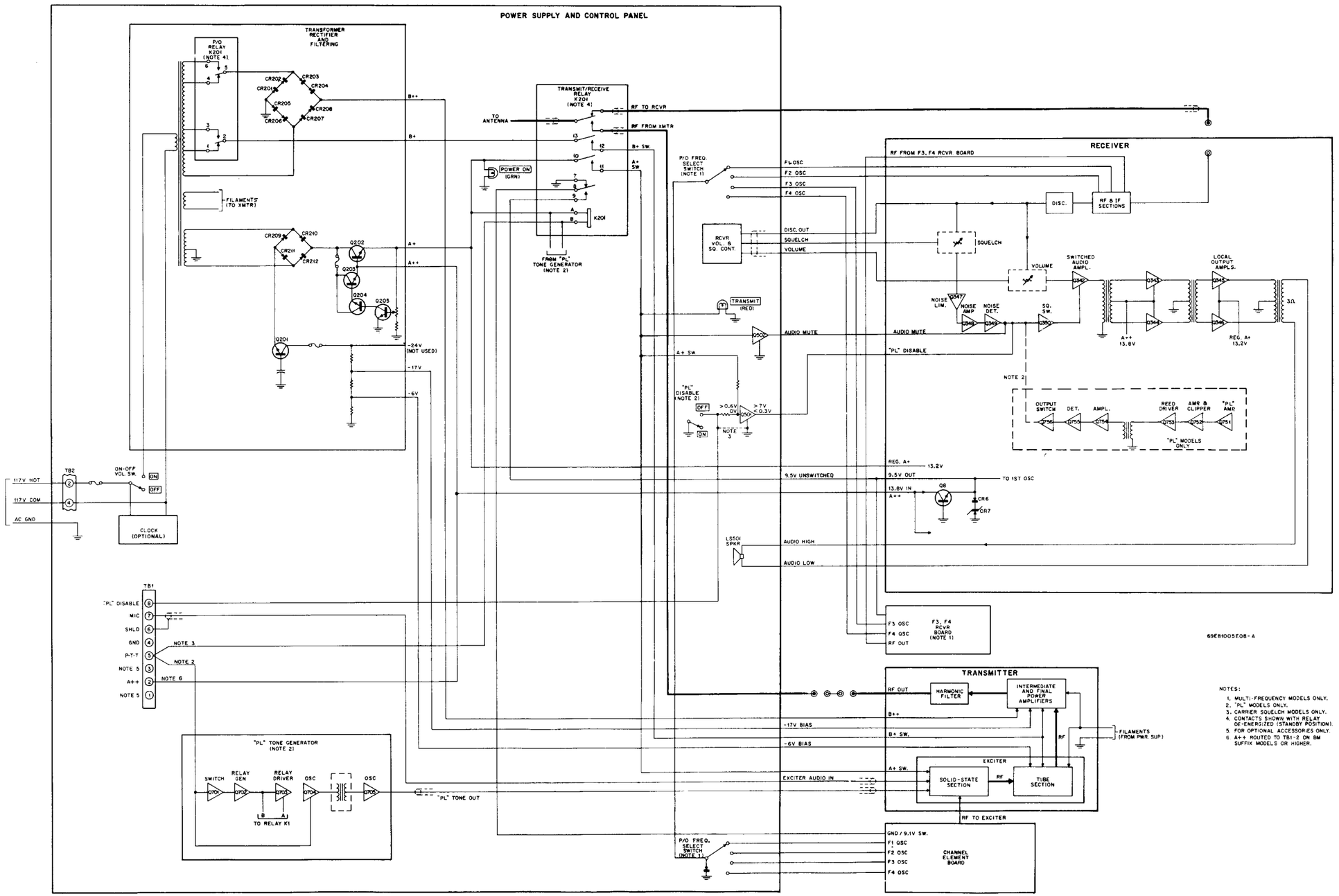


Intercabling Diagram
("AM" Suffix Models)
Motorola No. 63E81005E07-B
6/12/70-UP



Intercabling Diagram
("BM" or higher suffix models)
Motorola No. 63E81009E43-O
6/12/70-UP



Detailed Functional Diagram
Motorola No. 69E81005E08-A
6/12/70-UP

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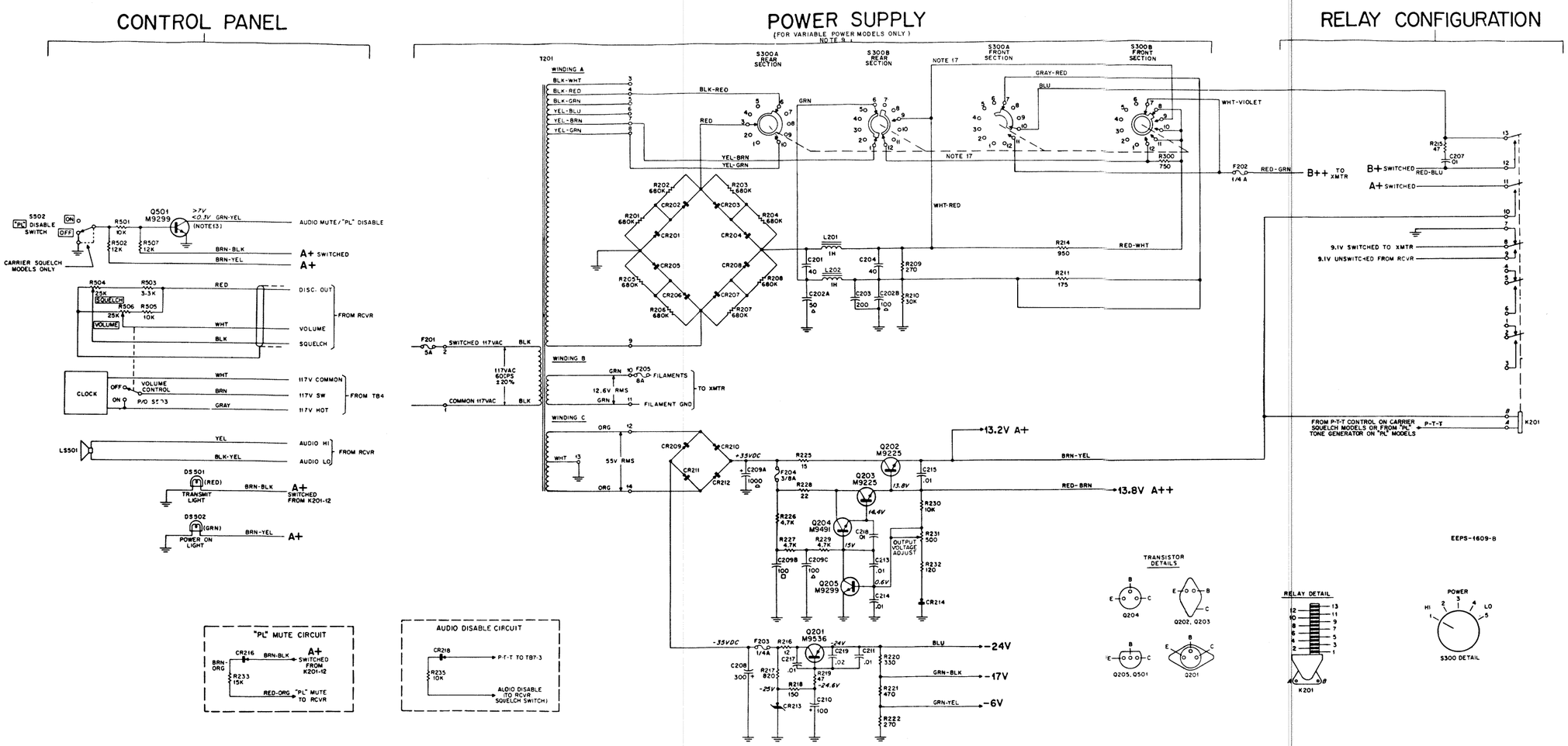

Schematic Diagram
Motorola No. 63P81005E39-A
(Sheet 1 of 3)
6/12/70-UP

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PARTS LIST

TLN4133B Chassis Assembly
TLN4133A Chassis Assembly — PL-537-A

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		CAPACITOR, fixed: uF:
C201, 204	23D83093G06	40 +150-10%; 450 V
C202	23D82125B21	2 section; c/o:
C202A		△ 50 +50-10%; 450 V
C202B		◯ 100 +50-10%; 450 V
C203	23D83093G07	200 +50-10%; 450 V
C205, 206	8C82095G08	0.1 ±10%; 400 V
C207	21C82164B01	.01 ±10%; 1000 V
C208	23D83093G08	300 +100-10%; 60 V
C209	23D82178B07	3 section c/o:
C209A		◯ 1000 +100-10%; 60 V
C209B		□ 100 +100-10%; 60 V
C209C		△ 100 +100-10%; 60 V
C219	21K832502	.02 +60-40%; 250 V
		SEMICONDUCTOR DEVICE, diode: (SEE NOTE)
CR219	48C82392B03	silicon (TLN4133B only)
		LAMP, incandescent: min bay:
DS501, 502	65C82110C03	14 V; 0.31 cp; type No. 756
		FUSE, cartridge: 1-1/4" x 1/4" 250 V: unl stated
F201	65S52293	5 A
F202	65S21975	1/2 A (30 watt radio)
	or65S20987	1/4 A (15 watt radio)
F203	65S20987	1/4 A
F204	65K868957	3/8 A
F205	65S135457	8 A; 125 V; wire-in lead type
		RELAY, armature: special purpose:
K201	80D83252G03	2 section; one section stack type cont assembly; c/o 2 form "A", 4 form "C"; other section coaxial type cont assembly, c/o 1 form "C"; coil res 85 ohms ±10%
		COIL, RF:
L201, 202	25C83252G02	choke; 1 H
		LOUDSPEAKER, magnetic: PM dynamic:
LS501	50D82774C01	oval; 3" x 5"; 3.2 ohms impedance
		TRANSISTOR: (SEE NOTE)
Q201	48R869536	N-P-N; type M9536; incl mounting insulator
Q202, 203	48R869225	N-P-N; type M9225; does not incl 14A83575A01 INSULATOR, mounting
Q501, 502	48R869299	N-P-N; type M9299
		RESISTOR, fixed: ±10%; 1/2 W unl stated
R209	6S6414	270K
R210	17D83122D10	30K ±5%; 6.5 W
R211	17C82381A15	175 ±5%; 15 W
R212, 213	6S2096	330K
R214	17C83390G01	950 ±5%; 40 W
R215	6S5550	47
R225	17C83389G01	15 ±5%; 20 W
R501	6S129225	10K; 1/4 W
R502	6S129230	12K; 1/4 W
R503	6S5581	3.3K
R504	18D82700D07	var: 25K ±30%; 0.16 W
R505	6S6320	10K
R506	18D82810C07	var: 25K ±30%; 0.33 W; incl spst switch (S503)
R507, 508	6S6394	12K
		TRANSFORMER, power: 117 V AC; 60 Hz:
T201	25D83299G01	pri: BLK, BLK; res 0.85 ohms ±10% high voltage sec: BLK-WHT, BLU with the following taps: BLK-RED, BLK-GRN, YEL-BLU, YEL-BRN, YEL-GRN; total res 30 ohms ±10% low voltage sec: ORG, ORG with WHT center tap; total res 0.7 ohms ±10% filament winding: GRN, GRN; res .09 ohm ±10%
		LAMPHOLDER:
XDS501, 502	9B82778C01	min bay; does not incl lens (see NON-REFERENCED ITEMS)
		FUSEHOLDER:
XF201, 202	9C82083C01	extractor post type
		NON-REFERENCED ITEMS
	55B83660E02	LOCK: incl 55K893872 KEY: 2 supplied
	42B84439A01	CLIP, channel element
	9B83662A01	SOCKET, transistor: 2 req'd
	31K857744	BOARD, fuse mtg.
	31B82573C07	BOARD, terminal: 8 screw terminal
	41B83831E01	SPRING, clip
	31S120975	STRIP, terminal: (8 lug; #3 & 8 GND) 3/8"; 2 req'd
	31S135071	STRIP, terminal: (9 lug; #4 & 8 GND) 1/4"' 3 req'd
	31S135012	STRIP, terminal: (9 lug; #4 & 9 mtg.) 3/8"
	31S136397	STRIP, terminal: (8 lug; #4 & 9 mtg.) 3/8"
	31S135976	STRIP, terminal: (3 lug; #1 & 5 GND) 1/4"
	1V80702B88	CABLE ASSY., interconnecting
	1V80775A77	FRONT PANEL ASSY.
	1V80775A78	FRONT FRAME & PLASTIC PANEL ASSY.
	9C82442E01	RECEPTACLE, chassis: female
	15A483599	HOOD, receptacle
	28B82331G01	CONNECTOR, plug:
	1V80782A53	SHIELD ASSY.
	42K861179	CLAMP, cable: 5/16"
	1V80776A49	LINE CORD
	42B82018H01	RETAINER, cable
	14A83575A01	INSULATOR, mica: 2 req'd
	7C83310G01	BRACKET, swivel mtg: 2 req'd
	37K109120	GROMMET, rubber
	65B83241G01	JEWEL, lamp: RED
	65B83241G02	JEWEL, lamp: GRN
	15B83154G01	COVER, lamp: 2 req'd

TLN8970A Variable Power Kit — PL-405-O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		RESISTOR, fixed:
R300	17C82381A18	750 ±10%; 15 w
		SWITCH, rotary: 5 position:
S300	40C84222A01	special type; incl.
S300A		front wafer
S300B		rear wafer, does not incl. 36B82573D01 KNOB, control

PARTS LISTS FOR PRINTED CIRCUIT BOARDS ARE ON THE BACK OF THE CORRESPONDING PRINTED CIRCUIT BOARD DETAILS

TRANSMITTER

TLN8890A Transmitter Chassis Kit (406-420 MHz)
TLN8891A Transmitter Chassis Kit (450-470 MHz)
TLN8315A Transmitter Chassis Kit (406-420 MHz)
TLN8316A Transmitter Chassis Kit (450-470 MHz) EPD-15274-H

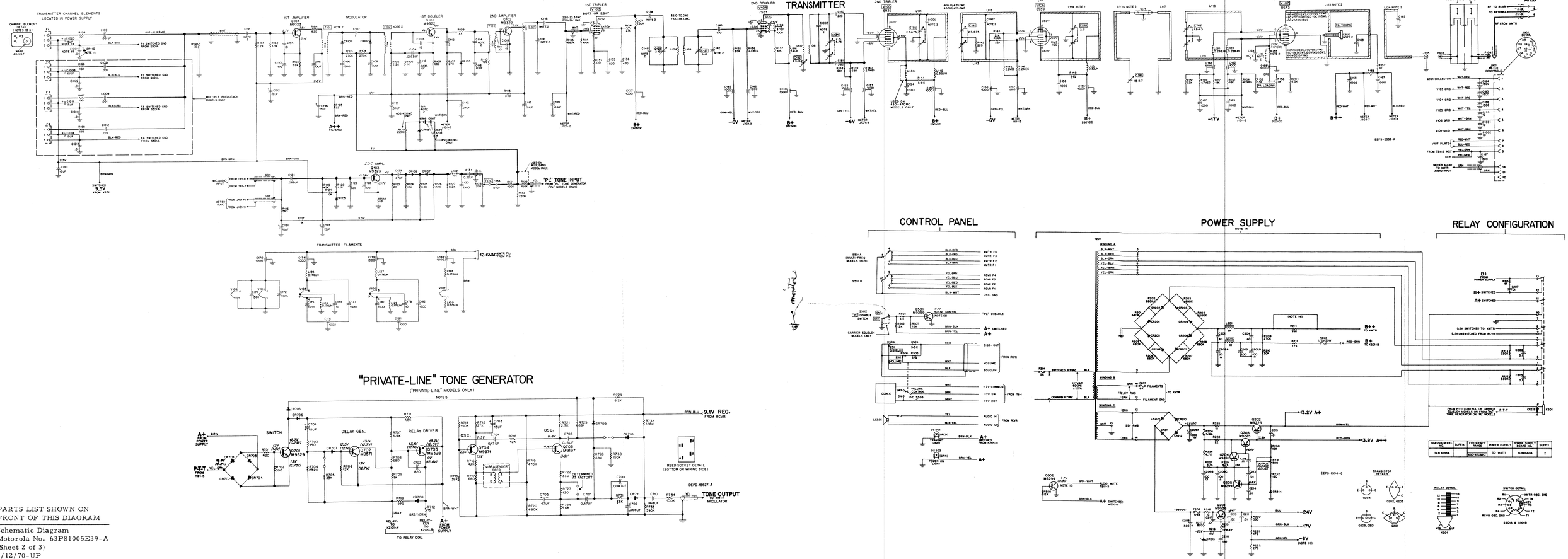
REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		CAPACITOR, fixed: pF ±10%; 500 v; unl stated
C125	20C82984E01	var: 3-12; NP0 p/o L104
C127	20C82984E01	var: 3-12; NP0 p/o L105
C132	19C475605	var: 2.3-14.2; p/o L107
C134	19K859089	var: 2.7-6.75; p/o L108
C135	21B837745	820
C136	21C82187B07	470
C137, 145, 146, 148, 152, 153, 155, 156, 157, 159, 161, 162, 165, 170, 174, 176, 179, 181, 183, 198	21B861219	1000 +100-0%; coded RED
C138	21K850510	470; 300 v; p/o L104
C139	19K859089	var: 2.7-6.75; p/o L111
C140	21K848525	16 ±5%; NP0; p/o L104 (TLN8316A, TLN8891A)
	or21K840365	24 ±5%; NP0 (TLN8315A, TLN8890A)
C141	19B82475E01	var: 2.7-6.75
C142	21K847874	12 ±5%; NP0; p/o L105 (TLN8316A, TLN8891A)
	or21K840849	20 ±5%; NP0 (TLN8315A, TLN8891A)
C143	21C82187B07	470; p/o L105
C144	19K859089	var: 2.7-6.75; p/o L114
C147	19A820263	var: 1.7-8.7
C149	19B82550E03	var: 1.8-4.5 pF; 850 v
C150, 151	21K847087	220; 300 v; p/o L108
C154, 158, 160, 163	21C83191A01	1000 +100-0%
C164	21K851846	8 ±0.25 pF; NP0 (TLN8316A, TLN8891A)
C166	1B82584E01	plate and screw assy; p/o L123 (TLN8316A, TLN8891A)
	or 1B82584E03	plate and screw assy; p/o L123 (TLN8315A, TLN8890A)
C167, 168	21C83805C01	1000 +100-0%; 100 v
C169, 188	21C82880E17	7; 850 v
C171, 172, 175, 177, 180, 182, 184, 185, 186, 187	21B800801	1500
C173, 178, 199, 1001, 1002	21R410063	10 ±0.5 pF; NP0
C1005	21C82450B17	2.2 ±5%; (TLN8315A, TLN8890A)
C1006	21C82450B08	1.2 ±5%; (TLN8315A, TLN8890A)
C1007	21C82450B33	0.56 ±5%; (TLN8315A, TLN8890A)
		CONNECTOR, receptacle:
J101	9C857358	female; 12 cont.
J105	9C83663C01	female; single cont.
		COIL, RF:
L103	24K859166	7.3 uH
L104	24V80901A76	plate coupling; incl. C125, 138, 140 (TLN8316A, TLN8891A)
	or24V80902A15	plate coupling; incl. C125, 138, 140 (TLN8315A, TLN8890A)
L105	24V80901A77	grid coupling; incl. C127, 142, 143 (TLN8316A, TLN8891A)
	or24V80902A16	grid coupling; incl. C127, 142, 143 (TLN8315A, TLN8890A)

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
L106	24D859162	choke; 1.2 uH
L107	24V80901A90	plate coupling; incl. C132
L108	24V80901A91	grid coupling; incl. C134, 150, 151 (TLN8316A, TLN8891A)
	or24V80902A17	grid coupling; incl. C134, 150, 151, C1005 (TLN8315A, TLN8890A)
L109	24A82998G01	choke; (TLN8315A, TLN8890A)
L110	24A835456	choke; 0.32 uH; p/o L111
L111	24V80901A92	plate coupling; incl. C139, L110 (TLN8316A, TLN8891A)
	or24V80902A18	plate coupling incl. C139, C1006, L110 (TLN8315A, TLN8890A)
L112	24A82617E01	grid coupling
L113	24A82618E01	grid coupling
L114	24V80901A97	I.P.A. plate; incl. C144, L115
L115	25A835456	choke; 0.32 uH
L116	24A82604E01	I.P.A. coupling loop
L117	24A82797E01	P.A. grid coupling
L118	24A82796E01	P.A. grid tuning
L119	24A82794E01	P.A. grid tuning
L120, 121	24B82613G01	choke; 0.288 uH
L123	1V80758A41	P.A. plate tank; incl. C166 and 7C83808C01 BRACKET, tank 39B83809C01 PIN, contact: 2 req'd 1V80726A35 PLATE & BUSHING ASSY. 14B83810C01 INSULATOR stand-off 4K868475 INSULATOR ASSY.: 4 req'd 7C83462D03 BRACKET, thermo 41B82790E01 SPRING, grounding 4C82418B68 WASHER, insulator 2B83677G01 NUT, lock (TLN8316A, TLN8891A)
	or1V80773A22	P.A. tank; incl. C166 and 7C83959E01 BRACKET, tank 39B83809C01 PIN, contact 2 req'd 1V80777A26 PLATE & BUSHING ASSY. 14B83810C01 INSULATOR, stand-off: 2 req'd 4K868475 INSULATOR ASSY: 4 req'd 7C83462D03 BRACKET, thermo 41A83059G01 SPRING, grounding 4C82418B83 WASHER, insulator 2B83677G01 NUT. lock (TLN8315A, TLN8890A)
L124	24A82626E01	P.A. plate coupling (TLN8316A, TLN8891A)
	or24B82580G01	P.A. plate coupling (TLN8315A, TLN8890A)
L125 thru 130	24K858989	choke; 0.176 uH
L137	24K858989	choke; 0.176 uH (TLN8315A, TLN8890A)
		CONNECTOR, plug:
P103, 104	28B82331G01	male; single cont.
		RESISTOR, fixed: ±10%; 1/2 w unl stated
R114	6S6031	100K
R133	6S6022	330
R134	6S6434	27K
R135	6S5644	82K
R136, 140	6S129239	2.7 meg; 1/4 w
R137	6S6320	10K
R138, 139	6S6074	68K
R141	6S5618	3.9K; 1 w
R142	6R6270	220
R143, 144	6S6397	22K
R145, 146	6S2073	2.2 meg ±5%
R147	6S6326	100
R148	6S5686	2.7K; 1 w
R149, 154	6S6446	4.7 meg
R150, 153	6S5410	33K
R151, 152	6S5591	18K
R155	6S6326	100 (TLN8316A, TLN8891A)
R156	18C83807C01	var: 5K; 12.5 w
R157	17C82177B02	32 ±5%; 5 w
R158	17K847359	2 ±2%; 1 w
R201	17D82177B15	4.5K; 7 w
		ELECTRON TUBE:
V103	65A83735A02	type 12BY7
	or95S164A02	type 12BY7A

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
V104	97R121A01	type 7551
V105, 106	97S113A01	type 6939
V107	97S136A02	type 8643 (TLN8315A, TLN8316A)
	or97S136A01	type 8643 (TLN8890A, TLN8891A)
		SOCKET, electron tube: female:
XV103, 104	9K858977	9 cont.
XV105, 106	9C82057E01	8 cont.
XV107	9B82264A01	7 cont.
		FILTER, harmonic:
Z105	1V80758A38	incl. P103, P104 (TLN8316A, TLN8891A)
	or1V80731A35	incl. P103, P104 (TLN8315A, TLN8890A)

NOTE:

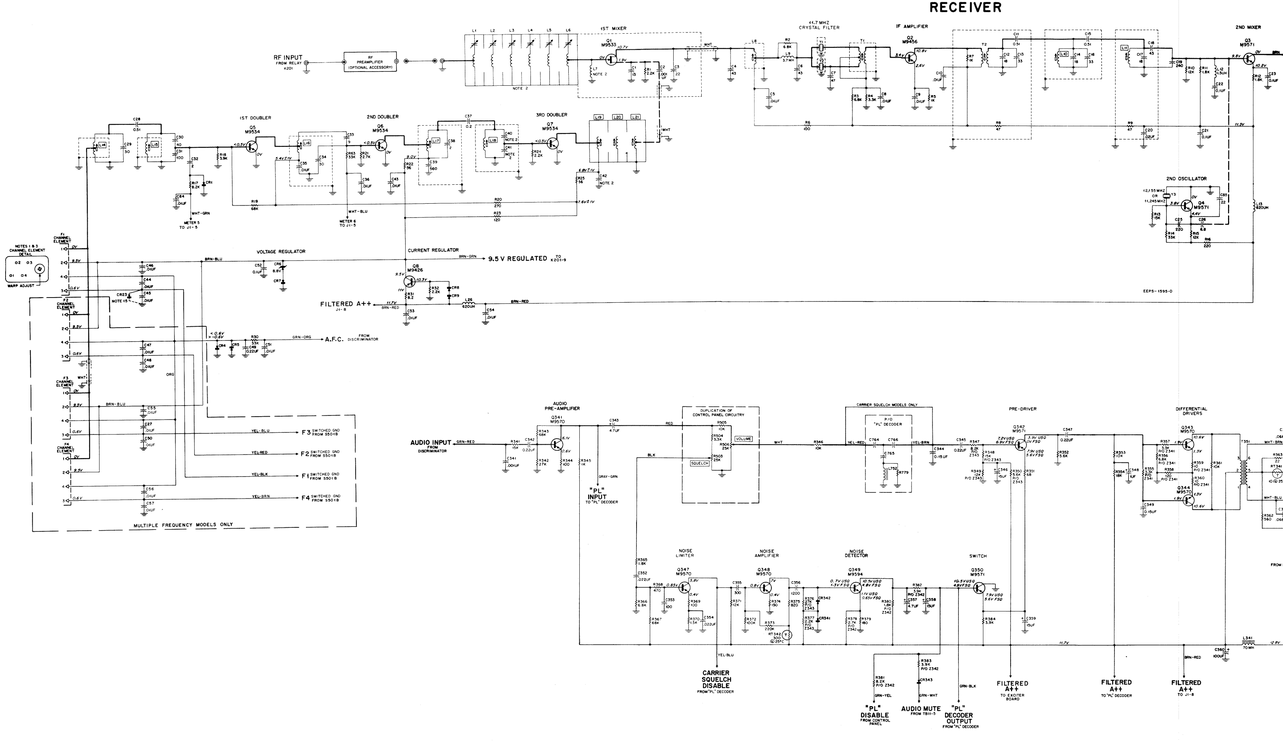
Replacement diodes and transistors must be ordered by Motorola part number only for optimum performance.



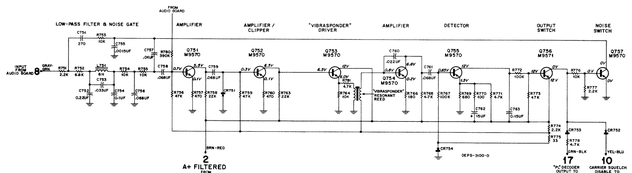
PARTS LIST SHOWN ON
FRONT OF THIS DIAGRAM

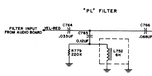
Schematic Diagram
Motorola No. 63P81005E39-A
(Sheet 2 of 3)
6/12/70-UP

RECEIVER



"PRIVATE-LINE" DECODER





NOTES:

1. FREQUENCY CALCULATIONS:

   TRANSMITTER

   $f_o = \frac{f_c}{36}$

   RECEIVER

   $f_o = \frac{f_c - 11.7\ MHz}{24}$

2. SEE PARTS LIST FOR COMPONENT VALUES.
3. PIN NUMBERS ARE FOR REFERENCE ONLY. PINS ARE PART OF CIRCUIT BOARD.
4. Q345 AND Q346 ARE LOCATED ON RECEIVER CHASSIS.
5. VOLTAGES IN PARENTHESES ARE FOR KEYED TRANSMITTER CONDITION.
6. COMPONENT REFERENCES OUTLINED BY A RECTANGLE INDICATE MARKING ON CHASSIS.
7. SEE PARTS LIST FOR RESISTOR WATTAGE RATINGS, UNLESS OTHERWISE STATED. CAPACITOR VALUES ARE IN PICOFARADS.
8. ALL DC VOLTAGES ARE MEASURED WITH A MOTOROLA SOLID-STATE DC MULTIMETER OR EQUIVALENT WITH 11 MEGOHM INPUT RESISTANCE.
9. S500 SHOWN IN POSITION 1 (15-WATT).
10. USED IN 15-WATT MODELS ONLY.
11. Z1 IS A POTTED ASSEMBLY AND IS REPLACEABLE AS A UNIT.
12. DIODE MOUNTED ON TERMINAL BOARD TB5-7, 8.
13. TCP VOLTAGE IS WITH FUNCTION ACTIVATED. BOTTOM VOLTAGE IS STANDBY.

    A > B = A IS GREATER THAN B.
    A < B = A IS LESS THAN B.
14. USED IN 30-WATT MODELS ONLY.
15. SINGLE-FREQUENCY MODELS ONLY.
16. SPLIT-CHANNEL ONLY.
17. PART OF S500.
18. NOT USED ON SINGLE-FREQUENCY MODELS.

EPS-2326-A

PARTS LIST SHOWN ON BACK OF THIS DIAGRAM

Schematic Diagram
Motorola No. 63P81005E39-A
(Sheet 3 of 3)
6/12/70-UP

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION

PARTS LIST

IMPORTANT

USE ONLY THE FOLLOWING MOTOROLA PART NUMBERS WHEN ORDERING REPLACEMENT PARTS

PARTS LISTS FOR PRINTED CIRCUIT BOARDS ARE ON THE BACK OF THE CORRESPONDING PRINTED CIRCUIT BOARD DETAILS

RECEIVER

TLN8846A Metering Socket & Cable — PL-315-O

C58, 59, 60, 61	21K832501	CAPACITOR, fixed .01 uF +60-40%; 250 v
J1	9C857358	CONNECTOR, receptacle: female; 12 cont.
R33, 34	6S129225	RESISTOR, fixed: 10K ±10%; 1/4 w

IF Filter — PL-314-O

Z1	TFN6022AS	FILTER, IF bandpass: (split channel); center freq. 455 kHz

TLN8993A Receiver Chassis Kit (Carrier Squelch)
TLN8994A Receiver Chassis Kit (Tone-Coded Squelch)
PL-317-O

Q345, 346	48K134584	TRANSISTOR: P-N-P; type M4584; does not incl. 14B82399B01 INSULATOR, mtg
T352	25C82061H02	TRANSFORMER, AF: lug terminals (not marked) pri: center tapped; total res 0.5 ohms ±10% sec: res 0.2 ohms max.
XQ345, 346	9B851303	SOCKET, transistor: 2 cont

Channel Element (Receiver with AFC) — PL-423-O

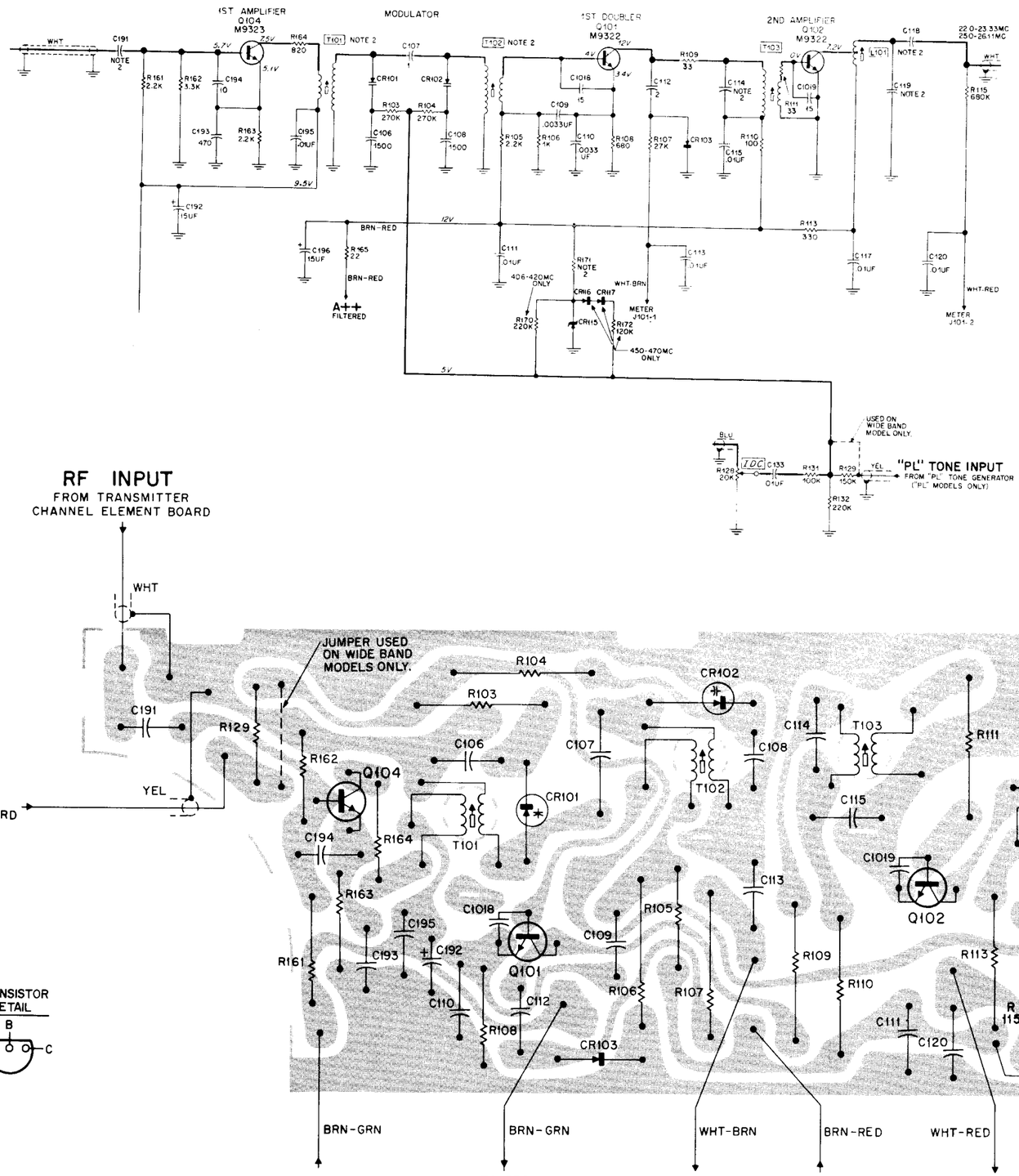
	CER-106B	CHANNEL ELEMENT, receiver control: capable of ±.0002% frequency stability in receivers with AFC; consists of: TLN8968A Oscillator Module RES-106B Resonator Module (crystal)

TLN4135A Multiple-Frequency Kit — PL-555-O

CR23	48C82392B03	SEMICONDUCTOR DEVICE, diode: silicon
S501	40C83304G01	SWITCH, rotary 2 pole; 4 position; incl adjustable stop; does not incl 36B82630H01 KNOB, control

NOTE:

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



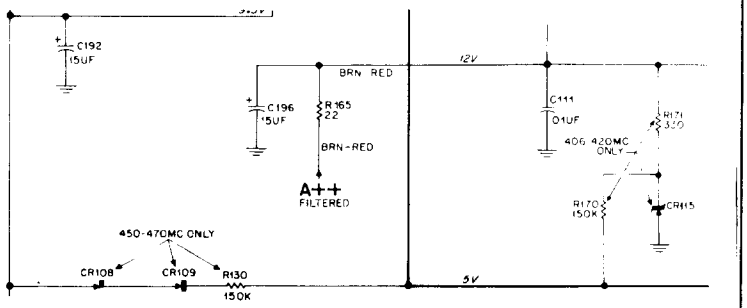
PREVIOUS REVISIONS AND PARTS LIST SHOWN ON BACK OF THIS DIAGRAM

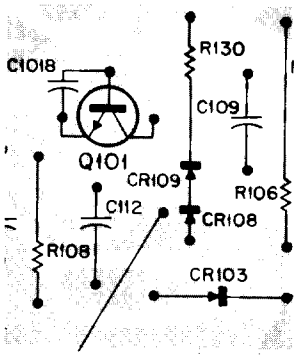
Exciter Circuit Board Detail
Motorola No. PEPD-18603-D
6/12/70-UP

REVISIONS

PEPD-18603-D

BOARD AND SUFFIX NO.	REF. SYMBOL	CHANGE	LOCATION
		REVISED DESIGNATION OF BRN-RED (A++) LEAD.	BOTTOM CENTER OF BOARD.
TLE6156A-2	C107	WAS 21C82450B08, 1.2 uuf	MODULATOR
	R170	WAS 6S128683, 150K	
TLE6157A-1	CR108, 109	REMOVED 48C82392B03	
	CR116, 117	ADDED	
	R130	REMOVED 6S5559, 150K	
	R131	ADDED, 100K (450-470 mc)	PARTS LIST
	R171	ADDED 430 OHMS (450-470 mc)	
	R172	ADDED 120K (450-470 mc) CIRCUIT WAS AS SHOWN BELOW:	





REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION

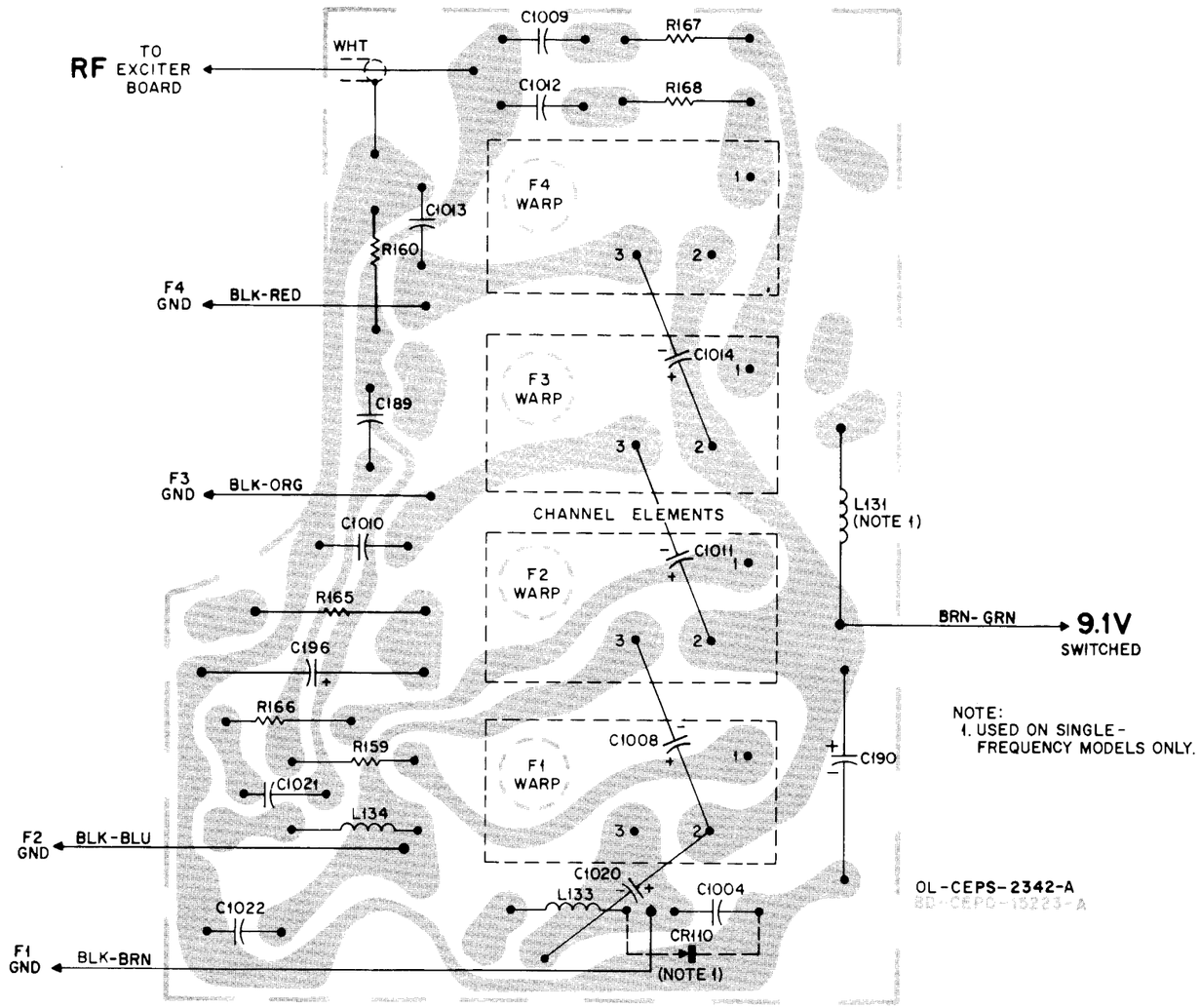
PARTS LIST

TLE6156A Exciter Kit (406-420 MHz)
TLE6157A Exciter Kit (450-470 MHz) EPD-15273-E

		CAPACITOR, fixed: pF; ±10%; 500 v; unl. stated
C106, 108	21D82187B18	1500; 1000 v
C107	21C82450B34	1 ±5%; (TLE6156A)
	or21C82450B08	1.2 ±5%; (TLE6157A)
C109, 110	21D82428B10	.0033 uF; 100 v
C111, 120	21D82428B58	.01 uF +80-20%
C112	21D82133G37	2 ±0.25 pF; NP0
C113, 115, 117, 195	21D82428B59	.01 uF+80-20%; 200 v
C114	21D82610C44	100 ±5%; 100 v; N220 (TLE6157A)
	or21D82610C09	120 ±5%; N220 (TLE6156A)
C118, 191	21D82187B10	270 (TLE6157A)
	or21C82428B59	.01uF +80-20%; 200 v (TLE6156A)
C119	21D82133G81	10; N1500 (TLE6157A)
	or21D82204B19	20 ±5%; N1500 (TLE6156A)
C133	8D82905G07	0.1 uF; 50 v
C192	23K865136	15 uF ±20%; 25 v
C193	21C82187B07	470
C194	21D82133G01	10 ±5%; NP0
C1018, 1019	21K840846	15 ±5%; NP0
		SEMICONDUCTOR DEVICE, diode: (SEE NOTE)
CR101, 102	48C82190H02	silicon; varactor type
CR103	48C82921G01	germanium
CR115	48D82256C56	silicon; zener type (TLE6156A only)
	or48D82256C16	silicon; zener type (TLE6157A only)
CR116, 117	48C82392B03	silicon (TLE6157A only)
		COIL, RF:
L101	24V80905A27	RED DOT; incl. 76C82098H01 CORE, tuning
		TRANSISTOR: (SEE NOTE)
Q101, 102	48R869322	N-P-N; type M9322
Q104	48R869323	N-P-N; type M9323
		RESISTOR ±5%; 1/2 w; unl. stated
R103, 104	6S2050	270K
R105, 161, 163	6S128689	2.2K ±10%; 1/4 w
R106	6S6229	1K ±10%
R107	6S5786	27K
R108	6S128599	680 ±10%; 1/4 w
R109, 111	6S2036	33 ±10%
R110	6S6326	100 ±10%
R113	6S6022	330 ±10%
R115	6S5775	680K
R128	18D82238D14	var; 20K; 1/4 w
R129	6S128683	150K; 1/4 w
R131	6S5553	100K (TLE6156A only)
	or6S124A97	100K; 1/4 w (TLE6157A only)
R132	6S400066	220K
R162	6S129231	3.3K ±10%; 1/4 w
R164	6S129432	820 ±10%; 1/4 w
R170	6S124B06	220K; 1/4 w (TLE6156A only)
R171	6S129806	330; 1/4 w (TLE6156A only)
	or6S124A40	430; 1/4 w (TLE6157A only)
R172	6S2049	120K (TLE6157A only)
		TRANSFORMER:
T101, 102	24V80903A21	coded GRAY-ORG incl. 76B82611C02 CORE, tuning; (TLE6157A)
	or24V80903A26	coded ORG-RED incl. 76B82611C02 CORE, tuning; (TLE6156A)
T103	24V80905A26	GRN DOT; incl. 76C82098H01 CORE, tuning
NON-REFERENCED ITEMS		
	1V80737A35	SHIELD ASSY. (Used with T101, T102)
	26A82076C03	SHIELD (Used with L101, T103)

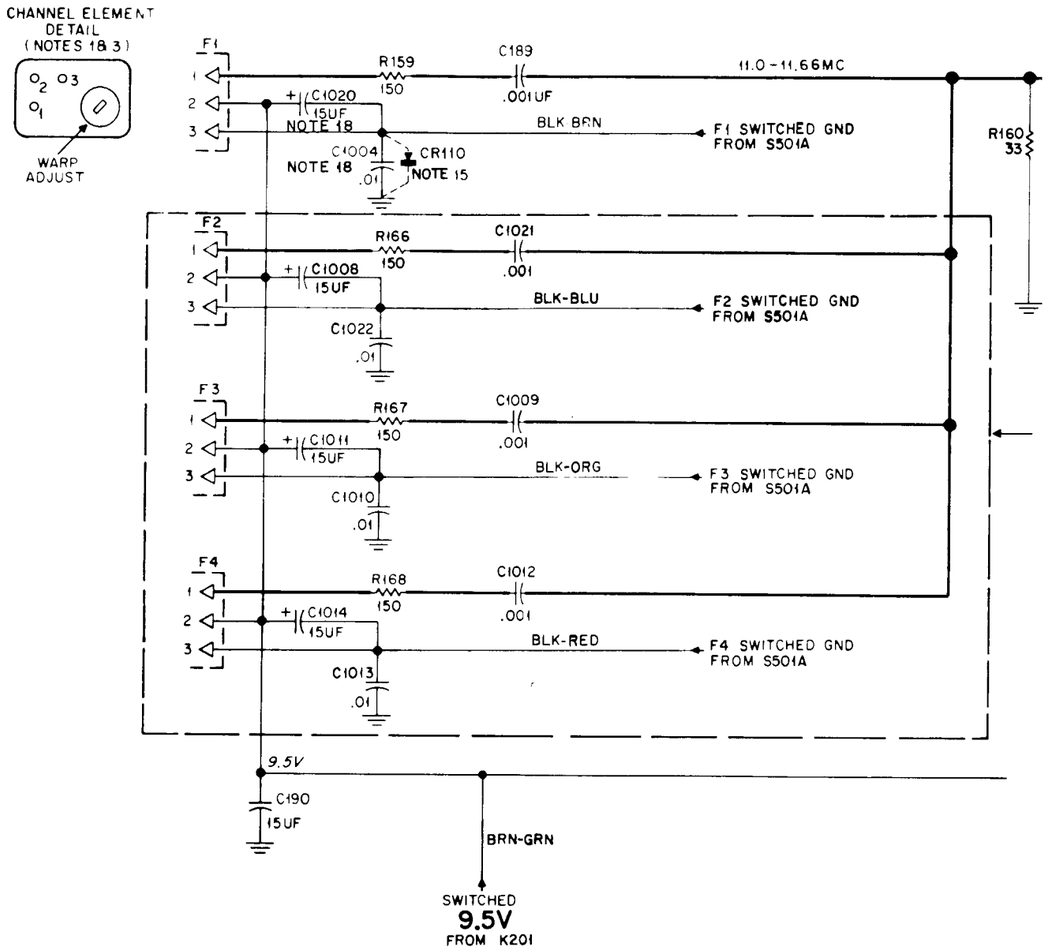
NOTE:

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



NOTE:
1. USED ON SINGLE-FREQUENCY MODELS ONLY.

TRANSMITTER CHANNEL ELEMENTS
LOCATED IN POWER SUPPLY



PARTS LIST SHOWN ON BACK OF THIS DIAGRAM

Transmitter Channel Element
Circuit Board Detail
Motorola No. PEPS-2343-A
6/12/70-UP

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION

PARTS LIST

TLN8530A Xmtr. Channel Element Board
(Multiple-Frequency) EPD-15556-G

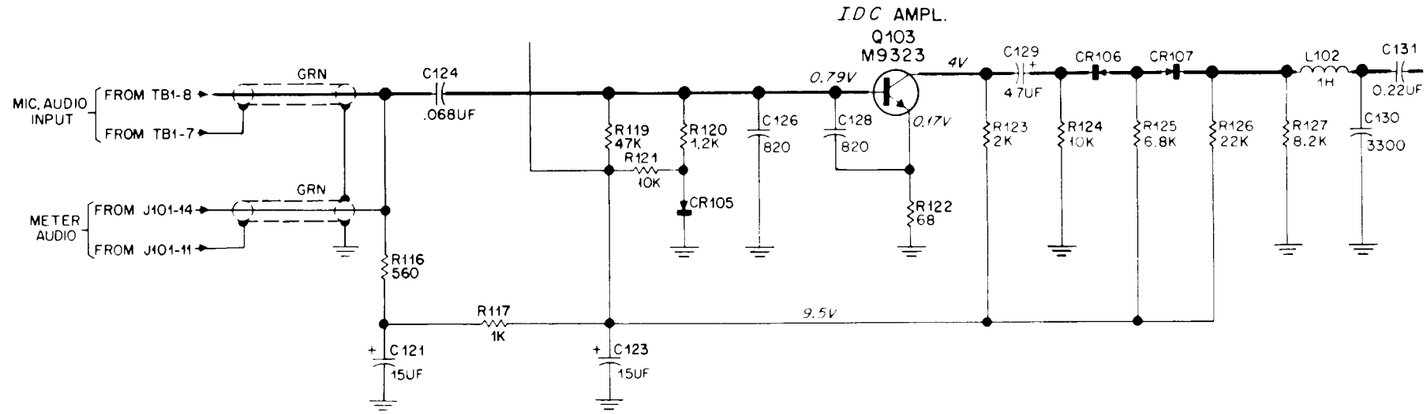
		CAPACITOR, fixed:
C189, 1021, 1009, 1012	21C82187B20	.001 uF ±10%; 100 V
C190, 196, 1020, 1008, 1011, 1014	23K865136	15 uF ±20%; 25 V
C1004, 1022, 1010, 1013	21D82428B59	.01 uF +80-20%; 200 V
		COIL, RF:
L133, 134	24V80900A61	choke; 0.62 mH; sleeved
		RESISTOR, fixed: ±10%;
R159, 166, 167, 168	6S129862	150; 1/4 W
R160	6S129754	33; 1/4 W
R165	6S6406	22; 1/2 W

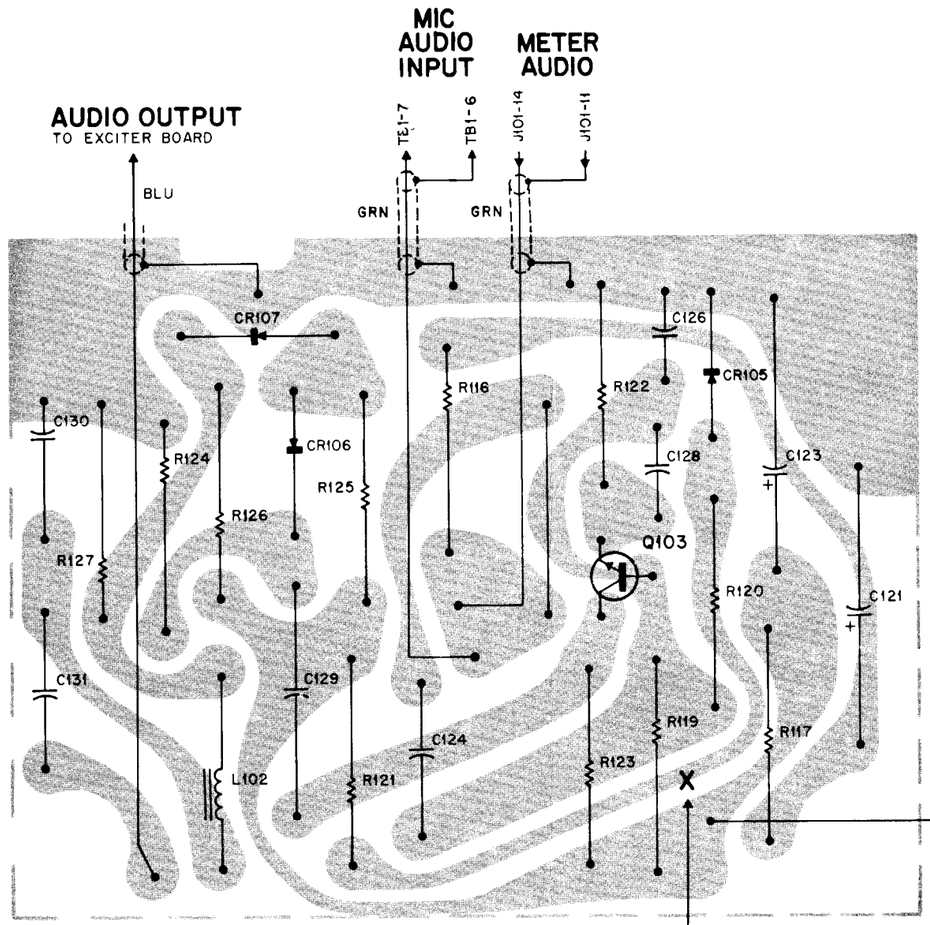
TLN8998A Channel Element Board Kit (F1) PL-355-O

		CAPACITOR, fixed:
C189	21C82187B20	.001 uF ±10%; 100 v
C190, 196	23K865136	15 uF ±20%; 25 v
		SEMICONDUCTOR DEVICE,
		diode: (SEE NOTE)
CR110	48C82392B03	silicon (SG3182)
		COIL, RF:
L131	1V80900A61	choke; 0.62 mH (sleeved)
		RESISTOR, fixed:
R159	6S129862	150 ±10%; 1/4 w
R160	6S129754	33 ±10%; 1/4 w
R165	6S6406	22 ±10%; 1/2 w

NOTE:

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

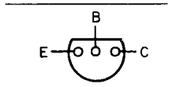




MODEL TABLE

MODEL	SUFFIX	DESCRIPTION
TLN8317A		"IDC" BOARD

TRANSISTOR DETAIL



PARTS LIST SHOWN ON BACK OF THIS DIAGRAM

IDC Circuit Board Detail
Motorola No. PEPD-18607-A
6/12/70-UP

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION

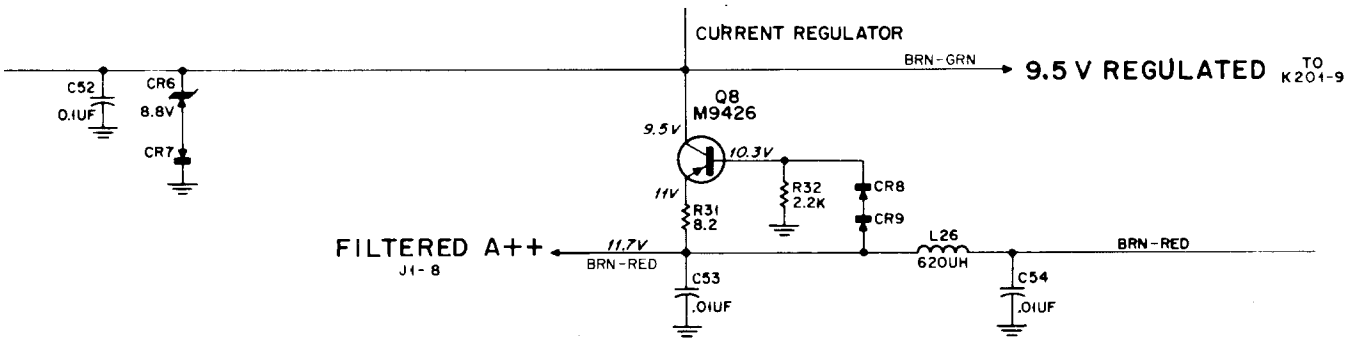
PARTS LIST

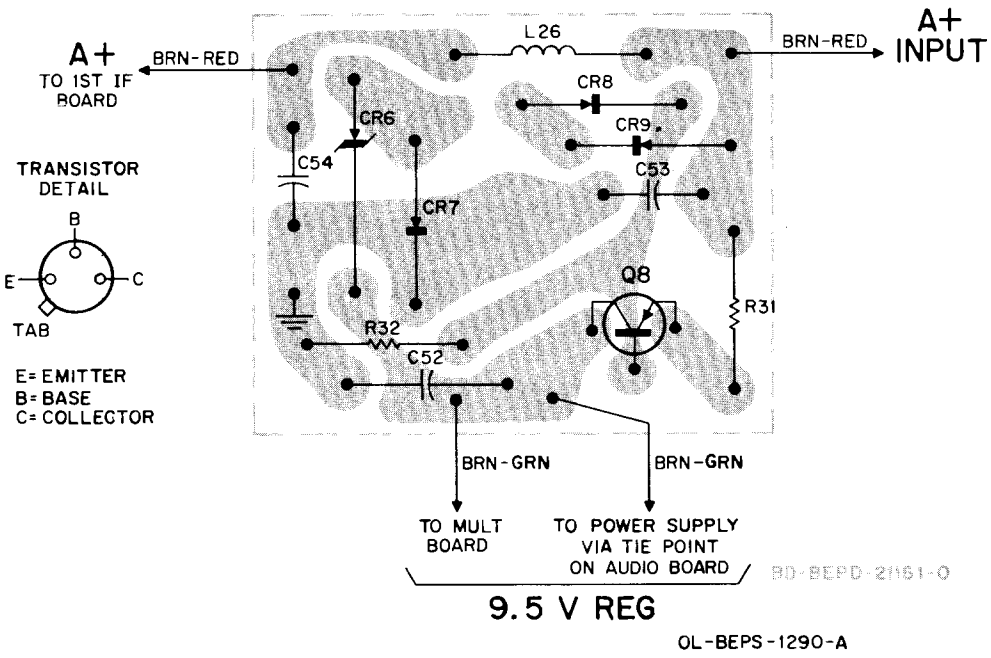
TLN8317A I.D.C. Board Kit EPD-15275-B

		CAPACITOR, fixed: uF ±10%; 25 v; unl. stated
C121, 123	23K865136	15 ±20%
C124	8D82905G04	.068; 50 v
C126, 128	21D82187B17	820 pF; 500 v
C129	23K865137	4.7 ±20%
C130	8D82905G25	.0033; 100 v
C131	8D82905G11	0.22; 50 v
		SEMICONDUCTOR DEVICE, diode: (SEE NOTE)
CR105, 106, 107	48C82392B03	silicon
		COIL, audio:
L102	25D82113H02	choke; 1 h
		TRANSISTOR: (SEE NOTE)
Q103	48R869323	N-P-N; type M9323
		RESISTOR, fixed: ±5%; 1/2 w; unl. stated
R116	6S6291	560 ±10%
R117	6S6229	1K ±10%
R119	6S5772	47K
R120	6S6166	1.2K
R121, 124	6S5556	10K
R122	6S400424	68
R123	6S400060	2K
R125	6S2001	6.8K
R126	6S6480	22K
R127	6S400490	8.2K

NOTE:

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





PARTS LIST SHOWN ON BACK OF THIS DIAGRAM

TLN8746A Voltage Regulator
Circuit Board Detail
Motorola No. PEPS-2703-O
6/12/70-UP

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION

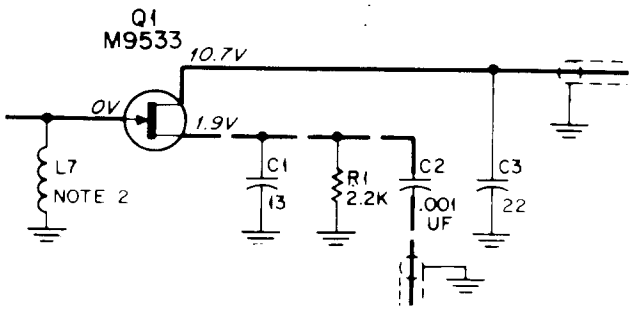
PARTS LIST

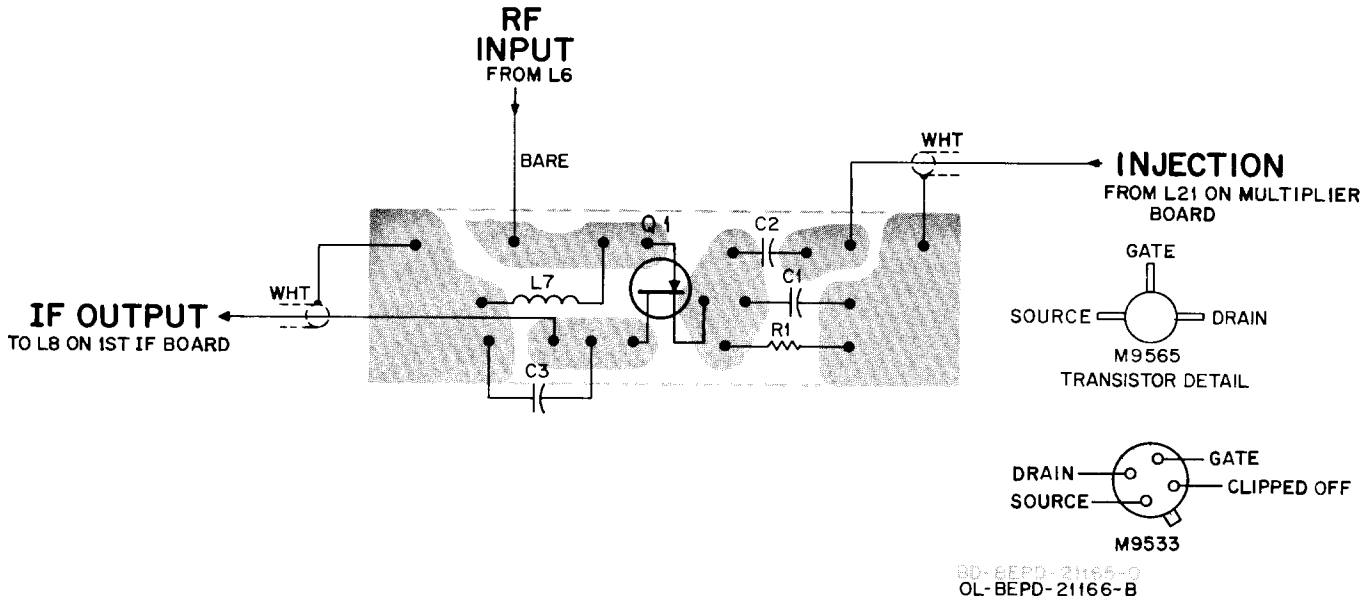
TLN8746A Regulator Board PL-323-O

		CAPACITOR, fixed:
C52	8D82905G30	0.1 uF ±10%; 50 v
C53	21D82428B59	.01 uF ±20%; 200 v
C54	21D82428B62	.01 uF ±20%; 200 v
		SEMICONDUCTOR DEVICE, diode: (SEE NOTE)
CR6	48D82533D10	silicon; zener type
CR7, 8, 9	48C82392B03	silicon
		COIL, RF:
L26	24D82135G08	choke; 620 uH
		TRANSISTOR: (SEE NOTE)
Q8	48R869426	P-N-P; type M9426; does not incl. 14B83878G01 INSULATOR, mounting
		RESISTOR, fixed:
R31	6S124B67	8.2 ±5%; 1/4 w
R32	6S128689	2.2K ±10%; 1/4 w

NOTE:

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





OL-BEPD-21166-B

PARTS LIST SHOWN ON
BACK OF THIS DIAGRAM

RF Deck Circuit Board Detail
Motorola No. PEPS-1289-A
6/12/70-UP

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION

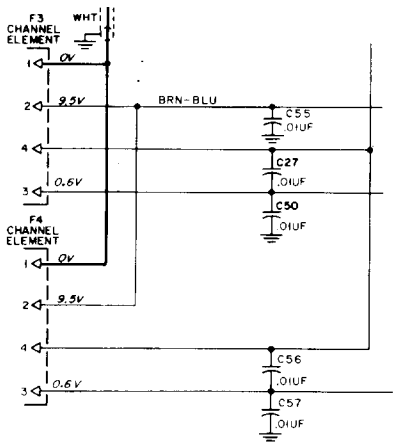
PARTS LIST

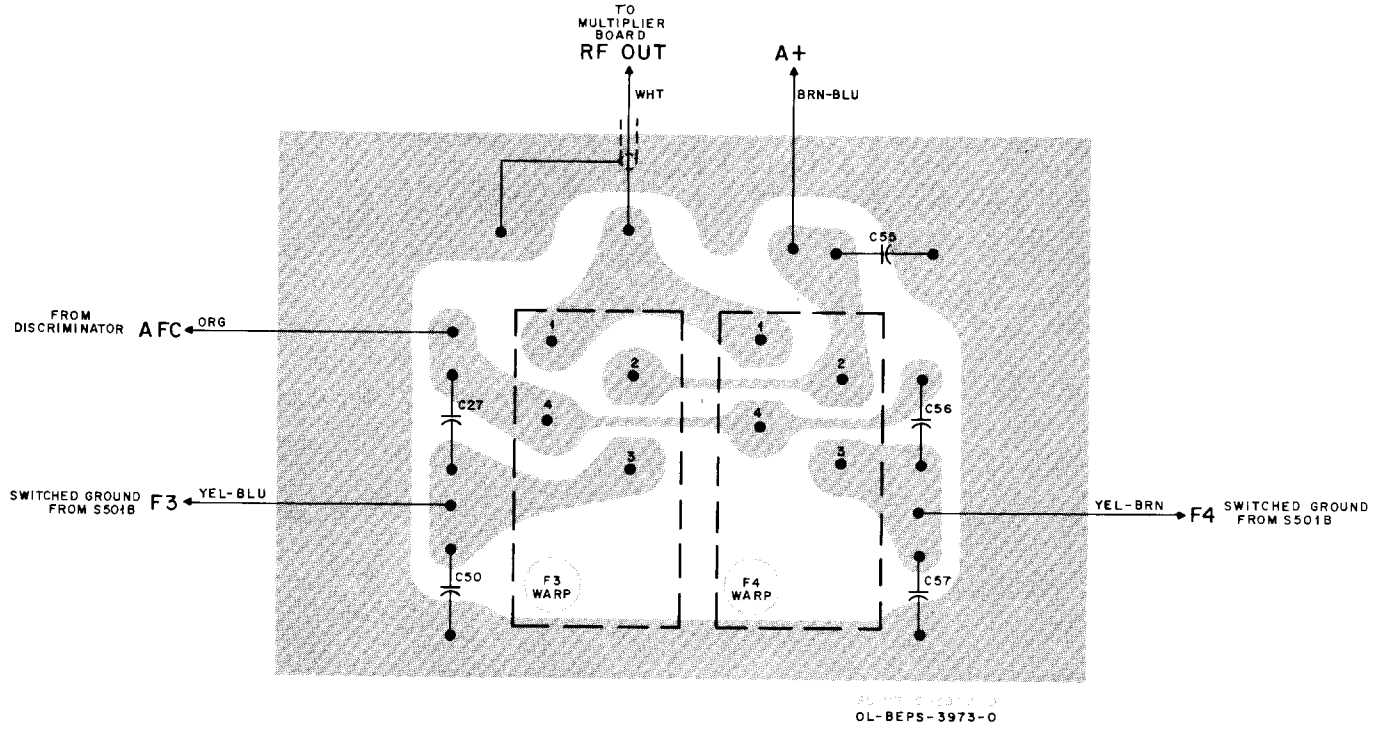
TLE6362A RF Deck — PL-311-A

		CAPACITOR, fixed:
C1	21K867302	13 pF ±5%; 500 v
C2	21D83880G01	.001 uF ±10%; 100 v
C3	21S124554	22 pF ±5%; 500 v; NP0
		CONNECTOR, receptacle:
J1	9B82323G01	female; coaxial; min.
		COIL, RF:
L1	1V80780A73	4 turns; tapped at 0.43 "front end"
L2, 3, 4, 5	24B83853G03	4 turns
L6	1V80780A72	4-1/4 turns; tapped at 1-5/8 turns
L7	24B83884G01	3-1/2 turns; coded RED
		TRANSISTOR: (SEE NOTE)
Q1	48R869533	field-effect; type M9533
		RESISTOR, fixed:
R1	6S185B83	2.2K ±10%; 1/8 w

NOTE:

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





PARTS LIST SHOWN ON BACK OF THIS DIAGRAM

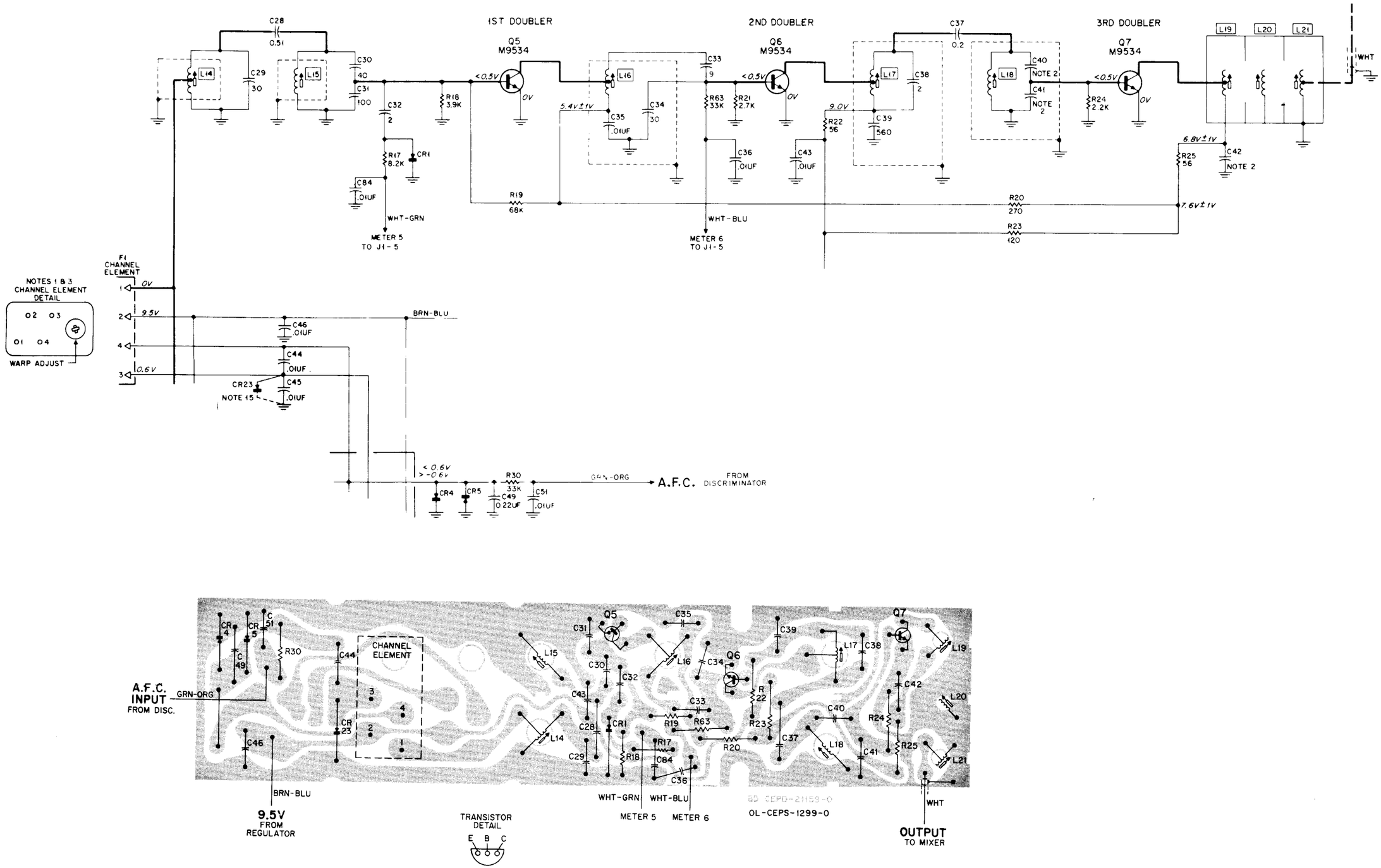
Multiple-Frequency Kit
Circuit Board Detail
Motorola No. PEPS-3981-O
6/12/70-UP

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION

PARTS LIST

TLN4134A Four-Frequency Receiver Board PL-562-O

C27, 50, 55, 56, 57	21D82428B59	CAPACITOR, fixed: .01 uF +80-20%; 200 v



PARTS LIST SHOWN ON
BACK OF THIS DIAGRAM

Multiplier Circuit Board Detail
Motorola No. PEPS-1292-A
6/12/70-UP

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION

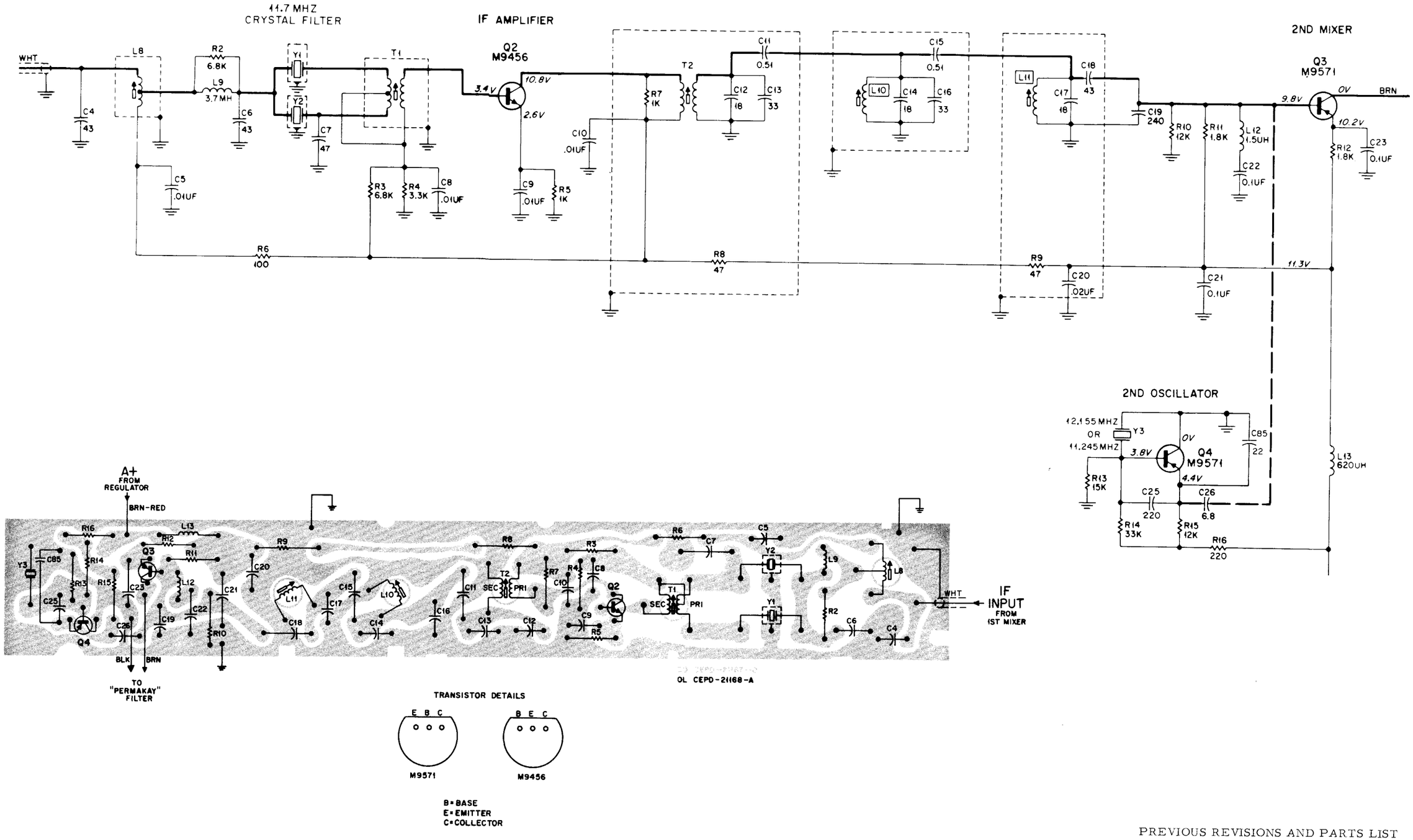
PARTS LIST

TLN8750A Multiplier Board (One-Frequency)
TLN8751A Multiplier Board (Multi-Frequency) PL-319-A

		CAPACITOR, fixed pF; ±5%; 500 v; unl. stated
C28	21C82450B29	0.51
C29	21S114166	30 ±10% (TLN8750A)
	or21D82133G06	27; NP0 (TLN8751A)
C30	21D82610C45	40; 100 v; NP0
C31	21D82610C44	100; 100 v; N220
C32, 38	21K857336	2 ±0.25 pF; NP0
C33	21K859642	9
C34	21K859697	30; N470
C35	21K832501	.01 uF +60-40%; 250 v
C36, 44, 46, 51	21D82428B59	.01 uF +80-20%; 200 v
C37	21D82450B35	0.2 ±10%
C39	21C82187B06	560 ±10%
C40	21K840850	4 ±0.5 pF; NP0
C41	21K840847	5 ±0.5 pF; NP0
C42	21K848525	16; NP0
C43, 84	21D82428B62	.01 uF +80-20%; 200 v
C45, 47, 48	21D82428B59	.01 uF +80-20%; 200 v (TLN8751A only)
C49	8D82905G11	0.22 uF ±10%; 50 v
		SEMICONDUCTOR DEVICE, diode: (SEE NOTE)
CR1	48C82921G02	germanium
CR4, 5	48C82392B13	silicon
CR23	48C82392B03	silicon
		COIL, RF:
L14	24D83857G01	coded BRN; incl. tuning core
L15	24D83857G02	coded RED; incl. tuning core
L16	24D83857G03	coded ORG; incl. tuning core
L17	24D83857G04	coded YEL; incl. tuning core
L18	24D83857G05	coded GRN; incl. tuning core
L19	24B83858G03	13-7/8 turns; tapped at 3-1/4 turns; does not incl. 76B83419G02 CORE, tuning
L20	24B83858G02	13-5/8 turns; does not incl. 76B83419G02 CORE, tuning
L21	24B83858G01	12-1/4 turns; tapped at 1-3/4 turns; does not incl. 76B83419G02 CORE, tuning
		TRANSISTOR: (SEE NOTE)
Q5, 6, 7	48R869534	N-P-N; type M9534
		RESISTOR, fixed ±10%; 1/4 w; unl. stated
R17	6S185B90	8.2K; 1/8 w
R18	6S185B86	3.9K; 1/8 w
R19	6S185C02	68K; 1/8 w
R20	6S129752	270
R21	6S128688	2.7K
R22, 25	6S129860	56
R23	6S129617	120
R24	6S128689	2.2K
R30, 63	6S127807	33K
	NON-REFERENCED ITEMS	
	26A82221H01	SHIELD, coil: used with L14, L15
	26A82076C01	SHIELD, coil: used with L16, L17, L18
	1V80780A82	SHIELD ASSEMBLY, coil: used with L19, L20, L21

NOTE:

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



PREVIOUS REVISIONS AND PARTS LIST
SHOWN ON BACK OF THIS DIAGRAM

TLN8752A 1st IF and
2nd Oscillator Circuit Board Detail
Motorola No. PEPS-1293-B
6/12/70-UP

REVISIONS

PEPS-1293-B

BOARD AND SUFFIX NO.	REF. SYMBOL	CHANGE	LOCATION
TLN8752A-1 TLN8752AL-1 TLN8753A-1	C24	20 pF; 21D82610C22 REMOVED	FROM BASE OF Q4 TO GROUND
TLN8753AL-1	C85	ADDED	Q4 EMITTER

PARTS LIST

1ST IF & 2ND Oscillator Board

TLN8752A (11.7 MHz, standard IF, high side injection)
TLN8752AL (11.7 MHz, standard IF, low side injection)
TLN8753A (11.6 MHz, shifted IF, high side injection)
TLN8753AL (11.6 MHz, shifted IF, low side injection)

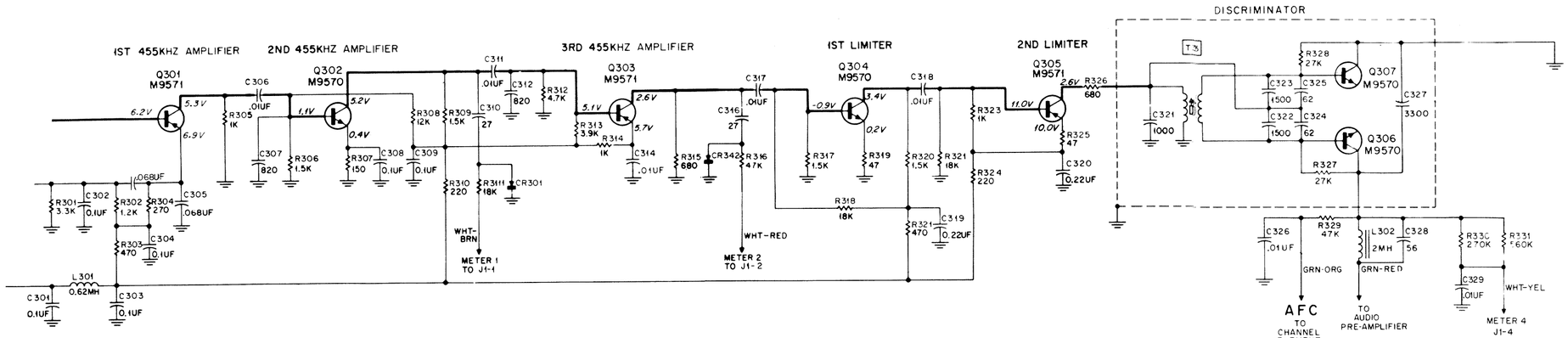
PL-318-A

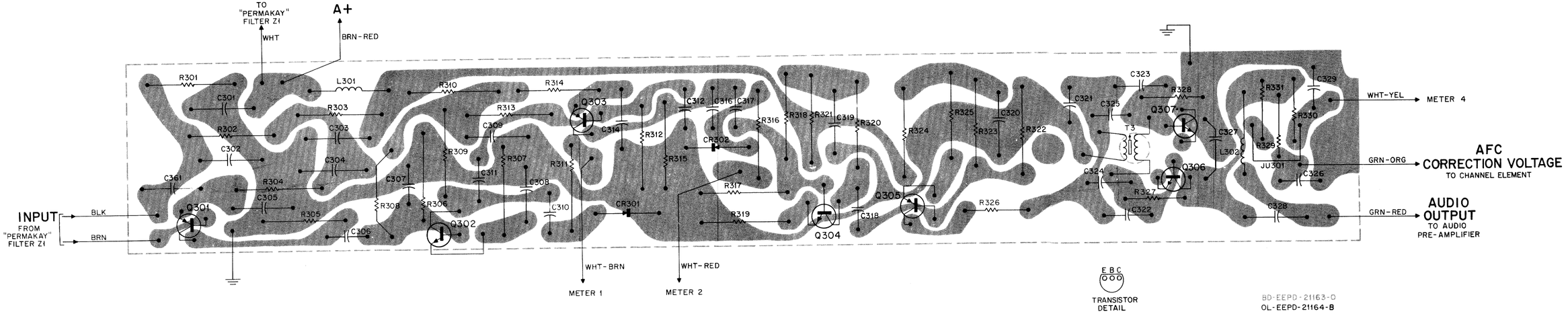
REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		CAPACITOR, fixed: pF; ±5%; 50 v; unl. stated
C4	21D82204B28	43; 200 v; N080
C5, 8, 9, 10	21D82428B59	.01 uF +80-20%; 200 v
C6	21D82204B29	43 ±3%; 200 v; NP0
C7	21D83406D18	47; N150
C11, 15	21D82450B29	0.51
C12, 14, 17	21D82133G44	18; N330
C13, 16	21D83406D19	33; NP0
C18	21D82133G52	43; NP0
C19	21K840048	240
C20	21D82428B26	.02 uF +80-20%; 200 v
C21, 23	8D83293B01	0.1 uF ±10%; 50 v
C22	21C82372C01	0.1 uF +80-20%; 25 v
C25	21K859942	220
C26	21D83406D10	6.8 ±0.25 pF; NP0
C85	21R124554	22; NP0
		COIL, RF:
L8	24E83879G01	coded BRN
L9	24C82835G21	choke; 3.7 uH
L10, 11	24E83879G04	coded YEL
L12	24D82135G04	choke; 1.5 uH
L13	24D82135G08	choke; 620 uH
		TRANSISTOR: (SEE NOTE I)
Q2	48R869456	N-P-N; type M9456
Q3, 4	48R869571	P-N-P; type M9571
		RESISTOR, fixed: ±10%; 1/4 w; unl. stated
R2, 3	6S128687	6.8K
R4	6S129231	3.3K
R5, 7	6S127802	1K
R6	6S129753	100
R8, 9	6S129233	47
R10, 15	6S129230	12K
R11, 12	6S129269	1.8K
R13	6S127805	15K
R14	6S127807	33K
R16	6S127800	220
		TRANSFORMER, RF:
T1	24E83879G02	coded RED; incl. tuning core
T2	24E83879G03	coded ORG; incl. tuning core
		CRYSTAL UNIT, quartz: (SEE NOTE II)
Y1	type FSD	11.70625 MHz (TLN8752A) or 11.60625 MHz (TLN8753A)
Y2	type FSD	11.6945 MHz (TLN8752A) or 11.5945 MHz (TLN8753A)
Y3		for standard IF:
	type GN	12.155 MHz (TLN8752A) or 11.245 MHz (TLN8752AL)
		for shifted IF:
	type GN	12.055 MHz (TLN8753A) or 11.145 MHz (TLN8753AL)
		NOTE Standard IF = 11.7 MHz Shifted IF = 11.6 MHz

NOTE:

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

II. When ordering crystal units, specify carrier frequency, crystal frequency and crystal type number.





FOR MODELS TLN8747A AND TLN8747AL SUFFIX -2 OR LATER, REFER TO CIRCUIT BOARD DETAIL PEPS-3320.

EPS-3322-O

PREVIOUS REVISIONS AND PARTS LIST SHOWN ON BACK OF THIS DIAGRAM

TLN8747A-1 & TLN8747AL-1
455 kHz IF Amplifier Circuit Board Detail
Motorola No. PEPS-1294-E
6/12/70-UP

REVISIONS

PEPS-1294-E

BOARD AND SUFFIX NO.	REF. SYMBOL	CHANGE	LOCATION
TLN8747A TLN8747AL	C361 C305	ADDED .068 uF WAS 8C82427B01	Q301 EMITTER PARTS LIST
TLN8747A-1 TLN8747AL-1	C313	REMOVED (WAS 21D82428B59, .01 uF CONNECTED BETWEEN GROUND AND JUNCTION OF R311 AND WHT-BRN METER-1 LEAD)	CENTER OF BOARD
	C315	REMOVED (WAS 21D82428B59, .01 uF CONNECTED BETWEEN GROUND AND JUNCTION OF R316 AND WHT-RED METER-2 LEAD)	CENTER OF BOARD
TLN8747A-2 TLN8747AL-2		EXTENSIVE CIRCUIT CHANGES	REFER TO PEPS-3320-O

PARTS LIST

TLN8747A 455 kHz IF Board
TLN8747AL 455 kHz IF Board (NOTE II)

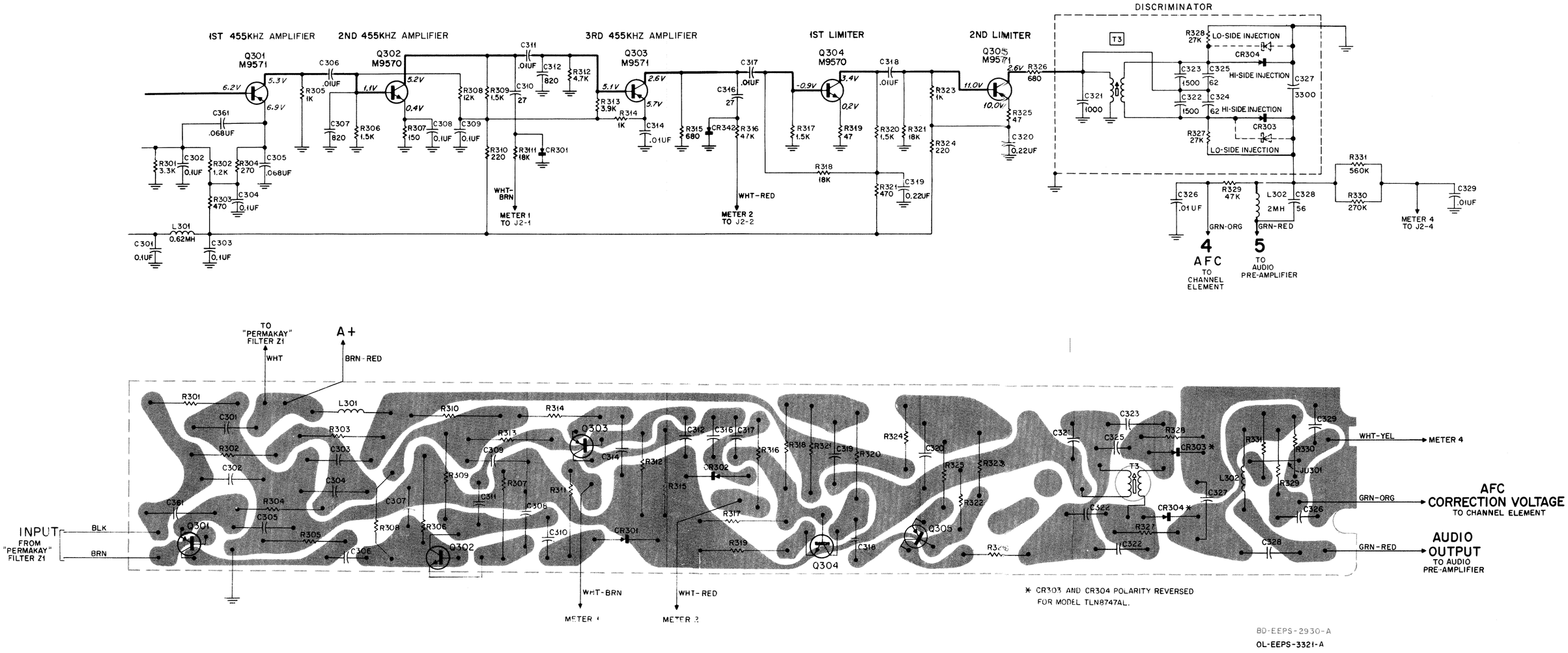
PL-322-B

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		CAPACITOR, fixed: uF; ±10%; 50 v; unl. stated
C303, 304, 309	8C82095G06	0.1; 200 v
C302	8D83813H04	0.1
	or8D82905G07	0.1
C308, 314, 301	21C82372C01	0.1 +80-20%; 25 v
C305, 361	8D82905G04	.068
C306, 311, 317, 318, 326, 329	21D82428B59	.01 +80-20%; 200 v
C307, 312	21C82187B17	820 pF; 500 v
C310, 316	21D82133G23	27 pF; 500 v NP0
C319, 320	8D83813H09	0.22
	or8D82905G11	0.22
C321	21E82537B38	1000 pF ±3%; 100 v
C322, 323	21E82537B39	1500 pF ±2%; 100 v
C324, 325	21D83406D20	62 pF ±5%; 500 v; N1500
C327	21D82187B25	3300 pF; 500 v
C328	21K859219	56 pF ±5%; 500 v
		SEMICONDUCTOR DEVICE, diode: (SEE NOTE I)
CR301, 302	48C82921G01	germanium
		COIL, RF:
L301	24D82135G08	choke; 0.62 mH
L302	24D82135G07	choke; 2 mH
		TRANSISTOR: (SEE NOTE I)
Q301, 303, 305	48R869571	P-N-P; type M9571
Q302, 304	48R869570	N-P-N; type M9570
Q306, 307	48R869570	N-P-N; type M9570 (TLN8747A)
	or48R869571	P-N-P; type M9571 (TLN8747AL)
		RESISTOR, fixed: ±10%; 1/2 w; unl. stated
R301	6S5581	3.3K
R302	6S6393	1.2K
R303, 321	6S6090	470
R304	6S6432	270
R305, 314, 323	6S6229	1K
R306, 309, 317, 320	6S6038	1.5K
R307	6S6373	150
R308	6S6394	12K
R310, 324	6S6270	220
R311, 318, 322	6S5591	18K
R312	6S6080	4.7K
R313	6S5659	3.9K
R315	6S6040	680
R316	6S6048	47K
R319, 325	6S5550	47
R326	6S128599	680; 1/4 w
R327, 328	6S129886	27K ±5%; 1/4 w
R329	6S128902	47K; 1/4 w
R330	6S129227	270K; 1/4 w
R331	6S129247	560K; 1/4 w
		TRANSFORMER, discriminator;
T3	24V80906A42	coded RED; incl. 76B82572G03 CORE, tuning

NOTES:

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

II. TLN8747AL used in receivers which employ low-side injection in high IF board.



FOR MODELS TLN8747A AND TLN8747AL SUFFIX -1 OR EARLIER, REFER TO CIRCUIT BOARD DETAIL PEPS-1294.

EPS-3323-O

PARTS LIST SHOWN ON BACK OF THIS DIAGRAM

TLN8747A-2 & TLN8747AL-2
455 kHz IF Amplifier Circuit Board Detail
Motorola No. PEPS-3320-A
6/12/70-UP

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION

PARTS LIST

TLN8747A 455 kHz IF Board
TLN8747AL 455 kHz IF Board (NOTE II) PL-779-O

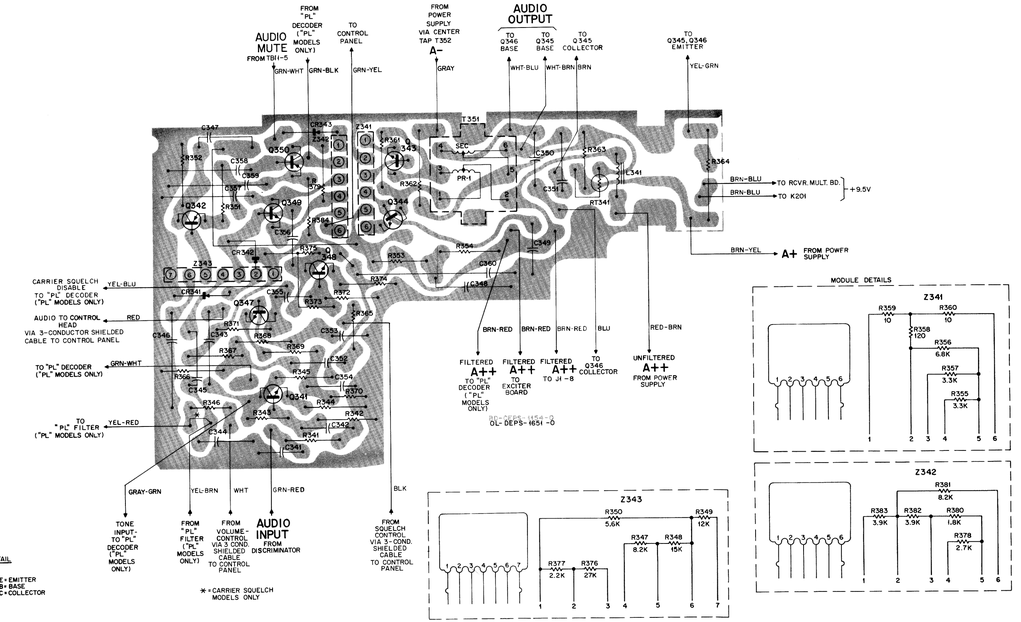
		CAPACITOR, fixed: uF; ±10%; 50 V; unl. stated
C303, 304,309	8C82095G06	0.1; 200 V
C302	8D83813H04	0.1
	or8D82905G07	0.1
C308, 314, 301	21C82372C01	0.1 +80-20%; 25 V
C305, 361	8D82905G04	.068
C306, 311, 317, 318, 326, 329	21D82428B59	.01 +80-20%; 200 V
C307, 312	21C82187B17	820 pF; 500 V
C310, 316	21D82133G23	27 pF; 500 V NP0
C319, 320	8D83813H09	0.22
	or8D82905G11	0.22
C321	21E82537B38	1000 pF ±3%; 100 V
C322, 323	21E82537B39	1500 pF ±2%; 100 V
C324, 325	21D83406D17	62 pF ±5%; 500 V N1750
C327	21D82187B25	3300 pF; 500 V
C328	21K859219	56 pF ±5%; 500 V
		SEMICONDUCTOR DEVICE, diode: (SEE NOTE I)
CR301, 302	48C82921G01	germanium
CR303, 304	48C83654H02	silicon (NOTE III)
		COIL, RF:
L301	24D82135G08	choke; 0.62 mH
L302	24D82135G07	choke; 2 mH
		TRANSISTOR: (SEE NOTE I)
Q301, 303, 305	48R869571	P-N-P; type M9571
Q302, 304	48R869570	N-P-N; type M9570
		RESISTOR, fixed: ±10%; 1/2 W; unl. stated
R301	6S5581	3.3K
R302	6S6393	1.2K
R303, 321	6S6090	470
R304	6S6432	270
R305, 314, 323	6S6229	1K
R306, 309, 317, 320	6S6038	1.5K
R307	6S6373	150
R308	6S6394	12K
R310, 324	6S6270	220
R311, 318, 322	6S5591	18K
R312	6S6080	4.7K
R313	6S5659	3.9K
R315	6S6040	680
R316	6S6048	47K
R319, 325	6S5550	47
R326	6S128599	680; 1/4 W
R327, 328	6S129886	27K ±5%; 1/4 W
R329	6S128902	47K; 1/4 W
R330	6S129227	270K; 1/4 W
R331	6S129247	560K; 1/4 W
		TRANSFORMER, discriminator;
T3	24V80906A42	coded RED; incl. 76B82572G03 CORE, tuning

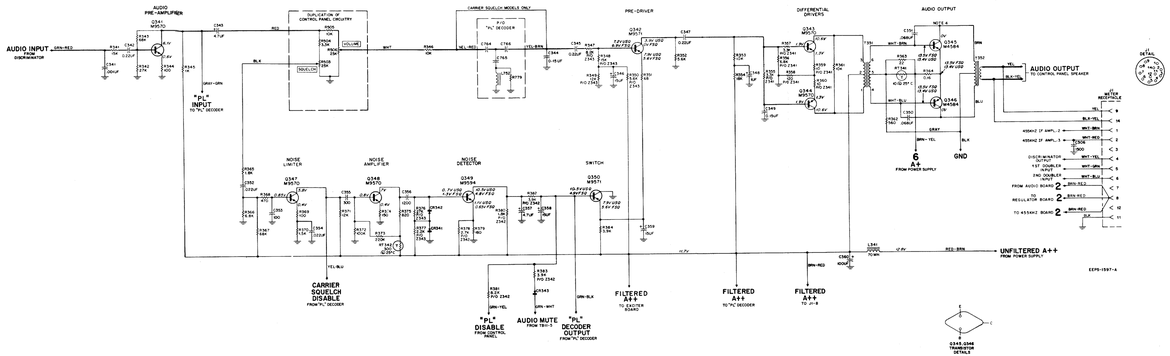
NOTES:

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

II. TLN8747AL used in receivers which employ low-side injection in high IF board.

III. CR303 and CR304 are reversed in polarity for Model TLN8747AL.





PARTS LIST SHOWN ON BACK OF THIS DIAGRAM

Audio and Squelch Circuit Board Detail
Motorola No. PEPS-3101-O
6/12/70-UP

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION

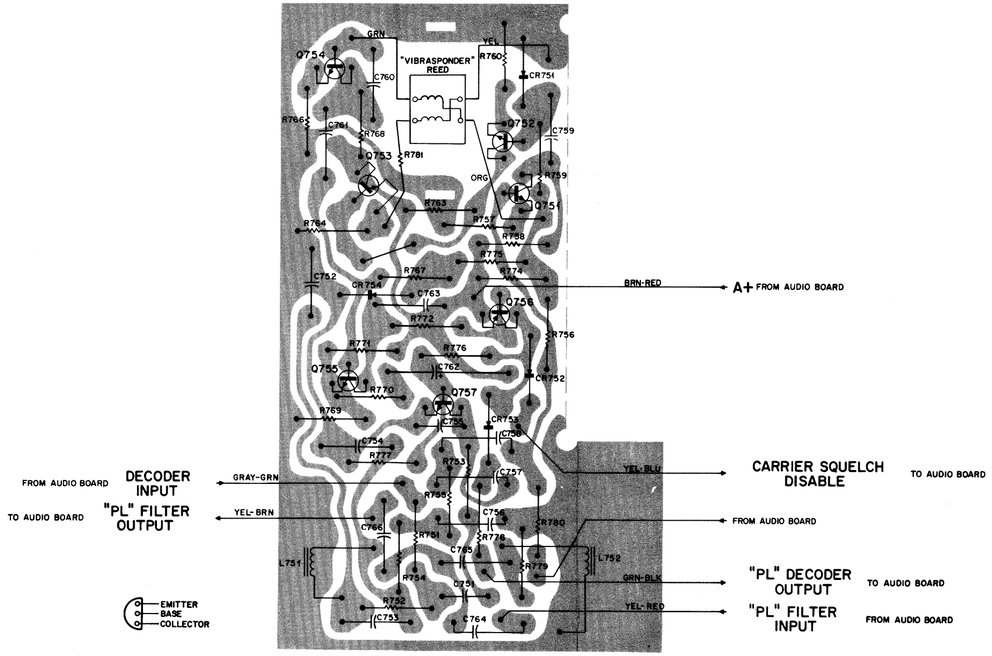
PARTS LIST

TLN8783A Audio & Squelch Board PL-320-A

		CAPACITOR, fixed: uF; ±10%; 50 v; unl. stated
C341	21D82187B29	.001; 100 v
C342, 345, 347	8D82905G11	0.22
C343, 357	23K865137	4.7 ±20%; 25 v
C344, 349	8D82905G05	0.15
C346, 358, 359	23K865136	15 +20%; 25 v
C348	23D82783B08	1 ±20%; 35 v
C350, 351	8D82905G04	.068
C352, 354	8D82905G02	.022
C353	21K850118	100 pF ±5%; 300 v
C355	21K859944	300 pF ±5%; 500 v
C356	21K874352	1200 pF ±5%; 300 v
C360	23D82601A25	100 +150-10%; 20 v
		SEMICONDUCTOR DEVICE, diode: (SEE NOTE)
CR341, 342, 343	48C82392B03	silicon
		COIL, RF:
L341	25B82878A03	choke; 70 mH
		TRANSISTOR: (SEE NOTE)
Q341, 343, 344, 347, 348	48R869570	N-P-N; type M9570
Q342, 350	48R869571	P-N-P; type M9571
Q349	48R869594	N-P-N; type M9594
		RESISTOR, fixed: ±5%; 1/4 w; unl. stated
R341	6S127805	15K ±10%
R342	6S127806	27K ±10%
R343	6S185C02	68K ±10%; 1/8 w
R344, 369	6S131524	100
R345	6S129805	1K
R346	6S185B91	10K ±10%; 1/8 w
R351	6S129861	68 ±10%
R352	6S129433	5.6K ±10%
R353, 361	6S129225	10K ±10%
R354	6S129804	18K ±10%
R362	6S6291	560 ±10%; 1/2 w
R363	6S131641	22 ±10%
R364	17C82350A05	0.16 ±10%; 1 w
R365	6S185B82	1.8K ±10%; 1/8 w
R366	6S129237	6.8K
R367	6S129299	68K
R368	6S127801	470 ±10%
R370	6S185A53	1.5K; 1/8 w
R371	6S129887	12K
R372	6S124A97	100K
R373	6S185B06	220K; 1/8 w
R374	6S131276	150
R375	6S185A47	820; 1/8 w
R379	6S129431	180
R384	6S129232	3.9K ±10%
		THERMISTOR:
RT341	6C82769A01	10 ohms @ 25°C
RT342	6B865641	300 ohms @ 25°C
		TRANSFORMER, AF:
T351	25C82058H01	lug terminals (not marked); pri: (center-tapped); total res. 670 ohms max. sec: (center-tapped); total res. 13 ohms max (primary center tap coded WHT dot)
		PACKAGED RESISTOR NETWORK:
Z341	51D82070H06	incl. R355, R356, R357, R358, R359, R360
Z342	51D82070H08	incl. R378, R380, R381, R382, R383
Z343	51D82070H09	incl. R347, R348, R349, R350, R376, R377

NOTE:

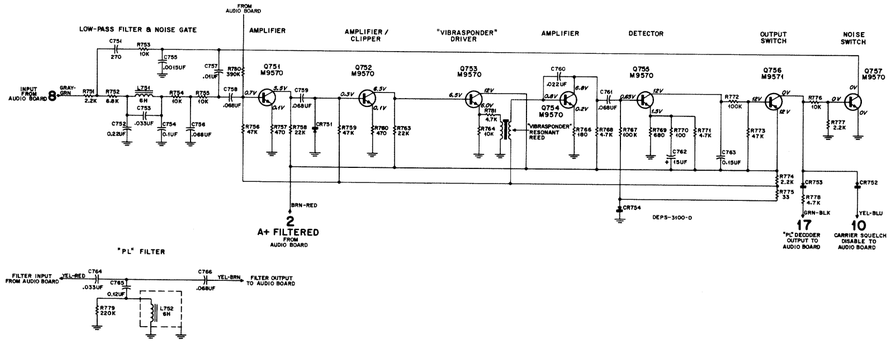
Replacement diodes and transistors must be ordered by Motorola part number only for optimum performance.



BD-DEPS-445-O

OL-DEPS-3102-O

"PRIVATE-LINE" DECODER



PARTS LIST SHOWN ON BACK OF THIS DIAGRAM

"Private-Line" Decoder and Filter Circuit Board Detail
Motorola No. PEPS-3103-O
6/12/70-UP

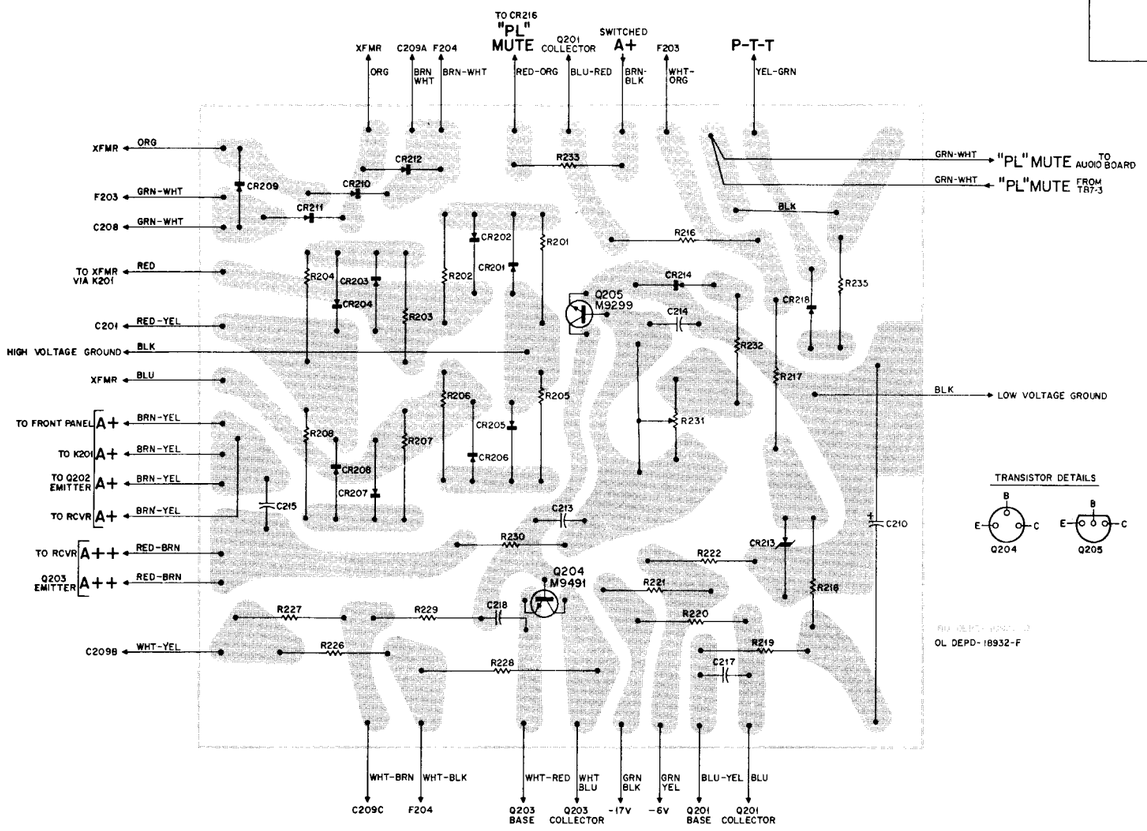
PARTS LIST

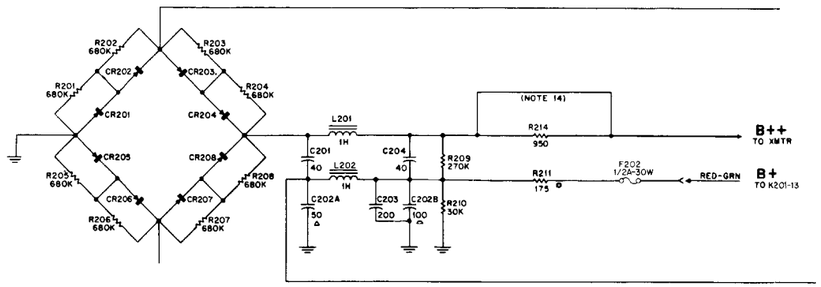
TLN8785A "PL" Decoder Board PL-324-A

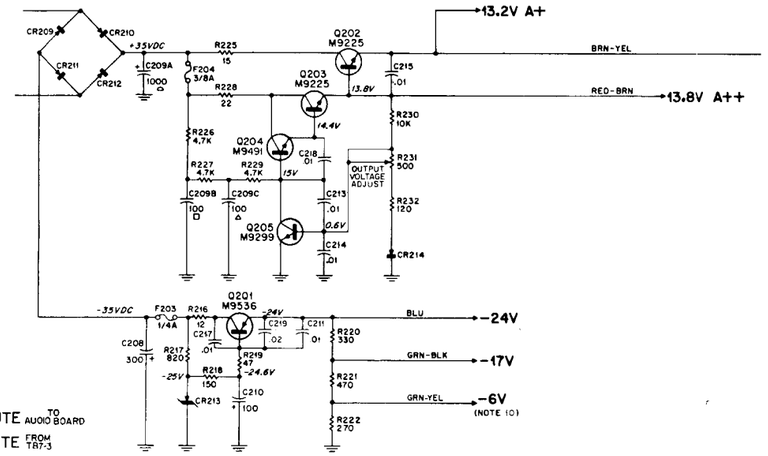
REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		CAPACITOR, fixed: uF; ±10%; 50 v; unl. stated
C751	21D82187B10	270 pF; 500 v
C752	8D82905G11	0.22
C753, 764	8D82905G08	.033
C754	8D82905G07	0.1
C755	21D82187B18	.0015; 100 v
C756, 758, 759, 761, 766	8D82905G04	.068
C757	8D82905G01	.01
C760	8D82905G02	.022
C762	23D83214C02	15 ±20%; 25 v
C763	8D82905G05	0.15
C765	8D82905G09	0.12
		SEMICONDUCTOR DEVICE, diode: (SEE NOTE)
CR751, 752, 753, 754	48C82392B03	silicon
		REACTOR: AF choke;
L751	24C84003A01	6 H
L752	24C84004A01	6 H; shielded
		TRANSISTOR: (SEE NOTE)
Q751, 752, 753, 754, 755, 757	48R869570	N-P-N; type M9570
Q756	48R869571	P-N-P; type M9571
		RESISTOR, fixed: ±5%; 1/4 w; unl. stated
R751, 777	6S128689	2.2K ±10%
R752	6S128687	6.8K ±10%
R753, 754, 755, 764, 776	6S129225	10K ±10%
R756, 759, 773	6S131527	47K
R757, 760	6S129709	470
R758, 763	6S129667	22K
R766	6S129431	180
R767, 772	6S124A97	100K
R768, 771 778, 781	6S129669	4.7K
R769	6S129984	680
R770	6S129753	100 ±10%
R774	6S129804	2.2K
R775	6S124A13	33
R779	6S129147	220K ±10%
R780	6S128682	390K ±10%
NON-REFERENCED ITEMS		
	14C83485C01	SOCKET, "Vibrasponder" Resonant Reed; 4 cont.

NOTE:

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







REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION

PARTS LIST

TLN8660A Power Supply Circuit Board EPD-18974-E

		CAPACITOR, fixed: uF:
C210	23C82077C01	100 +150-10%; 35 v
C213, 215, 217, 218	21D82428B59	.01 +80-20%; 200 v
C214	21D82428B40	.01 +60-40%; 250 v
		SEMICONDUCTOR DEVICE, diode: (NOTE)
CR201 thru 208, 210, 212	48C82466H16	silicon
CR209, 211	48C82466H12	silicon
CR213	48D83461E11	silicon; zener type
CR214	48C82178A04	silicon
CR218	48C82392B03	silicon
		TRANSISTOR: (NOTE)
Q204	48R869491	N-P-N; type M9491
Q205	48R869299	N-P-N; type M9299
		RESISTOR, fixed: ±10%; 1/2 w unl stated
R201 thru 208	6S6475	680K
R216	6S118226	12; 1 w
R217	6S5701	820; 1 w
R218	6S6373	150
R219	6S5550	47
R220	6S6022	330
R221	6S6090	470
R222	6S6432	270
R226, 227, 229	6S6080	4.7K
R228	6S2009	22; 2 w
R230	6S5556	10K ±5%
R231	18C83168C01	500 ±20%; 2 w
R232	6S5551	120
R233	6S6477	15K
R235	6S6320	10K

NOTE:

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

REVISIONS

PEPD-18933-D

BOARD AND SUFFIX NO.	REF. SYMBOL	CHANGE	LOCATION
TLN8660A-1	C218	ADDED .01 uf	Q204 EMITTER
TLN8660A-2	R235	ADDED 10K	TOP RIGHT OF BOARD
	CR218	ADDED	
	C219	ADDED	SCHEMATIC DIAGRAM
	Q204	WAS 48R869271, M9271	BOTTOM CENTER OF BD.

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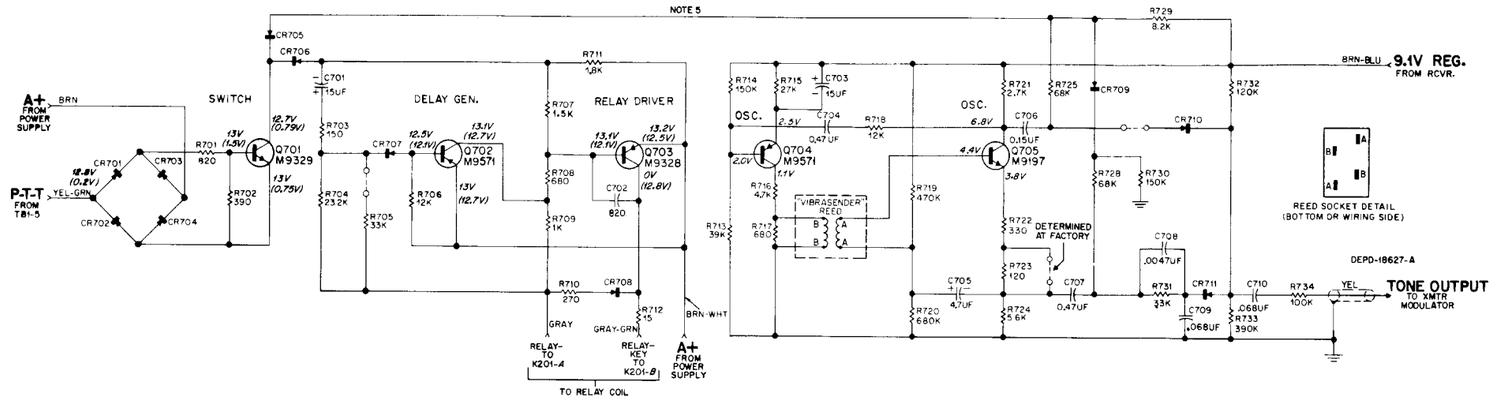
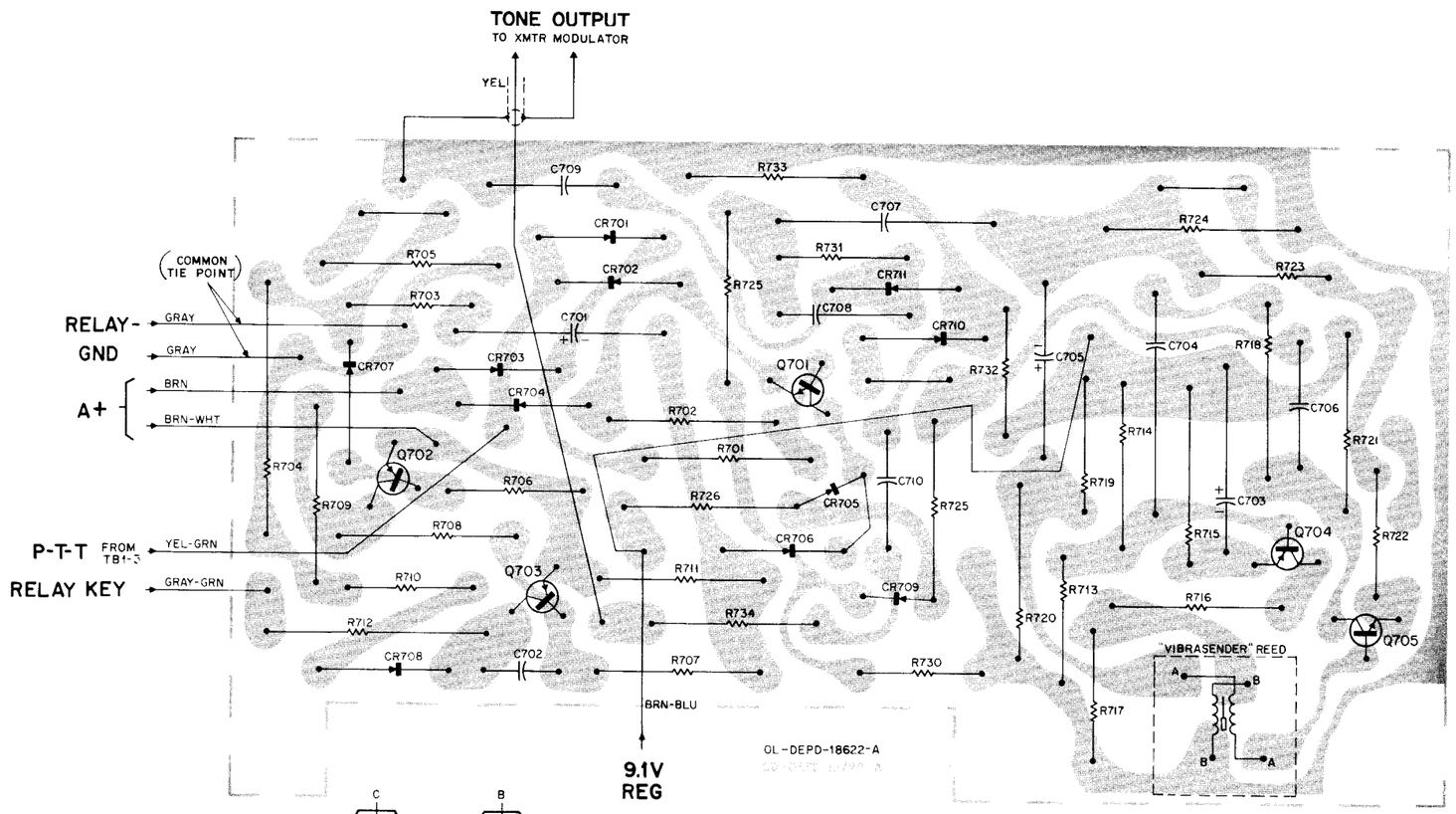
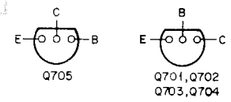
"PRIVATE-LINE" TONE GENERATOR

("PRIVATE-LINE" MODELS ONLY)







TRANSISTOR DETAILS

REFER TO OVERALL SCHEMATIC DIAGRAM FOR NOTE REFERENCES

PARTS LIST SHOWN ON BACK OF THIS DIAGRAM

"Private-Line" Tone Generator
Circuit Board Detail
Motorola No. PEPD-18621-B
6/12/70-UP

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION

PARTS LIST

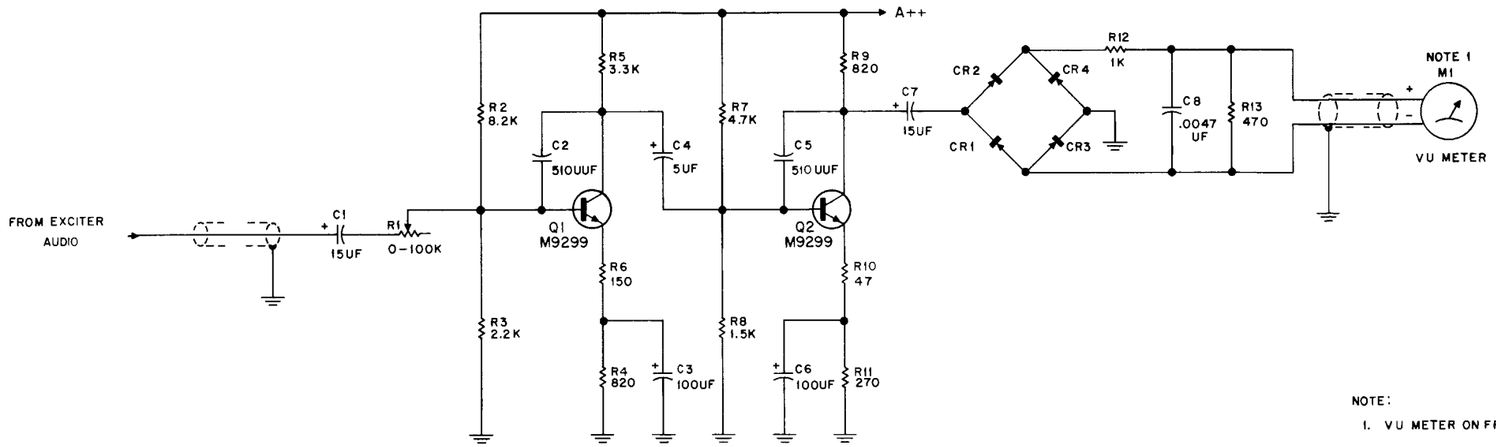
TLN4173A "Private-Line" Oscillator and Delay Board
TLN4197A "Private-Line" Oscillator and Delay Board
TLN8271A "Private-Line" Oscillator and Delay Board

EPD-14229-E

		CAPACITOR, fixed: uF ±10%; 25 V; unl. stated
C701	23D82783B24	15
C702	21D82187B21	820 pF; 200 V
C703	23K865136	15 ±20%
C704, 707	8D82905G33	0.47 ±20%; 50 V
C705	23K865137	4.7 ±20%
C706	8D82905G05	0.15; 50 V
C708	8D82905G26	.0047; 100 V
C709, 710	8D82905G04	.068; 50 V
		SEMICONDUCTOR DEVICE, diode: (SEE NOTE)
CR701 thru 710	48C82392B03	silicon
CR711	48C82392B04	silicon
		TRANSISTOR: (SEE NOTE)
Q701	48R869329	N-P-N; type M9329
Q702, 704	48R869571	P-N-P; type M9571
Q703	48R869328	P-N-P; type M9328
Q705	48R869197	N-P-N; type M9197
		RESISTOR, fixed: ±5%; 1/2 W unl. stated
R701	6S119172	820
R702	6S400804	390
R703	6S129862	150 ±10%; 1/4 W
R704	6D83175C32	23.2K ±1%; 1/4 W
R705	6S2068	33K
R706	6S129887	12K; 1/4 W
R707	6S400459	1.5K
R708	6S5651	680
R709	6S6411	1K
R710	6S129752	270 ±10%; 1/4 W
R711	6S2089	1.8K ±10%
R712	6S118227	15 ±10%; 1 W
R713	6S129777	39K
R714	6S5559	150K
R715	6S129886	27K; 1/4 W
R716	6S3924	4.7K
R717	6S129984	680; 1/4 W
R718	6S129230	12K ±10%; 1/4 W
R719	6K129149	470K; 1/4 W
R720	6R5775	680K
R721	6R5577	2.7K
R722	6K129806	330; 1/4 W
R723	6K129617	120
R724	6S129982	5.6K; 1/4 W
R725	6K129144	68K ±10%; 1/4 W
R728	6R6074	68K ±10%
R729	6S2004	8.2K ±10%
R730	6S128683	150K; 1/4 W
R731	6S129526	33K; 1/4 W
R732	6K128987	120K; ±10%; 1/4 W
R733	6R5777	390K
R734	6S5553	100K

NOTE:

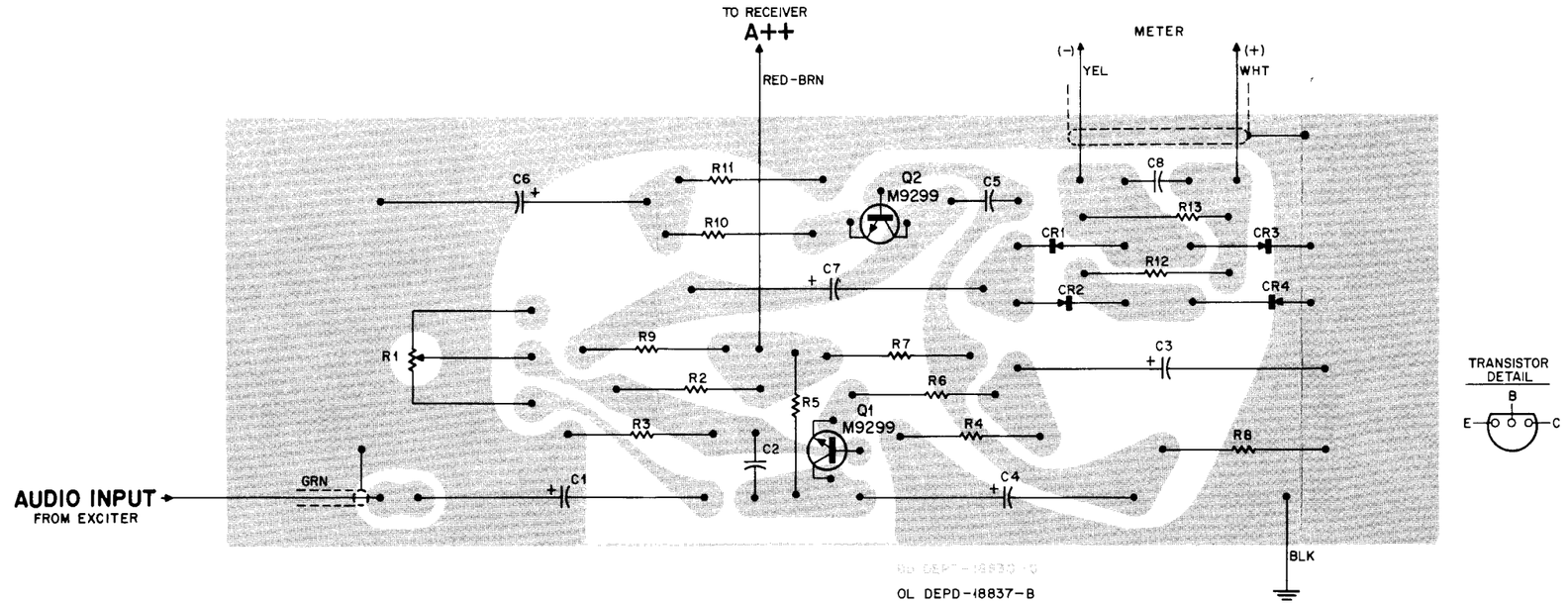
Replacement diodes and transistors must be ordered by Motorola part number only for optimum performance.



NOTE:

1. VU METER ON FRONT PANEL.

DEPD-18839-A



OL DEPD-18837-B

PREVIOUS REVISIONS AND PARTS LIST
SHOWN ON BACK OF THIS DIAGRAM

Model TLN1219A/TLN8624A VU Meter
Circuit Board Detail
Motorola No. PEPD-18838-B1
6/12/70-UP

REVISIONS

DIAG. ISSUE	CHASSIS AND SUFFIX NO.	REF. SYMBOL	CHANGE	LOCATION
A	TLN8624A	C5	WAS 570 MMF	Q2 BASE
B	TLN8624A		REPLACED WITH MODELS TLN8948A AND TLN8949A (NOMENCLATURE CHANGE ONLY).	PARTS LIST

PARTS LIST

TLN8948A VU Meter Kit — PL-203-O

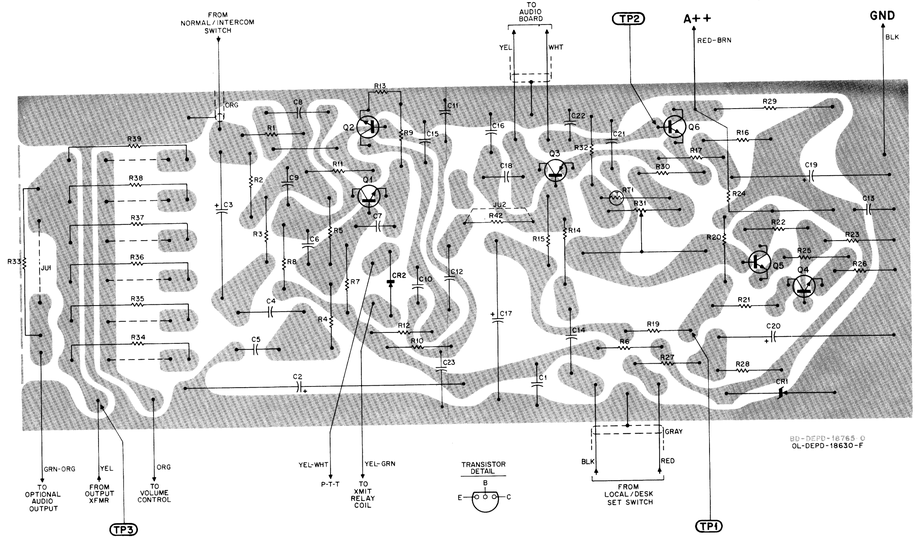
REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		CAPACITOR, fixed:
C1, 7	23D82601A31	15 uf +150-10%; 25 v
C2, 5	21K845214	510 uuf ±5%; 300 v
C3,	23D82601A12	100 uf +150-10%; 6 v
C4	23D82601A11	5 uf +33-10%; 25 v
C8	21D82428B27	.0047 uf ±10%; 100 v
		SEMICONDUCTOR DEVICE, diode: (SEE NOTE)
CR1, 2, 3, 4	48C82178A04	germanium
		TRANSISTOR: (SEE NOTE)
Q1, 2	48R869299	N-P-N; type M9299
		RESISTOR, fixed: ±10%; 1/2 w unl. stated
R1	18D82338B13	var: 100K; 1/4 w
R2	6S2004	8.2K
R3	6S6069	2.2K
R4, 9	6S6269	820
R5	6S5531	3.3K
R6	6S6373	150
R7	6S6080	4.7K
R8	6S6038	1.5K
R10	6S5550	47
R11	6S6432	270
R12	6S6229	1K
R13	6S6090	470

TLN8949A Miscellaneous Parts Kit — PL-204-O

M1	72C83270G01	METER, audio level: -20 to +3 VU

NOTE:

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



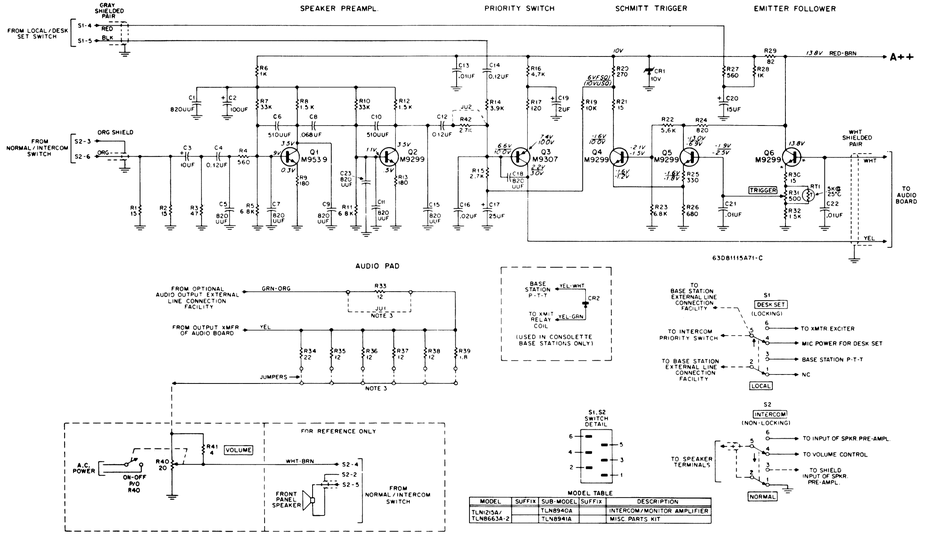
NOTES:

1. -13.0 V: TOP VOLTAGE INDICATES INTERCOM MODE.
   -6.9 V: BOTTOM VOLTAGE INDICATES RECEIVE MODE.
2. (+) INDICATES VOLTAGE VARIES WITH SQUELCH CONTROL SETTING.
3. JUMPERS ON CIRCUIT BOARD MUST BE USED OR CUT AS REQUIRED TO ADJUST AUDIO PAD ACCORDING TO THE PARTICULAR INSTALLATION. SEE JUMPER TABLE.
4. REMOVE JUMPER JU2 ONLY IN 25-50 MHz CONSOLETTE BASE STATIONS.

JUMPER TABLE

NO. OF DESK SETS	OMIT RESISTORS	REQUIRED RESISTORS
1	R33, 34, 35, 36	R37, 38, 39
2	R39	R33, 34, 35, 36, 37, 38
3	R38, 39	R33, 34, 35, 36, 37
4, 5, 6	R34, 38, 39	R33, 35, 36, 37
Supervisory Desk Set	R35, 36, 37, 38, 39	R33, 34

EPD-19499-D



MODEL	SUFFIX	SUB-MODEL	SUFFIX	DESCRIPTION
TLN1250A/ TLN8663A-2		TLN8940A		INTERCOM/MONITOR AMPLIFIER
		TLN8941A		MISC PARTS KIT

4-FREQ STRAPPING BOARD DETAIL

PREVIOUS REVISIONS AND PARTS LIST SHOWN ON BACK OF THIS DIAGRAM

TLN1215A Intercom Amplifier
Schematic Diagram and Circuit Board Detail
Motorola No. PEPD-18857-E
6/12/70-UP

REVISIONS

PEPD-18857-E

BOARD AND SUFFIX NO.	REF. SYMBOL	CHANGE	LOCATION
TLN8663A		EXTENSIVE CIRCUIT AND COMPONENT CHANGES AT START OF PRODUCTION	SCHEM. DIAG. & PARTS LIST
TLN8663A-1	C23	ADDED 820 pF	Q2 BASE
	Q1	WAS 48R869539, TYPE M9539	SPEAKER PREAMPL.
	R18	REMOVED 6K128686, 8.2K (WAS CONNECTED BETWEEN GROUND AND Q3 EMITTER VIA JUMPER JU1)	
	R21	WAS 6K129620, 560 OHMS	Q4 COLLECTOR
	R26	WAS 6K129753, 120 OHMS	Q5 EMITTER CIRCUIT
	R30	WAS 6S128688, 2.7K	Q6 EMITTER
	R32	WAS 6K128599, 680 OHMS	Q6 EMITTER CIRCUIT
	RT1	THERMISTOR ADDED	
TLN8663A-2	R42	ADDED 2.7K	Q3 BASE
TLN8663A-2		REPLACED WITH TLN8940A AND TLN8941A. (NOMENCLATURE CHANGE ONLY.)	PARTS LIST

PARTS LIST

TLN8940A Intercom Kit — PL-201-A

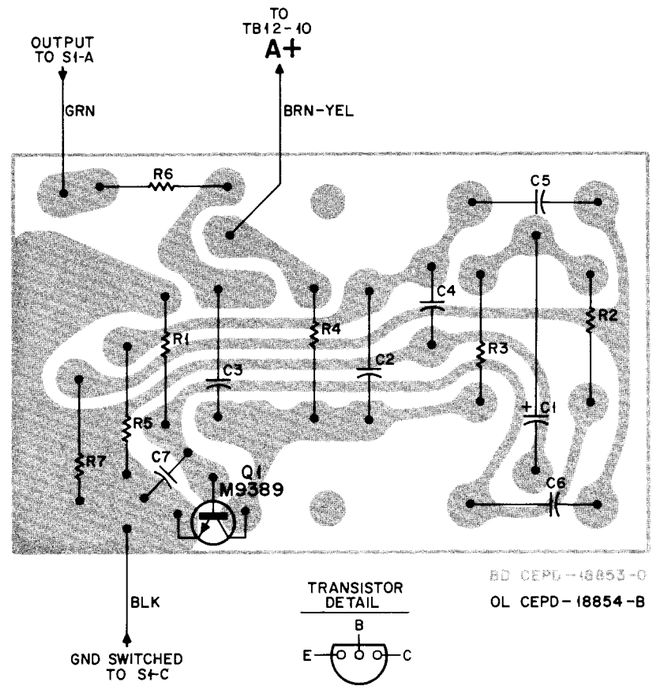
REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		CAPACITOR, fixed: uF; unl. stated
C1, 5, 7, 9, 11, 15, 18, 23	21D82187B21	820 pF ±10%; 200 V
C2	23D82601A21	100 +100-0%; 10 V
C3	23D82601A23	10 +150-10%; 20 V
C4, 12, 14	8D82905G09	0.12 ±10%; 50 V
C6, 10	21K845214	510 pF ±5%; 300 V
C8	8D82905G04	.068 ±10%; 200 V
C13, 21, 22	21D82428B59	.01 +80-20%; 200 V
C16	21D82428B26	.02 +80-20%; 200 V
C17	23D82601A26	25 +150-10%; 20 V
C19	23D82601A34	2 +150-10%; 25 V
C20	23D84669A25 or 23D82601A31	15 +150-10%; 25 V
		SEMICONDUCTOR DEVICE, diode: (SEE NOTE)
CR1	48D82256C28	silicon; zener type; 10 V
CR2	48C82466H13	rectifier; SR1151
		TRANSISTOR: (SEE NOTE)
Q1	48R869539	N-P-N; type M9539
Q2, 4, 5, 6	48R869299	N-P-N; type M9299
Q3	48R869307	P-N-P; type M9307
		RESISTOR, fixed: ±10%; 1/4 W unl. stated
R1, 2, 21, 30	6R131377	15
R3	6K129233	47
R4, 27	6K129620	560
R5, 11	6K128687	6.8K
R6, 28	6K127802	1K
R7, 10	6K127807	33K
R8, 12, 32	6K127803	1.5K
R9, 13	6K129662	180
R14	6K129232	3.9K
R15, 42	6K128688	2.7K
R16	6K127804	4.7K
R17	6K129753	120
R19	6K129225	10K
R20	6K129752	270
R22	6K129982	5.6K ±5%
R23	6K129237	6.8K ±5%
R24	6K129432	820
R25	6K129806	330 ±5%
R26	6K129984	680 ±5%
R29	6R488113	82; 1 W
R31	18C83168C01	var; 500 ±20%; 2 W
R33, 35, 36, 37, 38	6R118226	12; 1 W
R34	6R488026	22; 1 W
R39	17K890469	1.8; 1 W
		THERMISTOR:
RT1	6C82769A07	5020 Ohms ±10%; @25°C

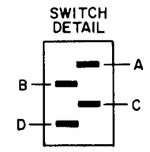
TLN8941A Miscellaneous Parts Kit — PL-202-O

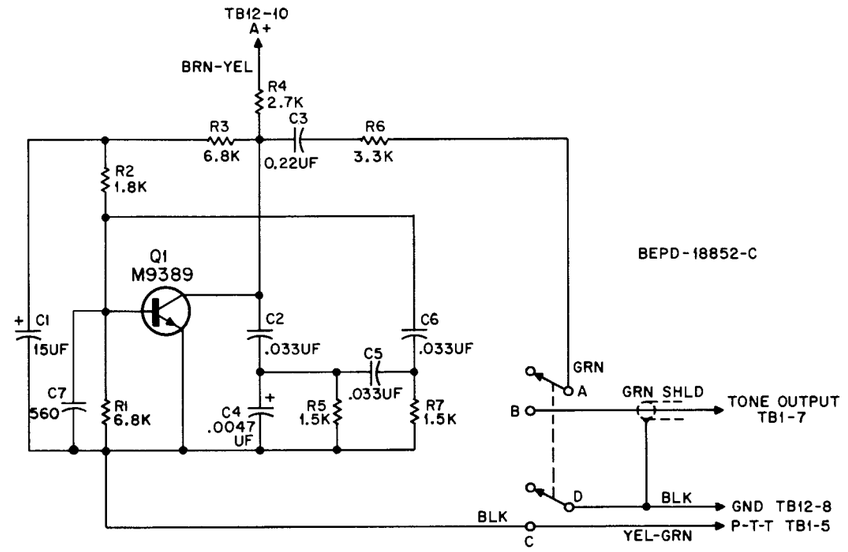
		RESISTOR, fixed: ±10%; 1/4 w unl. stated
R40	18C82528D03	var; 20; 2 w; incl. spst switch
R41	17D82177B03	4; 5 w
		SWITCH, lever:
S1	40C83303G05	2 form "C"; non-locking
S2	40C83303G04	2 form "C"; locking

NOTE:

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







PREVIOUS REVISIONS AND PARTS LIST SHOWN ON BACK OF THIS DIAGRAM

TLN1216A/TLN8664A Alert Tone Kit
Schematic and Circuit Board Detail
Motorola No. PEPD-18856-C
6/12/70-UP

REVISIONS PEPD-18856-C

CHASSIS AND SUFFIX NO.	REF. SYMBOL	CHANGE	LOCATION
TLN8664A		LEAD TERMINATIONS ADDED	CIRCUIT BD DETAIL
TLN8664A-1	C7	ADDED 560 uuf	Q1 EMITTER
		DIAGRAM WAS PEPD-18856-A	

PARTS LIST

TLN8942A Alert Tone Kit PL-182-A

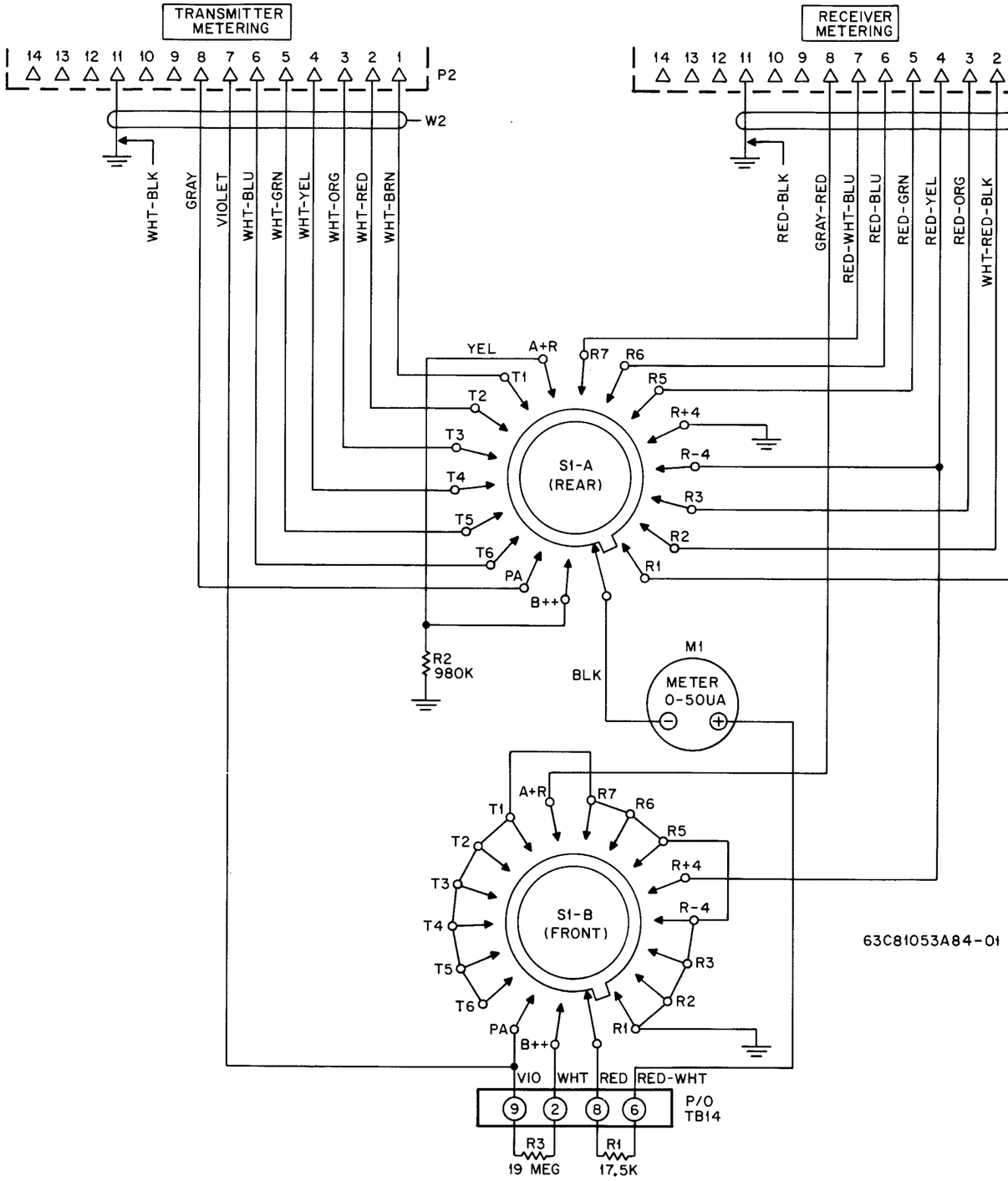
REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		CAPACITOR, fixed:
C1	23D83214C02	15 uf ±20%; 25 v
C2, 5, 6	8D82905G08	.033 uf ±10%; 50 v
C3	8D82905G11	0.22 uf ±10%; 50 v
C4	21D82428B27	.0047 uf ±10%; 100 v
C7	21C82187B06	560 pF ±10%; 50 v
		TRANSISTOR: (SEE NOTE)
Q1	48R869389	N-P-N: type M9389
		RESISTOR, fixed: ±10%; 1/4 w
R1, 3	6S128687	6.8K
R2	6S129269	1.8K
R4	6S128688	2.7K
R5, 7	6S127803	1.5K
R6	6S129231	3.3K

TLN8943A Miscellaneous Parts Kit PL-183-O

S1	40C83303G03	SWITCH, lever: dpst; 2-position; non-locking
NON-REFERENCED ITEMS		
	7B83664G01	BRACKET, Alert Tone
	64D83071G07	PANEL, insert

NOTE:

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



63C81053A84-01

NOTE:

B++ READS 1000V FULL SCALE OR 20V PER MICROAMPERE.

MODEL	SUFFIX	DESCRIPTION
TLN8623A		DC METERING KIT

PARTS LIST

TLN8623A DC Metering Kit EPD-19255-O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		AMMETER, DC:
M1	72C83319G01	0-50 microamperes; internal res 2560 ohms ±10%
		CONNECTOR, plug:
P1, 2	28B864669	male; 12 cont; does not incl 15A82798H01 SHELL
		RESISTOR, fixed: 1/2 w
R1	6K855337	17.5K ±2%
R2	6K811974	980K ±2%
R3	6D82475B64	19 meg ±1%
		SWITCH, rotary:
S1	40C83106B01	2 section; each section single pole; 18 position; non-shorting
		CABLE ASSEMBLY, special purpose:
W1-2	1V80775A50	c/o misc. leads, laced

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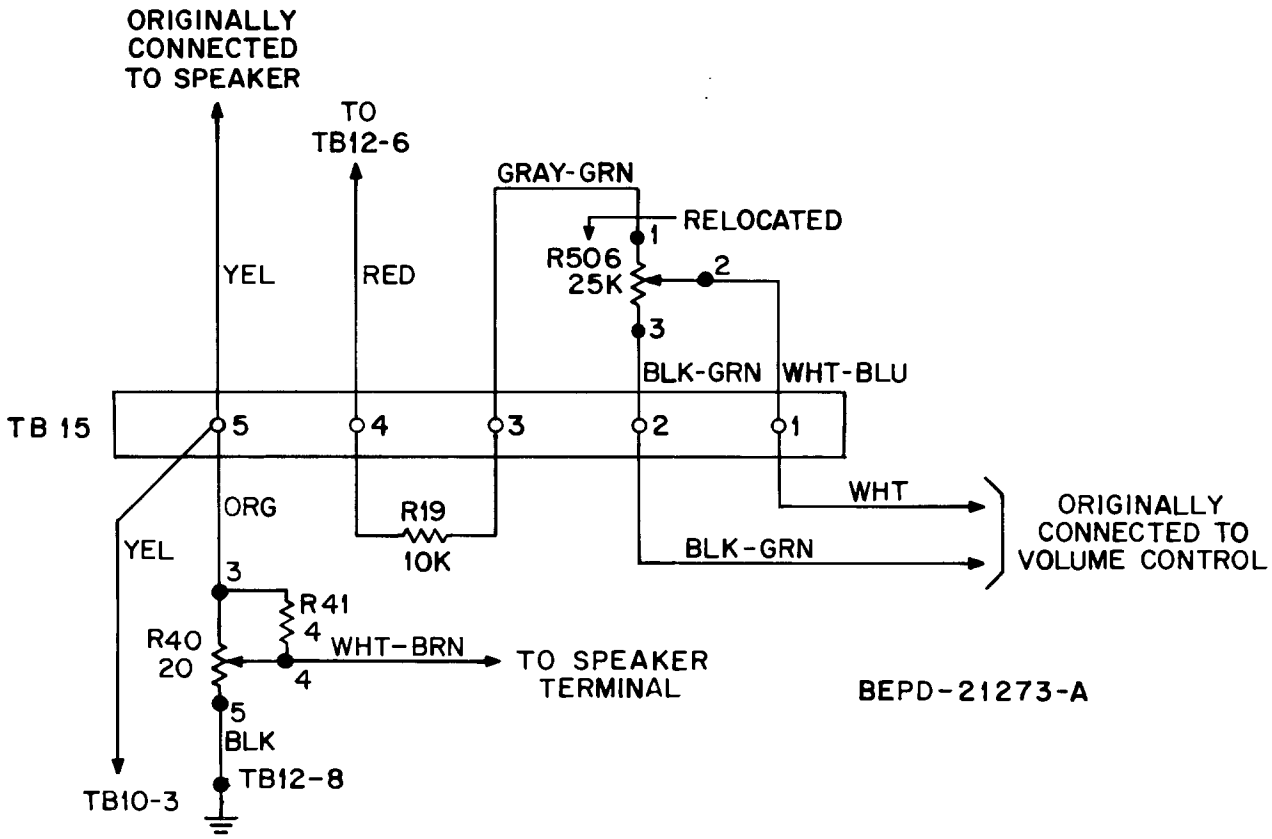
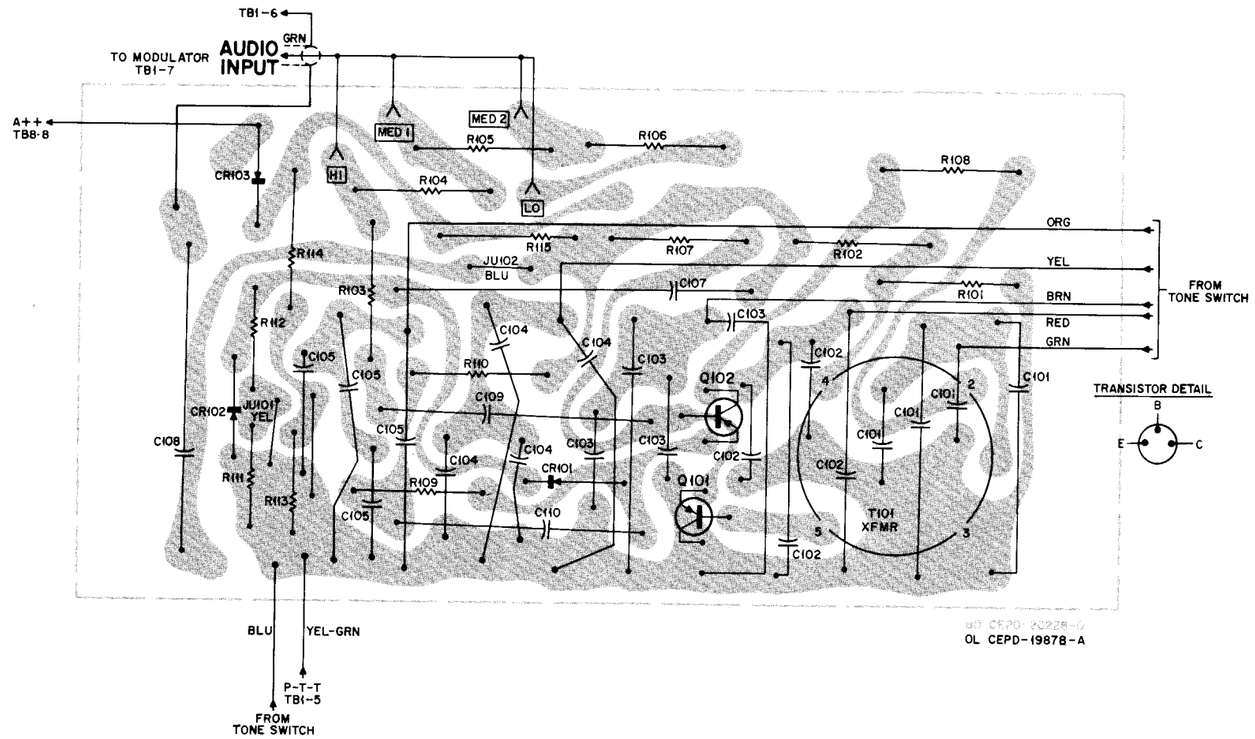
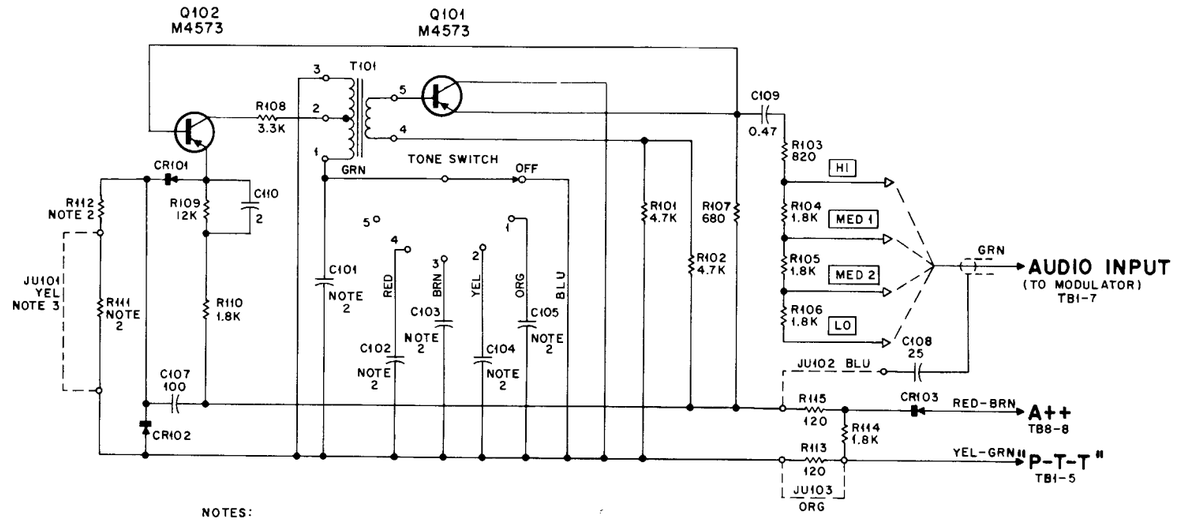


PARTS LIST

TLN8900A Speaker Pad Kit PL-353-A

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		RESISTOR:
R19	6S6477	fixed: 15K ±10%; 1/2 w
R40	18C82528D03	variable; 20 ±10%; 2 w
R41	17D82177B03	wirewound; 4 ±10%; 5 w
		BOARD, terminal:
TB15	31S127888	5 terminal lugs
	NON-REFERENCED ITEMS	
	1V80783A95	VARIABLE RESISTOR ASSEMBLY: incl ref. parts R40, R41 and misc. leads
	1V80779A75	BRACKET ASSEMBLY; incl ref. part R19, TB5, BRACKET and misc. leads.
	2S1376	NUT, hex: 3/8"-32 x 1/2"
	3S134186	MACHINE SCREW: #6 x 5/16"; hex hd.
	4S7698	LOCKWASHER; 3/8"
	36A82944A01	KNOB, control (volume)
	64B83745G01	PLATE, locating
	30S10286A24	WIRE, #18 stranded (YEL); 17" req'd





NOTES:

1. UNLESS OTHERWISE STATED:
   RESISTOR VALUES ARE IN OHMS, K = 1000
   CAPACITOR VALUES ARE IN MICROFARADS.
2. SPECIFIC COMPONENT VALUE FACTORY SELECTED.
3. REFER TO JUMPER CHART FOR TONE DURATION.

CEPD-20050-O

TONE DURATION JUMPER CHART

TONE DURATION	JUMPER CONNECTIONS
0.4 Second	JU101 (YEL) wired as shown.
1.5 Seconds	Remove JU101 (YEL).
Continuous Tone Operation	Disconnect R111 and JU101

EPD-20049-O

PREVIOUS REVISIONS AND PARTS LIST
SHOWN ON BACK OF THIS DIAGRAM

Model TLN1217A Multiple Frequency
Single-Tone Oscillator
Schematic Diagram and Circuit Board Detail
Motorola No. 63P81055A18-A
6/12/70-UP

REVISIONS

DIAG. ISSUE	CHASSIS AND SUFFIX NO.	REF. SYMBOL	CHANGE	LOCATION
A	TLN8711A		REPLACED WITH MODELS TLN8944A AND TLN8945A. (NOMENCLATURE CHANGE ONLY.)	PARTS LIST

PARTS LIST

TLN8944A Single-Tone Oscillator Board PL-214-O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		CAPACITOR, fixed: uf ±10%; 50 v; unl. stated
C107	23C82601A19	100 +50-0% 25 v
C108	23C82645A03	25 +100-10%; 25 v
C109	8K863994	0.47; 200 v
C110	23C82601A04	2 +250-10%; 25 v
		SEMICONDUCTOR DEVICE, diode: (SEE NOTE)
CR101, 102, 103	48C82178A01	silicon
		LEAD, electrical: jumper: (for reference only)
JU101, 102, 103, 104		
		TRANSISTOR, AF: (SEE NOTE)
Q101, 102	48R134573	germanium; M4573
		RESISTOR, fixed: ±10%; 1/2 w unl. stated
R101, 102	6S6080	4.7K
R103	6S6269	820
R104, 105, 106, 110, 114	6S2089	1.8K
R107	6S6040	680
R108	6S5581	3.3K
R109	6S2075	12K ±5%
R113	6K129617	120; 1/4 w
R115	6S5551	120
		TRANSFORMER, AF: toroidal:
T101	25C82283C01	pri: coded 1, 3 with tap coded 2; total res 113 ohms ±10%; sec: coded 4, 5; res 45 ohms ±10%

TLN8945A Miscellaneous Parts Kit PL-215-O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION	
		CAPACITOR, fixed: uf ±10%; 50 v; unl. stated	
C101, 102, 103, 104, 105	8C82284C01	.001	
	or8C82284C02	.0015	
	or8C82284C03	.002	
	or8C82284C04	.0033	
	or8C82284C05	.0047	
	or8C82284C06	.0068	
	or8C82284C07	.0082	
	or8C82284C08	.010	
	or8C82284C09	.015	
	or8C82284C10	.020	
	or8C82284C11	.033	
	or8C82284C12	.047	
	or21K859934	10 ±5%; 50 v	
	or21K859940	20 ±5%; 500 v	
	or21K867249	39 ±5%; 500 v	
	or21K852322	62 ±5%; 500 v	Factory Selected
	or21K847091	80 ±2%; 300 v	
	or21K850118	100 ±5%; 500 v	
	or21K868204	145 ±5%; 500 v	
	or21K863401	200 ±5%; 500 v	
	or21K863402	260 ±5%; 500 v	
	or21K859944	300 ±5%; 500 v	
	or21K840813	345 ±5%; 500 v	
	or21K848977	390 ±3%; 500 v	
	or21K850510	470; 300	
	or21K859947	510 ±5%; 500 v	
	or21K863948	565 ±5%; 500 v	
	or21K848236	650 ±5%; 300 v	
		RESISTOR, fixed:	
R111, 112	6K129819	3.9K ±5%; 1/4 w	
	or6K129669	4.7K ±5%; 1/4 w	
	or6K129238	5.1K ±5%; 1/4 w	Factory Selected
	or6K129982	5.6K ±5%; 1/4 w	
	or6K129237	6.8K ±5%; 1/4 w	
	or6K128686	8.2K; 1/4 w	
	or6K129804	2.2K ±5%; 1/4 w	
	or6K129707	2.7K ±5%; 1/4 w	
	or6K129981	3.3K ±5%; 1/4 w	
		SWITCH: rotary:	
S101	40C83754G01	7 contacts	
NON-REFERENCED ITEMS			
	9A83931B01	TERMINAL, female	
	36B82630H01	KNOB, control	

NOTE:

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

SINGLE TONE ENCODER

1. INTRODUCTION

The multiple frequency single-tone encoder provides a selective tone for base-to-mobile selective calling, and provide remote switching functions for control of standby equipment.

The Model TLN1339A Single-Tone Encoder is for use with consolette base stations. The Model TLN1337A Single-Tone Encoder is for use with local and extended local control "Compa-Station" base radios.

The oscillator may be used to tone-alert a receiving station to a pertinent incoming call or, the associated receiver station may incorporate a tone decoder unit, which when activated will complete the audio output circuit. Thus, only the receiver(s) for which the call was intended will receive the message. Also a tone decoder equipped receiver, when activated, can energize an external control circuit for repeater or alarm systems. The unit provides up to five tones which may be individually selected.

A six-position selector switch is used to select one of the tone frequencies or to turn "off" the tone transmission. The transistorized oscillator circuit is on a printed circuit board mounted inside the control console or base station.

2. DESCRIPTION

An oscillator is used to generate a fixed duration audible tone when the P-T-T button is pressed. This tone modulates the rf carrier and is transmitted to the receiver.

The oscillator circuitry consists of two transistors, a tapped coil, and a fixed capacitor. The frequencies are selected by switching the capacitor across the taps of the coil. By using jumper connections, the tone frequencies for F1, F2, F3, F4 and F5 can be arranged in any desirable order.

The output of the oscillator is fed to an amplifier. The amplifier output can be jumper selected for three levels of deviation. The output impedance can also be jumper selected for operation into a high or low impedance.

Grounding the P-T-T function activates a multivibrator which gates the oscillator on. The time the oscillator is on (tone duration) is controlled by jumper selections which provide durations of 0.5, 0.7, 1.0, and 1.5 seconds. If a longer tone duration is required, JU5 may be replaced with a resistor. Any resistance value up to 27K may be used. This will provide a maximum three-second tone duration. This resistance value must not be exceeded. Refer to the jumper chart on the tone encoder schematic for all jumper details.

3. PERFORMANCE SPECIFICATIONS

Tone Frequency Range	1350 Hz to 1950 Hz	
Power Input	+13.8 V DC	
Tone Duration	Approx. 0.5, 0.7, 1.0, and 1.5 seconds	
Output*	Pin Terminal Connection	Meter Indication
	High	Not more than 140 mV
	Medium	Not more than 40 mV
	Low	Not more than 20 mV
*Output specifications indicated for a transmitter input impedance of approximately 560 ohms.		

Specifications subject to change without notice.

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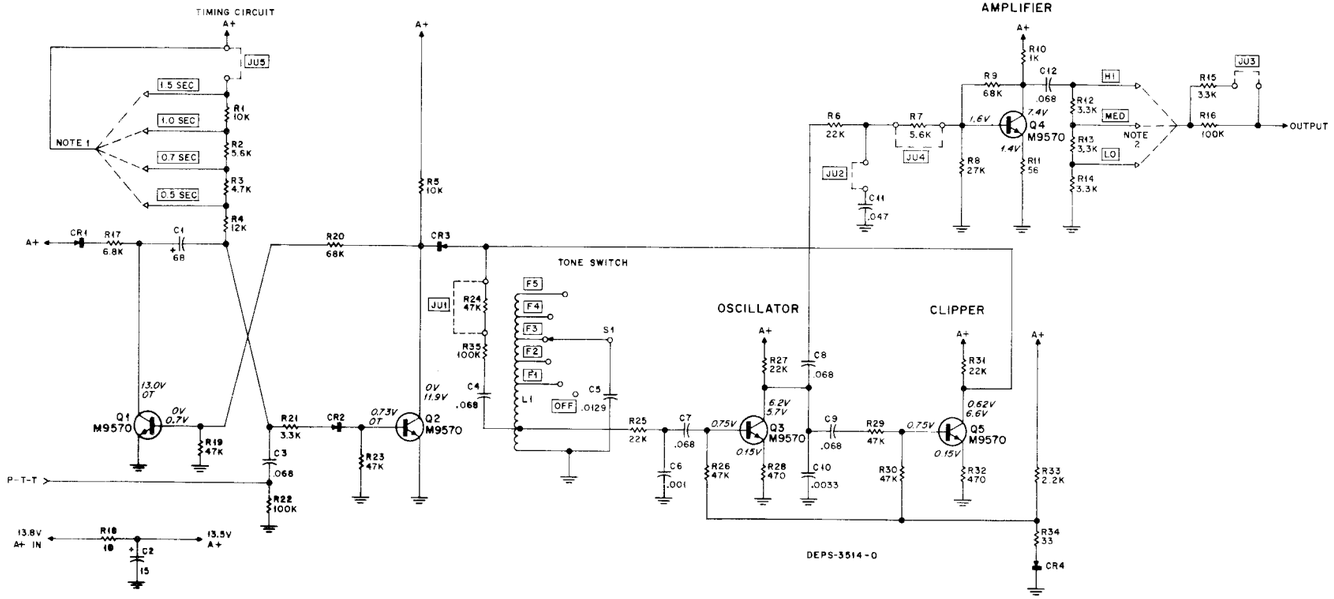
4. ADJUSTMENT

A level adjustment is usually unnecessary as the decoders in the receiving station operate over a wide range of deviation. However, if the oscillator fails to operate, check first to make sure all jumper options and external connections are properly made. Check to see that the unit is oscillating and then make the following tone level check:

With a clip lead jumper connected across resistor R23 (for continuous tone operation during adjustment) turn the radio set "on" and allow a five-minute warm-up time. The output control may then be set for proper deviation. A Motorola T1100A (25-54 MHz) or T1130A (144-174 MHz) Series FM Station Monitor (or equivalent) may be used for setting deviation.

With the FM station monitor, check the deviation caused by the tone modulation. This value should be approximately 50% of the maximum allowable deviation (maximum allowable deviation is ±5 kHz for split-channel models, and ±15 kHz for wideband models). If it is less than 30% or more than 90%, adjust the pin terminal jumper on the oscillator printed circuit board for the desired deviation.



NOTES:

1. JUMPER SELECTED OPTION. FACTORY SET FOR 1.5 SEC.
2. JUMPER SELECTED OPTION. FACTORY SET FOR MED. OUTPUT.

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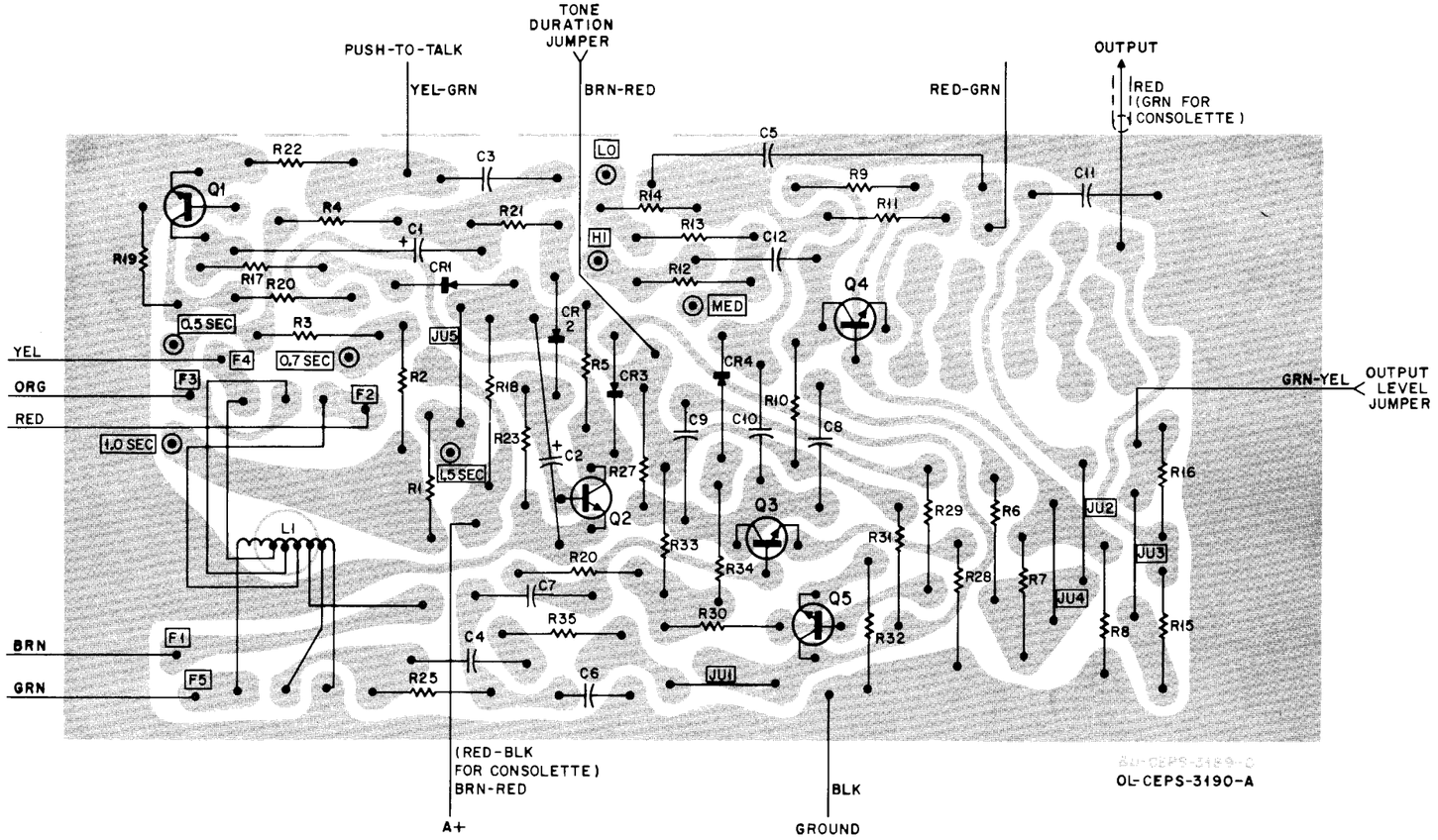

JUMPER CHART

JUMPER	STATUS
JU-1	IN
JU-2	OUT
JU-3	OUT
JU-4	OUT
JU-5	IN*

*Replace with a resistor when tone duration's greater than 1.5 seconds are required.

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PARTS LIST SHOWN ON BACK OF THIS DIAGRAM

Single-Tone Encoder
Schematic Diagram and Circuit Board Detail
Motorola No. 63P81100E95-A
6/12/70-UP

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION

PARTS LIST

IMPORTANT

USE ONLY THE FOLLOWING MOTOROLA PART NUMBERS WHEN ORDERING REPLACEMENT PARTS

PARTS LISTS FOR PRINTED CIRCUIT BOARDS ARE ON THE BACK OF THE CORRESPONDING PRINTED CIRCUIT BOARD DETAILS

TLN4272A Encoder Hardware Kit
TLN4270A Encoder Hardware Kit PL-794-A

S1	40C84354B01	SWITCH; rotary
NON-REFERENCED ITEMS		
	13C84344B01	ESCUTCHEON, engraved (TLN4270A)
	64D83071G14	ESCUTCHEON, painted
	7B83728G01	BRACKET, switch mtg. (TLN4272A)
	7B83765G01	BRACKET, board mtg. (TLN4272A)
	7B84345B01	BRACKET, switch mtg. (TLN4270A)
	7B84329B01	BRACKET, board mtg. (TLN4270A)
	3A82227A04	SCREW, special: #4-40 x 1/4"; 4 req'd
	3A82227A01	SCREW, special: No. 4-40 x 1/4"; 2 req'd
	3S134186	SCREW, captive: #6-32 x 5/16"; includes lockwasher: 2 req'd (TLN4270A)
	36B82630H01	KNOB, control
	36B82629H02	KNOB, control (TLN4270A)
	3S118768	SCREW, tapping #8 x 1/2" hex: 2 req'd. (TLN4270A)
	30K824277	CABLE, shielded: 1 conductor: 17" req'd. (TLN4270A)
	30K824274	CABLE, shielded: 1 conductor (GRN) (TLN4272A)
	39S10184A24	TERMINAL, pin: female; 11 req'd.
	29C83426B01	TERMINAL, pin: female; 4 req'd. (TLN4270A)
	42S10217A01	STRAP, cable: 8 req'd. (TLN4270A)
	37C82603D01	SLEEVE: coded No. 1 (TLN4270A)
	37C82603D02	SLEEVE: coded No. 2 (TLN4270A)
	37C82603D20	SLEEVE: coded No. 20 (TLN4270A)
	37C82603D21	SLEEVE: coded No. 21 (TLN4270A)
	37C82603D23	SLEEVE: coded No. 23 (TLN4270A)
	37C82603D42	SLEEVE: coded No. 42 (TLN4270A)
	37C82603D45	SLEEVE: coded No. 45 (TLN4270A)
	37C82603D56	SLEEVE: coded No. 56 (TLN4270A)
	37C82603D28	SLEEVE: coded No. 28 (TLN4270A)
	37C82603D60	SLEEVE: blank; 6 req'd.
	4S400136	FLATWASHER, 0.196"-.312" .067": 2 req'd.

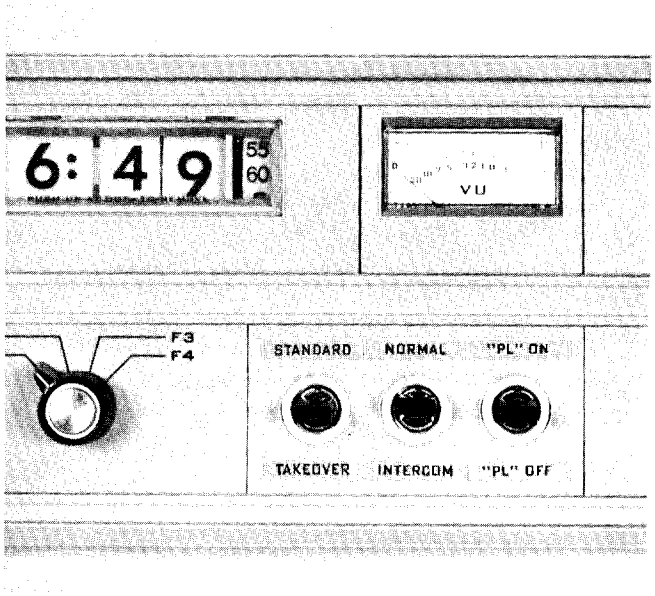
REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION

TLN4271A Single-Tone Encoder Board PL-795-B

		CAPACITOR, fixed: uF ±10%; 50 V; unl stated
C1	23K865594	68; 15 V
C2	23K865136	15 ±20%; 25 V
C3	8D82905G04	.068
C4	8D82905G04	.068
C5	8D84326A20	.0129
C6	21D82187B29	.001; 100 V
C7	8D82905G04	.068
C8	8D82905G04	.068
C9	8D82905G04	.068
C10	8D82905G25	.0033; 100 V
C11	8D82905G03	.047
C12	8D82905G04	.068
		SEMICONDUCTOR DEVICE, diode:
CR1, 2, 3, 4	48C82392B03	silicon
		COIL, AF
L1	24C84200A03	frequency determining; tapped
		TRANSISTOR:
Q1, 2, 3, 4, 5	48R869570	N-P-N; type M9570
		RESISTOR, fixed: ±10%; 1/4 W; unl stated
R1	6S129668	10K ±5%
R2	6S129982	5.6K ±5%
R3	6S129669	4.7K ±5%
R4	6S129887	12K ±5%
R5	6S129225	10K
R6	6S128685	22K
R7	6S129433	5.6K
R8	6S127806	27K
R9	6S129144	68K
R10	6S127802	1K
R11	6S128860	56
R12	6S129231	3.3K
R13	6S129231	3.3K
R14	6S129231	3.3K
R15	6S129231	3.3K
R16	6S129226	100K
R17	6S128687	6.8K
R18	6S5621	10; 1/2 W
R19	6S128902	47K
R20	6S129144	68K
R21	6S129231	3.3K
R22	6S129226	100K
R23	6S128902	47K
R24	6S128902	47K
R25	6S128685	22K
R26	6S128902	47K
R27	6S128685	22K
R28	6S127801	470
R29	6S128902	47K
R30	6S128902	47K
R31	6S128685	22K
R32	6S127801	470
R33	6S128689	2.2K
R34	6S129754	33
R35	6S129226	100K

INTERCOM KIT

MODEL TLN1215B



AEPS-3648-O

Figure 1.
External View

1. DESCRIPTION

This kit permits intercommunication between a Transistorized Consolette Base Station and a remote control console, between a Consolette Base Station and a T1370A or T1373A Local Control Unit, or between two or more local control units connected in parallel with the Consolette Base Station, without actuation of the transmitter. The kit consists of a transistorized amplifier, wiring for circuit interconnections, mounting hardware and supervisory and intercom switches. A "squelch-priority" feature disables the intercom circuit any time an on-frequency rf signal is received by the Consolette Base Station receiver. A speaker pad permits individual audio level adjustment at the Consolette Base Station and remote control console or desk set speakers.

2. FCC REQUIREMENTS

With respect to the Industrial Services, each transmitter must be installed and protected in a manner to prevent access to or operation of the station by persons other than those duly authorized by the licensee. Each station must have a control point and may, with authorization of the Federal Communications Commission, have further control points. A control point is an operating position which meets certain conditions: It must be under the control and supervision of the licensee; it must have either a carrier operated device to provide continuous visual indication when the transmitter is radiating or a pilot lamp or meter which will provide continuous visual indication when the transmitter control circuits have been placed in a condition to produce radiation; and it must have facilities which will permit the person responsible for the operation of the transmitter to turn the transmitter carrier on and off at will.

A dispatch point is defined as any position from which messages may be transmitted under the supervision of the person at a control point who is responsible for the operation of the transmitter. Dispatch points may be installed without authorization from the Commission. If dispatch points are installed in the system, the control point must be equipped to permit the person responsible for the operation of the transmitter to monitor all transmissions originating at dispatch points under his supervision. The control point must also have facilities which will permit the person responsible for the operation

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of the transmitter either to disconnect the dispatch point circuits from the transmitter or to render the transmitter inoperative from any dispatch point under this supervision.

The TLN1215B Intercom Kit allows use of the Consolette Base Station as a control point meeting all FCC requirements when T1370A and T1373A Local Control Units are used as dispatch points. Without this kit, each local control unit which is not within sight of the Consolette must be licensed as a control point.

3. CONNECTIONS

a. Connections for Local Control Units (T1370A Desk Sets and T1373A Wallmounts

If only one local control unit is to be used, connect it to the Consolette Base Station as shown in the following table. If more than one local control unit is to be used, connections must be made through a TLN1218B Junction Box Kit. Refer to the instructions provided with that kit.

SINGLE UNIT INSTALLATION

Desk Set or Wallmount Terminal	Lead Color	Function	Consolette Terminal
T1	RED	MIC HI	TB1-1
T2	GREEN	PUSH-TO-TALK	TB1-1*
T4	BLACK	MIC LO	TB1-6
T6	YELLOW	3Ω AUDIO HI	TB1-3
T7	SHIELD	GROUND	TB1-4
T8	WHITE	"PL" DISABLE	TB1-8
T9 (Wallmount only)	BROWN	A+	TB1-2

*Part of the intercom kit; mounted on the upper rear portion of the Consolette chassis.

An audio pad circuit on the intercom circuit board must be adjusted to compensate for the varying loads resulting from paralleled desk sets. Adjustment is accomplished by including certain resistors and disconnecting those which are not required. Jumpers are provided on the circuit board for this purpose. Refer to the schematic diagram for details.

CAUTION

More than six (6) local desk sets will cause excessive current drains from the receiver audio power amplifier and power supply.

The desk set speaker padding is set up to that, for any number of local control units attached to the Consolette Station (between 1 and 6), each unit will receive approximately 1/2 watt of audio power when the final audio amplifier is delivering 5 watts of output with the remaining audio power being delivered to the local speaker.

b. Microphone Connections

The TMN1000A Desk Microphone (TMN1001A for "Private-Line" tone-coded systems) is the microphone normally supplied with the transistorized Consolette Station. This microphone, in conjunction with the TLN1215B Intercom Kit, allows use of the transmit-monitor feature. This feature enables local control equipment being used as dispatch points to monitor the transmit audio of the base station and all other local control units. The microphone connections are as follows:

TMN1000A Lead Color	TMN1001A Lead Color	Consolette Terminal
RED	RED	TB1-7
BLACK	BLACK	TB1-6
SHIELD	SHIELD	TB1-4
GREEN	GREEN	TB1-5
BROWN	BROWN	TB1-3*
YELLOW	YELLOW	TB1-2*
WHITE	WHITE	TB1-8

*These terminals are part of the intercom kit and are located on the upper rear portion of the chassis. A bare wire jumper connecting these terminals must be cut to permit use of the transmit-monitor feature.

The TMN6041A and TMN6042A Microphones may also be used. The transmit-monitor feature cannot be used with these microphones. The connections are as follows:

TMN6041A Lead Color	TMN6042A Lead Color	Consolette Terminal
RED	RED	7
BLACK	BLACK	6
SHIELD	SHIELD	4
GREEN	GREEN	5
WHITE	WHITE	8

4. ADJUSTMENT

a. Preliminary Receiver Audio Potentiometer Setting

Before adjustments are made, set the receiver audio potentiometer (mounted on bracket near speaker) to a low audio power level. Turn the potentiometer to the full counterclockwise position and then rotate it in the clockwise direction approximately 45°.

b. TRIGGER Level Adjustment

(1) On "Private-Line" radios place the "PL" ON-"PL" OFF switch in the "PL" OFF position.

(2) Using a "Phillips" head or dial screwdriver, rotate the TRIGGER potentiometer on the intercom circuit board to the fully counterclockwise position. Use a dc voltmeter (0-10 volt scale) to monitor the squelch triggering voltage. Connect the ground (negative) lead to a convenient chassis location and the positive lead to point "TP2" shown on the schematic diagram and circuit board detail.

(3) Rotate the SQUELCH control on the front panel to the full counterclockwise position and note the voltage. Rotate the SQUELCH control clockwise until the voltage dips. Rotate the control clockwise until the voltage drops approximately 0.6 volt from the reading on the full counterclockwise position. Remove the positive lead from "TP2" and connect it to "TP1" on the circuit board. The meter should read approximately 10 volts. Slowly rotate the TRIGGER potentiometer clockwise until the voltage abruptly drops to approximately 7.0 volts.

c. SQUELCH Control

(1) On "Private-Line" radios place the "PL" ON-"PL" OFF switch in the "PL" OFF position.

(2) Proper setting of the SQUELCH control is essential for optimum intercom operation. Slowly rotate the SQUELCH control clockwise from the extreme counterclockwise position until the noise is just squelched (cuts out).

(3) Operate the STANDARD-TAKEOVER switch up and down while rotating the SQUELCH control clockwise until "switching pops" are heard from the speaker.

d. Receiver Audio Potentiometer

(1) With All Local Control Units Installed

(a) Rotate the SQUELCH control fully counterclockwise. On "Private-Line" radios, make certain that the "PL" ON-"PL" OFF switch is in the "PL" OFF position.

(b) Turn the VOLUME control on each of the desk sets to maximum volume.

(c) With an ac voltmeter connected between test point 3 (TP3) and ground, adjust the receiver audio potentiometer until the meter reads 3.0 volts.

(2) Alternate Method

In the event that the total intercom system is not yet installed or otherwise available, a dummy load resistor may be substituted in place of the junction box and/or local control units.

(a) Rotate the SQUELCH control fully counterclockwise. On "Private-Line" radios, make certain that the "PL" ON-"PL" OFF switch is in the "PL" OFF position.

(b) Place a dummy load resistor across terminals 3 and 4 of TB1 at the rear of the Consolette as shown in the following chart:

Total No. of Desk Sets	Load Resistor Required	
	Local Control Units Only	With One Supervisory Desk Set
1	2.5 ohm, 0.5 watt	None Required
2	10 ohm, 2 watt	6 ohm, 5 watt
3	7 ohm, 5 watt	4 ohm, 5 watt
4, 5, 6	6 ohm, 5 watt	4 ohm, 5 watt

(c) With an ac voltmeter connected between test point 3 (TP3) and ground, adjust the receiver audio potentiometer until the meter reads 3.0 volts.

5. OPERATING INSTRUCTIONS

a. Consolette Operator

(1) To Set Up Station

(a) Turn the station on and adjust all controls in the normal manner.

(b) Turn the SQUELCH control to the extreme counterclockwise position. Operate the STANDARD-TAKEOVER switch up and down while turning the SQUELCH control clockwise until a "popping" sound is heard.

(c) On "Private-Line" Consolettes, press the PL disable switch to "PL" OFF and adjust the SQUELCH as previously described.

(d) Place the STANDARD-TAKEOVER switch in the STANDARD position.

(2) Intercom

To communicate with other parallel-connected operators (desk sets):

(a) Press and hold the NORMAL-INTERCOM switch in the INTERCOM position.

(b) Speak directly into the front panel speaker. Do not use the microphone. Identify the operator you are calling.

(c) Release the switch to hear a reply or at the end of the conversation.

(d) If a radio transmission is received at the Consolette Station, the intercom facility is automatically disabled while the message is being received.

(3) To Transmit a Radio Message

The local operator may transmit with the STANDARD-TAKEOVER switch in either position. When the switch is in the STANDARD position the local control unit operators may also transmit. When it is in the TAKEOVER position only the Consolette operator may transmit.

(4) Transfer of Control Point

If the system is equipped with an alternate control point (FCC Authorized) and the Consolette station is to be left unattended, place the STANDARD-TAKEOVER switch in the STANDARD position. The alternate control point now assumes all supervisory functions.

b. Local Control Unit Operators

(1) Intercom

To communicate with other local control unit operators or the Consolette operator, lift the handset and speak into the mouthpiece. Do not operate the push-to-talk switch on the handset. Identify the operator you are calling. Replies will be heard from the earpiece without actuation of any switches. Hang up the handset when the conversation is completed.

(2) To Transmit a Radio Message

Normally, the local control operator(s) may pick up the handset and press the P-T-T switch to transmit. If the STANDARD-TAKEOVER switch is in the TAKEOVER position the local control operator must intercom to the consolette operator and request him to change the switch position.

Press the P-T-T switch on the handset and speak into the mouthpiece. Release the P-T-T switch to hear a reply.

6. FUNCTIONAL CIRCUIT DESCRIPTION

a. Intercommunication Between Local Control Unit & Consolette Station

Audio from the local control unit mouthpiece is applied to the priority switch stage. As long as no rf signal is being received at the Consolette station and the receiver is squelched, the local unit audio passes through the priority switch. The signal is amplified by the audio power amplifier stages of the receiver. The amplifier output is returned to the handset earpiece as side tone audio and applied to all other local control unit earpieces and the speaker of the Consolette base station.

b. Receiver Priority

If an rf carrier signal is received at the Consolette station, a dc signal from the squelch circuit of the receiver is applied to the emitter follower and Schmitt trigger circuits. The Schmitt trigger turns the priority switch off, breaking the audio signal path from the desk set to the receiver audio power amplifier. Since the intercom has been switched off, audio from the receiver will be heard without interference from local control units.

When the rf carrier ceases, the squelch circuit reverts the switching stage to the original

condition and the priority switch turns on allowing the intercom audio to enter the receiver power audio amplifier.

c. Desk Set (or Wallmount) Transmission

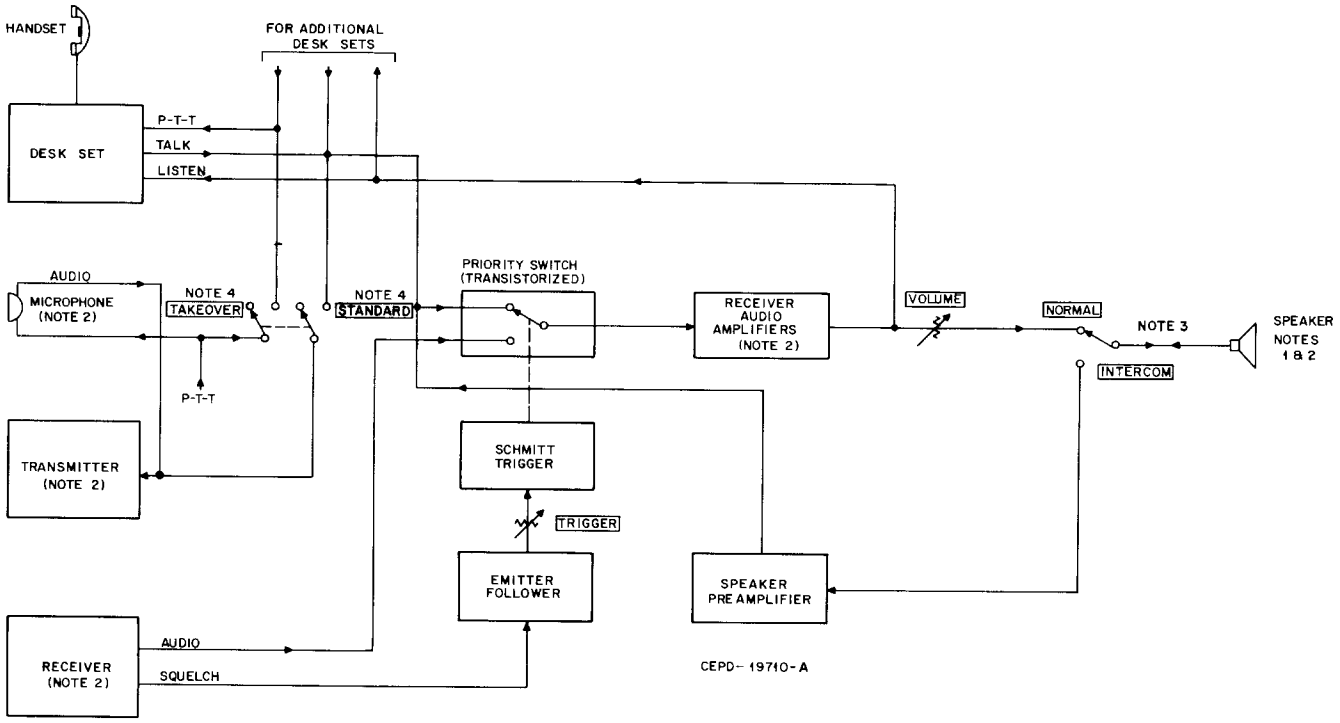
A desk set transmission is similar to a transmission by the Consolette operator except that the STANDARD-TAKEOVER switch must be in the STANDARD position. The Consolette operator may also transmit with the switch in the STANDARD position.

d. Supervisory Control

The Consolette operator retains supervisory control when a transmission is initiated from a desk set or wallmount unit. Audio generated at the local control unit and replies via the receiver are monitored on the Consolette speaker as described previously. The Consolette operator may cancel a desk set or wallmount transmission by placing the STANDARD-TAKEOVER switch in the TAKEOVER position.

e. Intercom from Consolette to Desk Set

When the Consolette operator wishes to talk to the desk set(s), the NORMAL-INTERCOM switch is held in the INTERCOM position. The speaker is converted into a microphone and the operator talks into the speaker. Audio from the speaker (microphone) is applied to a preamplifier and boosted to a usable level. The output of this preamplifier is routed through the priority switch, the audio power amplifiers, and to the local units.

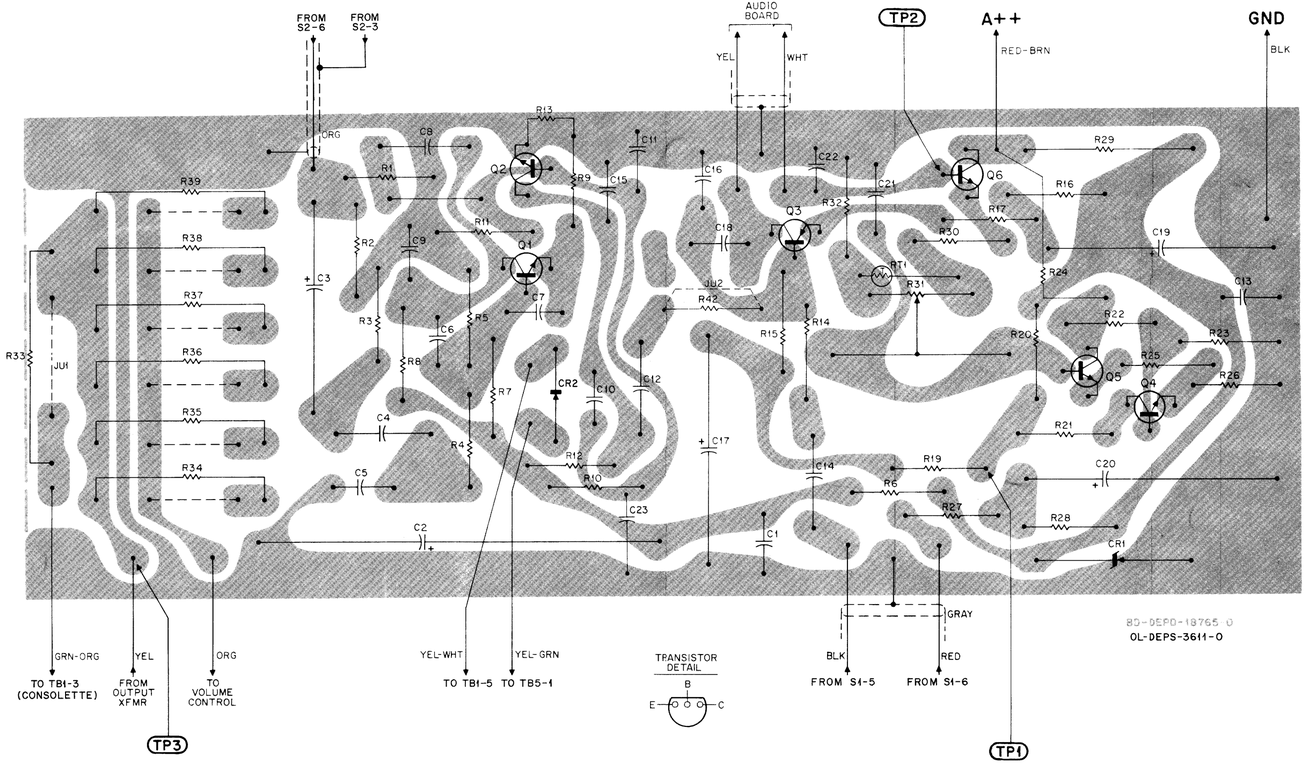


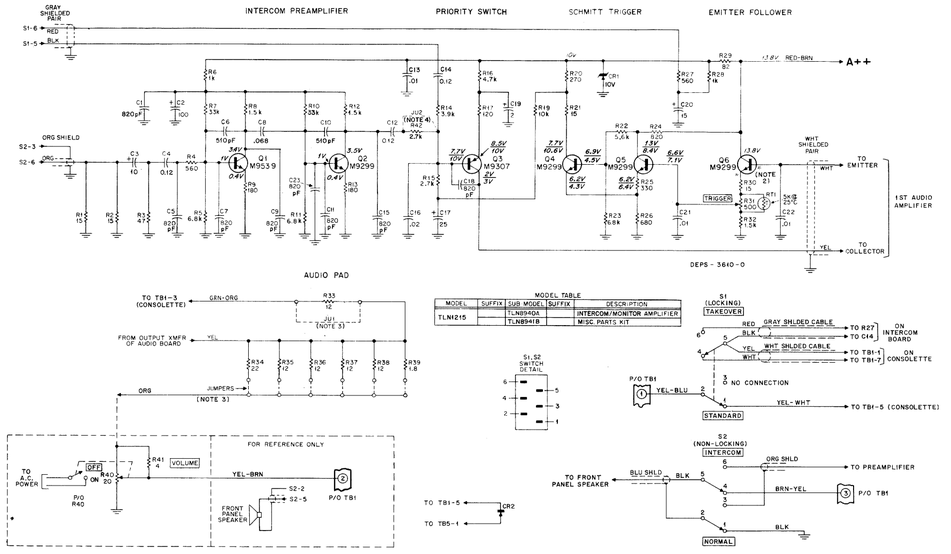
NOTES:

1. SPEAKER IS USED AS MICROPHONE WHEN SWITCH IS IN THE INTERCOM POSITION.
2. PART OF CONSOLETTE BASE STATION.
3. THE SPEAKER LEAD IS OPENED BY THE TRANSMIT SWITCH OF A TMN1000 SERIES MICROPHONE TO PROVIDE THE TRANSMIT—MONITOR FUNCTION.
4. IN "A" SUFFIX MODELS, THE TAKEOVER-STANDARD SWITCH IS LABELED LOCAL-DESK SET.

Figure 2.
Functional Block Diagram

(Page 31-6 is blank)





NOTES:

1. TOP VOLTAGE INDICATES INTERCOM MODE (INTERCOMING -13.0 V: OR STANDBY), BOTTOM VOLTAGE INDICATES RECEIVE MODE (RECEIVING AN RF SIGNAL).
2. (*) INDICATES VOLTAGE VARIES WITH SQUELCH CONTROL SETTING.
3. JUMPERS ON CIRCUIT BOARD MUST BE USED OR CUT AS REQUIRED TO ADJUST AUDIO PAD ACCORDING TO THE PARTICULAR INSTALLATION. SEE JUMPER TABLE.
4. REMOVE JUMPER JU2 ONLY IN 25-50 MHz CONSOLETTE BASE STATIONS.
5. ALL CAPACITOR VALUES ARE IN uF UNLESS OTHERWISE MARKED.

JUMPER TABLE

NO. OF DESK SETS	OMIT RESISTORS	REQUIRED RESISTORS
1	R33, 34, 35, 36	R37, 38, 39
2	R39	R33, 34, 35, 36, 37, 38
3	R38, 39	R33, 34, 35, 36, 37
4, 5, 6	R34, 38, 39	R33, 35, 36, 37
Supervisory Desk Set	R35, 36, 37, 38, 39	R33, 34

EPS-3612-O

PARTS LIST SHOWN ON BACK OF THIS DIAGRAM

Intercom Kit
Schematic Diagram and
Circuit Board Detail
Motorola No. 63P81101E19-O
6/12/70-UP

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION

PARTS LIST

TLN8940A Intercom Kit — PL-201-A

		CAPACITOR, fixed: uF; unl. stated
C1, 5, 7, 9, 11, 15, 18, 23	21D82187B21	820 pF ±10%; 200 V
C2	23D82601A21	100 +100-0%; 10 V
C3	23D82601A23	10 +150-10%; 20 V
C4, 12, 14	8D82905G09	0.12 ±10%; 50 V
C6, 10	21K845214	510 pF ±5%; 300 V
C8	8D82905G04	.068 ±10%; 200 V
C13, 21, 22	21D82428B59	.01 +80-20%; 200 V
C16	21D82428B26	.02 +80-20%; 200 V
C17	23D82601A26	25 +150-10%; 20 V
C19	23D82601A34	2 +150-10%; 25 V
C20	23D84669A25 or 23D82601A31	15 +150-10%; 25 V
		SEMICONDUCTOR DEVICE, diode: (SEE NOTE)
CR1	48D82256C28	silicon; zener type; 10 V
CR2	48C82466H13	rectifier; SR1151
		TRANSISTOR: (SEE NOTE)
Q1	48R869539	N-P-N; type M9539
Q2, 4, 5, 6	48R869299	N-P-N; type M9299
Q3	48R869307	P-N-P; type M9307
		RESISTOR, fixed: ±10%; 1/4 W unl. stated
R1, 2, 21, 30	6R131377	15
R3	6K129233	47
R4, 27	6K129620	560
R5, 11	6K128687	6.8K
R6, 28	6K127802	1K
R7, 10	6K127807	33K
R8, 12, 32	6K127803	1.5K
R9, 13	6K129662	180
R14	6K129232	3.9K
R15, 42	6K128688	2.7K
R16	6K127804	4.7K
R17	6K129753	120
R19	6K129225	10K
R20	6K129752	270
R22	6K129982	5.6K ±5%
R23	6K129237	6.8K ±5%
R24	6K129432	820
R25	6K129806	330 ±5%
R26	6K129984	680 ±5%
R29	6R488113	82; 1 W
R31	18C83168C01	var; 500 ±20%; 2 W
R33, 35, 36, 37, 38	6R118226	12; 1 W
R34	6R488026	22; 1 W
R39	17K890469	1.8; 1 W
		THERMISTOR:
RT1	6C82769A07	5020 Ohms ±10%; @25°C

TLN8941B Miscellaneous Parts Kit — PL-943-O

		RESISTOR, fixed: ±10%; unl. stated
R40	18C82528D03	var; 20; 2 W; incl. spst switch
R41	17D82177B03	4; 5 W
		SWITCH, level:
S1	40C83303G05	2 form "C"; non-locking
S2	40C83303G04	2 form "C"; locking
		BOARD, terminal:
TB1	31K868506	3 terminals

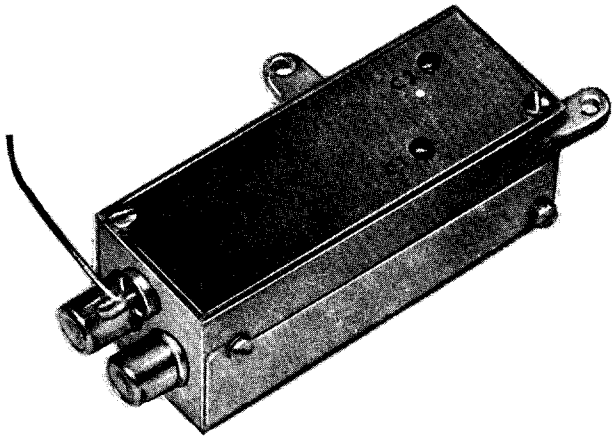
NOTE:

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

RF PREAMPLIFIER

MODEL TLN8532A

WITH TLN4182A CABLE KIT



AEPS-3083-O

1. SPECIFICATIONS

Radio set specifications that change due to the addition of the preamplifier are shown in the following table.

MAXIMUM BATTERY DRAIN		Add 10 mA
EIA SINAD INTERMODULATION		-75 dB
SENSITIVITY	-20 dB QUIETING	.25 uV
	EIA SINAD	.175 uV
SQUELCH - THRESHOLD & "PL" TONE-CODED FIXED SENSITIVITY		.15 uV or less

2. TLE6532A PREAMPLIFIER & TLN4182A MOUNTING HARDWARE & COAXIAL CABLE KIT

The preamplifier is a single stage grounded gate FET (field effect transistor) rf amplifier which connects between the antenna switch and receiver rf deck. It improves receiver sensitivity 6 dB from the specified receiver 20 dB quieting sensitivity of .5 microvolt.

The signal from the antenna is coupled directly into the input tuned-line of the preamplifier. This tuned-line passes the desired signal and matches the relatively low FET input impedance to the 50-ohm input line. The signal is capacitively coupled to the source terminal of the FET where it is amplified and then capacitively coupled to the output tuned-line. The output tuned-line is a high Q tank circuit. It passes the desired signal and matches the relatively high FET output impedance to the 50-ohm output line.

3. SERVICING

a. Unique Specifications and Measurements

The servicing procedure and most test readings for the receiver are the same with or without a preamplifier. Only the performance check specifications and "noise gain" measurements change with the use of the preamplifier. Refer to the instruction manual for test procedure information.

(1) Performance Checks

Check	Specifications (microvolt or less)	
	With Preamp	Without Preamp
20 dB Quieting Sensitivity	.25	.5
"Private-Line" Squelch Sensitivity	.15	.25
Squelch Threshold Sensitivity	.15	.25
Full Squelch Sensitivity	.6	1.2

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CAPACITOR CONNECTION POINT	TYPICAL VOLTMETER READING				"NOISE GAIN" (dB)	
	WITH PREAMP		WITHOUT PREAMP		WITH PREAMP	WITHOUT PREAMP
	mV	dBm	mV	dBm		
NONE	300	-7	100	-17	20	10

(2) "Noise Gain" Measurements

Only the "noise gain" measurements taken with a capacitor are changed when a preamplifier is used. All other measurements remain the same.

b. Localization of Receiver Malfunction to Preamplifier

Localization can be performed by either of the two following methodes:

(1) Preamplifier Isolation

This method bypasses the preamplifier permitting receiver checks without the effects of the preamplifier. If the receiver checks are satisfactory without the preamplifier, the malfunction exists in the preamplifier.

Two methods may be used to bypass the preamplifier.

(a) Bypassing With Motorola Model PK472 Adapter Kit

This kit consists of three cables, any one of which may be used to facilitate bypassing as follows:

1. Male UHF Connector to Male Phono Plug

This cable may be used to connect a signal generator with a UHF female output connector directly to the rf deck input.

2. Male BNC Connector to Male Phono Plug

This cable may be used to connect a signal generator with a BNC female output connector directly to the rf deck input.

3. Female Phono Plug to Female Phono Plug

This cable may be used to connect together the two cables normally connected to the preamplifier.

(b) Bypassing Without Adapter Kit

If an adapter kit is not available, the rf cable from the antenna relay must be removed from the preamplifier and rerouted to the rf deck input. The signal generator cable can then be connected to the rf deck input through the radio set antenna receptacle. This may be performed as follows:

1. Disconnect the phono plug from the rf deck input and lay aside.

2. Disconnect the phono plug from the INPUT of the preamplifier and reconnect it to the rf deck input.

3. Connect the signal generator to the antenna receptacle.

The preamplifier is now bypassed and the receiver should meet all specifications and measurements as described for the receiver without a preamplifier. If the receiver is okay, remove and repair the preamplifier.

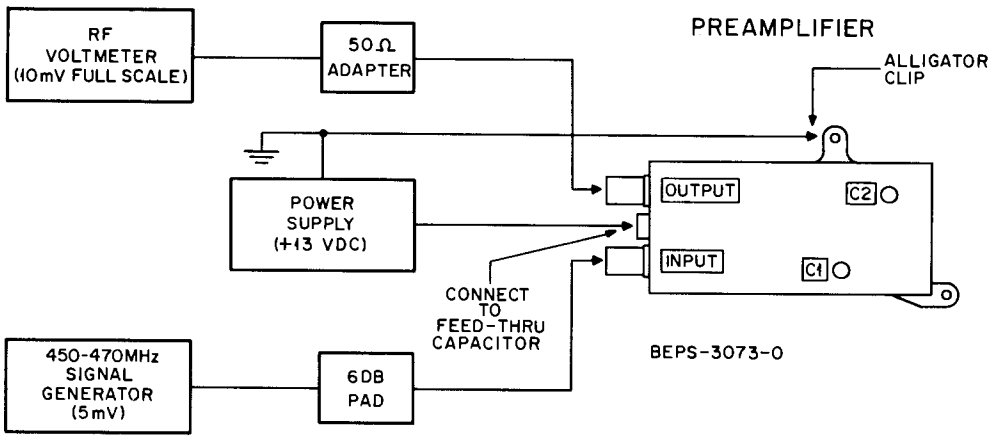
(2) Preamplifier Checks

This method permits checking of the preamplifier without checking the rest of the receiver.

(a) Test Equipment Required

1. Motorola Model S1318A Series Signal Generator, or equivalent.

2. Motorola Solid-State DC Multimeter, rf probe, and 50-ohm probe termination, or equivalent.



3. Motorola Model TEK-23 Regulated Power Supply, or equivalent.

4. Motorola Model PK472 Adapter Kit, or equivalent.

(b) Test Procedure

1. Connect the equipment as shown.

2. Adjust the power supply for 13 V DC.

3. Set the rf generator to the operating frequency.

4. Set the rf generator output attenuator to 5 millivolts.

5. Tune C2 on the preamplifier for a maximum reading on the multimeter.

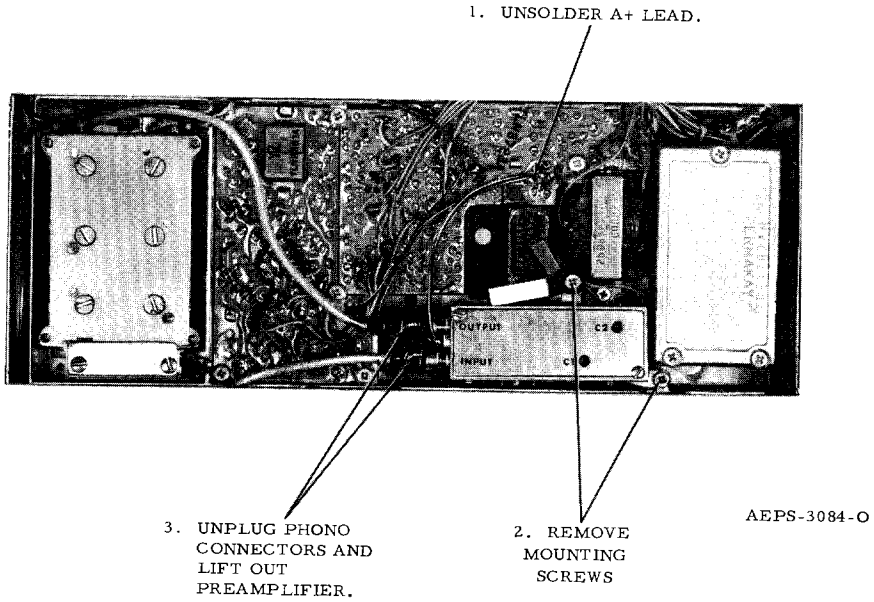
6. Tune C1 on the preamplifier for a maximum reading on the multimeter.

7. Repeat steps 5 and 6.

8. The voltmeter should now read 6.3 to 9.0 millivots. If the correct reading is not obtained, retouch both capacitors for maximum reading. If the correct reading still cannot be obtained, remove and repair the preamplifier.

c. Removal of Preamplifier

Removal of the preamplifier is as shown in the following photo.



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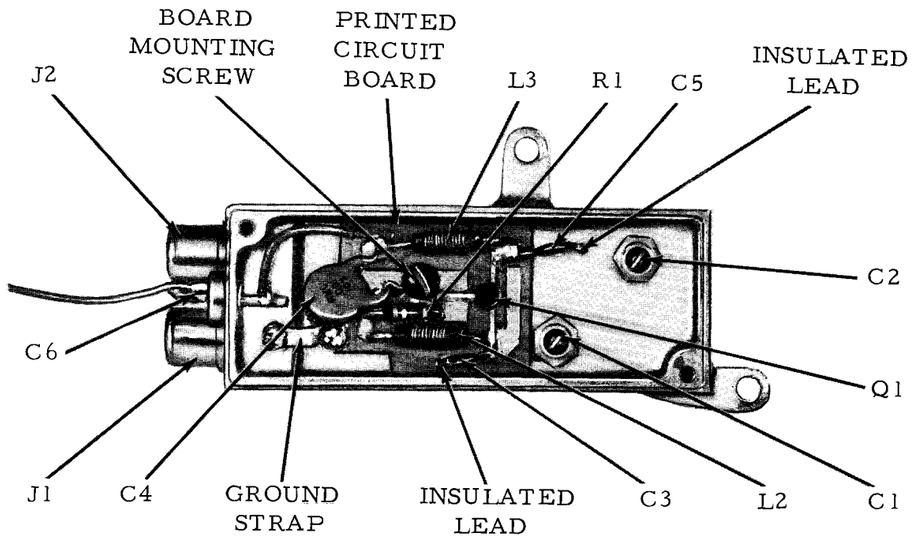
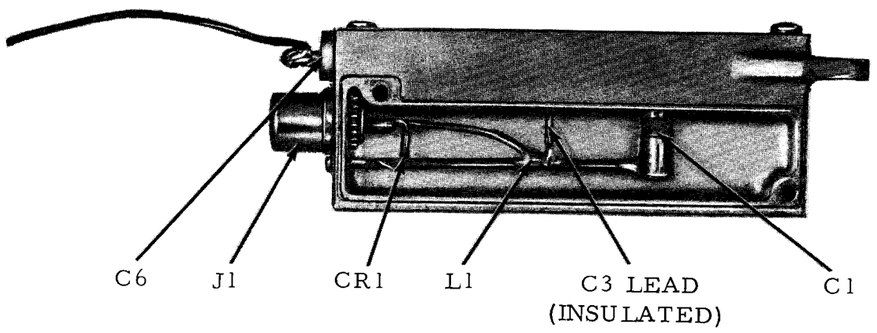
TOP VIEW
(COVER PLATE REMOVED)



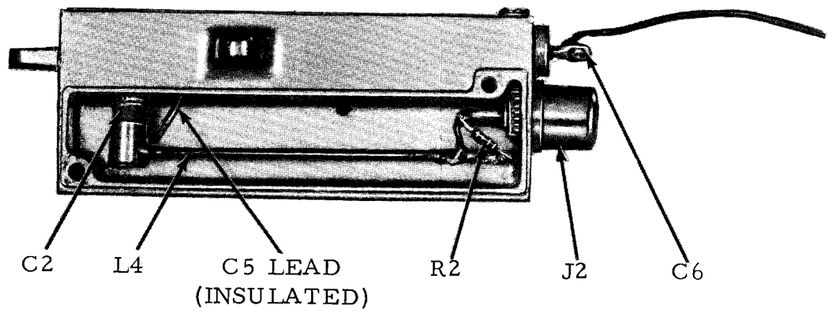
AEPS-3080-O

INPUT SIDE
(COVER PLATE REMOVED)

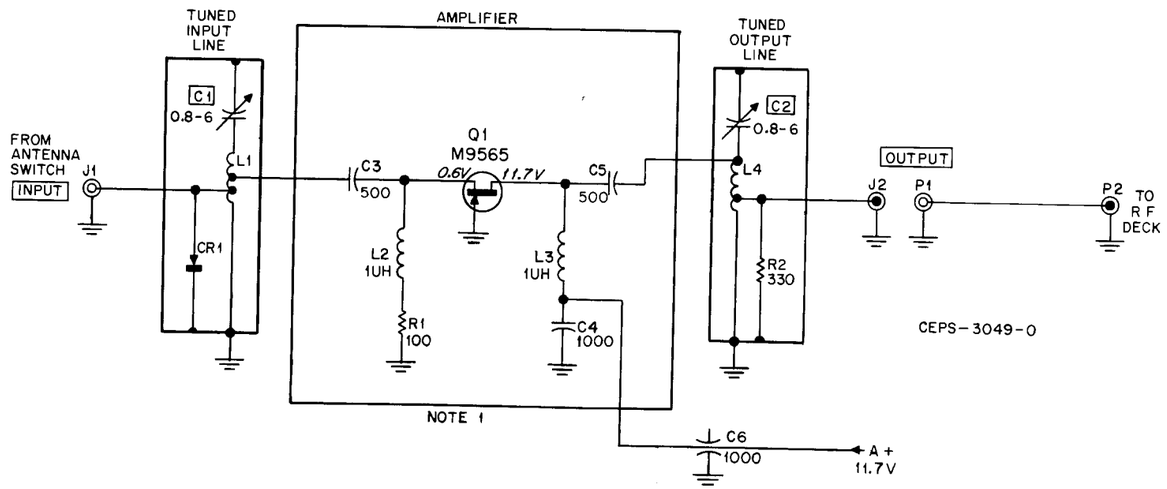


AEPS-3081-O

OUTPUT SIDE
(COVER PLATE REMOVED)



AEPS-3082-O



CEPS-3049-O

NOTES:

1. ALL COMPONENTS WITHIN THIS BOX ARE PHYSICALLY MOUNTED ON PRINTED CIRCUIT BOARD.
2. REFERENCES OUTLINED BY A RECTANGLE INDICATE MARKINGS ON CHASSIS.
3. ALL CAPACITOR VALUES ARE IN pF UNLESS OTHERWISE STATED.
4. ALL VOLTAGE READINGS MEASURED WITH A 20,000 OHM-PER-VOLT MULTIMETER.

EPS-3050-O

PARTS LIST SHOWN ON
BACK OF THIS DIAGRAM

450-470 MHz RF Preamplifier
Schematic Diagram
Motorola No. 63P81100E93-O
6/12/70-UP

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION

PARTS LIST

TLN4182A Hardware and Cable Kit
p/o TLE1280A — PL-737-O

P1, 2	28B82331G01	CONNECTOR, plug: male; coaxial; miniature type
W1	1V80708B84	LINE, RF transmission: includes P1, P2 and 30B83794C01 CABLE, RF: coaxial; 11" length req'd; and 37S134371 sleeve, heat shrink; 2" length req'd.

TLE6532A Preamplifier Chassis — PL-738-O

		CAPACITOR, fixed; pF: unl. stated
C1, 2		includes; 20C83693H01 CAPACITOR, variable; 0.8-6 and 76A84425B01 PISTON, tuning
C3	21K861441	500 ±10%; N4700
C4	21C82187B20	1000 ±10%; 200 V
C5	21K861441	500 ±10%; N4700
C6	21B861219	.001 uF +100-0%; 500 V, coded RED
		SEMICONDUCTOR DEVICE, diode: (SEE NOTE)
CR1	48C83654H01	silicon
		CONNECTOR, receptacle:
J1, 2	9C84135B01	female; single contact
		COIL, RF:
L1	47B84330B01	line input
L2	24B864019	choke, 1.0 uH
L3	24B864019	choke, 1.0 uH
L4	47B84330B03	line output
		TRANSISTOR: (SEE NOTE)
Q1	48R869565	field-effect "N Channel" type M9565
		RESISTOR, fixed:
R1	6S131524	100 ±10%; 1/4 W
R2	6S185B73	330 ±10%; 1/8 W
	NON-REFERENCED ITEMS	
	15B84322B01	COVER, top
	15B84323B01	COVER, side: 2 req'd.
	3A82126B06	SCREW, Nylon: #4-40 x 1/4" slotted round head
	15C84321B01	HOUSING, preamplifier
	14B82643E19	INSULATOR, Armite paper

TLN4372A Hardware and Cable Kit
p/o TLE1290A — PL-762-O

P1, 2	28B82331G01	CONNECTOR, plug: male; coaxial; miniature type
W1	1V80708B84	LINE, RF transmission: includes P1, P2 and 30B83794C01 CABLE, RF, coaxial; 11" length req'd. and 37S134371 SLEEVE, heat shrink; 2" length req'd.
	NON-REFERENCED ITEMS	
	42B84513B01	CLIP, channel element (insulated)
	43K24497	BUSHING, spacer: 1 used
	43K483672	BUSHING, spacer: 2 used

NOTE:

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

END OF CONSOLETTE DOCUMENT

MOTOROLA

DYNAMIC MICROPHONES

MODELS TMN1000A & TMN1001A

Note: This document is not part of the Consolette manual, but is included as a service to our readers. This microphone is an optional accessory to the station.

MODEL	APPLICATION
TMN1000A	Carrier Squelch
TMN1001A	"Private-Line" Disabling

1. DESCRIPTION AND APPLICATION

The TMN1000A Desk-Stand Dynamic Microphone is a unidirectional microphone for use with base station equipment. It has a two-stage transistor amplifier, a 9-foot stranded cord with spade lug terminations, and a TRANSMIT switch mounted in its desk stand base. The transmit switch consists of two sections mechanically operated by the transmit paddle. One section performs the normal transmit functions. The other section is a single normally-closed contact which may be used to break the speaker lead of the equipment to which it is connected. This is done to provide transmit audio to dispatch points while the local mike is transmitting. This allows the Model T1370 series local control equipment to monitor both the receive and transmit audio of the unit to which they are attached, provided that these units have intercom capability.

The TMN1001A Microphone is the same as the TMN1000A Microphone, except for the addition of a MONITOR switch. The switch provides for disabling the "Private-Line" feature of tone-coded squelch equipment, allowing the operator to monitor the channel before transmitting. The radio set PL switch should be left in the ON position to provide the proper "Private-Line" disabling function of the radio set from this desk-stand microphone.

2. INSTALLATION

For use with the T1366BM, T1367BM, T1391AM-T1398AM Remote Control Consoles; LHB and MHB "Compa-Station" Base Radios; and Transistorized Consolette Base Stations; refer to the appropriate instruction manuals.

For use with other radio equipment as a field replacement for the TMN6041A Series Microphones, use the table below.

LEAD COLOR	FUNCTION
BROWN	MIC-HI
BLACK	GND
GREEN	P-T-T
WHITE	"PL" DISABLE
SHIELD	MIC-LO
YELLOW	NOT USED
RED	NOT USED

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12/8/70-UP

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3. OPERATION

a. Channel Monitor (TMN1001A)

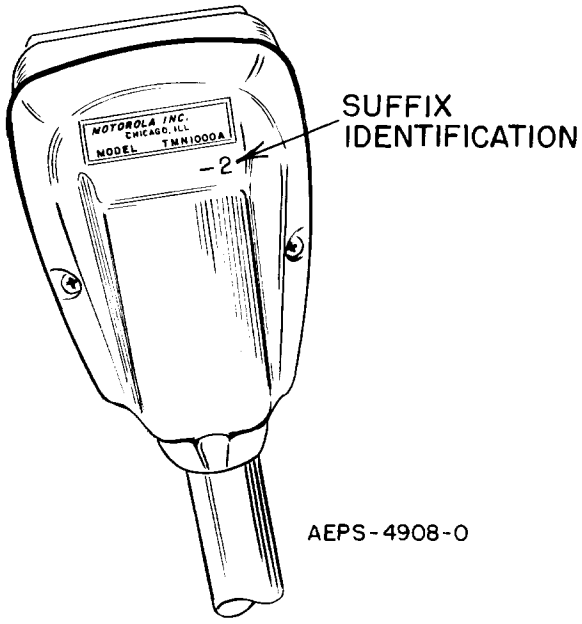
Federal Communications Commission regulations require that before each transmission the operator must disable the "Private-Line" tone-coded squelch of the receiver and ascertain that the channel is clear. This can be accomplished by pressing the MONITOR switch on the microphone base. This type of monitoring is solely the responsibility of the operator. If desired, a mandatory type of monitoring is available. This is done by cutting jumper JU2 on the microphone printed circuit board. With JU2 cut, the operator must press both the MONITOR and TRANSMIT switches to transmit. Pressing the TRANSMIT switch alone will not allow transmission. Releasing either switch will immediately terminate transmission.

b. To Transmit

To transmit, press the TRANSMIT switch on the microphone base and speak directly into the microphone from a distance of approximately six inches. This distance may vary somewhat from user to user depending on the individual's voice tones, etc. Within a short period of time, each operator should find his "natural" distance for optimum performance. It is important that the operator speak in a normal tone of voice. Speaking too far from or too close to the microphone will seriously detract from the audio quality.

4. SUFFIX IDENTIFICATION

Refer to the following detail for the location of the applicable suffix number (if any) on the microphone.



REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION

PARTS LIST

IMPORTANT

USE ONLY THE FOLLOWING MOTOROLA PART NUMBERS WHEN ORDERING REPLACEMENT PARTS

PARTS LISTS FOR PRINTED CIRCUIT BOARDS ARE ON THE BACK OF THE CORRESPONDING PRINTED CIRCUIT BOARD DETAILS

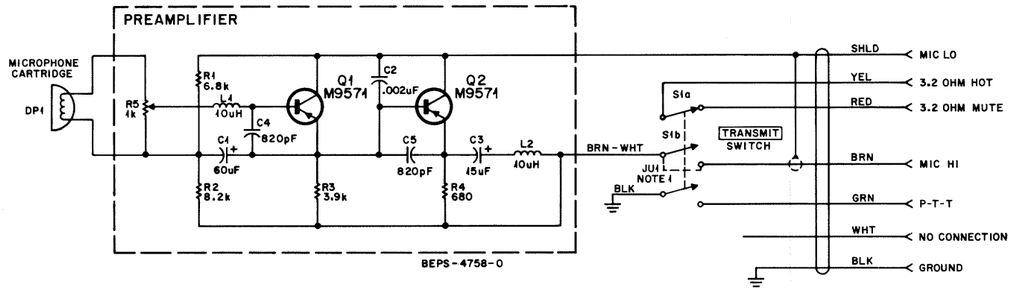
TMN6044A Desk Microphone PL-788-A

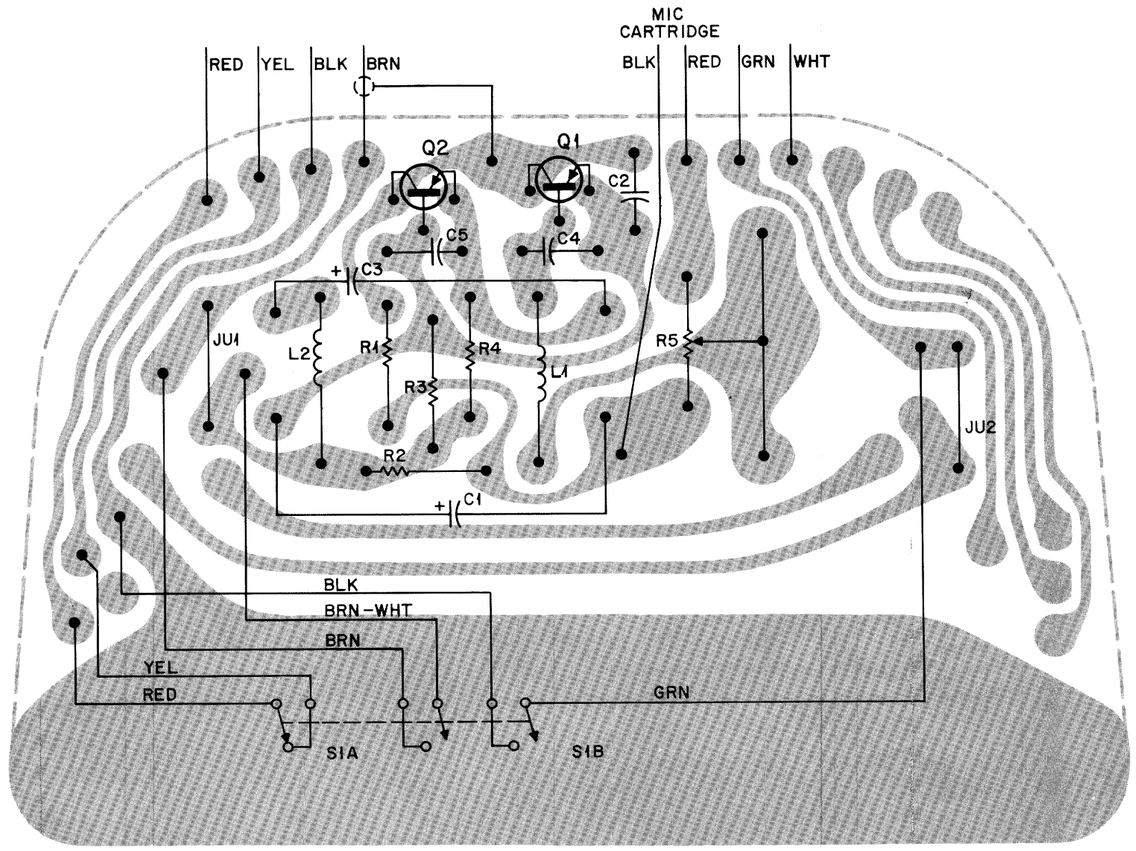
DP1	59C852603	CARTRIDGE, microphone: dynamic; 175 ohm impedance at 1 kHz
		SWITCH:
S1A	40C83298B04	open leaf; spst
S1B	40C83298B01	open leaf; dpst
	NON-REFERENCED ITEMS	
	1V80708B93	CABLE ASSEMBLY: includes 30C83560A02 CABLE, 6 conductor: 9 ft. req'd 37S122058 TUBING "Teflon" No. 10; 6" req'd. 42K893647 CLAMP, wire 29A823156 LUG; spade: 7 req'd.
	15C83171B01	HOUSING, microphone: rear
	15D83172B01	HOUSING, microphone: front
	13B83173B01	GRILLE, microphone: perforated metal
	13B83174B01	EMBLEM
	35A852701	GRILLE, cloth
	32B852702	GASKET, microphone
	42A852705	CLAMP, cartridge
	14A857137	INSULATOR, cartridge
	31S124665	STRIP, terminal; 2 lugs
	3S127924	SCREW, lock: No. 6-32 x 5/16"
	3S132401	SCREW, machine: No. 6-32 x 7/8"; 2 req'd.
	4S400386	LOCKWASHER: No. 6; 2 req'd.
	33B82828C16	NAMEPLATE
	7D83175B01	STAND, microphone
	47B83176B01	TUBE, microphone
	3B855008	PUSHBUTTON
	41K855005	SPRING, pushbutton retractor: 2 req'd.
	3S136878	SCREW, machine: No. 5-40 x 5/8"; 4 req'd.
	2B84331B01	NUT, switch mounting: 2 req'd.
	4S490774	FLATWASHER: .125"-9/32"-.027"
	42B84342B01	CLAMP, cable
	3S128052	SCREW, tapping: No. 6 x 5/16" 2 req'd.
	3S134168	SCREW, captive: No. 4 x 1/4" includes lockwasher; 4 req'd.
	64B855001	COVER, bottom
	46B854311	STUD, tri-mount: 4 req'd.
	75A838826	BUMPER, rubber: 4 req'd.

TLN4344A Microphone Circuit Board Kit PL-1002-A

		CAPACITOR, fixed: uF
C1	23D84669A22	60 +150-10%; 15 V
C2	21D82428B25	.002 ±20%; 500 V
C3	23D84669A25	15 +150-10%; 25 V
C4	21C82187B17	820 pF ±10%; 500 V
C5	21C82187B17	820 pF ±10%; 500 V
		COIL, RF:
L1	24D82723H07	10 uH
L2	24D82723H07	10 uH
		SEMICONDUCTOR DEVICE, diode: (SEE NOTE)
Q1	48R869571	P-N-P; type M9571
Q2	48R869571	P-N-P; type M9571
		RESISTOR, fixed: ±10%; 1/4 W; unl stated
R1	6S128687	6.8K
R2	6S128686	8.2K
R3	6S129232	3.9K
R4	6S128599	680
R5	18C83168C03	variable 1K ±20%

NOTE: Replacement diodes must be ordered by Motorola part number only for optimum performance.





BD-CEPS-4759-O
OL-CEPS-4760-O

NOTE:

1. REMOVE JUMPER JU1 FOR OPERATION WITH PARALLEL MICROPHONES, WHEN USING WITH TRANSISTORIZED CONSOLETTE BASE STATION, OR WHEN USING LHB OR MHB "COMPA-STATION" BASE RADIO EQUIPPED WITH TLN1184B INTERCOM KIT.

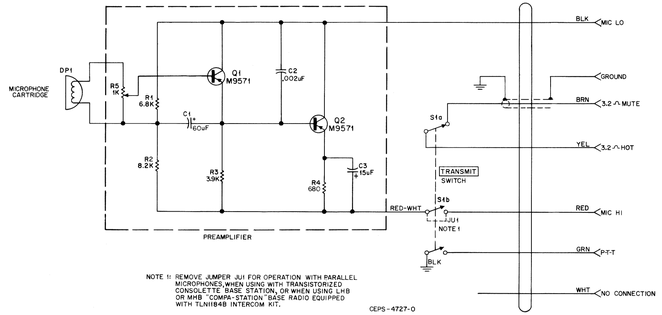
EPS-4726-O

SUFFIX -3

FOR USE WITH MODELS SHIPPED SINCE DECEMBER, 1970 AND MARKED SUFFIX -3. FOR EARLIER VERSIONS REFER TO THE DIAGRAMS ON THE REVERSE OF THIS PAGE.

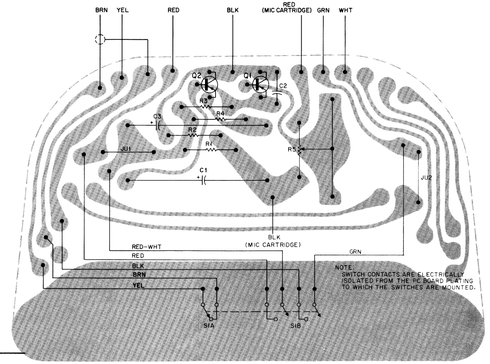
EPS-4757-A

TMN1000A-3 Desk Stand Dynamic Microphone
Schematic Diagram & Circuit Board Detail
Motorola No. 63P81101E47-C
12/8/70-UP



NOTE 1: REMOVE JUMPER J1/1 FOR OPERATION WITH PARALLEL MICROPHONES, WHEN USING WITH TRANSISTORIZED CONSOLETTE BASE STATION, OR WHEN USING LHB OR MHB "COMPA-STATION" BASE RADIO EQUIPPED WITH TLN1184B INTERCOM KIT.

CEPS-4727-0



NOTE: SWITCH CONTACTS ARE ELECTRICALLY ISOLATED FROM THE PC BOARD PLATING TO WHICH THE SWITCHES ARE MOUNTED.

GU-CEPS-3314-2
GU-CEPS-3516-A

TMN1000A, -1, and -2
Desk Stand Dynamic Microphones
Schematic Diagram & Circuit Board Detail
Motorola No. 63P81101E03-C
12/8/70-UP

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION

PARTS LIST

IMPORTANT

USE ONLY THE FOLLOWING MOTOROLA PART NUMBERS WHEN ORDERING REPLACEMENT PARTS

PARTS LISTS FOR PRINTED CIRCUIT BOARDS ARE ON THE BACK OF THE CORRESPONDING PRINTED CIRCUIT BOARD DETAILS

TMN6044A Desk Microphone — PL-788-A

DP1	59C852603	CARTRIDGE, microphone: dynamic; 175 ohm impedance at 1 kHz.
S1A S1B	40C83298B04 40C83298B01	SWITCH: open leaf; spst open leaf; dpst
		NON-REFERENCED ITEMS
	1V80708B93	CABLE ASSEMBLY: includes 30C83560A02 CABLE, 6 conductor: 9 ft. req'd 3TS122058 TUBING "Teflon" No. 10; 6" req'd. 42K6936-47 CLAMP, wire 29A823156 LUG; spade: 7 req'd.
	15C83171B01	HOUSING, microphone: rear
	15D83172B01	HOUSING, microphone: front
	13B83173B01	GRILLE, microphone: perforated metal
	13B83174B01	EMBLEM
	35A852701	GRILLE, cloth
	32B852702	GASKET, microphone
	42A852705	CLAMP, cartridge
	14A857137	INSULATOR, cartridge
	3SI124665	STRIP, terminal; 2 lugs
	3S127924	SCREW, lock: No. 6-32 x 5/16"
	3S132401	SCREW, machine: No. 6-32 x 7/8"; 2 req'd.
	4S400386	LOCKWASHER: No. 6; 2 req'd.
	33B82828C16	NAMEPLATE
	7D83175B01	STAND, microphone
	47B83176B01	TUBE, microphone
	3B855008	PUSHBUTTON
	41K855005	SPRING, pushbutton retractor: 2 req'd.
	3S136878	SCREW, machine: No. 5-40 x 5/8"; 4 req'd.
	2B84331B01	NUT, switch mounting: 2 req'd.
	4S490774	FLATWASHER: .125"-9/32"-.027"
	42B84342B01	CLAMP, cable
	3S128052	SCREW, tapping: No. 6 x 5/16" 2 req'd.
	3S134168	SCREW, captive: No. 4 x 1/4" includes lockwasher; 4 req'd.
	64B855001	COVER, bottom
	46B854311	STUD, tri-mount: 4 req'd.
	75A838826	BUMPER, rubber: 4 req'd.

TLN4344A Microphone Circuit Board Kit — PL-789-A

		CAPACITOR, fixed: uF
C1	23D84669A22	60 +150-10%; 15 V
C2	21D82428D25	.002 ±20%; 500 V
C3	23D84669A25	15 +150-10%; 25 V
		SEMICONDUCTOR DEVICE, diode: (SEE NOTE)
Q1	48R869571	P-N-P; type M9571
Q2	48R869571	P-N-P; type M9571
		RESISTOR, fixed: ±10%; 1/4 W; unl stated
R1	6S128687	6.8K
R2	6S128686	8.2K
R3	6S129232	3.9K
R4	6S128599	680
R5	18C83168C03	variable 1K ±20%

NOTE:

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

NON-SUFFIXED UNITS

THIS DIAGRAM IS FOR USE ONLY WITH MODELS SHIPPED PRIOR TO APRIL, 1970 AND NOT SUBSEQUENTLY MODIFIED. FOR LATER AND MODIFIED VERSIONS REFER TO SUFFIX -NUMBERED DIAGRAMS.

EPS-4724-A

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION

PARTS LIST

IMPORTANT

USE ONLY THE FOLLOWING MOTOROLA PART NUMBERS WHEN ORDERING REPLACEMENT PARTS

PARTS LISTS FOR PRINTED CIRCUIT BOARDS ARE ON THE BACK OF THE CORRESPONDING PRINTED CIRCUIT BOARD DETAILS

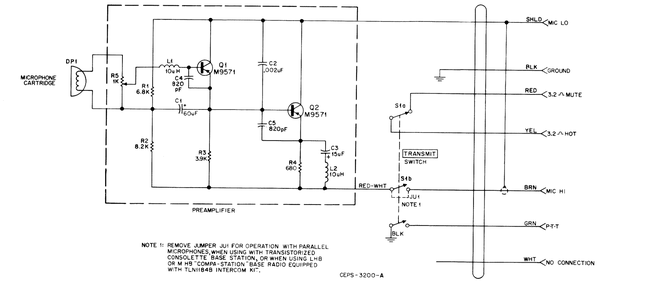
TMN6044A Desk Microphone — PL-788-A

DP1	59C852603	CARTRIDGE, microphone: dynamic; 175 ohm impedance at 1 kHz.
S1A S1B	40C83298B04 40C83298B01	SWITCH: open leaf; spst open leaf; dpst
		NON-REFERENCED ITEMS
	1V80708B93	CABLE ASSEMBLY: includes 30C83560A02 CABLE, 6 conductor: 9 ft. req'd 3TS122058 TUBING "Teflon" No. 10; 6" req'd. 42K6936-47 CLAMP, wire 29A823156 LUG; spade: 7 req'd.
	15C83171B01	HOUSING, microphone: rear
	15D83172B01	HOUSING, microphone: front
	13B83173B01	GRILLE, microphone: perforated metal
	13B83174B01	EMBLEM
	35A852701	GRILLE, cloth
	32B852702	GASKET, microphone
	42A852705	CLAMP, cartridge
	14A857137	INSULATOR, cartridge
	3SI124665	STRIP, terminal; 2 lugs
	3S127924	SCREW, lock: No. 6-32 x 5/16"
	3S132401	SCREW, machine: No. 6-32 x 7/8"; 2 req'd.
	4S400386	LOCKWASHER: No. 6; 2 req'd.
	33B82828C16	NAMEPLATE
	7D83175B01	STAND, microphone
	47B83176B01	TUBE, microphone
	3B855008	PUSHBUTTON
	41K855005	SPRING, pushbutton retractor: 2 req'd.
	3S136878	SCREW, machine: No. 5-40 x 5/8"; 4 req'd.
	2B84331B01	NUT, switch mounting: 2 req'd.
	4S490774	FLATWASHER: .125"-9/32"-.027"
	42B84342B01	CLAMP, cable
	3S128052	SCREW, tapping: No. 6 x 5/16" 2 req'd.
	3S134168	SCREW, captive: No. 4 x 1/4" includes lockwasher; 4 req'd.
	64B855001	COVER, bottom
	46B854311	STUD, tri-mount: 4 req'd.
	75A838826	BUMPER, rubber: 4 req'd.

TLN4344A Microphone Circuit Board Kit — PL-1002-A

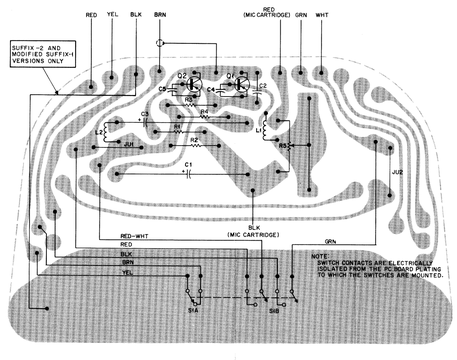
		CAPACITOR, fixed: uF
C1	23D84669A22	60 +150-10%; 15 V
C2	21D82428D25	.002 ±20%; 500 V
C3	23D84669A25	15 +150-10%; 25 V
C4	21C82187B17	820 pF ±10%; 500 V
C5	21C82187B17	820 pF ±10%; 500 V
		COIL, RF:
L1	24D82723H07	10 uH
L2	24D82723H07	10 uH
		SEMICONDUCTOR DEVICE, diode: (SEE NOTE)
Q1	48R869571	P-N-P; type M9571
Q2	48R869571	P-N-P; type M9571
		RESISTOR, fixed: ±10%; 1/4 W; unl stated
R1	6S128687	6.8K
R2	6S128686	8.2K
R3	6S129232	3.9K
R4	6S128599	680
R5	18C83168C03	variable 1K ±20%

NOTE: Replacement diodes must be ordered by Motorola part number only for optimum performance.



NOTE 1: REMOVE JUMPER J1/1 FOR OPERATION WITH PARALLEL MICROPHONES, WHEN USING WITH TRANSISTORIZED CONSOLETTE BASE STATION, OR WHEN USING LHB OR M HB "COMPA-STATION" BASE RADIO EQUIPPED WITH TLN1184B "INTERCOM KIT".

CEPS-3200-A



NOTE: SWITCH CONTACTS ARE ELECTRICALLY ISOLATED FROM THE PC BOARD PLATING TO WHICH THE SWITCHES ARE MOUNTED.

GU-CEPS-3314-2
GU-CEPS-3516-C

REVISIONS — 63P81101E03-C

CHASSIS AND SUFFIX NO.	REF. SYMBOL	CHANGE	LOCATION
TMN1000A-2		ADDED GND LEAD	LEFT SIDE OF BOARD

SUFFIX-1 AND -2

THIS DIAGRAM IS FOR USE WITH MODELS SHIPPED BETWEEN APRIL, 1970 AND DECEMBER, 1970 AND MARKED SUFFIX -1 OR -2. THIS DIAGRAM ALSO APPLIES TO MODIFIED NON-SUFFIX VERSIONS.

EPS-4723-A

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION

PARTS LIST

IMPORTANT

USE ONLY THE FOLLOWING MOTOROLA PART NUMBERS WHEN ORDERING REPLACEMENT PARTS

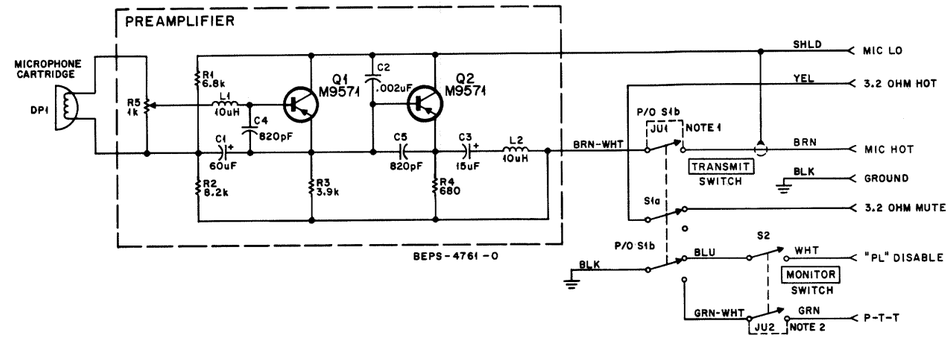
TLN4344A Microphone Circuit Board Kit — PL-1002-A

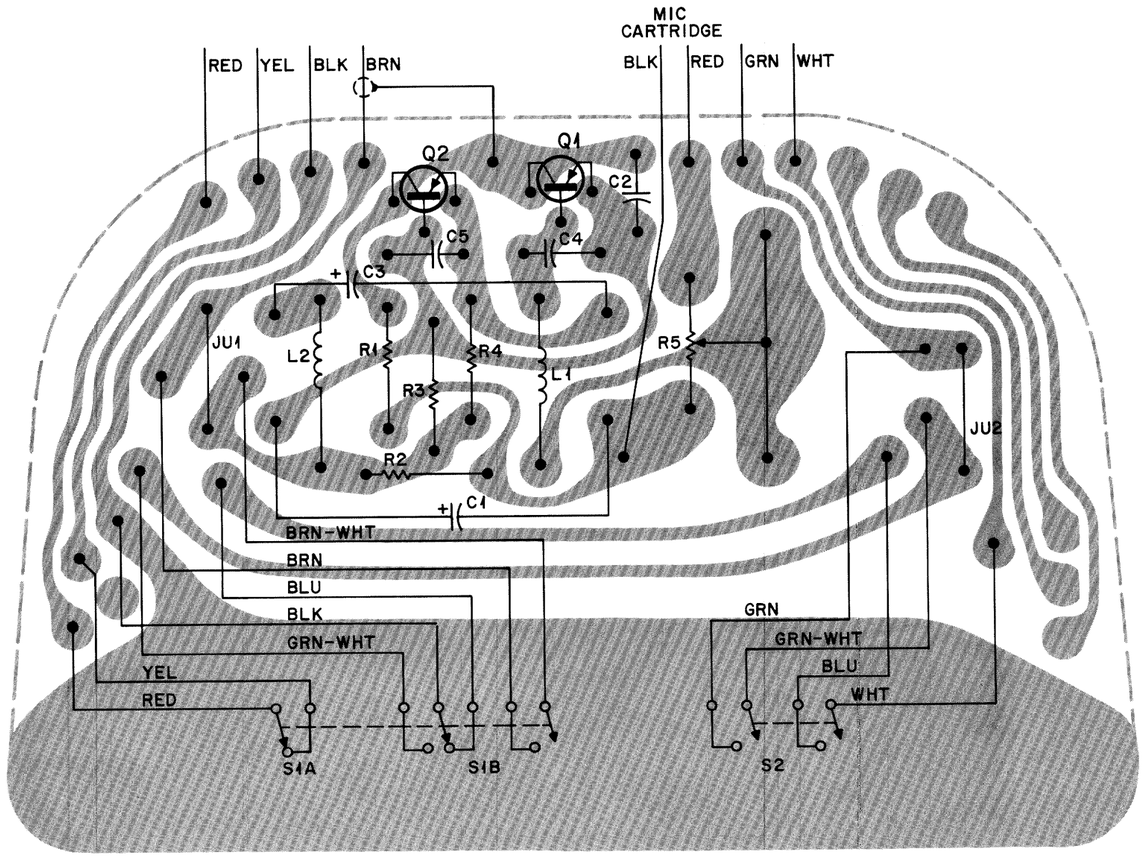
		CAPACITOR, fixed: uF
C1	23D84669A22	60 +150-10%; 15 V
C2	21D82428B25	.002 ±20%; 500 V
C3	23D84669A25	15 +150-10%; 25 V
C4	21C82187B17	820 pF ±10%; 500 V
C5	21C82187B17	820 pF ±10%; 500 V
		COIL, RF:
L1	24D82723H07	10 uH
L2	24D82723H07	10 uH
		SEMICONDUCTOR DEVICE, diode: (SEE NOTE)
Q1	48R869571	P-N-P; type M9571
Q2	48R869571	P-N-P; type M9571
		RESISTOR, fixed: ±10%; 1/4 W; unl stated
R1	6S128687	6.8K
R2	6S128686	8.2K
R3	6S129232	3.9K
R4	6S128599	680
R5	18C83168C03	variable 1K ±20%

TMN6045A Desk Microphone (PL) — PL-790-A

DP1	59C852603	CARTRIDGE, microphone: dynamic; 175 ohm impedance at 1 kHz
		SWITCH,
S1A	40C83298B04	open leaf; spst
S1B	40C83298B01	open leaf; dpst
S2	40C83298B05	open leaf; spst; 2 section
	NON-REFERENCED ITEMS	
	1V80708B93	CABLE ASSEMBLY: includes 30C83560A02 CABLE, 6 conductor: 9 ft. req'd 37S122058 TUBING; "Teflon" No. 10: 6" req'd 42K893647 CLAMP, wire 29A823156 LUG, spade: 7 req'd
	15C83171B01	HOUSING, microphone: rear
	15D83172B01	HOUSING, microphone: front
	13B83173B01	GRILLE, microphone: perforated metal
	13B83174B01	EMBLEM
	35A852701	GRILLE, cloth
	32B852702	GASKET, microphone
	42A852705	CLAMP, cartridge
	14A857137	INSULATOR, cartridge
	31S124665	STRIP, terminal; 2 lugs
	3S127924	SCREW, lock: No. 6-32 x 5/16"
	3S132401	SCREW, machine: No. 6-32 x 7/8" 2 req'd
	4S400386	LOCKWASHER: No. 6: 2 req'd
	33B82828C17	NAMEPLATE
	7D83175B01	STAND, microphone
	47B83176B01	TUBE, microphone
	38B855009	PUSHBUTTON: (TRANSMIT)
	38K855010	PUSHBUTTON (MONITOR)
	41K855005	SPRING, pushbutton retractor 2 req'd
	3S136878	SCREW, machine: No. 5-40 x 5/8"; 6 req'd
	2B84331B01	NUT, switch mounting: 3 req'd
	4S490774	FLATWASHER; .125" - 9/32" - .027"
	42B84342B01	CLAMP, cable
	3S128052	SCREW, tapping: No. 6 x 5/16"; 2 req'd
	3S134168	SCREW, captive: No. 4 x 1/4"; includes lockwasher; 4 req'd
	64B855001	COVER, bottom
	46B854311	STUD, tri-mount; 4 req'd
	75A838826	BUMPER, rubber; 4 req'd

NOTE: Replacement diodes must be ordered by Motorola part number only for optimum performance.





BD-CEPS-4759-O
OL-CEPS-4763-O

NOTES:

1. REMOVE JUMPER JU1 FOR PARALLEL MICROPHONE OPERATION, FOR USE WITH TRANSISTORIZED CONSOLETTE BASE STATION, AND FOR USE WITH LHB AND MHB "COMPA-STATION" BASE RADIO EQUIPPED WITH TLN1184B INTERCOM KIT.
2. REMOVE JUMPER JU2 FOR "MONITOR REQUIRED BEFORE TRANSMIT" OPERATION.

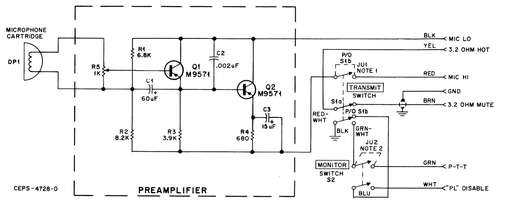
EPS-4762-O

SUFFIX -3

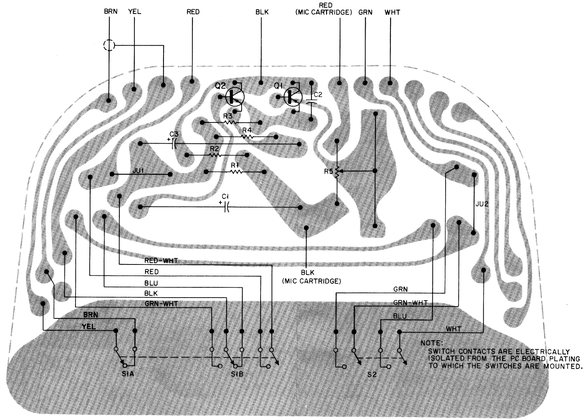
FOR USE WITH MODELS SHIPPED SINCE DECEMBER, 1970 AND MARKED SUFFIX -3. FOR EARLIER VERSIONS REFER TO THE DIAGRAMS ON THE REVERSE OF THIS PAGE.

EPS-4757-A

TMN1001A-3 Desk Stand Dynamic Microphone
Schematic Diagram & Circuit Board Detail
Motorola No. 63P81101E46-C
12/8/70-UP



NOTES:
1. REMOVE JUMPER JU1 FOR PARALLEL MICROPHONE OPERATION, FOR USE WITH TRANSISTORIZED CONSOLETTE BASE STATION, AND FOR USE WITH LHB AND MHB "COMPA-STATION" BASE RADIO EQUIPPED WITH TLN1184B INTERCOM KIT.
2. REMOVE JUMPER JU2 FOR "MONITOR REQUIRED BEFORE TRANSMIT" OPERATION.



OL-CEPS-3194-A

TMN1001A, -1, and -2
Desk Stand Dynamic Microphones
Schematic Diagram and Circuit Board Details
Motorola No. 63P81100E96-C
12/8/70-UP

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION

PARTS LIST

IMPORTANT

USE ONLY THE FOLLOWING MOTOROLA PART NUMBERS WHEN ORDERING REPLACEMENT PARTS

TLN4344A Microphone Circuit Board Kit PL-789-A

		CAPACITOR, fixed: uF
C1	23D84669A22	60 +150-10%; 15 V
C2	21D82428B25	.002 ±20%; 500 V
C3	23D84669A25	15 +150-10%; 25 V
		SEMICONDUCTOR DEVICE, diode: (SEE NOTE)
Q1	48R869571	P-N-P; type M9571
Q2	48R869571	P-N-P; type M9571
		RESISTOR, fixed: ±10%; 1/4 W; unl stated
R1	6S128687	6.8K
R2	6S128686	8.2K
R3	6S129232	3.9K
R4	6S128599	680
R5	18C83168C03	variable 1K ±20%

TMN6045A Desk Microphone (PL) PL-790-A

DP1	59C852603	CARTRIDGE, microphone: dynamic; 175 ohm impedance at 1 kHz
		SWITCH,
S1A	40C83298B04	open leaf; spst
S1B	40C83298B01	open leaf; dpst
S2	40C83298B05	open leaf; spst; 2 section
		NON-REFERENCED ITEMS
	1V8070B93	CABLE ASSEMBLY; includes 30C83560A02 CABLE, 6 conductor; 9 ft, req'd 37S122058 TUBING; "Teflon" No. 10; 6" req'd 42K893647 CLAMP, wire 29A823156 LUG, spade; 7 req'd
	15C83171B01	HOUSING, microphone: rear
	15D83172B01	HOUSING, microphone: front
	13B83173B01	GRILLE, microphone: perforated metal
	13B83174B01	EMBLEM
	35A852701	GRILLE, cloth
	32B852702	GASKET, microphone
	42A852705	CLAMP, cartridge
	14A857137	INSULATOR, cartridge
	31S124665	STRIP, terminal; 2 lugs
	3S127924	SCREW, lock: No. 6-32 x 5/16"
	3S132401	SCREW, machine: No. 6-32 x 7/8" 2 req'd
	4S400386	LOCKWASHER: No. 6; 2 req'd
	33B82828C17	NAMEPLATE
	7D83173B01	STAND, microphone
	47B83176B01	TUBE, microphone
	38B855009	PUSHBUTTON: (TRANSMIT)
	38K855010	PUSHBUTTON (MONITOR)
	41K855005	SPRING, pushbutton retractor 2 req'd
	3S136878	SCREW, machine: No. 5-40 x 5/8"; 6 req'd
	2B84331B01	NUT, switch mounting; 3 req'd
	4S490774	FLATWASHER; .125" - 9/32" - .027"
	42B84342B01	CLAMP, cable
	3S128052	SCREW, tapping: No. 6 x 5/16"; 2 req'd
	3S134168	SCREW, captive: No. 4 x 1/4"; includes lockwasher; 4 req'd
	64B855001	COVER, bottom
	46B854311	STUD, tri-mount; 4 req'd
	75A838826	BUMPER, rubber; 4 req'd

NOTE:

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

NON-SUFFIXED UNITS

THIS DIAGRAM IS FOR USE ONLY WITH MODELS SHIPPED PRIOR TO APRIL, 1970 AND NOT SUBSEQUENTLY MODIFIED. FOR LATER AND MODIFIED VERSIONS REFER TO SUFFIX-NUMBERED DIAGRAMS.

EPS-4724-A

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION

PARTS LIST

IMPORTANT

USE ONLY THE FOLLOWING MOTOROLA PART NUMBERS WHEN ORDERING REPLACEMENT PARTS

TLN4344A Microphone Circuit Board Kit PL-1002-A

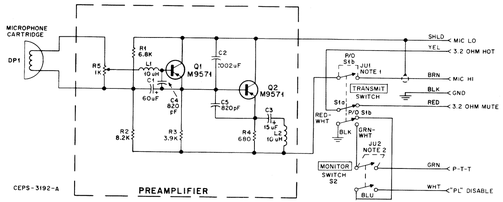
		CAPACITOR, fixed: uF
C1	23D84669A22	60 +150-10%; 15 V
C2	21D82428B25	.002 ±20%; 500 V
C3	23D84669A25	15 +150-10%; 25 V
C4	21C82187B17	820 pF ±10%; 500 V
C5	21C82187B17	820 pF ±10%; 500 V
		COIL, RF:
L1	24D82723H07	10 uH
L2	24D82723H07	10 uH
		SEMICONDUCTOR DEVICE, diode: (SEE NOTE)
Q1	48R869571	P-N-P; type M9571
Q2	48R869571	P-N-P; type M9571
		RESISTOR, fixed: ±10%; 1/4 W; unl stated
R1	6S128687	6.8K
R2	6S128686	8.2K
R3	6S129232	3.9K
R4	6S128599	680
R5	18C83168C03	variable 1K ±20%

TMN6045A Desk Microphone (PL) PL-790-A

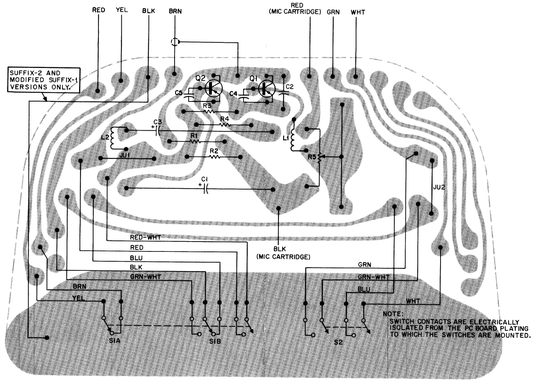
DP1	59C852603	CARTRIDGE, microphone: dynamic; 175 ohm impedance at 1 kHz
		SWITCH,
S1A	40C83298B04	open leaf; spst
S1B	40C83298B01	open leaf; dpst
S2	40C83298B05	open leaf; spst; 2 section
		NON-REFERENCED ITEMS
	1V8070B93	CABLE ASSEMBLY; includes 30C83560A02 CABLE, 6 conductor; 9 ft. req'd 37S122058 TUBING; "Teflon" No. 10; 6" req'd 42K893647 CLAMP, wire 29A823156 LUG, spade; 7 req'd
	15C83171B01	HOUSING, microphone: rear
	15D83172B01	HOUSING, microphone: front
	13B83173B01	GRILLE, microphone: perforated metal
	13B83174B01	EMBLEM
	35A852701	GRILLE, cloth
	32B852702	GASKET, microphone
	42A852705	CLAMP, cartridge
	14A857137	INSULATOR, cartridge
	31S124665	STRIP, terminal; 2 lugs
	3S127924	SCREW, lock: No. 6-32 x 5/16"
	3S132401	SCREW, machine: No. 6-32 x 7/8" 2 req'd
	4S400386	LOCKWASHER: No. 6; 2 req'd
	33B82828C17	NAMEPLATE
	7D83173B01	STAND, microphone
	47B83176B01	TUBE, microphone
	38B855009	PUSHBUTTON: (TRANSMIT)
	38K855010	PUSHBUTTON (MONITOR)
	41K855005	SPRING, pushbutton retractor 2 req'd
	3S136878	SCREW, machine: No. 5-40 x 5/8"; 6 req'd
	2B84331B01	NUT, switch mounting: 3 req'd
	4S490774	FLATWASHER; .125" - 9/32" - .027"
	42B84342B01	CLAMP, cable
	3S128052	SCREW, tapping: No. 6 x 5/16"; 2 req'd
	3S134168	SCREW, captive: No. 4 x 1/4"; includes lockwasher; 4 req'd
	64B855001	COVER, bottom
	46B854311	STUD, tri-mount; 4 req'd
	75A838826	BUMPER, rubber; 4 req'd

NOTE:

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



NOTES:
1. REMOVE JUMPER JU1 FOR PARALLEL MICROPHONE OPERATION, FOR USE WITH TRANSISTORIZED CONSOLETTE BASE STATION, AND FOR USE WITH LHB AND MHB "COMPA-STATION" BASE RADIO EQUIPPED WITH TLN1184B INTERCOM KIT.
2. REMOVE JUMPER JU2 FOR "MONITOR REQUIRED BEFORE TRANSMIT" OPERATION.



OL-CEPS-3917-C

REVISIONS 63P81100E96-C

CHASSIS AND SUFFIX NO.	REF. SYMBOL	CHANGE	LOCATION
TMN1001A-2		ADDED GND LEAD	LEFT SIDE OF BOARD

SUFFIX-1 AND -2

THIS DIAGRAM IS FOR USE WITH MODELS SHIPPED BETWEEN APRIL, 1970 AND DECEMBER, 1970 AND MARKED SUFFIX -1 OR -2. THIS DIAGRAM ALSO APPLIES TO MODIFIED NON-SUFFIX VERSIONS.

EPS-4723-A