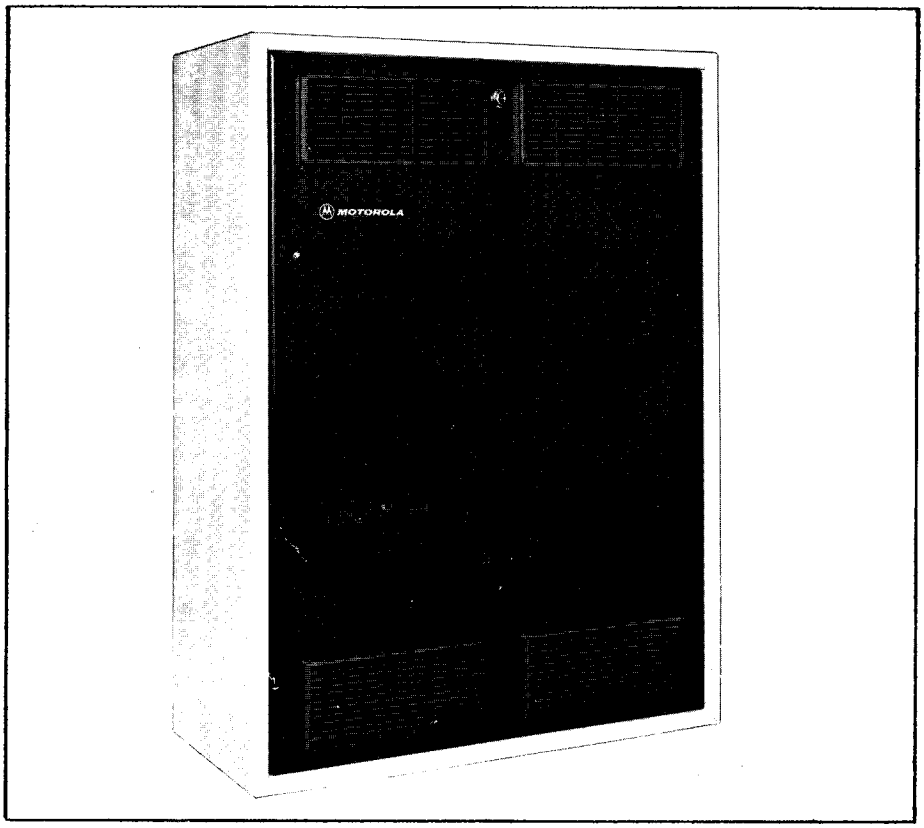
MOTOROLA

MICOR®
Community Repeater
406-420 & 450-512 MHz

68P81025E55-B

THIS MANUAL HAS BEEN
DISCONTINUED



SUPPLEMENT to Instruction Manual 68P81025E50

Note: 68P81025E50 is the Micor UHF Base and Repeater Station service manual

MICOR

Community Repeater

406-420 & 450-512 MHz

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MOTOROLA INC.
Communications Division

service publications
1301 E. Algonquin Road, Schaumburg, IL 60196

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68P81025E55-B

SECTION NUMBER

MODULES

(Pages iii and iv are omitted due to irrelevancy)

PERFORMANCE SPECIFICATIONS

GENERAL

Frequency Range 406-420 MHz, 450-512 MHz
No. of Frequencies: 1

406-420 MHz 450-470 MHz MODEL SERIES	MINIMUM CONTINUOUS RF POWER OUTPUT	MAXIMUM FINAL INPUT POWER	POWER INPUT REQUIREMENTS		DC POWER	
			STANDBY 121 V, 60 Hz	TRANSMIT 121 V, 60 Hz	STANDBY 13.6 V DC	TRANSMIT 13.6 V DC
C54RCB	45 W 40 W	120 W	.89 amp.	3.8 amp.	1.5 amp.	17.9 amp.
C64RCB	75 W	180 W	.85 amp.	6.1 amp.	1.5 amp.	27.0 amp.
470-512 MHz MODEL SERIES						
C54RCB	40 W	NOTE	.89 amp.	NOTE	1.5 amp.	NOTE
C64RCB	60 W	NOTE	.85 amp.	NOTE	1.5 amp.	NOTE

NOTE: Value same as comparable 450-470 MHz model except as reduced to meet E.R.P. requirements

CABINET	DIMENSION (INCHES)	APPROXIMATE SHIPPING WEIGHT (LBS)
41-Inch "Compa-Station" Indoor Cabinet	22 W x 41 H x 10 D	190 (86 kg)
46-Inch "Compa-Station" Outdoor Cabinet	22 W x 46 H x 20 D (including Rain Shields)	180 (82 kg)
Metering	Optional internal mounted meter used to measure all essential circuits for tuning and checking.	
	A single scale, 0-50 microampere meter with 2,000 ohms equivalent series resistance or Motorola portable test set can be used to measure all circuits essential to tuning and checking.	

TRANSMITTER

RF POWER OUTPUT	406-420 MHz 450-470 MHz 470-512 MHz	75 W 45 W 75 W 45 W 60 W 40 W
OUTPUT IMPEDANCE		50 ohms
OSCILLATOR FREQUENCY STABILITY		Channel element maintains oscillator frequency within ±0.0002% from -30°C to +60°C ambient (+25°C reference)
TRANSMITTER SIDE BAND NOISE		85 dB @±25 kHz 100 dB @±1 MHz
SPURIOUS & HARMONICS (CONDUCTED)		More than 85 dB below carrier
MODULATION		15F2 and 16F3: ±5 kHz for 100% at 1000 Hz
AUDIO SENSITIVITY		Local: 0.120 volt ±3 dB for 60% maximum deviation at 1000 Hz.
FM NOISE		55 dB below 60% system deviation at 1000 Hz
AUDIO RESPONSE		+1, -3 dB from 6 dB/octave pre-emphasis, 300-3000 Hz, referenced to 1000 Hz
AUDIO DISTORTION		Less than 2% at 1000 Hz; 60 % system deviation

PERFORMANCE SPECIFICATIONS CONTINUED
ON BACK OF PAGE

PERFORMANCE SPECIFICATIONS (CONT'D)

"SENSITRON" RECEIVER

CHANNEL SPACING		25 kHz
EIA MODULATION ACCEPTANCE		±7 kHz minimum
FREQUENCY STABILITY		AFC channel element maintains receiver frequency within ±0.0002% of reference frequency from -30°C to +60°C ambient temperature (+25°C reference). (Optional ±0.0002% non-AFC channel element also available.)
INPUT IMPEDANCE		50 ohms
SENSITIVITY	20 dB QUIETING	0.5 uV
	EIA SINAD	0.35 uV
SELECTIVITY (EIA SINAD)		-90 dB @±25 kHz
EIA SINAD INTERMODULATION		-85 dB
SPURIOUS AND IMAGE REJECTION		100 dB minimum
SQUELCH SENSITIVITY CARRIER SQUELCH (adjustable)		.25 uV or less at threshold
TONE "PRIVATE-LINE" SQUELCH		.25 uV or less
"DIGITAL PRIVATE-LINE" SQUELCH		.25 uV or less

FCC LICENSE DESIGNATION

TRANSMITTER			
MODEL	450-470 MHz	470-494 MHz	494-512 MHz
C64 Series 75 Watt 60 Watt	CC4224C ---	--- CC4224C-1	--- CC4224C-2
C54 Series 45 Watt 40 Watt	CC4223C	--- CC4223C-1	--- CC4243C-2
RECEIVER			
Non-Shifted IF Shifted IF	RC0080 RC0082		

SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE

EPS-18271-B

SAFETY INFORMATION

The United States Department of Labor, through the provisions of the Occupational Safety and Health Act of 1970 (OSHA), has established an electromagnetic radiation safety standard which applies to this equipment. Normal use of this radio will result in exposures far below the OSHA limit. However, the following precautions are recommended:

DO NOT approach the antenna closer than four inches for omni-directional antennas or four feet for all other antennas when the transmitter is operative.

DO NOT operate the transmitter unless all rf connectors are secure and any open connectors are properly terminated with a leakproof load.

NEPS-21233-O

MOTOROLA

ASSEMBLY BREAKDOWN CHART

FOR

ASSEMBLIES USED IN

"MICOR" COMMUNITY REPEATER (RT)

STATIONS

MODEL	ITEM DESCRIPTION
	EXCITER/1ST BANDPASS FILTER
TLE1721B	(406-420 MHz) FORMERLY TLE1721A
TLE1723B	(450-470 MHz) FORMERLY TLE1722A
TLE1724B	(470-494 MHz) FORMERLY TLE1723A
TLE1725B	(494-512 MHz) FORMERLY TLE1724A
	TRIPLER/LOW LEVEL AMPLIFIER
TLE1601A	(406-420 MHz)
TLE1603A	(450-470 MHz)
TLE1604A	(470-494 MHz)
TLE1605A	(494-512 MHz)
	ANTENNA NETWORK
TLE1671A	406-420 MHz
TLE1673A	450-470 MHz
TLE1674A	470-494 MHz
TLE1675A	494-512 MHz
	POWER AMPLIFIER (75/60 WATT)
TLE1711A	(406-420 MHz 75 W)
TLE1713A	(450-470 MHz 75 W)
TLE1714A	(470-512 MHz 60 W)
	RECEIVER RF & IF
TRE1201BA	(406-420 MHz)
TRE1203BA	(450-470 MHz)
TRE1204BA	(470-494 MHz)
TRE1205BA	(494-512 MHz)
TCN1211A	UNIFIED CONTROL CHASSIS
	POWER AMPLIFIER (45/40-WATT)
TLE1701A	(406-420 MHz 45 W)
TLE1703A	(450-470 MHz 45 W)
TLE1704A	(470-512 MHz 40 W)

MODEL	ITEM DESCRIPTION
TLD5491A	EXCITER BOARD (135.3-140 MHz) FORMERLY TLD5321A
TLD5492A	EXCITER BOARD (150-170.6 MHz) FORMERLY TLD5322A
TFD6371A	1ST BANDPASS FILTER (135.3-140 MHz)
TFD6373A	1ST BANDPASS FILTER (150.0-156.6 MHz)
TFD6374A	1ST BANDPASS FILTER (156.6-164.6 MHz)
TFD6375A	1ST BANDPASS FILTER (164.6-170.6 MHz)
TLN5650	TRIPLER/LOW LEVEL AMPLIFIER
TLE8391A	CHASSIS AND HARDWARE KIT (406-420 MHz)
TLE8393A	TRIPLER/AMPLIFIER (406-420 MHz)
TLE8394A	TRIPLER/AMPLIFIER (450-470 MHz)
TLE8395A	TRIPLER/AMPLIFIER (470-494 MHz)
TFE6151A	TRIPLER/AMPLIFIER (494-512 MHz)
TFE6153A	2ND BANDPASS FILTER (406-420 MHz)
TFE6154A	2ND BANDPASS FILTER (450-470 MHz)
TFE6155A	2ND BANDPASS FILTER (470-494 MHz)
TLE8291A	2ND BANDPASS FILTER (494-512 MHz)
TLE8293A	ANTENNA NETWORK
TLE8294A	CHASSIS AND HARDWARE KIT (406-420 MHz)
TLE8295A	CHASSIS AND HARDWARE KIT (450-470 MHz)
TFE6361A	CHASSIS AND HARDWARE KIT (470-494 MHz)
TFE6363A	CHASSIS AND HARDWARE KIT (494-512 MHz)
TRN6443A	ANTENNA NETWORK BOARD
TLN5645A	HARMONIC FILTER (406-420 MHz)
TLN5646A	HARMONIC FILTER (450-512 MHz)
TRN6421A	UNIFIED CONTROL CHASSIS
TLE8331A	CHASSIS
TLE8333A	TRANSMITTER INTERCONNECT BOARD
TLE8334A	RECEIVER INTERCONNECT BOARD
TLE8321A	UNIFIED CHASSIS INTERCONNECT BOARD
TLE8323A	POWER AMPLIFIER
TKN6768A	75-WATT PA (406-420 MHz)
TKN6767A	75-WATT PA (450-470 MHz)
TLE8021A	60-WATT PA (470-512 MHz)
TLE8023A	45-WATT PA (406-420 MHz)
TLE8024A	45-WATT PA (450-512 MHz)
TLE8025A	CABLE KIT (75-WATT)
TLE8031B	CABLE KIT (45-WATT)
TLE8032B	RECEIVER RF & IF
TLE8033B	RF DECK (406-420 MHz)
	RF DECK (450-470 MHz)
	RF DECK (470-494 MHz)
	RF DECK (494-512 MHz)
	RF & IF BOARD (406-420 MHz)
	RF & IF BOARD (450-494 MHz)
	RF & IF BOARD (494-512 MHz)

EPS-18273-B

MOTOROLA

STATION MODEL CHART

FOR

"MICOR" "COMPA-STATION" COMMUNITY REPEATER (RT)

406-420 MHz AND 450-512 MHz

CODE:

[X] = ONE SUPPLIED

[2] = TWO SUPPLIED

[0] = "VIBRASPONDER" RESONANT REEDS AND CODE PLUGS ARE REQUIRED ACCESSORIES AND MUST BE ORDERED SEPARATELY IN QUANTITY AS REQUIRED.

* INDICATES A MODEL SERIES. REFER TO MODEL SERIES BREAKDOWN CHART.

C64RCB-3105AY

- [3] = "PRIVATE-LINE" TONE-CODED SQUELCH
- [6] = "DIGITAL PRIVATE-LINE" BINARY-CODED SQUELCH

STATION MODEL	SQUELCH TYPE	TRANSMITTER RF POWER	OPERATING CHANNELS
C64RCB-3105AY	TONE "PRIVATE-LINE"	75/60 W	T1-R1
C64RCB-6105AY	"DIGITAL PRIVATE-LINE"	75/60 W	T1-R1
C54RCB-3105AY	TONE "PRIVATE-LINE"	45/40 W	T1-R1
C54RCB-6105AY	"DIGITAL PRIVATE-LINE"	45/40 W	T1-R1

ITEM	DESCRIPTION
TCN1211A	UNIFIED CONTROL CHASSIS,
TLE1600A Series	*TRIPLER/LOW LEVEL AMPLIFIER
TLE1670A Series	*ANTENNA NETWORK (RPTR)
TLE1720A Series	*EXCITER & 1ST BANDPASS FILTER
TLN4926A	POWER CONTROL BOARD
KKN1052A	CHANNEL ELEMENT (XMIT)
TRN6005A	CODE PLUG
TRN6165A	MASTER DECODER MODULE
TLN4635B	STATION CONTROL MODULE
TLN4636A	TIME-OUT TIMER MODULE
TLN8799A	SERVICE BOARD
TLN4662A	SQUELCH GATE MODULE
TRN6166A	4-USER MODULE, "DIGITAL PRIVATE-LINE"
TRE1200BA Series	RCVR RF & IF
TLN1685A	4-USER MODULE, TONE "PRIVATE-LINE"
TRN6006A	RCVR AUDIO & SQUELCH BOARD
TLN4290B	RCVR AUDIO POWER AMPLIFIER
KKN1024A	CHANNEL ELEMENT (RCVR)
TTN8381A	"VIBRASPONDER" RESONANT REED
TPN1110B	POWER SUPPLY
TLN4581A	AUDIO FILTER BOARD
TRN6199A	CABINET HARDWARE KIT
TLN5654A	"PL" HARDWARE KIT
TLE1710A Series	*POWER AMPLIFIER (75/60-WATT)
TKN6804A	CABLE KIT
TLE1700A Series	*POWER AMPLIFIER (45/40-WATT)
TTN6142A	CABINET

EPS-18272-B

FACTORY-INSTALLED OPTIONS

OPTION PLAN NUMBER OR OPTIONAL KIT NUMBER	DESCRIPTION	PUBLICATION REFERENCE	
		APPLICABLE SECTION WITHIN THIS MANUAL	PART NUMBER OF SEPARATE PUBLICATION
	SINGLE TONE		
TLN1181A	Single-Tone Decoder Module	68P81002E96	None
	EXPANDED "DIGITAL PRIVATE-LINE" CAPACITY (up to 16 codes)		
TRN6166A	"Digital Private-Line"4-User Control Module	68P81026E81	None
TRN6326A	"Digital Private-Line"2-User Control Module	68P81026E82	None
TRN6005A	Code Plug	68P81026E81	None
	EXPANDED TONE "PRIVATE-LINE" CAPACITY (up to 16 tones)		
TLN1685A	Tone "Private-Line" 4-User Control Module	68P81026E83	None
TLN8381A	"Vibrasponder" Resonant Reed	68P81026E83	None
	TONE "PRIVATE-LINE" CROSS-CODE (up to 4 tones)		
TRN6327A	Diode Logic Module	68P81026E84	None
TLN5744A	Multiple Tone "Private-Line" Encoder Mod.	68P81026E89	None
TLN6824A	"Vibrasender" Resonant Reed		None
	"DIGITAL PRIVATE-LINE" CROSS-CODE (up to 4 codes)		
TRN6327A	Diode Logic Module	68P81026E84	None
TRN6413A	Multiple "Digital Private-Line" Encoder Mod.	68P81026E86	None
TRN6005A	Code Plug	68P81026E81	None
	EXPANDED "DIGITAL PRIVATE-LINE" CROSS-CODE (up to 6 codes)		
TRN6327A	Diode Logic Module	68P81026E84	None
TRN6413A	Multiple "Digital Private-Line" Encoder Mod.	68P81026E86	None
TRN6005A	Code Plug	68P81026E81	None
TRN6326A	"Digital Private-Line"2-User Control Module	68P81026E82	None
	EXPANDED "DIGITAL PRIVATE-LINE" CROSS-CODE (up to 8 codes)		
TRN6327A	Diode Logic Module	68P81026E84	None
TRN6413A	Multiple "Digital Private-Line" Encoder Mod.	68P81026E86	None
TRN6005A	Code Plug	68P81026E81	None
TRN6166A	"Digital Private-Line"4-User Control Module	68P81026E81	None
	MIXED CROSS-CODE (up to 4 tones and 4 codes) (Note 1)		
TRN6327A	Diode Logic Module	68P81026E84	None
TLN5744A	Multiple Tone "Private-Line" Encoder Mod.	68P81026E89	None
TLN6824A	"Vibrasender" Resonant Reed	68P81026E89	None
TRN6413A	Multiple "Digital Private-Line" Encoder Mod.	68P81026E86	None
TRN6005A	Code Plug	68P81026E81	None
TRN6166A or TRN6326A	"Digital Private-Line"4-User Control Module "Digital Private-Line"2-User Control Module	68P81026E81 68P81026E82	None None
	MISCELLANEOUS (NOTE 2)		
C27	46-Inch Outdoor Cabinet	None	Installation Sec. of 68P81025E50
C38	120/220/240-Volt AC 50/60 Hz Power Supply	None	68P81104E92
C28	120-Volt AC/12-Volt DC Power Supply	None	68P81104E92
C180	60-Inch Indoor Cabinet (allows installation of duplexer)	None	Installation Sec. of 68P81025E50
C181, 182, 183	Duplexer (Note 3)	None	68P81102E96
TLN1740A	DC Metering W/Monitor Intercom (Note 4)	None	Metering/Intercom Sec. 68P81025E50
TLN8381A	"Vibrasponder" Resonant Reed	68P81026E83	None
TRN6005A	Code Plug	68P81026E81	None
TRN6193A	Transmitter Shield Kit	None	None
TRN6194A	Receiver Shield Kit	None	None

NOTES:

1. Mixed cross-code option is applicable to tone "Private-Line"stations only.
2. All tone "Private-Line" stations must incorporate the desired quantity of separately ordered "Vibrasponder" resonant reeds as required (used in four-user control modules). All "Digital Private-Line" stations must incorporate the desired quantity of separately ordered code plugs as required (used in four- and two-user control modules).
3. Duplexer option also requires the 46-inch outdoor cabinet option.
4. Intercom feature included with dc metering option not functional with these community repeater (RT) stations.

1. INTRODUCTION

1.1 Motorola "Micor" Community Repeater (RT) stations are typically shared by several subscribers. Any subscriber can use the repeater without listening to all other subscribers. Each subscriber in the system is assigned an exclusive "Private-Line" tone frequency or binary code. The "Private-Line" tone or binary code signals used by each subscriber are decoded for access to the repeater. Once access to the repeater is obtained, the "Private-Line" tone or binary code and the message audio are retransmitted. The stations operate in the 406 to 420 MHz or 450 to 470 MHz frequency range with an rf output of 75 or 45 watts; or in the 470 to 512 MHz frequency range with an rf output of 60 or 40 watts.

1.2 The basic models decode up to four "Private-Line" tones or four "Digital Private-Line" binary codes. Optional modules are available to increase code capacity and/or to provide cross-coding (transmit a different PL code than received). Tone "Private-Line" stations can be expanded to 8, 12 or 16 tones, or a mixture of tone "Private-Line" and "Digital Private-Line" codes is possible in any multiples or four codes of each type up to a maximum of 16 codes. Optional modules also provide cross coding of up to four tone "Private-Line" and four "Digital Private-Line" codes. Standard options do not permit cross coding from tone "Private-Line" to "Digital Private-Line" codes or vice versa. "Digital Private-Line" stations can be expanded to 8, 12 or 16 binary codes, and cross coding of up to 8 binary codes.

1.3 Optional equipment also is available for local metering, single tone decoding, and emergency power reverting, where emergency power is available from a 12-volt battery supply in case of an ac power failure.

1.4 The station cabinets are of rugged steel construction with front and rear doors that are easily removed for servicing. The compact cabinet size permits shelf mounting in addition to the standard floor mounting.

1.5 The station is constructed so that all metering controls are accessible without interrupting communications. Switches are provided for placing the station under local control while servicing.

1.6 An audio filter board is used with tone "Private-Line" stations to remove PL tones from receiver audio. This prevents the received PL tone from being transmitted via the audio path (an alternate PL tone path is already provided).

2. APPLICATION

2.1 Motorola community repeater (RT) stations are for use in two-way FM radio communications systems where extended range operation is required or where natural or man-made limitations to direct communications are encountered. The station is used primarily for "mobile relay" repeater applications. Refer to Figure 1 for a typical example of this application.

2.2 In a "mobile relay" circuit, signals as received by the repeater receiver from one mobile unit are rebroadcast to other mobiles by the repeater transmitter. Mobiles operating in a system of this type must employ a transmitter and receiver of different frequencies. The repeater

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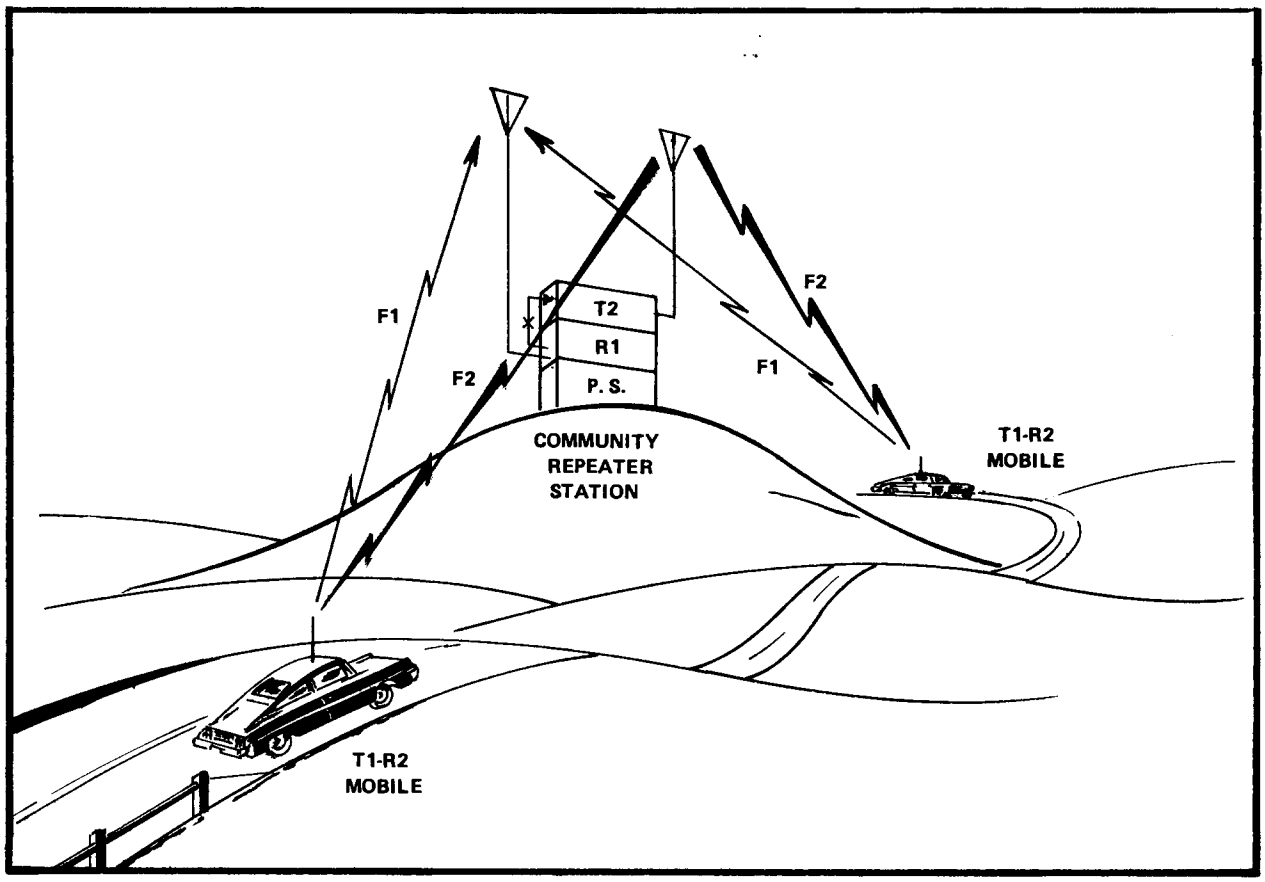


Figure 1. Typical Community Repeater Application

transmitter and receiver will consequently be aligned on exactly the reverse frequencies of the transmitters and receivers of the mobile units.

2.3 The station functions automatically; i.e., all control functions for the station are initiated via the rf carrier. As a signal is received by the receiver, the transmitter is automatically actuated. The output of the receiver is fed to the transmitter modulator input circuit so that the received signal is rebroadcast at greatly increased power on the repeater transmitter frequency.

3. DESCRIPTION OF ITEMS

3.1 GENERAL

Information pertaining to the transmitter, receiver and power supply is described in accompanying instruction manual 68P81025E50.

3.2 UNIFIED CONTROL CHASSIS

3.2.1 Transmitting and receiving controls are contained on plug-in modules inserted into the unified control chassis. A metering receptacle is provided on the unified chassis interconnect board for connection of a Motorola S1056B to S1059B Series Portable Test Set, or equivalent. This receptacle permits microphone and received audio monitoring at the station.

NOTE

Metering receptacles are also provided on the various transmitter and receiver circuit boards for tuning and alignment.

3.2.2 The basic community repeater (RT) station includes the following plug-in modules: station control, squelch gate, time-out timer, one tone "Private-Line" or "Digital Private-Line" four-user control, and master decoder.

3.3 STATION CONTROL MODULE

The station control module circuitry controls transmitter keying, PL disable, adjusts exciter audio level, and (for tone PL applications only) amplifies receiver discriminator signals.

3.4 SQUELCH GATE MODULE

The squelch gate module produces an output that activates the transmitter when a carrier signal is received that has a sufficiently high signal-to-noise ratio and a proper PL tone or code. It also provides a 1-8 second transmit drop-out delay interval.

3.5 TIME-OUT TIMER MODULE

This completely transistorized timer is used to turn off the transmitter after a predetermined transmission time for each message. It is adjustable in steps from 1/2 to 8 minutes.

3.6 TONE "PRIVATE-LINE" FOUR-USER CONTROL MODULE

This module contains four tone "Private-Line" decoder circuits and the necessary logic circuits to combine their outputs. The defeat switch disables the individual tone circuits as desired. One module is supplied and up to three additional four-user control modules can be added for maximum capability of 16 tones.

3.7 "DIGITAL PRIVATE-LINE" FOUR-USER CONTROL MODULE

This module contains four "Digital Private-Line" binary-code decoder circuits and the necessary logic circuits to combine their outputs. The defeat switch disables the individual code circuits as desired. One module is supplied and up to three additional four-user control modules can be added for maximum capability of 16 binary "PL" codes.

3.8 MASTER DECODER MODULE

This module routes PL tones or codes from the receiver discriminator through a transmission gate (if proper PL tone or code is simultaneously decoded by a four-user control module) to exciter audio input thus providing required retransmission. In optional cross-code operation, this module routes station generated cross-coded PL tone or code and blocks received PL tone or code.

3.9 SINGLE TONE DECODER (OPTIONAL)

The single tone decoder output enables the individual PL tone/code outputs in the four-user control modules. The correct single tone signal must be received before the PL tone/code can open the circuits for retransmission of the message.

3.10 BUILT-IN METERING KIT (OPTIONAL)

The metering kit provides a convenient test meter with switching facilities, thereby eliminating the need for a portable test set. This chassis also contains a speaker for local monitoring of receiver audio; a convenience for testing and adjusting the station.

3.11 46-INCH OUTDOOR CABINET (OPTIONAL)

The 46-inch outdoor cabinet allows the station to be installed at any convenient location (indoors or outdoors).

3.12 60-INCH INDOOR CABINET (OPTIONAL)

The 60-inch cabinet provides additional mounting space if needed.

3.13 MULTIPLE CODE ENCODERS (OPTIONAL)

The multiple encoders generate the PL tone or code for cross-code operation.

3.14 DIODE LOGIC MODULE (OPTIONAL)

The diode logic module determines the particular PL tone or code generated (cross-coded) by the applicable mutliple encoder.

AUDIO FILTER BOARD

MODEL TLN4581A

1. DESCRIPTION

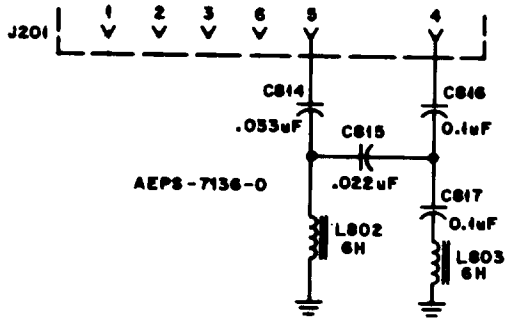
This audio filter circuit board can be used in carrier squelch radios to bypass the low frequency background noise of a PL tone present on the received carrier. The high-pass characteristics of this filter will allow voice signals above 300 Hz to pass but will block the lower frequency PL tones. Since this filter is connected in series with the audio signal path, the PL tones will not be heard in the speaker.

2. INSTALLATION

Physically, the audio filter board is plugged into the receiver audio and squelch board in the location normally occupied by the "Private-Line" decoder board in PL radio sets.

NOTE

WHEN USING THE AUDIO FILTER BOARD, JU201 ON THE RECEIVER AUDIO AND SQUELCH BOARD MUST BE REMOVED.



PARTS LIST

TLN4581A Audio Filter Board — PL-1345-A

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		CAPACITOR, fixed: uF ±10%: 50 V; unl. stated
C814	8-82905G08	.033
C815	8-82905G02	.022
C816	8-82905G30	0.1
C817	8-82905G30	0.1
J201		for reference only
		COIL, RF: choke;
L802	24-84003A01	6 H
L803	24-84003A01	6 H
NON-REFERENCED ITEMS		
	9-83011H01	TERMINAL, pin: female; 6 req'd.
	3-138162	SCREW, lock: No. 4 x 3/8"; 2 req'd.
	42-84284B01	RETAINER, Nylon: 2 req'd.
	7-84223B01	BRACKET, retainer

MOTOROLA INC. Communications Division
SERVICE PUBLICATIONS 1301 E. ALGONQUIN ROAD SCHAUMBURG, ILLINOIS 60172

SHOWN FROM SOLDER SIDE

Audio Filter Board
Circuit Board Detail
Motorola No. PEPS-7138-A
2/23/76-NPC

INSTALLATION AND OPERATION

1. INSTALLATION

Installation for these community repeater (RT) stations is the same as that described for comparable non-wire line repeater (RT) models in manual 68P81025E50.

2. PREOPERATIONAL ADJUSTMENTS

2.1 INTRODUCTORY NOTES

2.1.1 If the station is equipped with a single-tone decoder module for repeater access, unplug the single-tone decoder during adjustments.

2.1.2 Unplug the time-out timer module during all adjustments. Be sure to return module after adjustments are made.

2.1.3 The repeater must be PL disabled for repeater level setting adjustments. This PL disable disables the squelch gate as well as the receiver. Be sure to return the squelch gate and station control module to normal PL operating positions.

2.2 REPEATER LEVEL SETTING

2.2.1 Audio

Step 1. Connect transmitter to wattmeter or load.

Step 2. Connect an 8-ohm speaker or load to unified control chassis at J4-1 (Hi) and -12 (Low).

Step 3. Set the station control module to PL DISABLE.

Step 4. Set the receiver squelch control at squelch threshold.

Step 5. Set the squelch gate for "carrier-squelch" operation (PL disable) by moving JU14 and JU15 from PL position to CS position. The receiver is now PL disabled along with the squelch gate.

Step 6. Inject an on-frequency carrier signal into the receiver antenna input. Adjust the signal level to 20 dB quieting.

Step 7. Adjust the REPEATER SQUELCH KEY control on the squelch gate module so the transmitter just keys.

Step 8. Modulate the receiver input with a 1000-Hz tone at ±4 kHz deviation. Adjust the REPEATER LEVEL control on the squelch gate module so the exciter audio input is the value stamped on the exciter (modulator sensitivity +6 dB or approximately ±4 kHz transmitter deviation).

Step 9. Return station control module to PL operation.

Step 10. Return JU14 and JU15 on the squelch gate module to the PL position.

2.2.2 Tone "Private-Line" Output Level Adjust (Retransmit)

Step 1. Adjust the master decoder only after all other modules have been adjusted.

Step 2. Inject an on-frequency carrier signal which is modulated with a corresponding PL tone (with respect to a chosen PL tone from the 4-user control module being used) at ±750 Hz deviation into the receiver. The transmitter will key. Adjust R827 for a transmitted PL tone of ±750 Hz deviation.

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2.2.3 Tone "Private-Line" Output Level Adjust (Cross Code)

Step 1. Adjust the master decoder only after all other modules have been adjusted.

Step 2. Inject an on-frequency carrier signal which is modulated with a corresponding PL tone (with respect to a chosen PL tone from the 4-user control module being used for cross-coding) at ±750 Hz deviation into the receiver. The transmitter will key. Adjust R820 for a transmitted PL tone of ±750 Hz deviation.

2.2.4 "Digital Private-Line" Code Output Level Adjust (Retransmit)

Step 1. Adjust the master decoder only after all other modules have been adjusted.

Step 2. Inject an on-frequency carrier signal which is modulated with a corresponding "Digital Private-Line" code (with respect to a chosen code from the 4-user control module being used) at ±750 Hz deviation into the receiver. The transmitter will key. Adjust R830 for a transmitted binary "PL" code of ±750 Hz deviation.

2.2.5 "Digital Private-Line" Code Output Level Adjust (Cross Code)

Step 1. Adjust the master decoder only after all other modules have been adjusted.

Step 2. Inject an on-frequency carrier signal which is modulated with a corresponding "Digital Private-Line" code (with respect to a chosen code from the 4-user control module being used for

3. PREOPERATIONAL AND ROUTINE CHECK LIST

UNIT	STEP	CHECK
RECEIVER	1	Compare meter readings with the minimum values in the RECEIVER section of manual 68P81025E50. Realign if necessary.
	2	Measure signal level required for 20 dB quieting.
	3	Check that receiver squelch opens with each PL tone or code on carrier.
EXCITER-TRANSMITTER	4	Compare meter readings with minimum values in the EXCITER-TRANSMITTER section of manual 68P81025E50. Realign if necessary.
POWER AMPLIFIER	5	Tune and load to antenna.
SYSTEM ADJUSTMENTS	6	Measure power output of transmitter if required.
	7	Measure transmitter frequency and adjust if necessary.
	8	Measure deviation (equal input and output deviation of PL tone or code).
	9	Measure transmitter voice channel for proper deviation. Adjust IDC if necessary. (Master decoder module must be in position when check is made.)
	10	Measure exciter modulator sensitivity.
	11	Adjust receiver on frequency.
	12	Measure and adjust audio input to exciter.
	13	Check repeater operation.

BEFORE LEAVING STATION CHECK THE FOLLOWING

1. All external power switches ON.
2. Local speaker OFF (if applicable).
3. Cabinet doors locked.
4. Cabinet vents unobstructed.

cross coding) at ±750 Hz deviation into the receiver. The transmitter will key. Adjust R824 for a transmitted binary "PL" code of ±750 Hz deviation.

2.3 TIMING ADJUSTMENTS

2.3.1 The station is equipped with a time-out timer module that prevents unintentional continuous transmission. The timing jumper on the time-out timer module can be set for 1/2, 1-, 2-, 4-, or 8-minute operation.

2.3.2 The time-out timer will reset to its preset timed interval each time a new input signal arrives at the radio whether or not the dropout delay generator has shut off the transmitter.

2.3.3 The dropout delay generator prevents the transmitter from shutting off during loss or excessive fade of input signal for the length of time preset.

2.3.4 The dropout delay generator can be set for 1-, 2-, 4-, or 8-second operation.

4. OPERATING INSTRUCTIONS

4.1 UNATTENDED OPERATION

Once power is applied and the station is properly adjusted, the repeater station operates entirely unattended. When the receiver rf input is of sufficient level, the transmitter is keyed and the signal is retransmitted (or cross coded).

4.2 LOCAL CONTROL

The station may be operated locally in the following ways: (also refer to Table 1).

4.2.1 To Monitor

Step 1. Connect an 8-ohm speaker across J4-1 and -12 or connect a Motorola portable test set to J3.

Step 2. PL disable station control module to receive all codes and tones.

4.2.2 To Transmit

Step 1. Connect a microphone (Motorola Model TMN6020A or equivalent) to J4-3, -14, -15, -5, & -16 on unified control chassis interconnect board or connect a Motorola Portable test set to J3.

Step 2. Pl tones or codes may be transmitted by connecting tone or code to TB3-20 (exciter hi) and 16 (exciter lo).

TABLE 1
LOCAL CONTROLS (STATION CONTROL MODULE)

CONTROL	POSITION	FUNCTIONS POSSIBLE
XMIT	Normal (not Actuated)	Normal receive or standby mode of operation.
	Actuated (hold to right)	Turns on transmitter with no modulation. Use test microphone connected to unified chassis to modulate transmitter.
"PL DISABLE"	Normal (not Actuated)	Only PL tone-coded or binary-coded, on-frequency, signals accepted by receiver.
	Actuated (hold to right)	All on-frequency signals accepted by receiver.

FUNCTIONAL DESCRIPTION

1. INTRODUCTION

1.1 The basic function of a community repeater is to retransmit signals received from its subscribers. When the control circuitry detects a signal with the proper signal-to-noise ratio and one of the subscriber PL tones or binary codes (and if so equipped, the proper single tone frequency) it keys the transmitter and applies both the receiver audio and PL tone or binary code to the modulator.

1.2 The standard community repeater stations can retransmit up to four "Private-Line" tones or four "Digital Private-Line" codes, depending on station model. Standard factory installed options allow "Private-Line" code capacity to be expanded to 16; or to provide cross-code capability with a "Digital Private-Line" capacity of up to eight codes or with a tone "Private-Line" capacity of up to four tones. Cross coding permits a received PL tone or code signal to cause a different PL tone or code signal to be transmitted. Although it is possible to cross-code up to four tone PL signals or eight "Digital Private-Line" signals, options are not available to exchange tone PL signals for "Digital Private-Line" signals or vice versa. It is possible, however to cross code up to four tone PL signals and up to four "Digital Private-Line" signals in the same station.

2. RETRANSMITTED TONE "PRIVATE-LINE" SIGNAL OPERATION

2.1 Refer to the detailed functional diagram starting on the back of this page for the following discussion. Up to four "Private-Line" tones can be detected by the station. Only the time-out timer, squelch gate, station control, master decoder, and four-user control modules are incorporated in this standard application.

2.2 Tone "Private-Line" signal from the receiver discriminator is applied to station control module pin 21, amplied, and then routed to master decoder module pin 23. In the master decoder module, the tone signal is passed through a bandpass filter, buffer amplifier Q801, amplifier Q802, and level control R827 to the input side of transmission gate U801C. This gate inhibits tone signal passage to the transmitter for retransmission until the gate is enabled as follows. The tone signal applied to the transmission gate is also applied to the same module's output pin 7, and routed to four-user control module input pin 3. Here, the tone activates an applicable "Vibrasponder" resonant reed. Any activated reed causes four-user control module output pin 24 to go low which is in turn applied back to the master decoder module at pin 17. This low is inverted to a high by Q806 and applied to transmission gate U801C which then passes the tone signal waiting at the gate on to the transmitter for retransmission. A 150 millisecond drop-out delay network is included in the master decoder module which holds on the transmitter 150 millisecond after loss of P-T-T during which time a "reverse burst" "Private-Line" signal is transmitted which immediately squelches applicable receiver(s).

3. RETRANSMITTED "DIGITAL PRIVATE-LINE" SIGNAL OPERATION

3.1 Refer to the detailed functional diagram starting on the back of this page for the following discussion. Functionally, operation is very similar to that described for retransmitted tone "Private-Line" signals. Up to four binary codes can be detected by the "Digital Private-Line" station. Modules used in the tone "Private-Line" station are the same as used with the tone "Private-Line" station except that a "Digital Private-Line" four-user control module is used in place of the tone "Private-Line" four-user control module.

3.2 A binary PL signal from the receiver discriminator is applied to master decoder module pin 22 and passes through a low pass filter to data conditioner U802 circuit and following inverter/level shifter stage Q814. The data conditioner circuit "squares" input data and the inverter/level shifter stage inverts and limits data shifts to about 6.0 volts peak-to-peak. The "conditioned", "shifted" code signal is then applied to a 140 Hz active lowpass filter via buffer Q815. From Q815, the code signal is level-set by R830 and applied to transmission gate U801B which inhibits passage to transmitter until the gate is enabled. The gate is enabled as follows. The code signal applied to transmission gate U801B is also applied to master decoder module output pin 4, and routed to "Digital Private-Line" four-user control module pin 2 where it is detected by an applicable decoder (U1-U4). An activated decoder causes four-user control module output pin 13 to go low which is in turn applied back to the master decoder module at pin 13. This low is inverted to a high by Q807 and applied to transmission gate U801B which then passes the code signal waiting at the gate to the transmitter for retransmission. As with tone "Private-Line" signal retransmission, a turn-off delay is provided during which time a turn-off code is transmitted which immediately squelches applicable receivers. The drop-out delay interval for "Digital Private-Line" signals is, however, 250 milliseconds.

4. CROSS-CODE OPERATION (OPTIONAL)

4.1 INTRODUCTION

4.1.1 Optional cross-code operation allows a different "Private-Line" tone or binary code signal to be transmitted than is received.

NOTE

Exchanging tone "Private-Line" signals for "Digital Private-Line" signals or vice versa is not available as an option. However, it is possible to cross code up to four tone PL signals and up to four binary PL signals in the same station.

4.1.2 The optional modules required to provide up to four cross-code capacity are the diode logic module and a multiple encoder module. The diode logic module determines the specific code signal to be generated by the applicable PL encoder. To increase "Digital Private-Line" cross-code capacity to a maximum eight, an additional four-user control module is required to detect the additional code signals.

4.1.3 Any four-user control module used with cross coding must be located in either position 8 or 9 on the unified control chassis and jumpers or diodes in the modules must be removed as explained later.

4.2 TONE "PRIVATE-LINE" CROSS-CODE OPERATION

4.2.1 As with retransmitted tone "Private-Line" signals, tones to be cross-coded are detected by an applicable "Vibrasponder" resonant reed in the four-user control module. However, a retransmit low function does not appear at output pin 24 because an applicable diode (CR1-CR4) is removed.

NOTE

Any of these diodes not removed results in a retransmit function applied to output pin 24 when the applicable tone is detected. The retransmit function causes the same tone to be retransmitted.

4.2.2 To simplify the following discussion, only tone "A" is mentioned but the operation, in general, is also applicable to tone "B", "C", and "D". Cross coding requires that the four-user control module be located in position 8 and that diode CR1 be removed from the module (to disable the retransmit "A" function). When tone "A" is detected, four-user control module output pin 19 goes low which is applied to diode logic module input pin 2. This low causes a new tone PL signal to be generated which is routed to the transmitter as follows. With pin 2 of the diode logic module low (and jumper JU1 in), a corresponding low is routed out pin 3 to multiple tone "Private-Line" encoder module input pin 2. This low causes the encoder to generate a different PL tone which is routed out of the module at pin 7 to master decoder module input pin 14. Here it is level set by R820 and applied to transmission gate U801A but must wait for a gate enable function that must come from the diode logic module. The low at diode logic module input pin 2 which caused the new PL tone to be generated also enables the transmission gate. The low is inverted to a high at output pin 7 which is applied to master decoder module input pin 8. This enables transmission gate U801A passing the new (cross-coded) PL tone to the transmitter. The originally detected tone was also applied to transmission gate U801C but was not applied to the transmitter because that gate did not become enabled. The diode logic module also supplies a 150 millisecond time delay interval to allow for reverse burst transmission.

4.3 "DIGITAL PRIVATE-LINE" CROSS-CODE OPERATION

"Digital Private-Line" binary codes to be cross-coded are applied to "Digital Private-Line" four-user control module input pin 2 and detected by an applicable decoder circuit as with retransmit type operation. However, with cross-code operation, a retransmit low function does not appear at output pin 13 because of jumpering differences. For example, a code "A" at "Digital Private-Line" four-user control module input pin 2 produces two output lows from switch inverter Q3. The low retransmit function is blocked because jumper JU13 is removed, but the low cross-code "A" function is routed out pin 19 to diode logic module input pin 2. From here, operation is the same as described for tone "Private-Line" cross-code operation except that a multiple "Digital Private-Line" encoder module is enabled instead of a multiple tone "Private-Line" encoder module. Also the diode logic module provides a 210 millisecond drop out delay interval to allow for turn-off code transmission. This gate enable function appears at pin 10 and is routed to master decoder module pin 10.

5. SINGLE TONE OPERATION (OPTIONAL)

5.1 INTRODUCTION

Single tone operation provides additional system security in that a proper received simple tone signal, in addition to a proper PL tone or code is required to key the station. A received single tone signal from the receiver discriminator is applied to single tone decoder module input pin 3. This causes a switched ground output (low) from output pin 17 which is applied to and controls four-user control module outputs.

5.2 SINGLE TONE USED WITH TONE "PRIVATE-LINE" OPERATION

In the tone "Private-Line" four-user control module, this low applied to pin 23 satisfies one half of AND gate Q3, Q6, Q9, and/or Q12 when applicable jumper(s) JU5, JU6, JU7, and JU8 are in and jumpers JU1, JU2, JU3, and JU4 are out. When a correct "Private-Line" tone signal is received with the single tone signal, the other half of the applicable gate is satisfied and the gate is then enabled. This causes the "Private-Line" tone signal to be either retransmitted or cross-coded as described previously.

5.3 SINGLE TONE USED WITH "DIGITAL PRIVATE-LINE" OPERATION

The single tone low applied to "Digital Private-Line" four-user control module input pin 23 is applied to four switch inverters Q3, Q5, Q7, and Q9 as determined by applicable jumpers JU2, JU4, JU6, and JU8 (corresponding jumpers JU1, JU3, JU5, and/or JU7 must be removed). When both the single tone signal and code enable functions are applied to an applicable switch inverter, the switch inverter is enabled which causes the code signal to be either retransmitted or cross-coded.

UNICHASSIS INTERCONNECT TABLE

POSITION	MODULE	EXCITER MIC INPUT	UNNOTCHED MIC TO NOTCH	NOTCHED MIC TO EXCITER	A+	GROUND	LOCAL P–T–T	+9.6 V	T–O–T RESET	ANT SWITCH	P–T–T KEY TRANSMIT INHIBIT	KEYED A–	KEYED A+	"PL" ENABLE/F1 OSC GND	EXCITER LO	DELAYED KEYED A+	RPTR P–T–T	UNNOTCHED MIC HI/RPTR AUDIO	LINE P–T–T
1	TIME–OUT TIMER				12	1	5		22		*4								
2	STATION CONTROL				12	1/24	5			*2	3	*7	*8	9	11	13	15	*16	
3	SQUELCH GATE				12	1/23	13		*22				6	*3		7	*18	11	16
	SINGLE TONE DECODER				12	1													
5	MASTER DECODER				12	1									24				
6	4–USER MODULE				12	1													
7	4–USER MODULE				12	1													
8	4–USER MODULE				12	1													
9	4–USER MODULE				12	1													
10	DIODE LOGIC MODULE				12	1										13			
11	MULTIPLE TONE "PL" ENCODER				12	1		10											
12	MULTIPLE "DIGITAL PRIVATE–LINE" ENCODER		18	22	12	1		10											
	INDIVIDUAL PINS (P100–)				1,6	3,4				2		9				5			
	JUMPERS	7/8	4/6	5/7														6/8	
	J1 POWER SUPPLY				1	4		3											
	J2 RECEIVER				24	23/26		25				8	5						
	J3 TEST SET METER					6	5											7	
	J4 METERING				21	5	16								14			15	
	J5 TRANSMITTER	24			28	20		13		14		30	25	19	17	27			
	TB1 NO CONNECTIONS																		
	TB2 HIGH CURRENT																		
	TB3 EXTERNAL				8	1	6								16	10	14	18	12

POSITION	MODULE	R1 DISC	"PL" DISABLE	OSC. GND	AUDIO A–	R1 SQ. IND.	STD RESET	"PL" INDICATE/SW A+	R1 AUDIO	SQ. INHIBIT	RPTR AUDIO	STD RESET	AMPLIFIED R1 DISC.	SW GND	BINARY OR TONE "PL" TO MODULATOR	BINARY "PL" OUT	TONE "PL" OUT	"PL" DET EMITTER BIAS	BINARY "PL" DETECT (RETRANSMIT)	TONE "PL" DETECT (RETRANSMIT)	"PL" DET BASE BIAS	SW GND
1	TIME–OUT TIMER																					
2	STATION CONTROL	21	*23										*22									
3	SQUELCH GATE			2		5	*8	14	17	19	*24		10									
	SINGLE TONE DECODER							16		*18		9	3	*17								
5	MASTER DECODER	22						*16					23		*2	*4	*7	*11	13	17	*18	
6	4–USER MODULE															2	3	11	*13	*24	18	23
7	4–USER MODULE															2	3	11	*13	*24	18	23
8	4–USER MODULE															2	3	11	*13	*24	18	23
9	4–USER MODULE															2	3	11	*13	*24	18	23
10	DIODE LOGIC MODULE							*17														
11	MULTIPLE TONE "PL" ENCODER																					
12	MULTIPLE "DIGITAL PRIVATE–LINE" ENCODER																					
	INDIVIDUAL PINS (P100–)																					
	JUMPERS						3					2/3		1								1
	J1 POWER SUPPLY				5																	
	J2 RECEIVER	*15	11		4	13		10	14		6				16							
	J3 TEST SET METER																					
	J4 METERING										3											
	J5 TRANSMITTER			18	26										29							
	TB1 NO CONNECTIONS																					
	TB2 HIGH CURRENT																					
	TB3 EXTERNAL	2													20							

POSITION	MODULE	DECODER OUTPUT A	DECODER OUTPUT E	DECODER OUTPUT B	DECODER OUTPUT F	DECODER OUTPUT C	DECODER OUTPUT G	DECODER OUTPUT D	DECODER OUTPUT H	KEYED A+	AUDIO A+	12–WATT PA METER –	12–WATT PA METER +	NA	NA	AUDIO LO	AUDIO HI
1	TIME–OUT TIMER																
2	STATION CONTROL																
3	SQUELCH GATE																
	SINGLE TONE DECODER																
5	MASTER DECODER																
6	4–USER MODULE																
7	4–USER MODULE																
8	4–USER MODULE	*19		*20		*21		*22									
9	4–USER MODULE		*19		*20		*21		*22								
10	DIODE LOGIC MODULE	2	18	4	20	22	21	23	24	*6							
11	MULTIPLE TONE "PL" ENCODER									5							
12	MULTIPLE "DIGITAL PRIVATE–LINE" ENCODER									5							
	INDIVIDUAL PINS (P100–)																
	JUMPERS																
	J1 POWER SUPPLY																
	J2 RECEIVER										6						
	J3 TEST SET METER										3			17	18	1	2
	J4 METERING															2	1
	J5 TRANSMITTER											10	19	7	17	12	1
												15	16				
	TB1 NO CONNECTIONS																
	TB2 HIGH CURRENT																
	TB3 EXTERNAL																

POSITION	MODULE	NA	NA	ADL OUTPUT	HIGH CURRENT A+	HIGH CURRENT A–	TONE "PL" GATE KEY	BINARY "PL" GATE KEY	MULTI "PL"–A LATCHED OUTPUT	MULTI "PL"–E LATCHED OUTPUT	MULTI "PL"–B LATCHED OUTPUT	MULTI "PL"–F LATCHED OUTPUT	MULTI "PL"–C LATCHED OUTPUT	MULTI "PL"–G LATCHED OUTPUT	MULTI "PL"–D LATCHED OUTPUT	MULTI "PL"–H LATCHED OUTPUT	CROSS CODE TONE "PL"	CROSS CODE BINARY "PL"	QUIETING INDICATE		POSITION
1	TIME–OUT TIMER																				1
2	STATION CONTROL																				2
3	SQUELCH GATE																				3
	SINGLE TONE DECODER																		*9		4
5	MASTER DECODER																				5
6	4–USER MODULE						8	10									14	15	19		6
7	4–USER MODULE																				7
8	4–USER MODULE																				8
9	4–USER MODULE																				9
10	DIODE LOGIC MODULE						*7	*10	*3	*19	*5	*16	*14	*15	*11	*9					10
11	MULTIPLE TONE "PL" ENCODER								2	18	4	20	22	21	23	24	*7				11
12	MULTIPLE "DIGITAL PRIVATE–LINE" ENCODER								2		4	20		21	23	24		*7			12
	INDIVIDUAL PINS (P100–)	7	8																		
	JUMPERS									4			5						2		
	J1 POWER SUPPLY																				
	J2 RECEIVER																				
	J3 TEST SET METER																				
	J4 METERING																				
	J5 TRANSMITTER	22	11																		
				7/8	1,2,3	4,5,6															
	TB1 NO CONNECTIONS																				
	TB2 HIGH CURRENT																				
	TB3 EXTERNAL			3	1	2															

Annotations on table: "WHEN RE–TRANSMITTING" (at *16, "PL" INDICATE/SW A+); "WHEN CROSS–CODING" (at *17, "PL" INDICATE/SW A+); "STARTS HERE ONLY WHEN RE–TRANSMITTING" (at *13/*24, "PL" DETECT columns); "STARTS HERE ONLY WHEN CROSS–CODING" (at *7/*10, "PL" GATE KEY columns).

HOW TO READ THIS TABLE

1. THIS TABLE SHOWS ALL INTERCONNECTIONS MADE BY THE PLATING ON BOTH SIDES OF THE INTERCONNECT BOARD AND BY WIRE JUMPERS.
2. ALL PIN NUMBERS IN EACH VERTICAL COLUMN ARE ELECTRICALLY COMMON (INTERCONNECTED BY CIRCUIT BOARD PLATING).
3. TO TRACE INTERCONNECTIONS FROM ANY STARTING POINT TO ALL OTHER COMMON POINTS PROCEED AS FOLLOWS:

STEP 1. FIND THE MODULE POSITION OR CONNECTOR IN THE LEFT OR RIGHT HAND COLUMN OF THE TABLE.

STEP 2. FIND THE DESIRED PIN NUMBER. ALL PINS OF A SPECIFIC CONNECTOR ARE LISTED IN THE LINE THAT EXTENDS TO THE RIGHT.

STEP 3. NOTE THE FUNCTION OF THE DESIRED PIN. THE FUNCTION IS LISTED AT THE TOP OF THE COLUMN IN WHICH THE PIN NUMBER APPEARS. ALL OTHER PINS LISTED IN THE SAME FUNCTION COLUMN ARE INTERCONNECTED. FOR EACH ENTRY IN THE FUNCTION COLUMN, TRACE BACK TO THE LEFT HAND COLUMN TO FIND THE MODULE OR CONNECTOR NUMBER. (SEE EXAMPLE.)

STEP 4. * EQUALS FUNCTION SOURCE.

EXAMPLE:

STATION CONTROL MODULE (MODULE POSITION 2) PIN 5 HAS THE FUNCTION LOCAL P–T–T WHICH IS INTERCONNECTED TO T–O–T (PIN 5), SQUELCH GATE (PIN 13), J3 (PIN 5), J4 (PIN 16), AND TB3 (PIN 6).

NOTES:

1. POSITIONS 6–9 CAN BE USED FOR RETRANSMITTING "PL" SIGNALS. HOWEVER, WHEN CROSS–CODING "PL" SIGNALS, ONLY POSITIONS 8 AND 9 CAN BE USED, AND THEN, WHEN CROSS–CODING INVOLVES "PL" TONES, THE TONE "PRIVATE–LINE" 4–USER MODULE MUST BE IN POSITION 8.
2. A MAXIMUM OF EIGHT CODES CAN BE CROSS–CODED USING THE MULTIPLE "DIGITAL PRIVATE–LINE" ENCODER, THE SPECIAL ENCODER (8 REEDS) OR THE STANDARD MULTIPLE TONE "PRIVATE–LINE" ENCODER AND THE MULTIPLE "DIGITAL PRIVATE–LINE" ENCODER. WHEN THE SPECIAL MULTIPLE TONE "PRIVATE–LINE" ENCODER IS USED, JU901 AND JU902 MUST BE REMOVED – – THEY ARE IN FOR THE STANDARD MODULE. IF MIXED CROSS–CODING IS USED, THE MULTIPLE "DIGITAL PRIVATE–LINE" ENCODER MUST USE ONLY THE LAST 4 CODE PLUG POSITIONS.
3. "DIGITAL PRIVATE–LINE" 4– & 2–USER MODULE JUMPER CONFIGURATIONS JU1–JU2, JU3–JU4,JU5–JU6, AND JU7–JU8 ARE NEVER CONNECTED AT THE SAME TIME. JU1, JU3, JU5 AND JU7 ARE THE NORMAL CONNECTIONS. JU2, JU4, JU6 AND JU8 ARE CONNECTED WHEN THE REPEATER FURNISHES A GROUND INPUT TO PIN 23 FROM ANOTHER MODULE (SUCH AS A SINGLE TONE DECODER).
4. JUMPERS JU13, JU14, JU15 AND JU16 ON "DIGITAL PRIVATE–LINE" 4– &2–USER MODULES ARE CONNECTED WHEN THE RECEIVED CODE DATA IS TO BE RETRANSMITTED. IF NEW CODE DATA IS GENERATED FOR CROSS–CODE TRANSMISSION, THE CORRESPONDING JUMPER IS REMOVED.
5. DIODE LOGIC MODULE JUMPER COMBINATIONS JU1–JU2–JU3–JU4, AND JU5–JU6–JU7–JU8 CAN BE USED TO CROSS–CODE BINARY OR TONE "PL". THE CORRESPONDING JUMPERS ARE REMOVED DEPENDING ON THOSE 4–USER MODULES FILLING POSITIONS 8 AND 9.
6. TONE "PRIVATE–LINE" 4–USER MODULE JUMPER COMBINATIONS JU1–JU5, JU2–JU6, JU3–JU7 AND JU7–JU8 ARE NEVER CONNECTED AT THE SAME TIME. JU1, JU2, JU3 AND JU4 ARE THE NORMAL CONNECTIONS. JU5, JU6, JU7 AND JU8 ARE CONNECTED WHEN THE REPEATER FURNISHES A GROUND INPUT TO PIN 23 FROM ANOTHER MODULE (SINGLE TONE DECODER).
7. CR1, CR2, CR3 AND CR4 IN TONE "PRIVATE–LINE" 4–USER MODULE ARE NORMALLY CONNECTED, WHEN CROSS–CODING IS DESIRED THE CORRESPONDING DIODE IS REMOVED.
8. UNIFIED CONTROL CHASSIS CIRCUIT BOARD JUMPERS JU6 AND JU7 USED FOR A NOTCH FILTER SPECIAL APPLICATION. WHEN JU6 AND JU7 ARE USED, JU4, JU5 AND JU8 ARE REMOVED.
9. WHEN CROSS–CODING "PL" TONES, REMOVE R821. WHEN CROSS–CODING BINARY "PL" CODES, REMOVE R825 IN MASTER DECODER MODULE.
10. DIODE LOGIC MODULE–WHEN CROSS–CODING ONLY BINARY "PL" CODES, USE JU9 AND JU10 – REMOVE JU12. WHEN CROSS–CODING ONLY "PL" TONES, USE JU9 AND JU12 – REMOVE JU10. WHEN USING MIXED CROSS–CODING, USE JU10 AND JU12 · REMOVE JU9.
11. MULTIPLE TONE "PRIVATE–LINE" ENCODER IS REFERENCED IN 900 SERIES.

JUMPER TABLE

	JU1 (OR JU901 – NOTE 11)	JU2 (OR JU902 – NOTE 11)	JU3 (OR JU903 – NOTE 11)	JU4 (OR JU904 – NOTE 11)	JU5 (OR JU905 – NOTE 11)	JU6	JU7	JU8	JU9	JU10	JU11	JU12	JU13	JU14	JU15	JU16	TIMING OPTIONS	OTHER NOTES
UNIFIED CONTROL CHASSIS CIRCUIT BOARD	IN	IN (FOR STD RESET W/O QUIETING)	IN (FOR STD RESET W/O SQUELCH)	IN (FOR NORMAL OPERATION)	IN (FOR NORMAL OPERATION)	NOTE 8	NOTE 8	IN (FOR NORMAL OPERATION)										
TIME–OUT–TIMER																	1/2, 1, 2, 4, 8 (MIN.)	
STA CONTROL MODULE	IN	IN	IN	IN			IN	IN	IN									
SQ. GATE MODULE			IN	IN "PL"	IN	IN	IN	IN	IN	IN	IN	IN	SELECTED DELAY	IN "PL"	IN "PL"		1, 2, 4, 8 (SEC.)	
SINGLETONE DECODER MODULE	IN (FOR 5 SEC. TURN–OFF DELAY)	IN (FOR LOCK MODE)	IN		IN	IN												
MASTER DECODER MODULE	IN (ONLY FOR TOTAL BINARY SYSTEM)	IN (ONLY FOR TOTAL TONE SYSTEM)																NOTE 9
"DIGITAL PRIVATE–LINE" 4– &2–USER CONTROL MODULE	NOTE 3	NOTE 3	NOTE 3	NOTE 3	NOTE 3	NOTE 3	NOTE 3	NOTE 3	IN	IN	IN	IN	NOTE 4	NOTE 4	NOTE 4	NOTE 4		
TONE "PRIVATE–LINE" 4–USER CONTROL MODULE	NOTE 6	NOTE 6	NOTE 6	NOTE 6	NOTE 6	NOTE 6	NOTE 6	NOTE 6										NOTE 7
DIODE LOGIC MODULE	NOTE 5	NOTE 5	NOTE 5	NOTE 5	NOTE 5	NOTE 5	NOTE 5	NOTE 5	NOTE 10	NOTE 10	IN (ONLY WITH 150 MSEC. DROP–OUT OPTION)	NOTE 10	IN (FOR 150 MSEC. DROP–OUT OPTION)					
MULTIPLE "DIGITAL PRIVATE–LINE" ENCODER MODULE																		
TONE "PRIVATE–LINE" MULTIPLE ENCODER MODULE	NOTE 2	NOTE 2	IN	IN														

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TO SHEET 2 OF 2

POS 1

TIME-OUT TIMER

TLN4836A TIME-OUT TIMER: LIMITS TRANSMITTER TURN ON TIME TO PRESET VALUE

POS 2

STATION CONTROL

TLN4635B STATION CONTROL MODULE: CONTROLS XMTR KEYING & AMPLIFIES XMIT AUDIO AND RECEIVER DISCRIMINATOR AUDIO (T "PL" ONLY).

POS 3

SQUELCH GATE

TLN4662A SQUELCH GATE: PROVIDES TRANSMITTER TURN ON WHEN NOISE DROPS BELOW THRESHOLD (10-25 dB QUIETING). CORRECT "PL" CODE IS ALSO REQUIRED.

POS 4

SINGLE-TONE DECODER

NOTE: J01 IS INSTALLED FOR 5-SECOND TURN-OFF DELAY.
J02 IS INSTALLED FOR 1-SECOND DELAY.
J03 IS INSTALLED FOR LOCK MODE.

TLN1181A SINGLE TONE DECODER: CONVERTS A 300 mS TONE IN THE 600-3300 Hz RANGE TO A SWITCHING FUNCTION.

POS 5

MASTER DECODER

TRN6165A MASTER DECODER MODULE: ROUTES RECEIVED "PL" CODE SIGNAL TO TRANSMITTER FOR RETRANSMISSION OR, OPTIONAL, ROUTES APPLICABLE CROSS CODED "PL" SIGNAL TO TRANSMITTER FOR UNIQUE "PL" TRANSMISSION.

POS 6

"DIGITAL PRIVATE-LINE" 4-USER CONTROL

TRN6166A "DIGITAL PRIVATE-LINE" 4-USER CONTROL MODULE: CONVERTS ONE OF UP TO FOUR BINARY CODES TO A SWITCHING FUNCTION WHICH IS USED TO CONTROL "PL" CODE RETRANSMISSION OR, OPTIONAL, IS USED TO CAUSE A DIFFERENT "PL" CODE TO BE TRANSMITTED (CROSS CODED).

(POS 6 CONT.) OR

"DIGITAL PRIVATE-LINE" 2-USER CONTROL

TRN6326A "DIGITAL PRIVATE-LINE" 2-USER CONTROL MODULE: CONVERTS ONE OF TWO BINARY CODES TO A SWITCHING FUNCTION WHICH IS USED TO CONTROL "PL" CODE RETRANSMISSION OR, OPTIONAL, IS USED TO CAUSE A DIFFERENT "PL" CODE TO BE TRANSMITTED (CROSS CODED).

(POS 6 CONT.) OR

TONE "PRIVATE-LINE" 4-USER CONTROL

TLN1685A TONE "PRIVATE-LINE" 4-USER CONTROL MODULE : CONVERTS ONE OF UP TO FOUR "PL" TONES TO A SWITCHING FUNCTION WHICH IS USED TO CONTROL "PL" RETRANSMISSION OR, OPTIONAL, IS USED TO CAUSE A DIFFERENT "PL" TONE TO BE TRANSMITTED (CROSS CODED).

POS 7

POS 8 (NOTE 1)

POS 9 (NOTE 1)

NOTE:
MODULES USED IN POS'S 7,8, AND 9 ARE THE SAME AS SHOWN IN POS 6. EXCEPT POS 9 OUTPUTS FOR PINS 19 THRU 22 BECOME DECODER OUTPUT E,F,G,AND H.

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(SHEET 1OF2)

SEE TABLE ON OPPOSITE PAGE FOR MODULE INTERCONNECTIONS

FUNCTIONAL DESCRIPTION

Community Repeater
Detailed Functional Diagram
Motorola No. PEPS-18199-A
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UNICHASSIS INTERCONNECT TABLE

POSITION	MODULE	EXCITER MIC INPUT	UNNOTCHED MIC TO NOTCH	NOTCHED MIC TO EXCITER	A+	GROUND	LOCAL P–T–T	+9.6 V	T–O–T RESET	ANT SWITCH	P–T–T KEY TRANSMIT INHIBIT	KEYED A–	KEYED A+	"PL" ENABLE/F1 OSC GND	EXCITER LO	DELAYED KEYED A+	RPTR P–T–T	UNNOTCHED MIC HI/RPTR AUDIO	LINE P–T–T	R1 DISC
1	TIME–OUT TIMER				12	1	5		22		*4									
2	STATION CONTROL				12	1/24	5			*2	3	*7	*8	9	11	13	15	*16		21
3	SQUELCH GATE				12	1/23	13		*22				6	*3		7	*18	11	16	
	SINGLE TONE DECODER				12	1														
5	MASTER DECODER				12	1									24					22
6	4–USER MODULE				12	1														
7	4–USER MODULE				12	1														
8	4–USER MODULE				12	1														
9	4–USER MODULE				12	1														
10	DIODE LOGIC MODULE				12	1										13				
11	MULTIPLE TONE "PL" ENCODER				12	1		10												
12	MULTIPLE "DIGITAL PRIVATE–LINE" ENCODER		18	22	12	1		10												
	INDIVIDUAL PINS (P100–)				1,6	3,4				2		9				5				
	JUMPERS	7/8	4/6	5/7														6/8		
	J1 POWER SUPPLY				1	4		3												
	J2 RECEIVER				24	23/26		25				8	5							*15
	J3 TEST SET METER					6	5											7		
	J4 METERING				21	5	16								14			15		
	J5 TRANSMITTER	24			28	20		13		14		30	25	19	17	27				
	TB1 NO CONNECTIONS																			
	TB2 HIGH CURRENT																			
	TB3 EXTERNAL				8	1	6								16	10	14	18	12	2

POSITION	MODULE	"PL" DISABLE	OSC. GND	AUDIO A–	R1 SQ. IND.	STD RESET	"PL" INDICATE/SW A+	R1 AUDIO	SQ. INHIBIT	RPTR AUDIO	STD RESET	AMPLIFIED R1 DISC.	SW GND	BINARY OR TONE "PL" TO MODULATOR	BINARY "PL" OUT	TONE "PL" OUT	"PL" DET EMITTER BIAS	BINARY "PL" DETECT (RETRANSMIT)	TONE "PL" DETECT (RETRANSMIT)
1	TIME–OUT TIMER																		
2	STATION CONTROL	*23										*22							
3	SQUELCH GATE		2		5	*8	14	17	19	*24		10							
	SINGLE TONE DECODER						16		*18		9	3	*17						
5	MASTER DECODER						*16					23		*2	*4	*7	*11	13	17
6	4–USER MODULE														2	3	11	*13	*24
7	4–USER MODULE														2	3	11	*13	*24
8	4–USER MODULE														2	3	11	*13	*24
9	4–USER MODULE														2	3	11	*13	*24
10	DIODE LOGIC MODULE						*17												
11	MULTIPLE TONE "PL" ENCODER																		
12	MULTIPLE "DIGITAL PRIVATE–LINE" ENCODER																		
	INDIVIDUAL PINS (P100–)																		
	JUMPERS					3					2/3		1						
	J1 POWER SUPPLY			5															
	J2 RECEIVER	11		4	13		10	14		6				16					
	J3 TEST SET METER																		
	J4 METERING									3									
	J5 TRANSMITTER		18	26										29					
	TB1 NO CONNECTIONS																		
	TB2 HIGH CURRENT																		
	TB3 EXTERNAL													20					

POSITION	MODULE	"PL" DET BASE BIAS	SW GND	DECODER OUTPUT A	DECODER OUTPUT E	DECODER OUTPUT B	DECODER OUTPUT F	DECODER OUTPUT C	DECODER OUTPUT G	DECODER OUTPUT D	DECODER OUTPUT H	KEYED A+	AUDIO A+	12–WATT PA METER –	12–WATT PA METER +	NA	NA	AUDIO LO	AUDIO HI	NA
1	TIME–OUT TIMER																			
2	STATION CONTROL																			
3	SQUELCH GATE																			
	SINGLE TONE DECODER																			
5	MASTER DECODER	*18																		
6	4–USER MODULE	18	23																	
7	4–USER MODULE	18	23																	
8	4–USER MODULE	18	23	*19		*20		*21		*22										
9	4–USER MODULE	18	23		*19		*20		*21		*22									
10	DIODE LOGIC MODULE			2	18	4	20	22	21	23	24	*6								
11	MULTIPLE TONE "PL" ENCODER											5								
12	MULTIPLE "DIGITAL PRIVATE–LINE" ENCODER											5								
	INDIVIDUAL PINS (P100–)																			7
	JUMPERS		1																	
	J1 POWER SUPPLY												6							
	J2 RECEIVER												3			17	18	1	2	
	J3 TEST SET METER																	2	1	
	J4 METERING													10	19	7	17	12	1	22
	J5 TRANSMITTER													15	16					
	TB1 NO CONNECTIONS																			
	TB2 HIGH CURRENT																			
	TB3 EXTERNAL																			

POSITION	MODULE	NA	ADL OUTPUT	HIGH CURRENT A+	HIGH CURRENT A–	TONE "PL" GATE KEY	BINARY "PL" GATE KEY	MULTI "PL"–A LATCHED OUTPUT	MULTI "PL"–E LATCHED OUTPUT	MULTI "PL"–B LATCHED OUTPUT	MULTI "PL"–F LATCHED OUTPUT	MULTI "PL"–C LATCHED OUTPUT	MULTI "PL"–G LATCHED OUTPUT	MULTI "PL"–D LATCHED OUTPUT	MULTI "PL"–H LATCHED OUTPUT	CROSS CODE TONE "PL"	CROSS CODE BINARY "PL"	QUIETING INDICATE		POSITION
1	TIME–OUT TIMER																			1
2	STATION CONTROL																			2
3	SQUELCH GATE																	*9		3
	SINGLE TONE DECODER																			4
5	MASTER DECODER					8	10									14	15	19		5
6	4–USER MODULE																			6
7	4–USER MODULE																			7
8	4–USER MODULE																			8
9	4–USER MODULE																			9
10	DIODE LOGIC MODULE					*7	*10	*3	*19	*5	*16	*14	*15	*11	*9					10
11	MULTIPLE TONE "PL" ENCODER							2	18	4	20	22	21	23	24	*7				11
12	MULTIPLE "DIGITAL PRIVATE–LINE" ENCODER							2		4	20		21	23	24		*7			12
	INDIVIDUAL PINS (P100–)	8																		
	JUMPERS								4			5						2		
	J1 POWER SUPPLY																			
	J2 RECEIVER																			
	J3 TEST SET METER																			
	J4 METERING	11																		
	J5 TRANSMITTER		7/8	1,2 3	4,5 6															
	TB1 NO CONNECTIONS																			
	TB2 HIGH CURRENT																			
	TB3 EXTERNAL		3	1	2															

WHEN RE–TRANSMITTING

WHEN CROSS–CODING

STARTS HERE ONLY WHEN RE–TRANSMITTING

STARTS HERE ONLY WHEN CROSS–CODING

HOW TO READ THIS TABLE

1. THIS TABLE SHOWS ALL INTERCONNECTIONS MADE BY THE PLATING ON BOTH SIDES OF THE INTERCONNECT BOARD AND BY WIRE JUMPERS.
2. ALL PIN NUMBERS IN EACH VERTICAL COLUMN ARE ELECTRICALLY COMMON (INTERCONNECTED BY CIRCUIT BOARD PLATING).
3. TO TRACE INTERCONNECTIONS FROM ANY STARTING POINT TO ALL OTHER COMMON POINTS PROCEED AS FOLLOWS:

   STEP 1. FIND THE MODULE POSITION OR CONNECTOR IN THE LEFT OR RIGHT HAND COLUMN OF THE TABLE.

   STEP 2. FIND THE DESIRED PIN NUMBER. ALL PINS OF A SPECIFIC CONNECTOR ARE LISTED IN THE LINE THAT EXTENDS TO THE RIGHT.

   STEP 3. NOTE THE FUNCTION OF THE DESIRED PIN. THE FUNCTION IS LISTED AT THE TOP OF THE COLUMN IN WHICH THE PIN NUMBER APPEARS. ALL OTHER PINS LISTED IN THE SAME FUNCTION COLUMN ARE INTERCONNECTED. FOR EACH ENTRY IN THE FUNCTION COLUMN, TRACE BACK TO THE LEFT HAND COLUMN TO FIND THE MODULE OR CONNECTOR NUMBER. (SEE EXAMPLE.)

   STEP 4. * EQUALS FUNCTION SOURCE.

EXAMPLE:

STATION CONTROL MODULE (MODULE POSITION 2) PIN 5 HAS THE FUNCTION LOCAL P–T–T WHICH IS INTERCONNECTED TO T–O–T (PIN 5), SQUELCH GATE (PIN 13), J3 (PIN 5), J4 (PIN 16), AND TB3 (PIN 6).

NOTES:

1. POSITIONS 6–9 CAN BE USED FOR RETRANSMITTING "PL" SIGNALS. HOWEVER, WHEN CROSS–CODING "PL" SIGNALS, ONLY POSITIONS 8 AND 9 CAN BE USED, AND THEN, WHEN CROSS–CODING INVOLVES "PL" TONES, THE TONE "PRIVATE–LINE" 4–USER MODULE MUST BE IN POSITION 8.
2. A MAXIMUM OF EIGHT CODES CAN BE CROSS–CODED USING THE MULTIPLE "DIGITAL PRIVATE–LINE" ENCODER, THE SPECIAL ENCODER (8 REEDS) OR THE STANDARD MULTIPLE TONE "PRIVATE–LINE" ENCODER AND THE MULTIPLE "DIGITAL PRIVATE–LINE" ENCODER. WHEN THE SPECIAL MULTIPLE TONE "PRIVATE–LINE" ENCODER IS USED, JU901 AND JU902 MUST BE REMOVED – – THEY ARE IN FOR THE STANDARD MODULE. IF MIXED CROSS–CODING IS USED, THE MULTIPLE "DIGITAL PRIVATE–LINE" ENCODER MUST USE ONLY THE LAST 4 CODE PLUG POSITIONS.
3. "DIGITAL PRIVATE–LINE" 4– & 2–USER MODULE JUMPER CONFIGURATIONS JU1–JU2, JU3–JU4,JU5–JU6, AND JU7–JU8 ARE NEVER CONNECTED AT THE SAME TIME. JU1, JU3, JU5 AND JU7 ARE THE NORMAL CONNECTIONS. JU2, JU4, JU6 AND JU8 ARE CONNECTED WHEN THE REPEATER FURNISHES A GROUND INPUT TO PIN 23 FROM ANOTHER MODULE (SUCH AS A SINGLE TONE DECODER).
4. JUMPERS JU13, JU14, JU15 AND JU16 ON "DIGITAL PRIVATE–LINE" 4– &2–USER MODULES ARE CONNECTED WHEN THE RECEIVED CODE DATA IS TO BE RETRANSMITTED. IF NEW CODE DATA IS GENERATED FOR CROSS–CODE TRANSMISSION, THE CORRESPONDING JUMPER IS REMOVED.
5. DIODE LOGIC MODULE JUMPER COMBINATIONS JU1–JU2–JU3–JU4, AND JU5–JU6–JU7–JU8 CAN BE USED TO CROSS–CODE BINARY OR TONE "PL". THE CORRESPONDING JUMPERS ARE REMOVED DEPENDING ON THOSE 4–USER MODULES FILLING POSITIONS 8 AND 9.
6. TONE "PRIVATE–LINE" 4–USER MODULE JUMPER COMBINATIONS JU1–JU5, JU2–JU6, JU3–JU7 AND JU7–JU8 ARE NEVER CONNECTED AT THE SAME TIME. JU1, JU2, JU3 AND JU4 ARE THE NORMAL CONNECTIONS. JU5, JU6, JU7 AND JU8 ARE CONNECTED WHEN THE REPEATER FURNISHES A GROUND INPUT TO PIN 23 FROM ANOTHER MODULE (SINGLE TONE DECODER).
7. CR1, CR2, CR3 AND CR4 IN TONE "PRIVATE–LINE" 4–USER MODULE ARE NORMALLY CONNECTED, WHEN CROSS–CODING IS DESIRED THE CORRESPONDING DIODE IS REMOVED.
8. UNIFIED CONTROL CHASSIS CIRCUIT BOARD JUMPERS JU6 AND JU7 USED FOR A NOTCH FILTER SPECIAL APPLICATION. WHEN JU6 AND JU7 ARE USED, JU4, JU5 AND JU8 ARE REMOVED.
9. WHEN CROSS–CODING "PL" TONES, REMOVE R821. WHEN CROSS–CODING BINARY "PL" CODES, REMOVE R825 IN MASTER DECODER MODULE.
10. DIODE LOGIC MODULE–WHEN CROSS–CODING ONLY BINARY "PL" CODES, USE JU9 AND JU10 – REMOVE JU12. WHEN CROSS–CODING ONLY "PL" TONES, USE JU9 AND JU12 – REMOVE JU10. WHEN USING MIXED CROSS–CODING, USE JU10 AND JU12 - REMOVE JU9.
11. MULTIPLE TONE "PRIVATE–LINE" ENCODER IS REFERENCED IN 900 SERIES.

JUMPER TABLE

	JU1 (OR JU901 – NOTE 11)	JU2 (OR JU902 – NOTE 11)	JU3 (OR JU903 – NOTE 11)	JU4 (OR JU904 – NOTE 11)	JU5 (OR JU905 – NOTE 11)	JU6	JU7	JU8	JU9	JU10	JU11	JU12	JU13	JU14	JU15	JU16	TIMING OPTIONS	OTHER NOTES
UNIFIED CONTROL CHASSIS CIRCUIT BOARD	IN	IN (FOR STD RESET W/O QUIETING)	IN (FOR STD RESET W/O SQUELCH)	IN (FOR NORMAL OPERATION)	IN (FOR NORMAL OPERATION)	NOTE 8	NOTE 8	IN (FOR NORMAL OPERATION)										
TIME–OUT–TIMER																	1/2, 1, 2, 4, 8 (MIN.)	
STA CONTROL MODULE	IN	IN	IN	IN			IN	IN	IN									
SQ. GATE MODULE			IN	IN "PL"	IN	IN	IN	IN	IN	IN	IN	IN	SELECTED DELAY	IN "PL"	IN "PL"		1, 2, 4, 8 (SEC.)	
SINGLETONE DECODER MODULE	IN (FOR 5 SEC. TURN–OFF DELAY)	IN (FOR LOCK MODE)	IN		IN	IN												
MASTER DECODER MODULE	IN (ONLY FOR TOTAL BINARY SYSTEM)	IN (ONLY FOR TOTAL TONE SYSTEM)																NOTE 9
"DIGITAL PRIVATE–LINE" 4– &2–USER CONTROL MODULE	NOTE 3	NOTE 3	NOTE 3	NOTE 3	NOTE 3	NOTE 3	NOTE 3	NOTE 3	IN	IN	IN	IN	NOTE 4	NOTE 4	NOTE 4	NOTE 4		
TONE "PRIVATE–LINE" 4–USER CONTROL MODULE	NOTE 6	NOTE 6	NOTE 6	NOTE 6	NOTE 6	NOTE 6	NOTE 6	NOTE 6										NOTE 7
DIODE LOGIC MODULE	NOTE 5	NOTE 5	NOTE 5	NOTE 5	NOTE 5	NOTE 5	NOTE 5	NOTE 5	NOTE 10	NOTE 10	IN (ONLY WITH 150 MSEC. DROP–OUT OPTION)	NOTE 10	IN (FOR 150 MSEC. DROP–OUT OPTION)					
MULTIPLE "DIGITAL PRIVATE–LINE" ENCODER MODULE																		
TONE "PRIVATE–LINE" MULTIPLE ENCODER MODULE	NOTE 2	NOTE 2	IN	IN														

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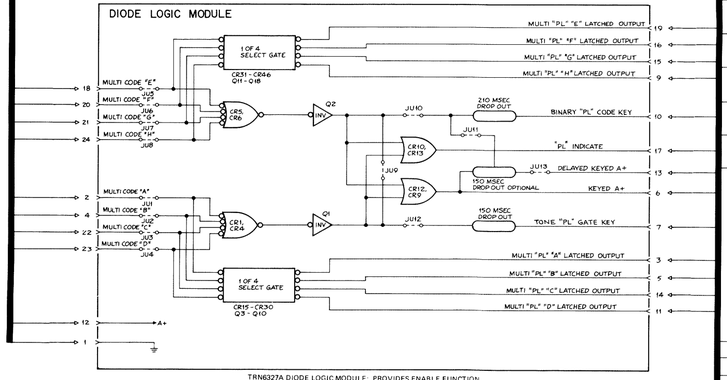
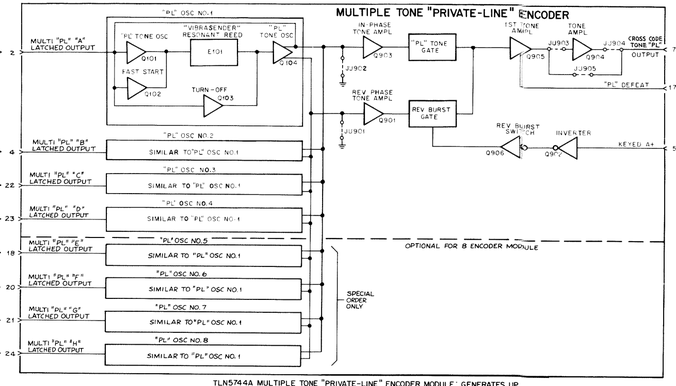
POS 10
(CROSS CODE OPTION)



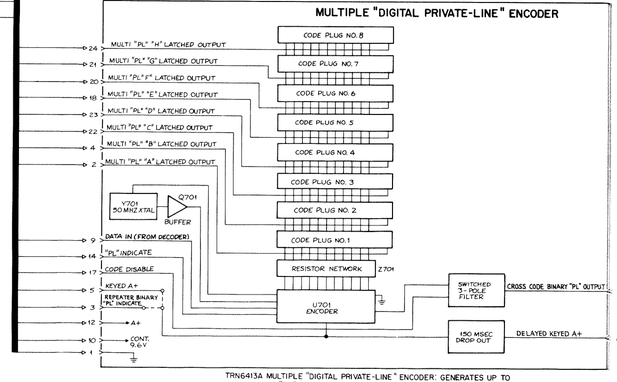
TRN6327A DIODE LOGIC MODULE: PROVIDES ENABLE FUNCTION (LATCHED OUTPUT) TO CROSS CODE ENCODER. ALSO PROVIDES APPLICABLE BINARY OR TONE "PL" GATE KEY FUNCTION TO MASTER DECODER MODULE IN RESPONSE TO INPUT FROM 4- OR 2-USER MODULE.

POS 11
(CROSS CODE OPTION- SEE NOTE 2)



TLN5744A MULTIPLE TONE "PRIVATE-LINE" ENCODER MODULE: GENERATES UP TO FOUR "PL" TONES (ONE AT A TIME) IN RESPONSE TO INPUT FROM DIODE LOGIC MODULE.

POS 12
(CROSS CODE OPTION- SEE NOTE 2)



TRN6413A MULTIPLE "DIGITAL PRIVATE-LINE" ENCODER: GENERATES UP TO EIGHT BINARY "PL" CODES (ONE AT A TIME) IN RESPONSE TO INPUT FROM DIODE LOGIC MODULE.

POWER SUPPLY J1
1 A+
2
3 +9.6 V
4 GND
5 AUDIO A-
6 AUDIO A+

RCVR J2
1 AUDIO LO
2 AUDIO HI
3 AUDIO A+
4 AUDIO A-
5 KEYED A+
6 LOCAL SPEAKER/LOCAL REPEAT AUDIO
7
8 KEYED A-
9
10 PL IND./SW A+
11 PL DISABLE
12
13 R1 SQ. CONT/R1 SQ. IND
14 R1 AUDIO INPUT
15 R1 DISCR. OUT
16 TONE OR BINARY "PL" TO MODULATOR
17
18
19
20
21
22
23 GND
24 A+
25 +9.6 V
26 GND
27
28
29
30

TEST SET J3
1 AUDIO HI
2 AUDIO LO
3
4
5 LOCAL PTT
6 GND
7 UNNOTCHED MIC HI

METER/ INTERCOM J4
1 AUDIO HI
3 LOCAL SPKR/LOCAL REPEAT AUDIO
5 GND
7
8
9 R1 INPUT/LO OUT
10 12 WATT PA METER-
11
12 AUDIO LO
14 XCTR LO
15 UNNOTCHED MIC HI
16 LOCAL PTT
17
18
19 12 WATT PA METER+
20 INTERCOM PTT
21 A+
22

XMIT J5
1 HIGH CURRENT A+
2
3
4 HIGH CURRENT A-
5
6
7 POWER CONTROL/RDL OUTPUT
8
9
10
11
12
13 +9.6 V
14 ANT SW/LD DISABLE
15 12 WATT PA METER -
16 12 WATT PA METER +
17 XCTR LO
18 XMIT OSC GND/CHAN E/GND
19 F1 OSC GND/PL ENABLE
20 GND
21
22
23
24 XCTR INPUT/MIC HI/REPEAT AUDIO
25 KEYED A+
26 AUDIO A-
27 DELAYED KEYED A+
28 A+
29 TONE OR BINARY "PL" TO MODULATOR
30 KEYED A-

HIGH CURRENT POWER TB2
1 HIGH CURRENT A+
2 HIGH CURRENT A-
3 PWR CONTROL/ADL OUTPUT

EXTERNAL EQUIPMENT TB3
1 GND
2 R1 DISC OUT
3
4
5
6 LOCAL PTT
7
8 A+
9
10 DELAYED KEYED A+
11
12 LINE PTT
13
14 RPTR PTT
15
16 XMIT LO
17
18 UNNOTCHED MIC HI
19
20 TONE OR BINARY "PL" TO MODULATOR

SEE TABLE ON OPPOSITE PAGE FOR MODULE INTERCONNECTIONS

FUNCTIONAL DESCRIPTION

EEPS-18187-A (SHEET 2 OF 2)

Community Repeater
Detailed Functional Diagram
Motorola No. PEPS-18199-A
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UNIFIED CONTROL CHASSIS

MODEL TCN1121A

1. DESCRIPTION

1.1 The unified control chassis permits the station to operate as an automatic unattended community repeater and performs the following functions:

--Detects the presence of an rf input signal.

--Detects the presence of proper PL codes (up to 4 different codes).

--Keys the transmitter when an input of a predetermined quieting level (or greater) and a proper PL code is present.

--Applies received audio to the transmitter at the proper level for retransmission.

--Retransmits the PL code.

--Limits the maximum time the repeater can be operated continuously by one user.

1.2 The control unit features all solid-state circuitry and modular construction. The basic assembly consists of a control unit chassis and five plug-in modules. A basic community repeater includes one 4-user control module, which permits the use of up to four PL tones or binary codes. If more capacity is required, more 4-user control modules may be added by merely plugging them into the control chassis. A total of four of these modules can be used, for a maximum station capability of 16. A space is also provided for adding an optional single tone decoder module. If this accessory is used, a specific audio tone frequency is required at the beginning of each initial incoming message, in addition to the PL code to operate the repeater.

2. MAINTENANCE

2.1 REMOVAL AND REPLACEMENT OF MODULES

2.1.1 Modules may be removed by simply pulling outward on the module, and may be replaced by pushing the module into its position in the panel. The module is labelled and the mounting positions are marked on the chassis.

CAUTION

1. Never attempt to plug a module into the pins on the back of the Control Unit.
2. Always be sure of the correct module position before plugging in a module.
3. Turn off power to the station before removing or inserting modules to prevent transistor damage from transients.

2.1.2 The Motorola Model TLN8799A Service Board Kit is available for extending the module to provide access to the circuitry while providing all power and signal connections.

2.1.3 Technicians who service many of these stations may wish to carry spare modules and replace malfunctioning modules for immediate restoration of operation. The module may then be repaired at the shop and used as the next replacement spare.

NOTE

All jumper connections must be identical on modules that are removed and modules that are inserted before swapping can be successfully used as a trouble-shooting technique.

MOTOROLA INC.
Communications Division

service publications
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2.2 ADJUSTMENTS

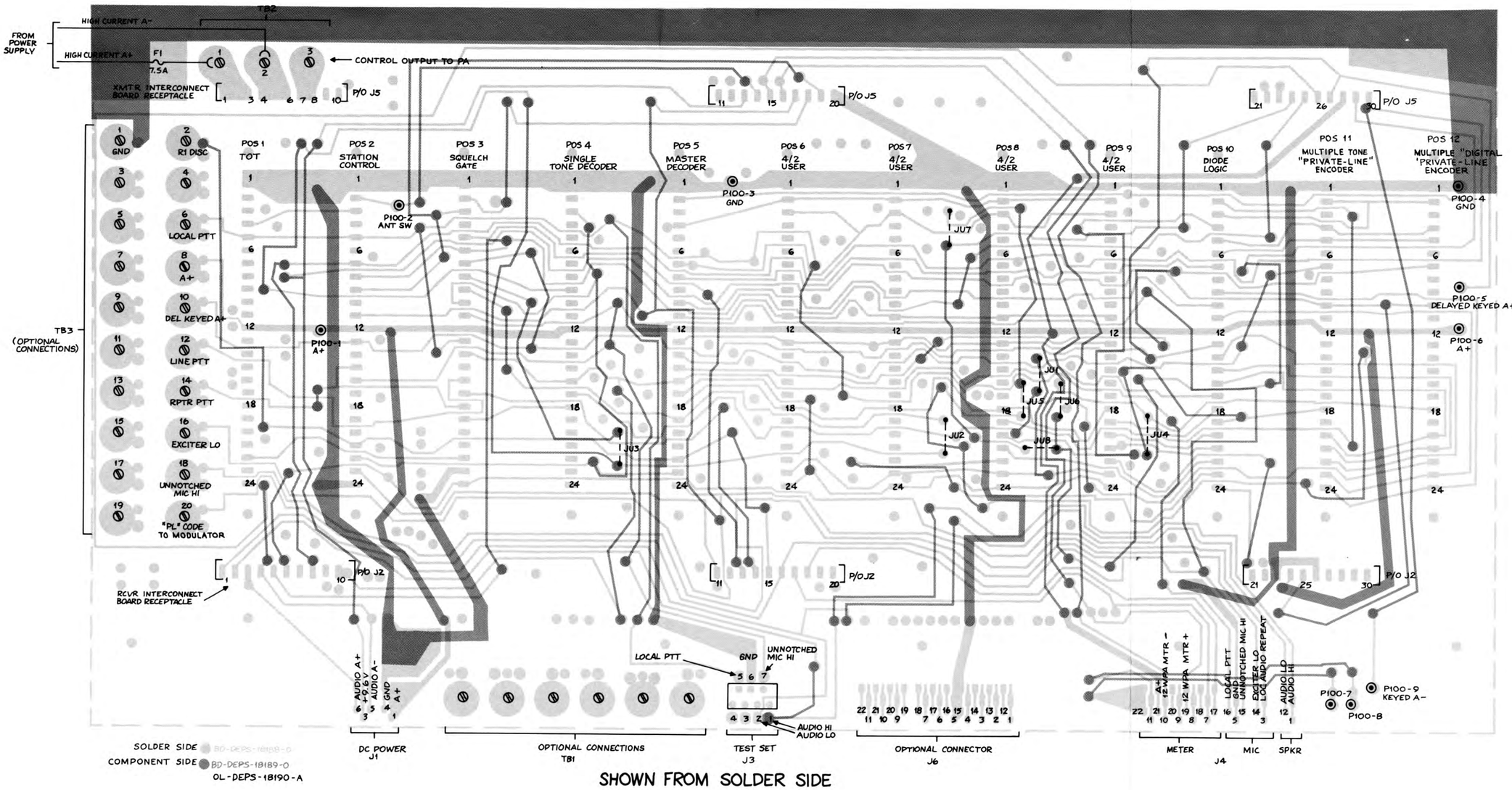
All adjustment procedures are provided in the INSTALLATION AND OPERATION section of this manual.

2.3 TROUBLESHOOTING

The first step that should be performed when looking for trouble in the unified control chassis is to check all modes of operation. This helps localize the source of trouble because some of the circuitry is common to all types of operation; while some of it is used only for one type of operation. The next step should be to connect a portable test set to the various transmitter and receiver metering receptacles and check the meter readings. A list of typical readings for a normally operating unit is given in manual 68P81025E50. The meter readings will isolate the trouble to a few stages. Voltage or signal measurements may then be taken in these suspected stages to isolate the defect to a specific component. Typical dc voltages are shown on the schematic diagrams.

NOTE

Some of the circuits may operate properly although the test set or voltage readings may vary considerably from the typical values given. Proper operation of the logic circuits can usually be presumed if there is a distinct difference in the reading between the active and inactive states.



SHOWN FROM SOLDER SIDE

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION

PARTS LIST

TRN6421A Interconnect Board PL-3513-O

	9-84207B01	CONNECTOR, receptacle: female: 7-Contact (J3)
	46-84703E01	GUIDE, circuit board "homing" (Qty. 12)
	28-84269C01	TERMINAL, contact: (low profile): (part of J1 and J4) (Qty. 23)
	28-84269C02	TERMINAL, contact: (high profile);(part of J1 and J4) (Qty. 20)
	3-00001976	SCREW, machine: 6-32 x 5/16" slotted binder head (Qty. 29)
	29-83362G01	TERMINAL, contact: male (Qty. 29)
	29-84028H09	TERMINAL, contact: male ("stake pin") (Qty. 348)

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UNIFIED CONTROL CHASSIS

TCN1211A Unified Control Chassis
(Community Repeater (RT) Stations)
Circuit Board Detail
Motorola No. PEPS-18191-A
2/23/76-NPC

SQUELCH GATE MODULE

MODEL TLN4662A

FUNCTION

Measures received noise levels and controls transmitter keying.

NOTES:

1. UNLESS OTHERWISE STATED:
   RESISTOR VALUES ARE IN OHMS (K = 1000)
   CAPACITOR VALUES ARE IN MICROFARADS
2. RELAY KIT IS AN OPTIONAL ACCESSORY ITEM. REFER TO RELAY APPLICATION CHART FOR CR15, JU8 AND JU9 USAGE WITH RELAY.
3. USE OF THIS RESISTOR AND CAPACITOR IS DETERMINED AT FACTORY.
4. REFER TO JUMPER TABLE

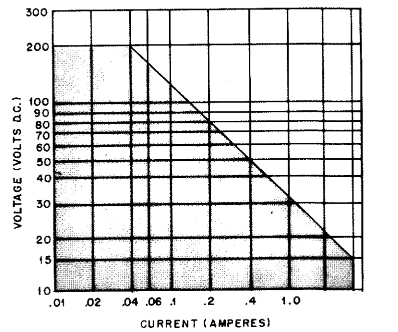
JUMPER TABLE

APPLICATION	JU1	JU2	JU3	JU4	JU5	JU6	JU7	JU8	JU9	JU10	JU11	JU12	JU13	JU14	JU15
LINE CONTROL BASE	OUT	OUT	IN	OUT	OUT	OUT	IN	IN	IN	OUT	OUT	OUT	SELECTED DELAY	IN	OUT
REPEATER (RT) STATION WITHOUT WIRE LINE CONTROL	OUT	OUT	IN	IN "PL"	IN	IN	IN	IN	IN	IN	IN	IN	SELECTED DELAY	IN "CS"	IN "PL"
REPEATER (RT) STATION WITH WIRE LINE CONTROL	OUT	OUT	IN	IN "PL"	NOTE 6	NOTE 6	IN	IN	IN	IN	OUT	IN	SELECTED DELAY	IN "CS"	IN "PL"
BASE (RA) STATION	IN	OUT	IN	IN "PL"	IN	IN	IN	*	*	OUT	OUT	OUT	SELECTED DELAY	IN "CS"	IN "PL"
REPEATER (RA) STATION	OUT	OUT	IN	IN "PL"	IN	IN	OUT	*	*	OUT	OUT	OUT	SELECTED	IN "CS"	IN "PL"
COMMUNITY REPEATER (RT) STATION	OUT	OUT	IN	IN	IN	IN	IN	IN	IN	IN	IN	IN	SELECTED DELAY	OUT	IN

5. VOLTAGE READINGS SHOWN ARE FOR TWO CONDITIONS:
   USQ = UNSQUELCHED
   FSQ = FULLY SQUELCHED
6. JUMPERS JU5 & JU6 ARE USED IN DC-CONTROLLED "PL" REPEATER STATIONS WHEN SUCH STATIONS CONTAIN AN UNSUFFIXED DC TRANSFER MODULE.
7. CAPACITOR C18 IS .01 uF IN STANDARD APPLICATIONS. CAPACITOR C18 IS CHANGED TO 10 uF WHEN THE C145 TAC ENCODER OPTION IS INSTALLED.

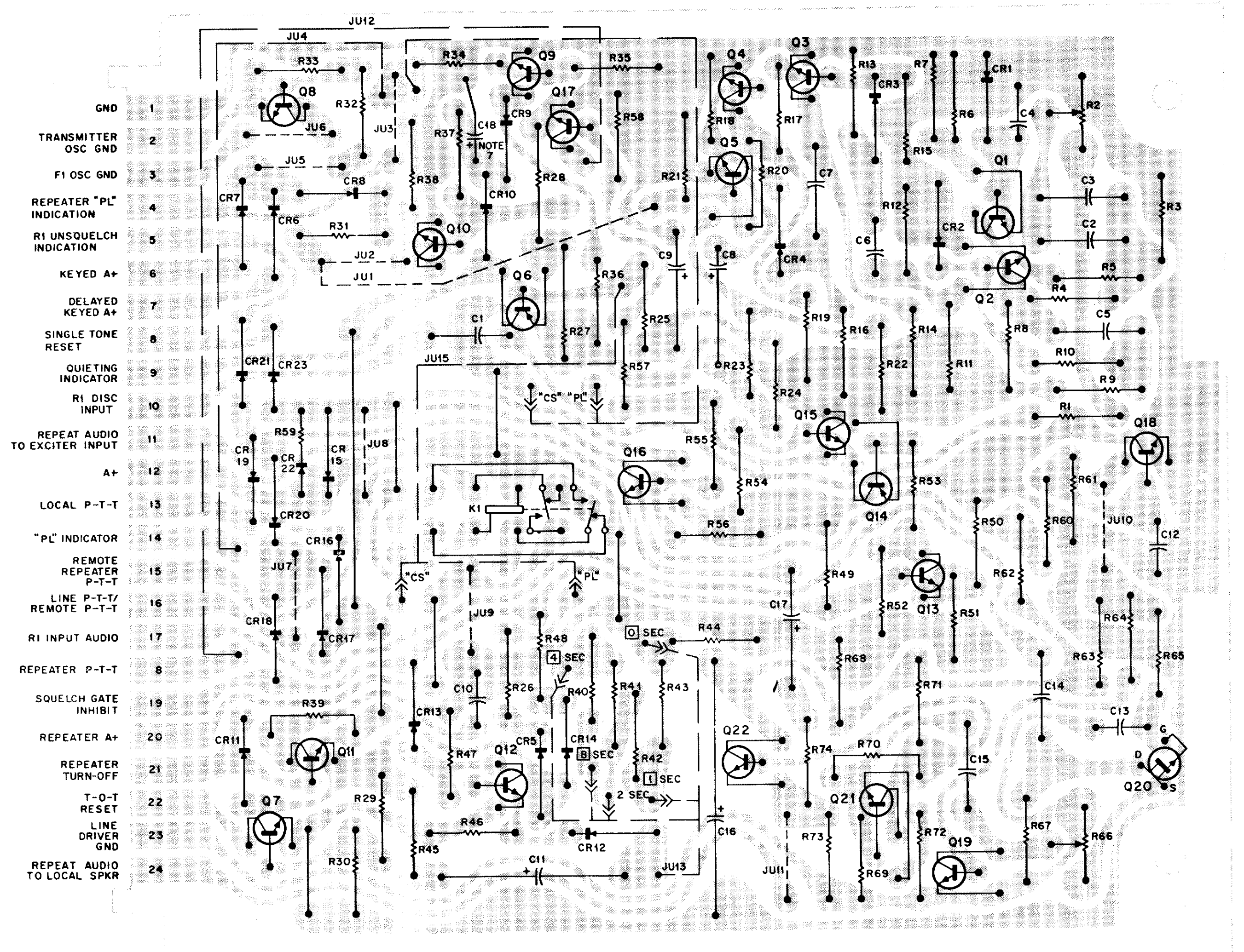
* RELAY APPLICATION CHART

TLN4151A RELAY KIT	DIODE CR15	JU8	JU9
NOT USED	OUT	IN	IN
USED	IN	OUT	OUT



LOAD MUST BE IN SHADED AREA

TLN4151A RELAY KIT RELAY CONTACT RATING



SHOWN FROM SOLDER SIDE

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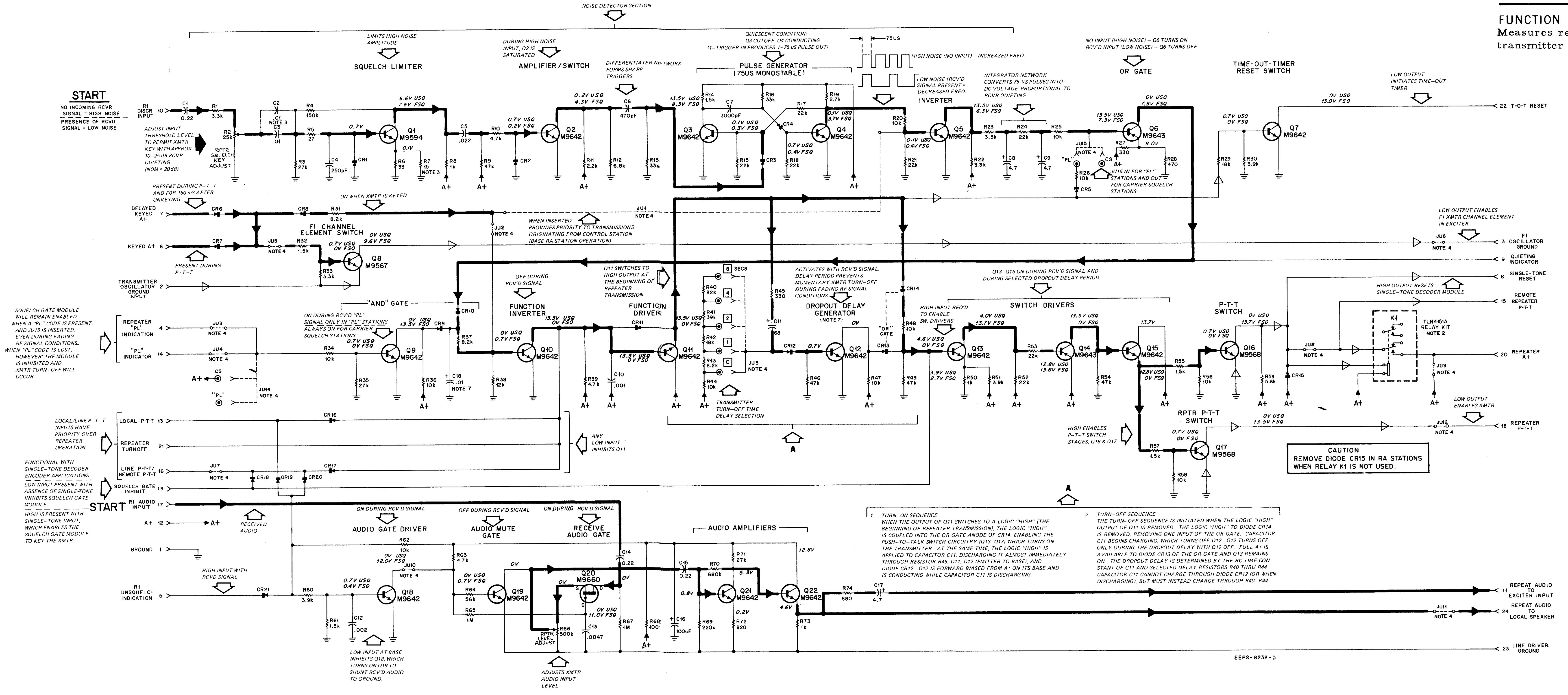


LEGEND:

START = CIRCUIT THEORY MOST EASILY UNDERSTOOD BY BEGINNING AT THIS POINT AND FOLLOWING SIGNAL FLOW.

(open arrow) = THEORY OF OPERATION DATA

(solid arrow) = MAINTENANCE DATA

(heavy line arrow) = PRIMARY SIGNAL FLOW

(light line arrow) = SECONDARY SIGNAL FLOW

SQUELCH GATE MODULE

PARTS LIST SHOWN ON BACK

68P81015E33-G

2/23/76-NPC

PARTS LIST

TLN4662A Squelch Gate Module — PL-1697-B

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		CAPACITOR, fixed: pF: ±10%; 50 V; unl. stated
C1	8-82905G11	0.22 uF
C2, 3	8-82905G01	.01 uF
C4	21-859943	250 ±5%; 500 V
C5	8-82905G02	.022 uF
C6	21-850510	470; 300 V
C7	21-850994	3000 ±5%; 500 V
C8, 9	23-82783B25	4.7 uF; 25 V
C10	21-82187B29	.001 uF; 100 V
C11	23-865594	68 uF; 15 V
C12	21-82428B25	.002 uF ±20%; 500 V
C13	21-83596E23	.0047 uF; 200 V
C14, 15	8-82905G11	0.22 uF
C16	23-82783B04	100 uF ±20%; 25 V
C17	23-82783B25	4.7 uF; 25 V
C18	21-82428B62	.01 uF
		SEMICONDUCTOR DEVICE, diode: (SEE NOTE)
CR1, 2	48-82392B03	silicon
CR3	48-83654H01	silicon
CR4 thru CR8	48-82392B03	silicon
CR9, 10	48-83654H01	silicon
CR11 thru 21	48-82392B03	silicon
CR22, 23	48-83654H01	silicon
		TRANSISTOR: (SEE NOTE)
Q1	48-869594	N-P-N; type M9594
Q2 thru 5	48-869642	N-P-N; type M9642
Q6	48-869643	P-N-P; type M9643
Q7	48-869642	N-P-N; type M9642
Q8	48-869567	N-P-N; type M9567
Q9 thru 13	48-869642	N-P-N; type M9642
Q14	48-869643	P-N-P; type M9643
Q15	48-869642	N-P-N; type M9642
Q16, 17	48-869568	N-P-N; type M9568
Q18, 19	48-869642	N-P-N; type M9642
Q20	48-869660	field-effect; type M9660
Q21, 22	48-869642	N-P-N; type M9642
		RESISTOR, fixed: ±10%; 1/4 W; unl. stated
R1	6-129231	3.3k
R2	18-83083G03	variable: 25k ±30%
R3	6-127806	27k
R4	6-129146	150k
R5	6-131594	27
R6	6-124A13	33 ±5%
R7	6-124A05	15 ±5%
R8	6-129805	1k ±5%
R9	6-128902	47k
R10	6-127804	4.7k
R11	6-128689	2.2k
R12	6-128687	6.8k
R13	6-127807	33k
R14	6-127803	1.5k
R15	6-128685	22k
R16	6-129526	33k ±5%
R17, 18	6-128685	22k
R19	6-128688	2.7k
R20	6-129225	10k
R21	6-128685	22k
R22, 23	6-129231	3.3k
R24	6-128685	22k
R25, 26	6-129225	10k
R27	6-129775	330
R28	6-129709	470 ±5%
R29	6-128904	18k
R30	6-129232	3.9k
R31	6-128686	8.2k
R32	6-127803	1.5k
R33	6-129231	3.3k
R34	6-129225	10k
R35	6-127806	27k
R36	6-129225	10k
R37	6-128686	8.2k
R38	6-129230	12k
R39	6-127804	4.7k
R40	6-129145	82k
R41	6-128903	39k
R42	6-128904	18k
R43	6-128686	8.2k
R44	6-129225	10k
R45	6-129775	330
R46	6-128902	47k
R47, 48	6-129225	10k
R49	6-128902	47k
R50	6-127802	1k
R51	6-129232	3.9k
R52, 53	6-128685	22k
R54	6-128902	47k
R55	6-127803	1.5k
R56	6-129225	10k
R57	6-127803	1.5k
R58	6-129225	10k
R59	6-129433	5.6k
R60	6-129232	3.9k
R61	6-127803	1.5k
R62	6-129225	10k
R63	6-127804	4.7k
R64	6-129242	56k
R65	6-129013	1 m
R66	18-83083G02	variable; 500k ±30%
R67	6-129013	1 m
R68	6-129753	100
R69	6-129147	220k
R70	6-129010	680k
R71	6-127806	27k
R72	6-129432	820
R73	6-127802	1k
R74	6-128599	680

TLN4151A Relay Kit — PL-455-O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
K1	80C84201A01	RELAY, armature: 2 form "C", coil res. 200 ohms

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

TLN8772A Squelch Gate Panel — PL-454-O

	64B83926G01	PANEL, squelch gate
	45B83914G01	GUIDE, printed circuit board: 2 req'd
	43B82721C01	INSULATOR, bushing: 2 req'd
	46B83284H01	PLUG, keying

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

REVISIONS

68P81015E33-G

CHASSIS AND SUFFIX NO.	REF. SYMBOL	CHANGE	LOCATION
TLN4662A-1	CR22, 23	ADDED 48-83654H01	P-T-T SWITCH CIRCUIT
TLN4662A-2	CR9, 10	CHANGED FROM PART NO. 48-82392B03 TO 48-83654H01	GATE CIRCUIT Q9
	C18	ADDED	

STATION CONTROL MODULE

PARTS LIST

TLN4635B Station Control Module PL-3235-O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		CAPACITOR, fixed; uF ±10%; 50 V; unl. stated
C1, 2	23-865136	15 ±20%; 25 V
C3	8-82905G05	0.15
C4	23-865136	15 ±20%; 25 V
C5	21-82187B20	.001; 100 V
C6	23-865136	15 ±20%; 25 V
C7	8-82905G07	0.10
C8	23-865136	15 ±20%; 25 V
C9	8-82905G11	0.22
C10	8-82905G07	0.10
C11, 12	23-865136	15
C13, 14, 15, 17	21-82187B20	.001; 100 V
C16		NOT USED
		SEMICONDUCTOR DEVICE, diode: (SEE NOTE)
CR1, 2, 3, 4	48-82392B03	silicon
CR5	48-82466H13	silicon
CR6 thru 24	48-82392B03	silicon
		LAMP, incandescent:
DS1	65-83554G01	12 volts; 0.19 amp.
		TRANSISTOR: (SEE NOTE)
Q1, 2	48-869642	NPN; type M9642
Q3	48-869539	NPN; type M9539
Q4	48-869642	NPN; type M9642
Q5	48-869660	field-effect; type M9660
Q6	48-869643	PNP; type M9643
Q7	48-869539	NPN; type M9539
Q8	48-869568	NPN; type M9568
Q9, Q16	48-869643	PNP; type M9643
Q10	48-869642	NPN; type M9642
Q11	48-869568	NPN; type M9568
Q12	48-869642	NPN; type M9642
Q13		NOT USED
Q14, Q17	48-869642	NPN; type M9642
Q15, Q18	48-869643	PNP; type M9643
		RESISTOR, fixed: ±10%; 1/4 W unl. stated
R1	6-129146	150k
R2	6-128903	39k
R3	6-129863	390
R4	6-127802	1k
R5	6-129146	150k
R6	6-128903	39k
R7	6-129683	390
R8	6-127802	1k
R9	6-129226	100k
R10	18-83083G03	var: 25k
R11	6-127802	1k
R12	6-127807	33k
R13	6-129144	68k
R14	6-129148	470k
R15	6-129269	1.8k
R16	6-127806	27k
R17	6-129753	100
R18	6-129433	5.6k
R19	6-129013	1 meg
R20	6-129242	56k
R21	6-129013	1 meg
R22	6-129225	10k
R23	6-129226	100k
R24	6-129225	10k
R25	6-128687	6.8k
R26	6-129145	82k
R27	6-127806	27k
R28	6-129235	1.2k
R29	6-129620	560
R30	6-129860	56
R31	6-128902	47k
R32	6-129432	820
R33	6-127800	220
R34	6-129775	330
R35, R63	6-129231	3.3k
R36, R62, R64	6-128599	680
R37, R65	6-129755	10
R38	6-128688	2.7k
R39	6-129225	10k
R40	6-128688	2.7k
R41	6-129225	10k
R42	6-129225	10k
R43	6-129225	10k
R44	6-128689	2.2k
R45	6-129231	3.3k
R46	6-127803	1.5k
R47	6-127803	1.5k
R48, R49, R50		NOT USED
R51, 52	6-128689	2.2k
R53	6-127802	1k
R54, 55	6-129225	10k
R56	6-129231	3.3k
R57	6-128599	680
R58	6-129755	10
R59	6-124A89	47k; ±5%
R60	6-124A71	8.2k; ±5%
R61	6-124C71	8.2k
		SWITCH:
S1	40-83468E01	slide; xmtr.
S2, 3	40-83204B01	slide; "PL" & line disable
		LAMPHOLDER:
XDS1	9-84285C01	female; single contact
		NON-REFERENCED ITEMS
	61-855798	JEWEL, lamp
	43-82721C01	BUSHING, insulator
	43-865080	BUSHING, threaded; 2 req'd
	9-83011H01	female, receptacle; 24 req'd

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

REVISIONS

68P81015E31-F

CHASSIS AND SUFFIX NO.	REF. SYMBOL	CHANGE	LOCATION
TLN4635A	R38	WAS 6-129232 3.9k	Q10 BASE
	R39	WAS 6-128904 18k	Q10 BASE
	R35	6-127805 15k	Q9 BASE
	R36	WAS 6-128902 47k	Q9 BASE
	R48	WAS 6-129687 6.8k	Q13 BASE
	R49	WAS 6-129225 10k	Q13 BASE
TLN4635A-1			
TLN4635A-2	R38	FROM 6-127806, 27k TO 6-128688, 2.7k	Q10 BASE CIRCUIT
	R39	FROM 6-128688, 2.7k TO 6-129225, 10k	
	R40	FROM 6-128902, 47k TO 6-128688, 2.7k	
	CR23	ADDED 48-82392B03	
	C17	ADDED 21-82187B20, .001 uF	KEY INHIBIT INVERTER
	CR22	ADDED 48-82392B03	
	Q15	ADDED 48-869571, M9571	
	R56	ADDED 6-129231, 3.3k	
	R57	ADDED 6-128599, 680	
	R58	ADDED 6-129755, 10	
	C1, 2	FROM 8-82905G11, 0.22 uF TO 23-865136, 15 uF	DISCRIMINATOR AMPLIFIER CIRCUIT
	C1, 2	FROM 23-865136, 15 uF TO 8-82905G11, 0.22 uF	

STATION CONTROL MODULE

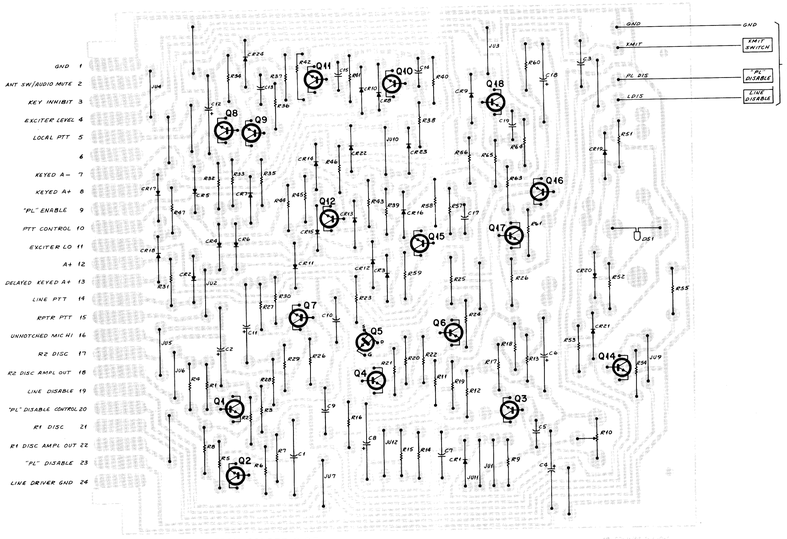
MODEL TLN4635B

FUNCTION

--Integrates control functions from other modules to key the station transmitter.

--Adjusts exciter audio level.

--Amplifies receiver discriminator signals which are used externally.



MAINTENANCE & TROUBLESHOOTING

THIS MODULE MAY BE SERVICED EITHER WHILE CONNECTED TO THE UNIFIED CHASSIS INTERCONNECT BOARD OR WHILE CONNECTED TO SEPARATE EXTERNAL TEST EQUIPMENT. REFER TO THE UNIFIED CHASSIS INTERCONNECT BOARD SERVICING INFORMATION IN THIS MANUAL FOR "SET-UP" DETAILS.

STEP 1. CHECK JUMPERS AS APPLICABLE FOR THE MODE OF OPERATION OF THIS MODULE.

STEP 2. CONNECT POWER AND SIGNAL SOURCES TO THE MODULE AS INDICATED IN THE FOLLOWING CHART.

PIN NO.	CONNECT
1, 11, 24	GROUND
4	AUDIO OSCILLATOR
12	+12 VOLTS DC
16	AC VOLTMETER TO GROUND
2	10 KILOHMS TO 12 VOLTS DC
10	10 KILOHMS TO 12 VOLTS DC
23	10 KILOHMS TO 12 VOLTS DC

NOTE: LEVEL ADJUST CONTROL SHOULD BE FULL CLOCKWISE.

STEP 3. ADJUST AUDIO OSCILLATOR OUTPUT FOR –25 dBm AT PIN 4. PIN 19 SHOULD MEASURE APPROXIMATELY –10 dBm WITH JU1 CONNECTED. IF THIS LEVEL CANNOT BE ACHIEVED CHECK STAGES Q13 AND Q7. IF THE LEVEL IS CORRECT, GROUND PIN 5 OR PIN 19, AND NOTE THAT THE READING DROPS TO 0. IF THIS DOES NOT OCCUR CHECK STAGES Q4 & Q5 AND THEIR ASSOCIATED DRIVER STAGES.

STEP 4. GROUND PINS 14 AND 8. MEASURE THE DC VOLTAGE AT PINS 10 AND 8. EACH SHOULD READ +12 VOLTS. PINS 7 AND 2 SHOULD READ ZERO. IF A VOLTAGE OR GROUND DOES NOT APPEAR AT THE PRESCRIBED LOCATION, CHECK EACH STAGE ASSOCIATED WITH THAT LOCATION.

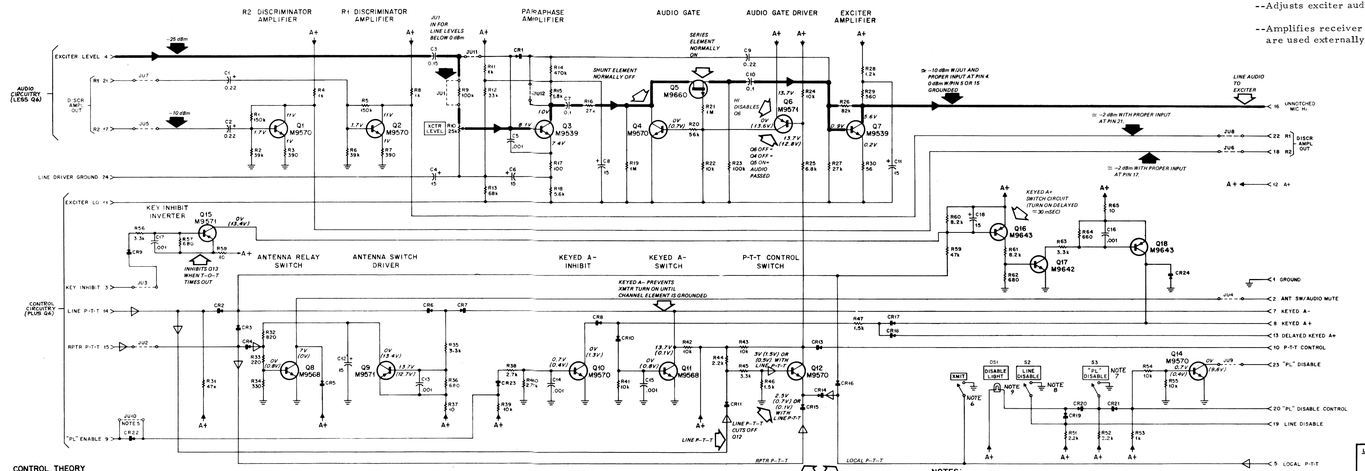
STEP 5. GROUND PIN 15. MEASURE THE DC VOLTAGE AT PINS 7 AND 2. EACH SHOULD READ +12 VOLTS. PIN 10 SHOULD READ ZERO VOLTS.

STEP 6. WITH PIN 15 STILL GROUNDED, APPLY A GROUND TO PIN 14. CHECK FOR +12 VOLTS DC AT PIN 10.

STEP 7. GROUND PIN 20 AND CHECK THE DC VOLTAGE AT PIN 23. THE METER INDICATION SHOULD BE +12 VOLTS. REMOVE THE GROUND FROM PIN 20 AND THE VOLTAGE SHOULD DROP TO ZERO.

STEP 8. APPLY A –10 dBm SIGNAL FROM THE AUDIO OSCILLATOR TO PIN 17 AND MEASURE THE AC VOLTAGE AT PIN 18. THE VOLTMETER SHOULD INDICATE APPROXIMATELY –2 dBm.

STEP 9. APPLY A –10 dBm SIGNAL FROM THE AUDIO OSCILLATOR TO PIN 21 AND CHECK THE AC VOLTAGE ON PIN 22. THE INDICATION SHOULD BE APPROXIMATELY –2 dBm.



CONTROL THEORY

WHEN A P-T-T SIGNAL IS APPLIED TO PIN 5, 14, OR 15 THE FOLLOWING FUNCTIONS OCCUR:

—A LOW IS APPLIED TO THE BASE OF Q16. AFTER A 36 MILLISECOND DELAY, THIS PROVIDES A HIGH OUTPUT TO PIN 8 AND TO Q11 FROM Q17 AND Q18.

—THE DRIVE TO Q11 WILL BE INHIBITED BY Q10 UNTIL A LOW IS APPLIED TO PIN 9, INDICATING AN OSCILLATOR CHANNEL ELEMENT GROUND. THIS PREVENTS A– FROM ENERGIZING THE TRANSMITTER CIRCUITS UNTIL AFTER THE CHANNEL ELEMENT HAS BEEN GROUNDED. Q11 CAN ALSO BE INHIBITED BY A LOW ENTERING ON PIN 3 FROM THE TIME–OUT–TIMER MODULE AT THE END OF A PRE–SET TIME LIMIT.

—THE LOW IS ALSO APPLIED TO THE BASE OF Q9 WHERE IT IS INVERTED AND APPLIED AS A HIGH TO THE BASE OF Q8. IF A LOW IS APPLIED AS REPEATER P–T–T ON PIN 15, Q8 WILL BE INHIBITED. HOWEVER, IF THE LOW IS APPLIED TO EITHER PIN 5 OR 14, Q8 WILL SATURATE AND PROVIDE A LOW TO OPERATE THE ANTENNA SWITCH. SWITCH Q8 DOES NOT TURN OFF THE INSTANT P–T–T LOW IS REMOVED. INSTEAD IT IS KEPT ON FOR THE TIME REQUIRED FOR C12 TO DISCHARGE THROUGH R32 AND R33. THIS ALLOWS THE HIGH LEVEL RF ENERGY TO DECAY BEFORE THE ANTENNA SWITCH REVERTS TO THE RECEIVE CONDITION.

—IF THE P–T–T LOW IS APPLIED TO THE MODULE ON PIN 5 OR 15, A CONDUCTION PATH IS PROVIDED FOR Q12. WHEN Q12 CONDUCTS, A LOW IS APPLIED TO PIN 10. THIS CONTROL CAN BE OVERRIDDEN BY A LINE P–T–T SIGNAL APPLIED TO PIN 14. THIS SIGNAL REACHES THE BASE OF Q12 CAUSING IT TO CUT OFF AND REMOVE THE LOW FROM PIN 10.

WHEN XMIT SWITCH S1 IS ACTUATED, A GROUND IS SUPPLIED TO THE EMITTER OF Q13 WITH THE SAME RESULT AS A LOW APPLIED TO PIN 5 OR 15. ACTUATING LINE DISABLE SWITCH S2 APPLIES A GROUND OUTPUT TO PIN 19. S2 ALSO PROVIDES A GROUND TO THE DISABLE LIGHT DS1, WHICH CAUSES IT TO ILLUMINATE. WHEN "PL" DISABLE SWITCH S3 IS ACTUATED, DS1 ALSO ILLUMINATES AND A LOW IS APPLIED TO THE BASE OF "PL" DISABLE INVERTER Q14. THIS LOW CAUSES Q14 (WHICH IS NORMALLY CONDUCTING) TO CUT OFF AND REMOVES THE "PL" DISABLE SWITCHED GROUND FROM PIN 23. THE STATION SHOULD NOT BE LEFT IN THE LINE OR "PL" DISABLE MODE UNDER NORMAL, OPERATING CONDITIONS.

IN "PRIVATE–LINE" APPLICATIONS, KEYED A– RELEASE IS DELAYED AT THE END OF A TRANSMISSION BY AN INPUT TO PIN 13 FROM THE EXTERNAL "PRIVATE–LINE" REVERSE BURST CIRCUITRY. THIS INPUT MAINTAINS TRANSMITTER KEYING FOR THE DURATION OF THE REVERSE BURST TONE.

RPTR P–T–T FOR LOCAL P–T–T IS PRESENT. THIS DISABLES AUDIO GATE Q4–Q5

NOTES:

1. JU1 IS IN FOR LINE LEVELS BELOW 0 dBm AND REMOVED FOR LINE LEVELS ABOVE 0 dBm.
2. JU2 THRU JU8 IS IN FOR ALL WIRE LINE CONTROL BASE STATIONS AND (R1) REPEATERS.
3. JU8 IS IN FOR "PL" OPERATION AND REMOVED FOR CARRIER SQUELCH OPERATION.
4. VOLTAGES SHOWN IN PARENTHESES ARE NORMALLY MEASURED WHEN FUNCTION IS ACTIVATED. VOLTAGES NOT IN PARENTHESES ARE NORMALLY MEASURED WHEN FUNCTION IS DEACTIVATED.
5. JU10 CUT FOR NON–WIRE LINE REPEATERS.
6. TO KEY THE TRANSMITTER, SLIDE THE XMIT SWITCH TO THE RIGHT (CLOSED) AND HOLD IN THIS POSITION. TO UNKEY THE TRANSMITTER, RELEASE THE SWITCH.
7. WHEN THE PL DISABLE SWITCH IS IN THE NOR–MALLY POSITION (TO THE LEFT), THE "PRIVATE–LINE" FUNCTIONS OF THE STATION IS OPERATIONAL. IN THE ACTUATED POSITION (TO THE RIGHT), THE RECEIVER "PRIVATE–LINE" TONE–CODED SQUELCH CIRCUIT IS DISABLED SO THAT ALL ON–FREQUENCY SIGNALS MAY BE MONITORED.
8. WHEN THE LINE DISABLE SWITCH IS IN THE NOR–MAL POSITION (TO THE LEFT, OPEN), STATION OPERATION CAN BE INITIATED BY REMOTE CONTROL. IN THE ACTUATED POSITION (TO THE RIGHT, CLOSED), REMOTE CONTROLS ARE DISABLED AND THE STATION CAN ONLY BE OPERATED VIA LOCAL CONTROLS.
9. THE DISABLE LIGHT IS ILLUMINATED WHEN EITHER THE PL OR LINE DISABLE SWITCHES ARE ACTUATED.

EEPS-16769-B

LEGEND
= THEORY OF OPERATION DATA
= MAINTENANCE DATA
= PRIMARY SIGNAL FLOW
= SECONDARY SIGNAL FLOW

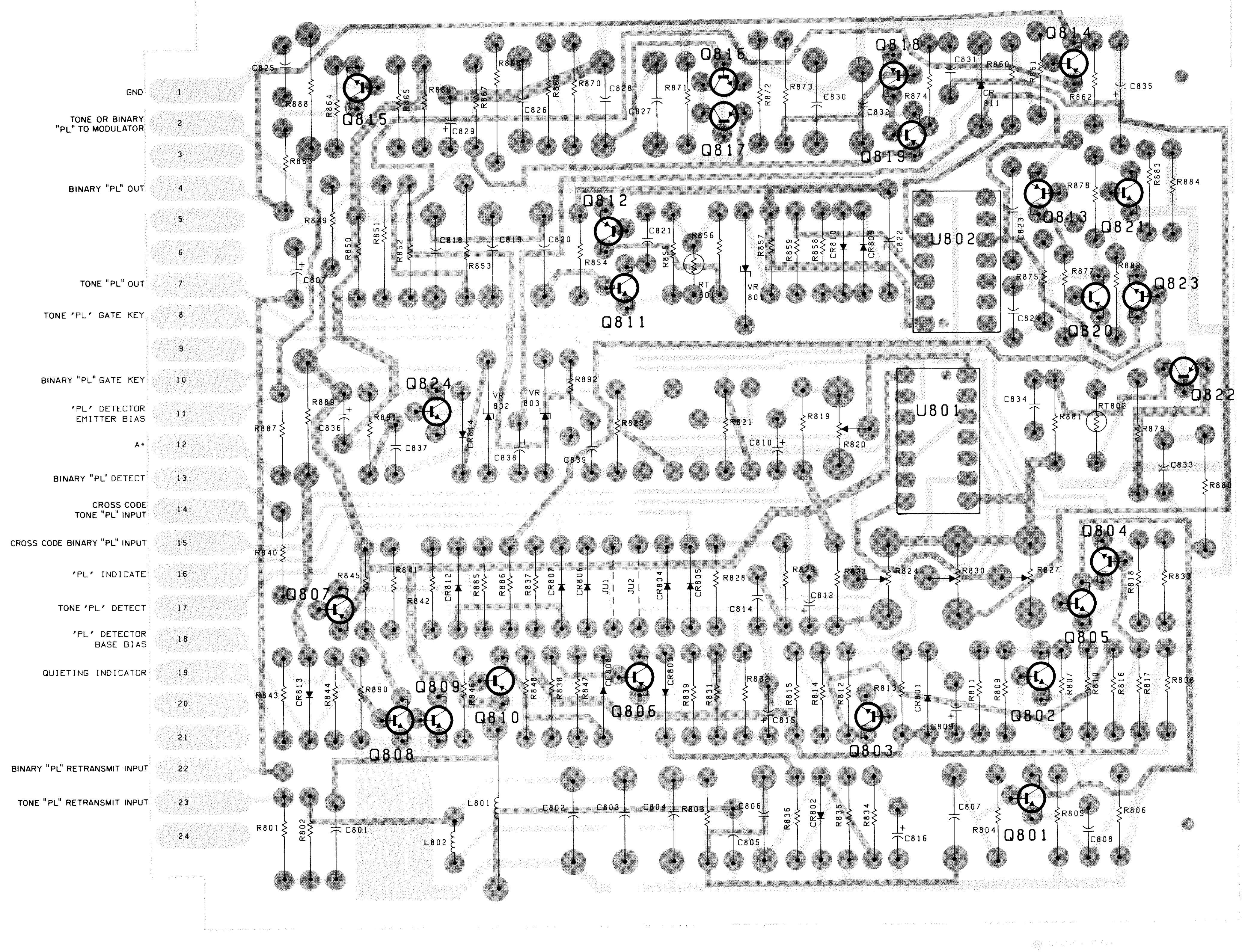
STATION CONTROL MODULE

MASTER DECODER MODULE

MODEL TRN6165A

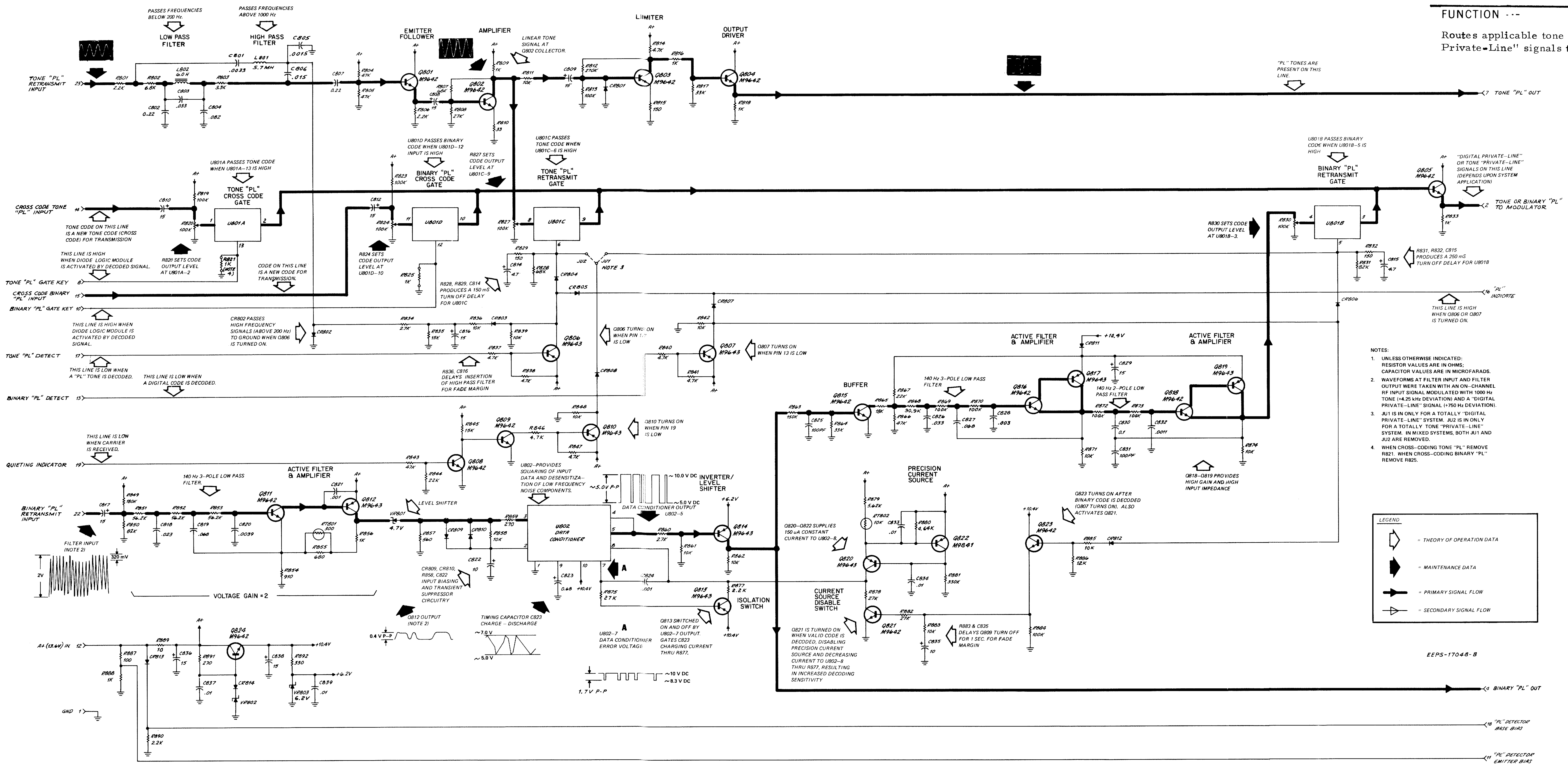
FUNCTION ---

Routes applicable tone "Private-Line" or "Digital Private-Line" signals to transmitter.



GND
TONE OR BINARY "PL" TO MODULATOR
BINARY "PL" OUT
TONE "PL" OUT
TONE "PL" GATE KEY
BINARY "PL" GATE KEY
"PL" DETECTOR EMITTER BIAS
A+
BINARY "PL" DETECT
CROSS CODE TONE "PL" INPUT
CROSS CODE BINARY "PL" INPUT
"PL" INDICATE
TONE "PL" DETECT
"PL" DETECTOR BASE BIAS
QUIETING INDICATOR
BINARY "PL" RETRANSMIT INPUT
TONE "PL" RETRANSMIT INPUT
U801
U802
DL-EEPS-17058-A

SHOWN FROM SOLDER SIDE



LOW PASS FILTER
HIGH PASS FILTER
EMITTER FOLLOWER
AMPLIFIER
LIMITER
OUTPUT DRIVER
TONE "PL" RETRANSMIT INPUT
TONE "PL" OUT
TONE "PL" CROSS CODE GATE
BINARY "PL" CROSS CODE GATE
TONE "PL" RETRANSMIT GATE
BINARY "PL" RETRANSMIT GATE
TONE OR BINARY "PL" TO MODULATOR
ACTIVE FILTER & AMPLIFIER
BUFFER
PRECISION CURRENT SOURCE
INVERTER/ LEVEL SHIFTER
ISOLATION SWITCH
CURRENT SOURCE DISABLE SWITCH
DATA CONDITIONER
VOLTAGE GAIN = 2
BINARY "PL" OUT
"PL" DETECTOR BASE BIAS
"PL" DETECTOR EMITTER BIAS
NOTES:
1. UNLESS OTHERWISE INDICATED: RESISTOR VALUES ARE IN OHMS; CAPACITOR VALUES ARE IN MICROFARADS.
2. WAVEFORMS AT FILTER INPUT AND FILTER OUTPUT WERE TAKEN WITH AN ON–CHANNEL RF INPUT SIGNAL MODULATED WITH 1000 Hz TONE (+4.25 kHz DEVIATION) AND A "DIGITAL PRIVATE–LINE" SIGNAL (+750 Hz DEVIATION).
3. JU1 IS IN ONLY FOR A TOTALLY "DIGITAL PRIVATE–LINE" SYSTEM. JU2 IS IN ONLY FOR A TOTALLY TONE "PRIVATE–LINE" SYSTEM. IN MIXED SYSTEMS, BOTH JU1 AND JU2 ARE REMOVED.
4. WHEN CROSS–CODING TONE "PL" REMOVE R821. WHEN CROSS–CODING BINARY "PL" REMOVE R825.
LEGEND
= THEORY OF OPERATION DATA
= MAINTENANCE DATA
= PRIMARY SIGNAL FLOW
= SECONDARY SIGNAL FLOW
EEPS-17046-B

MASTER DECODER MODULE

PARTS LIST

TRN6165A Master Decoder Module PL-3419-A

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		CAPACITOR, fixed:
C801	21-82187B25	.0033 uF ±10%; 500 V
C802, 807	8-82905G11	0.22 uF ±10%; 50 V
C803	8-82905G08	.033 uF ±10%; 50 V
C804	8-82905G45	.082 uF ±10%; 50 V
C805	21-82187B18	.0015 uF ±10%; 100 V
C806	8-82905G10	.015 uF ±10%; 50 V
C808, 809, 810, 812, 816, 817, 829, 836, 838	23-84538G04	15 uF ±20%; 20 V
C814, 815	23-84538G02	4.7 uF ±20%; 20 V
C818	8-82905G39	.023 uF ±5%; 50 V
C819, 827	8-83813H23	.068 uF ±5%; 50 V
C820	8-83813H19	.0039 uF ±5%; 50 V
C821, 824	21-82187B20	.001 uF ±10%; 200 V
C822, 835	23-84762H03	10 uF ±10%; 20 V
C823	23-82783B48	0.68 uF ±5%; 35 V
C828	21-850994	.003 uF ±5%; 500 V
C830	8-82905G14	0.1 uF ±5%; 200 V
C831, 825	21-83798B01	100 pF ±5%; 200 V
C832	21-83003G01	.0011 uF ±5%; 100 V
C833, 834, 837, 839	21-82428B59	.01 uF +80-20%; 200 V
C826	8-83813H34	.033 uF ±5%; 100 V
		DIODE: (SEE NOTE)
CR801 thru 808, 812, 813, 814	48-83654H01	planar; silicon
CR809, 810	48-84616A01	hot-carrier
CR811	48-82466H13	rectifier; silicon
		COIL, RF:
L801	24-864763	choke; 5.7 mH
L802	24-84003A01	choke; 6 H
		TRANSISTOR: (SEE NOTE)
Q801 thru 805, 808, 809, 811, 815, 816, 818, 821, 823, 824	48-869642	NPN; type M9642
Q806, 810, 812, 813, 814, 817, 819, 820, 807	48-869643	PNP; type M9643
Q822	48-869841	PNP; type M9841
		RESISTOR, fixed: ±10%; 1/4 W; unless otherwise stated
R801, 806, 890	6-124C57	2.2k
R802	6-124C69	6.8k
R803	6-124C61	3.3k
R804, 805, 843	6-124C89	47k
R807, 828	6-124C93	68k
R808, 878, 882, 875	6-124C83	27k
R809, 818, 833, 821, 825	6-124C49	1k
R810	6-124C13	33
R811, 836, 839, 842, 848, 858, 861, 862, 883	6-124A73	10k
R812	6-124B08	270k ±5%
R813	6-124A97	100k ±5%
R814	6-124A65	4.7k ±5%
R815	6-124A29	150 ±5%
R816, 856	6-124A49	1k ±5%
R817	6-124A85	33k ±5%
R819, 823, 884	6-124C97	100k
R820, 824, 827, 830	18-83083G01	variable; 100k
R829, 832	6-124C29	150
R831	6-124C95	82k
R834, 860	6-124C59	2.7k
R835, 845	6-124C77	15k
R837, 838, 840, 841, 846, 847	6-124C65	4.7k
R844	6-124C81	22k
R849	6-124B04	180k ±5%
R850	6-124A95	82k ±5%
R851, 852, 853	6-13755D64	56.2k ±1%
R854	6-124A48	910 ±5%
R855	6-124A45	680 ±5%
R857	6-124C43	560
R859, 891	6-124C35	270
R863	6-124D02	150k
R864	6-124C85	33k
R865	6-124A79	18k ±5%
R866	6-124A89	47k ±5%
R867	6-124A81	22k ±5%
R868	6-13755D84	90.9k ±1%
R869, 870, 872, 873	6-13755D88	100k ±1%
R871, 874, 885	6-124A73	10k ±5%
R877	6-124A57	2.2k ±5%
R879	6-13755C67	5.62k ±1%
R880	6-13755C59	4.64k ±1%
R881	6-124B10	330k ±5%
R886	6-124A75	12k ±5%
R887	6-124A25	100 ±5%
R888	6-125A49	1k ±5%; 1/2 W
R889	6-125C01	10; 1/2 W
R892	6-124C37	330
		THERMISTOR
RT801	6-865641	300
RT802	6-82696B01	10k
		INTEGRATED CIRCUIT: (SEE NOTE)
U801	51-82822F12	type 4016AE
U802	51-84320A55	type LM565
		VOLTAGE REGULATOR
VR801	48-82256C03	Zener type; 4.7 V
VR802	48-82256C34	Zener type; 11 V
VR803	48-83696E07	Zener type; 6.2 V
		NON-REFERENCED ITEM
	45-83914G01	GUIDE, card: 2 req'd.

NOTE:
Replacement diodes, transistors, and integrated circuits must be ordered by Motorola part number for optimum performance.

TONE "PRIVATE-LINE" FOUR-USER CONTROL MODULE

MODEL TLN1685A

FUNCTION -

Decodes "Private-Line" tone codes and provides a low output as long as the code is received.

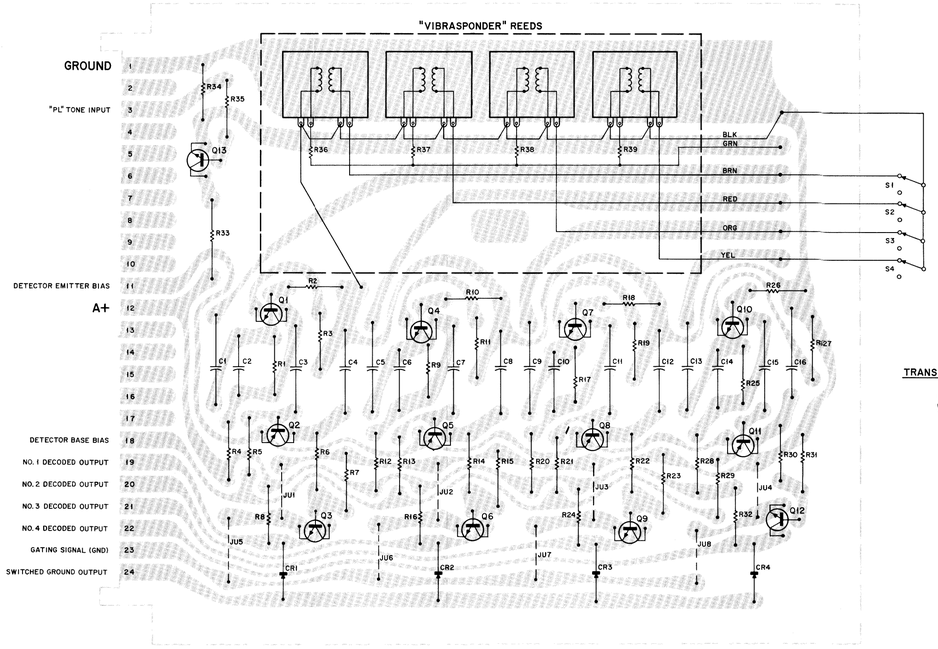
PARTS LIST

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
TLN5804A Four-Tone Decoder Board		PL-2750-O
		CAPACITOR, fixed:
C1, 3, 5, 7, 9, 11, 13, 15	23K865137	4.7 uF ±20%; 25 v
C2, 6, 10, 14	8D82905G07	.002 uF ±10%; 50 v
C4, 8, 12, 16	23D82783B08	1.0 uF ±20%; 35 v
		SEMICONDUCTOR DEVICE, diode: (SEE NOTE)
CR1, 2, 3, 4	48C82392B03	silicon (SG318Z)
		TRANSISTOR: (SEE NOTE)
Q1, 3, 4, 6, 7, 9, 10, 12, 13	48R869570	N-P-N; type M9570
Q2, 5, 8, 11	48R869571	P-N-P; type M9571
		RESISTOR, fixed: ±10%; 1/4 w; unl. stated
R1, 9, 17, 25	6S129144	68K
R2, 5, 10, 13, 18, 21, 26, 29	6S127806	27K
R3, 11, 19, 27	6S124A13	33 ±5%
R4, 12, 20, 28	6S129805	1K ±5%
R6, 7, 8, 14, 15, 16, 22, 23, 24, 30, 31, 32	6S129225	10K
R33	6S10053A26	33 ±5%; 1/2 W
R34	6S127802	1K
R35	6S129753	100
R36 thru 39	6S129982	5.6K ±5%
NON-REFERENCED ITEMS		
	9C83035A02	SOCKET, "Vibrasponder": 4 used
	9B83011H01	CONNECTOR, receptacle: female; 12 used

TLN8782A Four-Tone Decoder Panel		PL-292-O
S1, 2, 3, 4	40B83204B01	SWITCH, slide: dpdt

NOTE:

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



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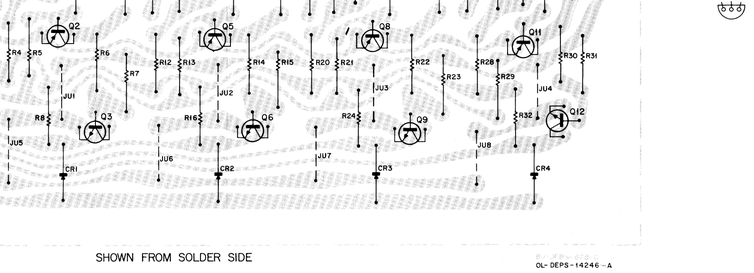
TRANSISTOR DETAIL



NOTES

1. JUMPERS JU5 THROUGH JU8 ALLOW "AND" GATING OF "PL" DECODER WITH SINGLE-TONE DECODER. JUMPERS JU1 THROUGH JU4 PROVIDE OPERATION WITHOUT SINGLE-TONE DECODER.
2. VOLTAGE READINGS IN PARENTHESES ARE LEVELS PRESENT WHEN THAT PARTICULAR CIRCUIT IS DECODING.
3. TESTING POINT ONLY.
4. UNLESS OTHERWISE STATED
   ALL RESISTOR VALUES ARE IN OHMS (K = 1000).
   ALL CAPACITOR VALUES ARE IN MICROFARADS.

MODEL TABLE

MODEL	SUFFIX	KIT	SUFFIX	DESCRIPTION
TLN1685A FOUR-USER CONTROL MODULE		TLN5804A		FOUR-TONE DECODER CIRCUIT BOARD
		TLN8782A		FOUR-TONE DECODER PANEL

EPS-14249-O

OL-DEPS-14246-A

TONE "PRIVATE-LINE" FOUR-USER CONTROL MODULE / DIGITAL PRIVATE-LINE" FOUR-USER CONTROL MODULE AND "DIGITAL PRIVATE-LINE" TWO-USER CONTROL MODULE

68P81026E83-A
2/23/76-NPC

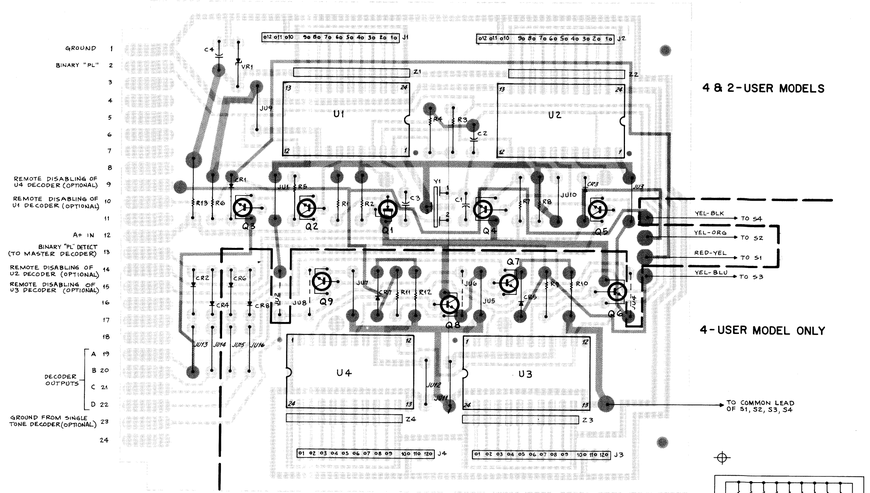
"DIGITAL PRIVATE-LINE" FOUR-USER CONTROL MODULE
MODEL TRN6166A

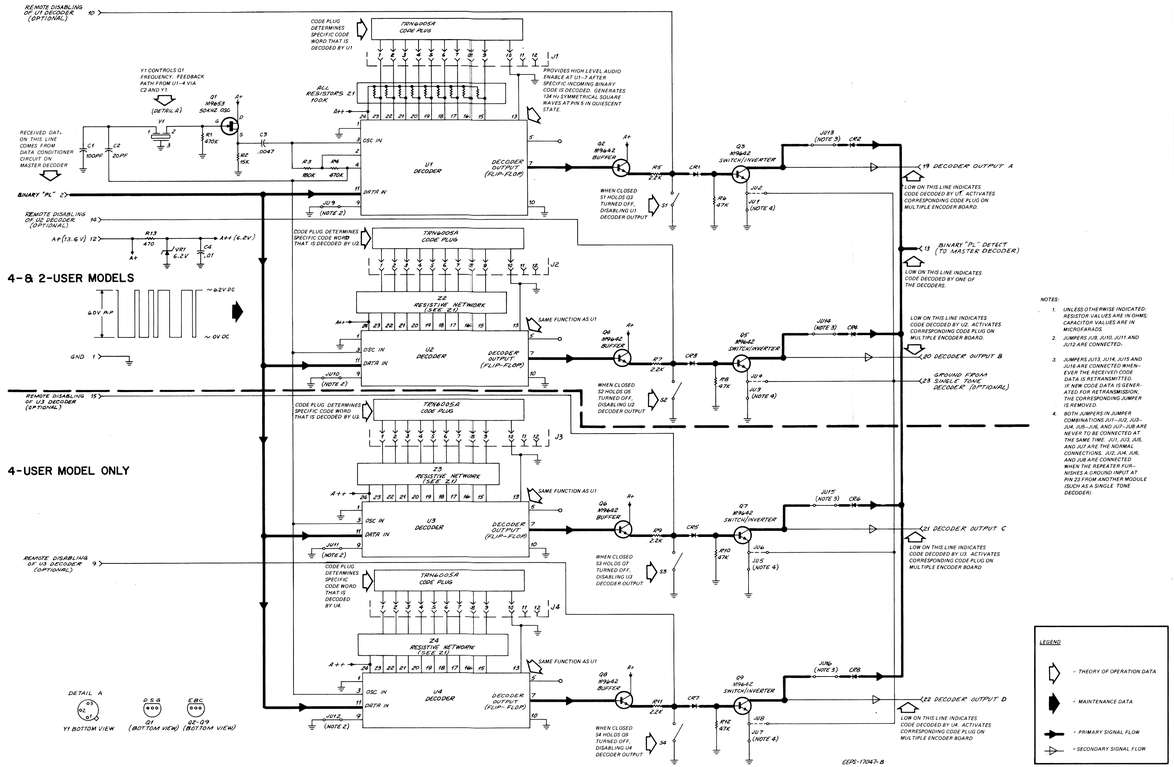
AND

"DIGITAL PRIVATE-LINE" TWO-USER CONTROL MODULE
MODEL TRN6326A

FUNCTION

Decodes "Digital Private-Line" codes and provides a low output as long as the code is received.





REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION

PARTS LIST

TRN6326A Two-User Control Module
TRN6166A Four User Control Module (NOTE III) PL-3460-A

		CAPACITOR, fixed:
C1	21-83798B01	100 pF ±5%; 200 V
C2	21-82610C22	20 pF ±5%; 200 V
C3	21-82428B09	.0047 uF ±10%; 100 V
C4	21-82428B59	.01 uF +80-20%; 200 V
		DIODE: (SEE NOTE I)
CR1 thru 4	48-836541D01	silicon
CR5[6] thru 8[6]	48-836541D01	silicon
		SOCKET
J1, 2	9-82071K01	code plug
J3[6], 4[6]	9-82071K01	code plug
		TRANSISTOR: (SEE NOTE I)
Q1	48-869653	field-effect type M9653
Q2 thru 5	48-869642	NPN; type M9642
Q6[6] thru 9[6]	48-869642	NPN; type M9642
		RESISTOR, fixed; ±5%; 1/4 W; unless otherwise stated
R1, 4	6-124B14	470k
R2	6-124A77	15k
R3	6-124B04	180k
R5, 7, 9[6], 11[6]	6-124C57	2.2k ±10%
R6, 8, 10[6], 12[6]	6-124C89	47k ±5%
R13	6-125C41	470 ±10%; 1/2 W
		SWITCH:
S1, 2, 3[6], 4[6]	40-83204B01	spst; slide
		INTEGRATED CIRCUIT: (SEE NOTE I)
U1, 2, 3[6], 4[6]	51-84267A82	type M6782
		VOLTAGE REGULATOR: (SEE NOTE I)
VR1	48-83696E07	Zener type; 6.2 V
		CRYSTAL: (SEE NOTE II)
Y1	48-82003K01	50 kHz
		NETWORK:
Z1, 2, 3[6], 4[6]	51-82142K02	resistor

NOTE I. For optimum performance, diodes, transistors, and integrated circuits must be ordered by Motorola part numbers.

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

NOTE III. Components referenced with an asterisk (*) are used only with the 4-user control module. All other components are used with both modules.

68P81026E81-A
2/23/76-NPC

TIME-OUT TIMER

MODEL TLN4636A

FUNCTION-

Limits period of time the transmitter may be keyed.

MAINTENANCE & TROUBLESHOOTING

This module may be serviced either while connected to the station or while connected to external test equipment as described in the Control Chassis section of this manual. The following procedure is written for out-of-station servicing but is functionally applicable to in-station servicing also.

Step 1. Remove the module from the chassis.

Step 2. Connect a 13.5 V DC power supply to the module so ground (-) is connected to pin 1 and the positive (+) terminal is connected to pin 12. Turn the power supply on.

Step 3. Connect a 5k-ohm resistor between pins 4 and 12.

Step 4. Disconnect both time selection jumpers and place them so they will not contact any portion of the circuitry.

Step 5. Connect a temporary jumper between pins 5 and pin 1.

Step 6. Refer to the schematic diagram and chart and note the desired timing cycle for different stages of the module. Use a stop-watch to compare the desired timing of highs and lows on a VTVM. Timing should be accurate to within ±10%.

Step 7. Move the temporary jumper between pins 6 and 1 and repeat step 6.

Step 8. Move the temporary jumper to pins 22 and 1 and repeat step 6.

Step 9. If a defective stage is not located, check connections and continuity of plating for opens and shorts.

CIRCUIT DESCRIPTION

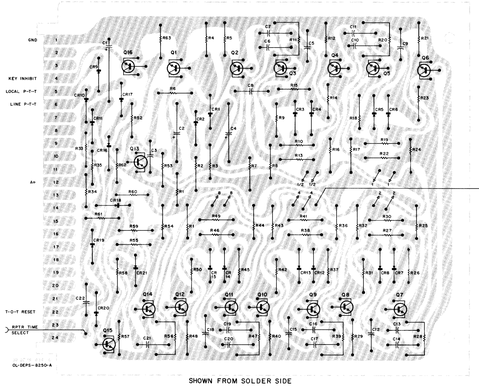
The timing function is started by either a line or local P-T-T signal, or by a reset signal from the squelch gate module. These starting signals are switched grounds which are applied to the base of reset switch Q12 through a diode or gate formed by CR9 and CR10, and another diode or gate, CR16 and CR17. When any one of these grounds reach the base of Q13, the stage is turned on, which causes switched A+ to be applied to all other stages of the Time-Out Timer module.

Application of switched A+ starts the master timing generator, which is an astable multivibrator (formed by C1 and Q2) that operates at a rate of one cycle every 15 seconds. The transistors and capacitors in this stage are specially selected for low leakage and must be replaced by low leakage components to retain the 15-second cycle. As shown in the waveform chart. The output section starts in the saturated condition and reverses every 7-1/2 seconds.

The five time multipliers are bistable multivibrators which actually perform frequency division. However, when dealing with low frequencies it is more convenient to refer to the time or period of one cycle; by halving the frequency, the period is doubled. Each bistable starts with its output section saturated and its input section in cutoff, and reverses this condition only by application of a negative-going signal. This initially produces a low level at the time multiplier outputs. The first time multiplier must be held in this condition until the timing generator has stabilized. This is accomplished by applying a positive pulse to the cathode of CR4 at the instant the switched A+ is turned on. This pulse reaches CR4 through C8 and R15 to counteract a negative pulse which may be produced by the timing generator when it is first turned on. As the signal from the timing generator goes through the first complete cycle (goes to a high level and then returns to a low level) the condition of the time multiplier #1 is reversed such that Q3 is driven into saturation and the output section Q4 is cut off. This results in the output of time multiplier #1 going high. No other changes occur until the timing generator completes its second cycle, which causes time multiplier #1 to reset to the initial state. This reset produces a negative-going input to the time multiplier #2, causing it to reverse states. This process continues through all five time multipliers with each one producing an output with a period which is exactly twice the period of the input. Once the desired time limit on continuous transmission has been determined, jumpers are connected to the output of the appropriate time multiplier. Different transmission times may be selected for base station or repeater functions. These jumpers route the negative-going multiplier output to the time-out storage multivibrator.

The time-out storage stage, formed by Q14 and Q15, is also a bistable multivibrator which acts as a driver for the inhibit switch, Q16. Assume that the timing sequence was initiated by a line or local P-T-T signal and that the base station function is connected to "Time-Out" after four minutes. Also assume that the repeater function is jumpered to time out after only two minutes. The low level signal from the two-minute output is prevented from reversing the condition of the time-out storage bistable by the application of A+ through R34 and diode CR19 to the cathode of CR20. This logic high counteracts the effect of the negative-going pulse. When the period reaches four minutes, the fourth multiplier returns to its normal state and produces a low level output. This output is coupled through C21 as a negative pulse. This negative pulse is applied to the base of Q15 through CR21 and causes the storage bistable to change states. When this occurs, Q15 is driven into cutoff, causing the storage output to go high. This high level causes Q16 to go into saturation and provides a switched ground output.

The switched ground output turns off the transmitter. When the input is removed from the time-out timer reset stage, this stage cuts off and switched A+ is removed from all stages. As a result, the switched ground output is removed. When the input is again applied, the timer is instantly reset and another timing cycle starts.



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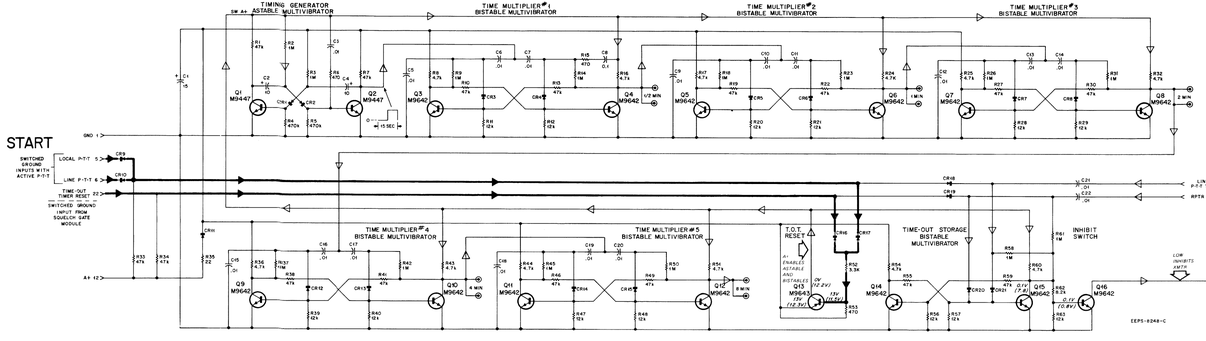
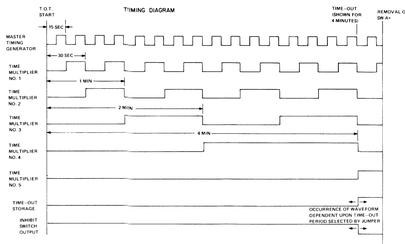




NOTES:
1. UNLESS OTHERWISE STATED:
   RESISTOR VALUES ARE IN OHMS;
   CAPACITOR VALUES ARE IN MICROFARADS
2. VOLTAGES SHOWN IN PARENTHESES ARE NORMALLY MEASURED DURING TRANSMIT TIME

LEGEND

START — CIRCUIT THEORY MUST FASTLY UNDERSTOOD BY BEGINNING AT THIS POINT AND FOLLOWING SIGNAL FLOW

THEORY OF OPERATION DATA

MAINTENANCE DATA

PRIMARY SIGNAL FLOW

SECONDARY SIGNAL FLOW

PARTS LIST SHOWN ON BACK

68P81015E41-E

TIME-OUT TIMER

REVISIONS

63P81015E41-E

BOARD AND SUFFIX NO.	REF. SYMBOL	CHANGE	LOCATION
TLN4636A	CR1	WAS 48-82392B03	Q1 BASE
	CR2	WAS 48-82392B03	Q2 BASE
	CR3	WAS 48-82392B03	Q3 BASE
	CR4	WAS 48-82392B03	Q4 BASE
	CR5	WAS 48-82392B03	Q5 BASE
	CR6	WAS 48-82392B03	Q6 BASE
	CR7	WAS 48-82392B03	Q7 BASE
	CR8	WAS 48-82392B03	Q8 BASE
	CR12	WAS 48-82392B03	Q9 BASE
	CR13	WAS 48-82392B03	Q10 BASE
	CR14	WAS 48-82392B03	Q11 BASE
	CR15	WAS 48-82392B03	Q12 BASE
	CR20	WAS 48-82392B03	Q15 BASE
	CR21	WAS 48-82392B03	Q15 BASE
TLN4636A-1	R52	FROM 6-129269, 1.8k TO 6-124C61, 3.3k	Q13 BASE

PARTS LIST

TLN4636A Time-Out-Timer Board — PL-1695-C

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		CAPACITOR, fixed: uF ±10%; 25 V; unl stated
C1	23-865136	15 ±20%; 20 V
C2	23-82783B27	10
C3	21-82428B35	.01 +80-20%; 500 V
C4	23-82783B27	10
C5, 6, 7	21-82428B35	.01 +80-20%; 500 V
C8	8-82905G07	0.1; 50 V
C9 thru 22	21-82428B35	.01 +80-20%; 500 V
		SEMICONDUCTOR DEVICE, diode: SEE NOTE
CR1 thru 8, 12 thru 15, 20, 21	48-83654H01	silicon
CR9, 10, 11, 16, 17, 18, 19	48-82392B03	silicon
		TRANSISTOR: SEE NOTE
Q1, 2	48-869447	N-P-N; type M9447
Q3 thru 12	48-869642	N-P-N; type M9642
Q13	48-869643	P-N-P; type M9643
Q14, 15, 16	48-869642	N-P-N; type M9642
		RESISTOR, fixed: ±10%; 1/4 W; unl stated
R1	6-128902	47k
R2, 3	6-129189	1 meg ±5%
R4, 5	6-129148	470k
R6	6-127801	470
R7	6-128902	47k
R8	6-127804	4.7k
R9	6-129013	1 meg
R10	6-128902	47k
R11, 12	6-129230	12k
R13	6-128902	47k
R14	6-129013	1 meg
R15	6-127801	470
R16, 17	6-127804	4.7k
R18	6-129013	1 meg
R19	6-128902	47k
R20, 21	6-129230	12k
R22	6-128902	47k
R23	6-129013	1 meg
R24, 25	6-127804	4.7k
R26	6-129013	1 meg
R27	6-128902	47k
R28, 29	6-129230	12k
R30	6-128902	47k
R31	6-129013	1 meg
R32	6-127804	4.7k
R33, 34	6-128902	47k
R35	6-124B09	22
R36	6-127804	4.7k
R37	6-129013	1 meg
R38	6-128902	47k
R39, 40	6-129230	12k
R41	6-128902	47k
R42	6-129013	1 meg
R43, 44	6-127804	4.7k
R45	6-129013	1 meg
R46	6-128902	47k
R47, 48	6-129230	12k
R49	6-128902	47k
R50	6-129013	1 meg
R51	6-127804	4.7k
R52	6-124C61	3.3k
R53	6-127801	470
R54	6-127804	4.7k
R55	6-128902	47k
R56, 57	6-129230	12k
R58	6-129013	1 meg
R59	6-128902	47k
R60	6-127804	4.7k
R61	6-129013	1 meg
R62	6-128686	8.2k
R63	6-129230	12k

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
NON-REFERENCED ITEMS:		
	45-83914C01	GUIDE, card; 2 req'd
	9-83011H01	RECEPTACLES, female; 9 req'd.
	39-10184A30	TERMINALS, male; 10 req'd.
	43-865080	BUSHING; 2 req'd
	39-10184A24	TERMINAL, female; 2 req'd.
	64-84937D01	PANEL, time-out timer

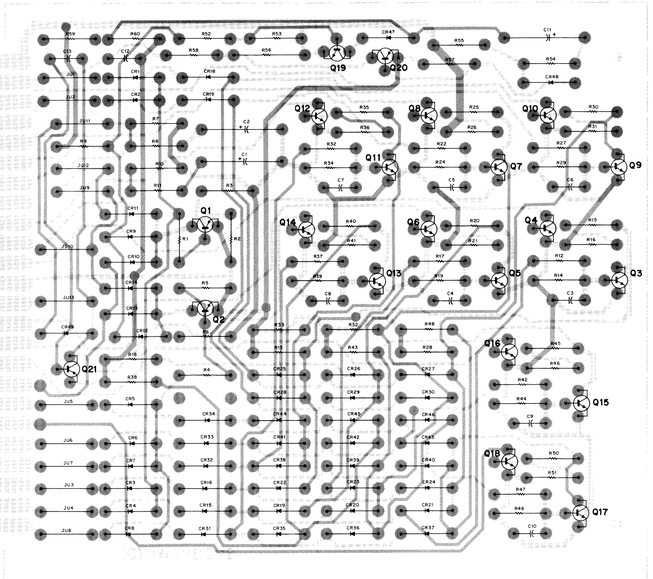
NOTE:
Replacement diodes and transistors must be ordered only by Motorola part number for optimum performance.

DIODE LOGIC MODULE

MODEL TRN6327A

FUNCTION–

Adapts community repeater for cross coding (transmits a different PL code than was received). Provides a logic interface which accepts a low logic level from any one of eight tone or binary "Private-Line" decoders and provides a logic low to activate a corresponding tone or binary "Private-Line" encoder.



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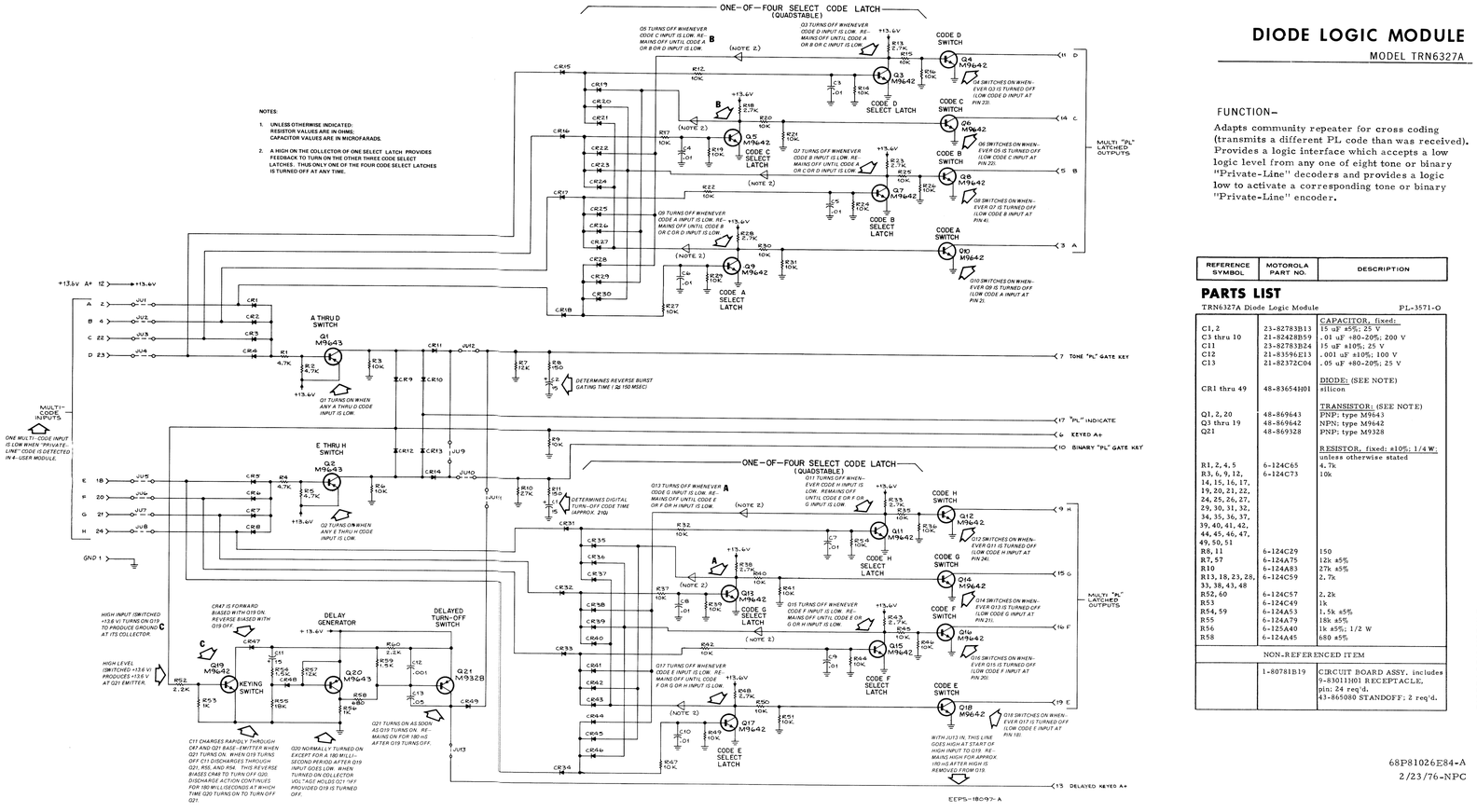
SOLDER SIDE 80-DEPS-18098-A
COMPONENT SIDE 80-DEPS-18099-A
OL-DEPS-18100-A



REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION

PARTS LIST

TRN6327A Diode Logic Module PL-3571-O

		CAPACITOR, fixed:
C1, 2	23-82783B13	15 uF ±5%, 25 V
C3 thru 10	21-82428B59	.01 uF +80-20%, 200 V
C11	23-82783B24	15 uF ±10%, 25 V
C12	21-83596E13	.001 uF ±10%, 100 V
C13	21-82372C04	.05 uF +80-20%, 25 V
		DIODE: (SEE NOTE)
CR1 thru 49	48-83654H01	silicon
		TRANSISTOR: (SEE NOTE)
Q1, 2, 20	48-869643	PNP; type M9643
Q3 thru 19	48-869642	NPN; type M9642
Q21	48-869328	PNP; type M9328
		RESISTOR, fixed: ±10%; 1/4 W; unless otherwise stated
R1, 2, 4, 5	6-124C65	4.7k
R3, 6, 9, 12, 14, 15, 16, 17, 19, 20, 21, 22, 24, 25, 26, 27, 29, 30, 31, 32, 34, 35, 36, 37, 39, 40, 41, 42, 44, 45, 46, 47, 49, 50, 51	6-124C73	10k
R8, 11	6-124C29	150
R7, 57	6-124A75	12k ±5%
R10	6-124A83	27k ±5%
R13, 18, 23, 28, 33, 38, 43, 48	6-124C59	2.7k
R52, 60	6-124C57	2.2k
R53	6-124C49	1k
R54, 59	6-124A53	1.5k ±5%
R55	6-124A79	18k ±5%
R56	6-125A40	1k ±5%; 1/2 W
R58	6-124A45	680 ±5%
		NON-REFERENCED ITEM
	1-80781B19	CIRCUIT BOARD ASSY. includes 9-83011H01 RECEPTACLE, pin: 24 req'd. 43-865080 STANDOFF: 2 req'd.

DIODE LOGIC MODULE

68P81026E84-A
2/23/76-NPC

MULTIPLE TONE "PRIVATE-LINE" ENCODER MODULE

MODEL TLN5744A

FUNCTION -

Generates a tone "Private-Line" signal to be transmitted in community repeaters where cross-coding is required. A low input from a diode logic module determines which of four tone oscillators is enabled.

1. FUNCTIONAL OPERATION

When a switched ground is received from the diode logic module, one of the PL tone oscillators is enabled. A fast start feature provides usable output from the selected oscillator within 30 milliseconds. A reverse burst feature reverses the phase of the generated PL tone for approximately 130-180 milliseconds after the transmitter is unkeyed. This dampens the "Vibrasponder" resonant reeds in listening receivers and eliminates receiver squelch tail noise bursts at the end of each message.

2. CIRCUIT DESCRIPTION

2.1 Operation of all four PL tone oscillators is identical. Therefore, the following theory describes only the circuit operation of PL tone oscillator No. 1, and is applicable to the other three. Refer to Figure 1 and the schematic diagram.

2.2 The tone oscillator consists basically of a two-stage oscillator (Q101 and Q104), a turn-off stage (Q103), and tone amplifiers (Q904 and Q905). The frequency-determining element of the oscillator is "Vibrasender" resonant reed E101 (an electromechanical equivalent of a parallel-tuned high Q tank circuit). The output stage of the oscillator Q104 provides a tone from both its emitter and its collector. Tones from the two outputs are of opposite phase, with the Q104 emitter supplying the PL tone during a transmission and the Q104 collector supplying the out-of-phase tone (reverse burst) at the end of a transmission. These tone outputs are fed into separate amplifiers (Q901 and Q903) where they are amplified to a usable level before routing to the PL tone gate and reverse gate.

2.3 Passage of tones from one or the other outputs to the base of tone amplifiers Q904 and Q905 is controlled by the PL tone gate and the reverse burst gate. During a transmission, the PL tone gate is open, passing the tones from the emitter output of Q104, through amplifier Q903, to tone amplifiers Q904 and Q905. From the collector of Q904 the tone is fed into the transmitter modulator. (At this time, the reverse burst gate is closed.) When the operator releases his push-to-talk switch at the end of a transmission, the PL tone gate closes, terminating transmission of the in-phase "Private-Line" tone. Simultaneously the reverse burst gate opens, passing the out-of-phase tone signal from Q104 through amplifier Q901 to tone amplifiers Q904 and Q905. Q902 is an inverter stage that feeds the reverse burst switch (Q906).

2.4 The oscillator turn-off circuit (Q103), connected across the secondary winding of the "Vibrasender" resonant reed coil, shorts that winding so as to disable the tone output of Q101 whenever ground is removed from the oscillator turn-on point (pin 2).

2.5 The purpose of the Q102 pulse circuit is to "fast-start" the tone oscillator to permit faster receiver PL squelch action thereby speeding up system operation. The pulse circuit increases the PL tone oscillator rise time to a usable level in approximately 30 milliseconds instead of the usual 2-1/2 seconds. This is accomplished by pulsing the primary input of the tone oscillator "Vibrasender" resonant reed with a 3 millisecond pulse which causes the tone oscillator to "fast-start".

3. MAINTENANCE

3.1 RECOMMENDED TEST EQUIPMENT

a. Motorola SLN6221A "Private-Line" Tone Generator--used for testing "Vibrasender" resonant reed.

b. Motorola solid state ac voltmeter--used for tone level measurements.

c. General purpose oscilloscope--valuable for signal tracing and locating sources of distortion.

d. Motorola solid state dc multimeter --used for dc voltage measurement.

e. Motorola S1324A Digital Frequency Meter or S1325A Digital Frequency and Deviation Meter--used for measuring PL tone frequency.

3.2 PERFORMANCE TEST

Measure frequency deviation of the transmitter in which the encoder is installed. With the transmitter keyed and PL tone modulation (only), deviation should read ±0.5 to ±1.0 kHz.

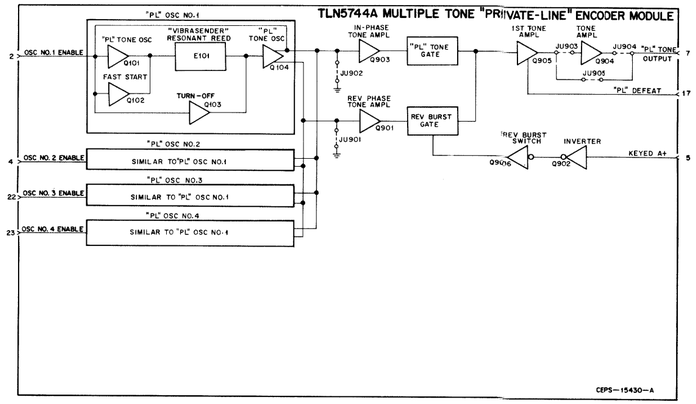


Figure 1.
Encoder Module Functional Diagram

3.3 TROUBLESHOOTING

Step 1. If no deviation is measured, the trouble may lie in the tone oscillator or tone output circuit. The trouble may be isolated by the following steps.

a. Check A+ input to encoder.

b. Check ac signal voltage at collector of Q903.

c. If signal is present, check Q904.

d. If no signal is present any component in the oscillator loop could cause the trouble. Check the "Vibrasender" resonant reed in the "Private-Line" tone generator.

e. If the tone generator does not produce an output signal the reed is defective.

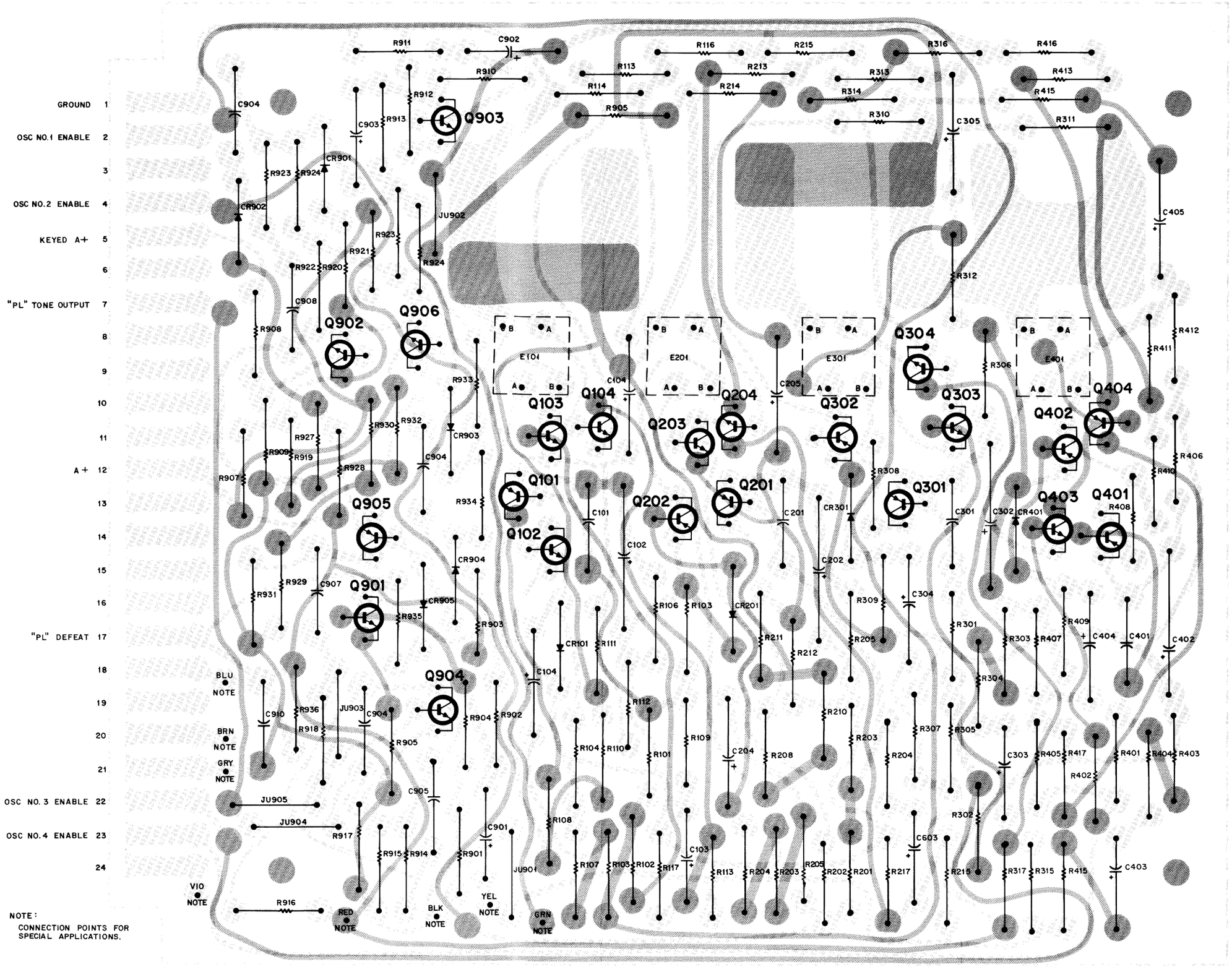
f. If the reed is good, replace it in the encoder and make dc voltage measurements in the tone oscillator circuit to locate the defective component.

Step 2. If low deviation is measured, check ac signal voltages and compare them with the schematic voltage readings to find the source of trouble.

Step 3. If deviation is normal, but calls are not being received, check the frequency of the PL encoder tone. If off-frequency, replace the "Vibrasender" resonant reed.

Step 4. If squelch tail noise bursts are heard by all listening receivers, check dc voltages of Q902 and Q906 in keyed and unkeyed conditions.

Step 5. If too much tone deviation is measured, check feedback amplifier Q904.



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E B C
TRANSISTOR DETAIL

COMPONENT SIDE
SOLDER SIDE

BD-DEPS-14781-0

OL-DEPS-14782-A

TLN5744A Multiple Tone "Private-Line" Encoder Module
Schematic Diagram and Circuit Board Detail
Motorola No. PEPS-14784-C
(Sheet 1 of 2)
2/23/76-NPC

PARTS LIST

TLN5744A Multiple Tone "Private-Line" Encoder Module PL-2863-C

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		CAPACITOR, fixed: uF ±10%; 50 V; unless otherwise stated
C101	8-82905G01	.01
C102	23-865136	15 ±20%; 25 V
C103	23-84762H14	0.47 ±20%
C104	23-82783B08	1.0 ±20%; 35 V
C105	23-865137	4.7; 25 V
C201	8-82905G01	.01
C202	23-865136	15 ±20%; 25 V
C203	23-84762H14	0.47 ±20%
C204	23-82783B08	1.0 ±20%; 35 V
C205	23-865137	4.7; 25 V
C301	8-82905G01	.01
C302	23-865136	15 ±20%; 25 V
C303	23-84762H14	0.47 ±20%
C304	23-82783B08	1.0 ±20%; 35 V
C305	23-865137	4.7; 25 V
C401	8-82905G01	.01
C402	23-865136	15 ±20%; 25 V
C403	23-84762H14	0.47 ±20%
C404	23-82783B08	1.0 ±20%; 35 V
C405	23-865137	4.7; 25 V
C901, 902	23-84762H08	3.9 ±20%; 15 V
C903	23-84762H14	0.57 ±20%
C904	8-82905G26	.0047; 100 V
C905	8-82905G10	.015; 100 V
C906	8-82905G05	0.15
C907	--	NOTE 6
C908	8-82905G07	0.1
C909	8-82905G05	0.15
C910	8-82905G01	.01
		SEMICONDUCTOR DEVICE, diode: (SEE NOTE)
CR101, 201, 301, 401, 901 thru 905	48-83654H01	silicon
		TRANSISTOR, NPN: unless otherwise stated (SEE NOTE)
Q101, 102	48-869643	PNP; type M9643
Q103, 104	48-869642	type M9642
Q201, 202	48-869643	PNP; type M9643
Q203, 204	48-869642	type M9642
Q301, 302	48-869643	PNP; type M9643
Q303, 304	48-869642	type M9642
Q401, 402	48-869643	PNP; type M8643
Q403, 404	48-869642	type M9642
Q901 thru 904	48-869642	type M9642
Q905	48-869643	PNP; type M9643
Q906	48-869642	type M9642
		RESISTOR, fixed: ±5%; 1/4 W; unless otherwise stated
R101	6-129777	39k
R102	6-129668	10k
R103	6-128683	150k
R104	6-129887	12k
R105	6-127801	470 ±10%
R106	6-127806	27k ±10%
R107	6-129225	10k ±10%
R108	6-129669	4.7k
R109	6-129225	10k ±10%
R110	6-131275	220
R111	6-131857	680k
R112	6-129149	470k
R113	6-131275	220
R114	6-129982	5.6k
R115	6-127806	27k ±10%
R116	6-129242	56k ±10%
R117	6-129707	2.7k
R201	6-129777	39k
R202	6-129668	10k
R203	6-128683	150k
R204	6-129887	12k
R205	6-127801	470 ±10%
R206	6-127806	27k ±10%
R207	6-129225	10k ±10%
R208	6-129669	4.7k
R209	6-129225	10k ±10%
R210	6-131275	220
R211	6-131857	680k
R212	6-129149	470k
R213	6-131275	220
R214	6-129982	5.6k
R215	6-127806	27k ±10%
R216	6-129242	56k ±10%
R217	6-129707	2.7k
R301	6-129777	39k
R302	6-129668	10k
R303	6-128683	150k
R304	6-129887	12k
R305	6-127801	470 ±10%
R306	6-127806	27k ±10%
R307	6-129225	10k ±10%
R308	6-129669	4.7k
R309	6-129225	10k ±10%
R310	6-131275	220
R311	6-131857	680k
R312	6-129149	470k
R313	6-131275	220
R314	6-129982	5.6k
R315	6-127806	27k ±10%
R316	6-129242	56k ±10%
R317	6-129707	2.7k
R401	6-129777	39k
R402	6-129668	10k
R403	6-128683	150k
R404	6-129887	12k
R405	6-127801	470 ±10%
R406	6-127806	27k ±10%
R407	6-129225	10k ±10%
R408	6-129669	4.7k
R409	6-129225	10k ±10%
R410	6-131275	220
R411	6-131857	680k
R412	6-129149	470k
R413	6-131275	220
R414	6-129982	5.6k
R415	6-127806	27k ±10%
R416	6-129242	56k ±10%
R417	6-129707	2.7k
R901	6-128687	6.8k ±10%
R902	6-128683	150k
R903	6-129707	2.7k
R904	6-131527	47k
R905	6-131276	150
R906	6-128904	18k ±10%
R907	6-129887	12k
R908	6-129299	68k
R909	6-129668	10k
R910	6-129229	180k ±10%
R911	6-128902	47k
R912	6-131525	270
R913	6-129882	5.6k
R914	6-129299	68k
R915	6-128902	47k
R916	6-129805	1k
R917	6-10401A27	120
R918	6-124A61	3.3k
R919	6-129147	220k ±10%
R920	6-129242	56k
R921	6-128686	8.2k ±10%
R922	6-129667	22k
R923	6-129526	33k
R924	6-129299	68k
R925	6-129526	33k
R926	6-129299	68k
R927	6-128683	150k
R928	6-129299	68k
R929	6-129887	12k
R930	6-129981	3.3k
R931	6-129668	10k
R932	6-128902	47k ±10%
R933	6-129299	68k
R934	6-129526	33k
R935	6-129669	4.7k
R936	6-129668	10k
		NON-REFERENCED ITEMS
	9-84910C01	SOCKET, "Vibrasponder" resonant reed
	45-83914G01	GUIDE RAIL, circuit board
	3-8022	SCREW, machine: 4-40 x 1/4"
	4-7683	LOCKWASHER: No. 4

NOTE: For optimum performance, diodes, transistors, and integrated circuits must be ordered by Motorola part numbers.

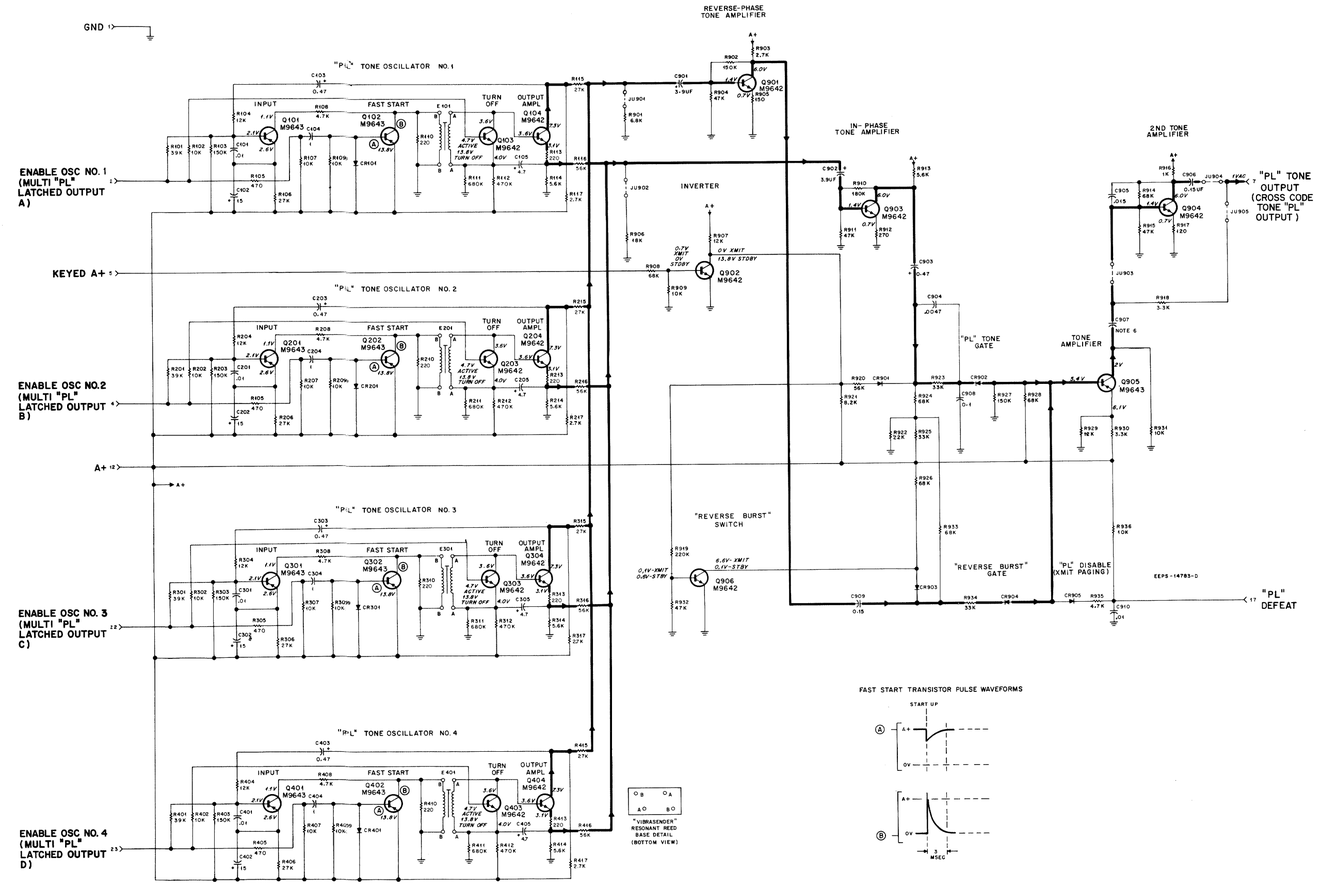
NOTES:

1. UNLESS OTHERWISE STATED: CAPACITOR VALUES ARE IN MICROFARADS. RESISTOR VALUES ARE IN OHMS.
2. UNLESS OTHERWISE STATED: VOLTAGES REPRESENT THE ACTIVE STATE AND ARE TAKEN WITH RESPECT TO CHASSIS GROUND.
3. ALL AC VOLTAGE MEASUREMENTS ARE RMS VALUE.
4. ALL DC VOLTAGE MEASUREMENTS MAY BE TAKEN WITH 20,000 OHM-PER-VOLT METER.
5. JUMPER TABLE

JUMPER	STATUS
JU901, 902	IN FOR 4-FREQUENCY APPLICATIONS: OUT FOR 8-FREQUENCY APPLICATIONS
JU903, 904	IN WHEN TRANSMITTER-EXCITER UTILIZES DIRECT FREQUENCY MODULATION: OUT WHEN DIRECT FM IS NOT USED (SERRASOID MODULATOR IS INCORPORATED).
JU905	OPPOSITE OF JU903 & JU904 -- OUT FOR DIRECT FM: IN OTHERWISE.

6. CAPACITOR C907 IS PART OF TLN5747A "PL" CONVERTER BOARD KIT. REFER TO APPLICABLE PARTS LIST FOR COMPONENT VALUE.

NEPS-15370-A



MULTIPLE TONE "PRIVATE-LINE" ENCODER MODULE

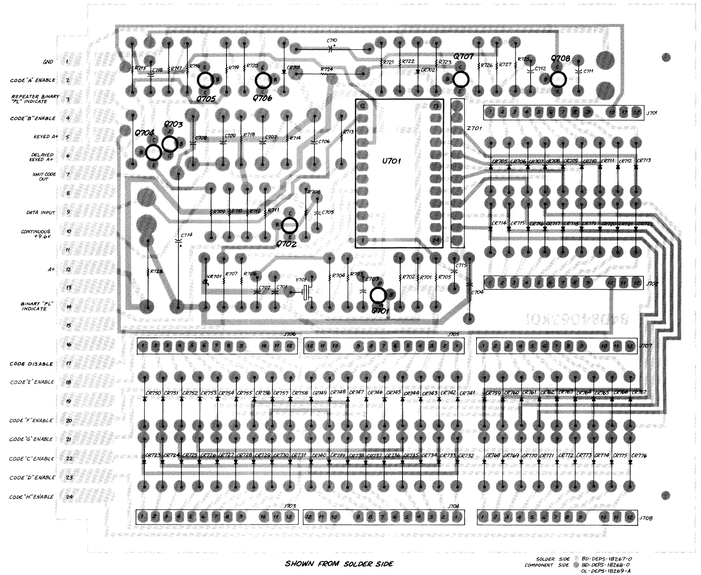
TLN5744A Multiple Tone "Private-Line" Encoder Module
Schematic Diagram and Circuit Board Detail
Motorola No. PEPS-14784-C
(Sheet 2 of 2)
2/23/76-NPC

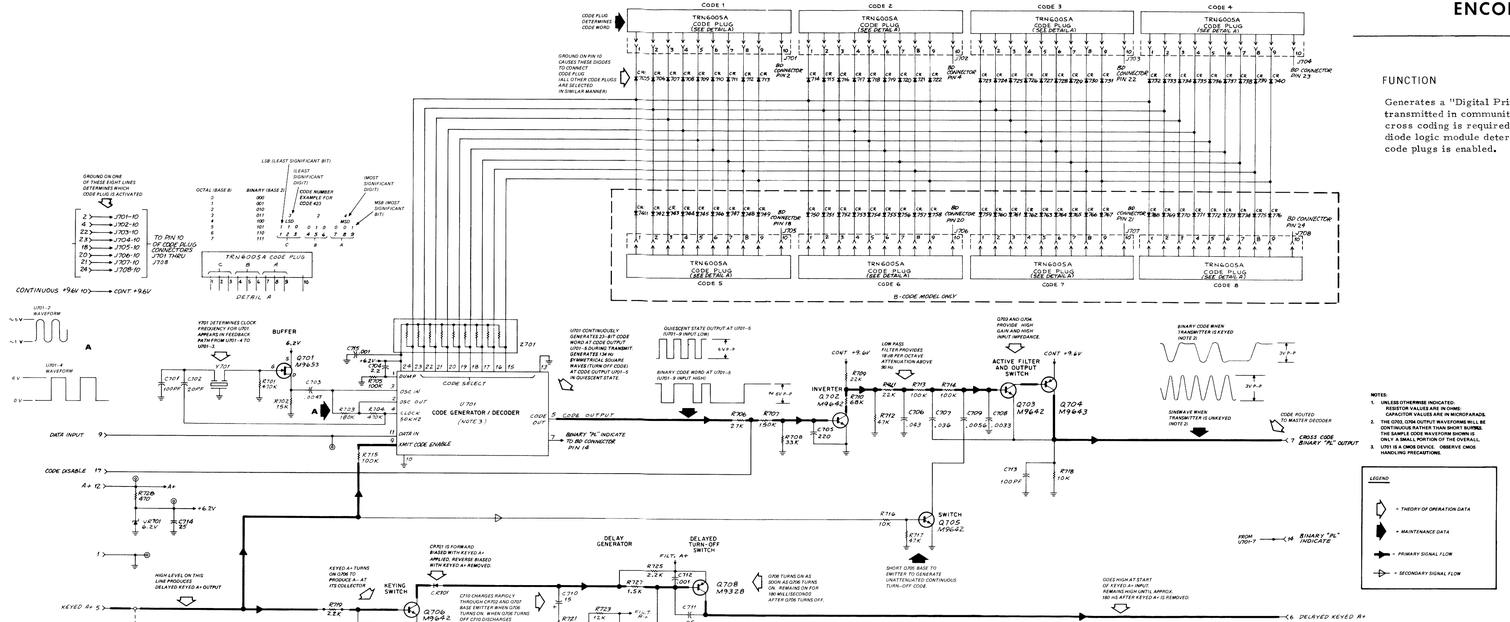
MULTIPLE "DIGITAL PRIVATE-LINE" ENCODER MODULE

MODEL TRN6413A

FUNCTION

Generates a "Digital Private-Line" code to be transmitted in community repeaters where cross coding is required. A low input from a diode logic module determines which of four code plugs is enabled.





REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION

PARTS LIST

TRN6413A Multiple Encoder PL-3562-O

		CAPACITOR, fixed: uF; unless otherwise stated
C701, 713	21-831125	100 pF ±10%; 300 V
C702	21-82133G24	20 pF ±5%; 500 V
C703	21-82428B09	.0047 ±10%; 100 V
C704	23-82783B16	2.2 ±10%; 15 V
C705	21-83596E10	220 pF ±20%; 500 V
C706	8-83813H14	.043 ±5%; 50 V
C707	8-83813H24	.036 ±5%; 50 V
C708	8-83813H27	.0033 ±5%; 50 V
C709	8-83813H26	.0056 ±5%; 500 V
C710	23-82783B24	15 ±10%; 25 V
C711	21-82372C04	.05 ±10%; 25 V
C712, 715	21-83596E13	.001 ±10%; 100 V
C714	23-83210A01	25 +150-10%; 25 V
		DIODE: (SEE NOTE I)
CR701, 702, 705 thru 776	48-83654H01	silicon
		CONNECTOR, receptacle:
J701 thru 708	9-82071K01	female; 10 contact
		TRANSISTOR: (SEE NOTE I)
Q701	48-869653	field-effect; M9653
Q702, 703, 705, 706	48-869642	NPN; type M9642
Q704, 707	48-869643	PNP; type M9643
Q708	48-869328	PNP; type M9328
		RESISTOR, fixed: ±5%; 1/4 W; unless otherwise stated
R701, 704	6-124B14	470k
R702	6-124A77	15k
R703	6-124B04	180k
R705, 715	6-124C97	100k ±10%
R706	6-124A83	27k
R707	6-124B02	150k
R708	6-124C85	33k
R709, 711	6-124A81	22k
R710, 722	6-124A79	18k
R712, 717	6-124A89	47k
R713, 714	6-124A97	100k
R716, 718	6-124A73	10k
R719, 725	6-124C57	2.2k ±10%
R720	6-124C49	1k ±10%
R721, 729	6-124A53	1.5k
R723	6-124A75	12k
R724	6-125A49	1k
R726	6-124A45	680
R727	6-125C41	470 ±10%; 1/2 W
		INTEGRATED CIRCUIT: (SEE NOTE I)
U701	51-84267A82	type M6782
		VOLTAGE REGULATOR: (SEE NOTE I)
VR701	48-83696F07	Zener; 6.2 V
		CRYSTAL: (SEE NOTE II)
Y701	48-82003K01	resonator; 50.000 KC
		RESISTOR NETWORK:
Z701	1-80772B36	pull-up, 10 pin

NOTE:

I. For optimum performance, diodes, transistors and integrated circuits must be ordered by Motorola part number.

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

SINGLE TONE DECODER MODULE

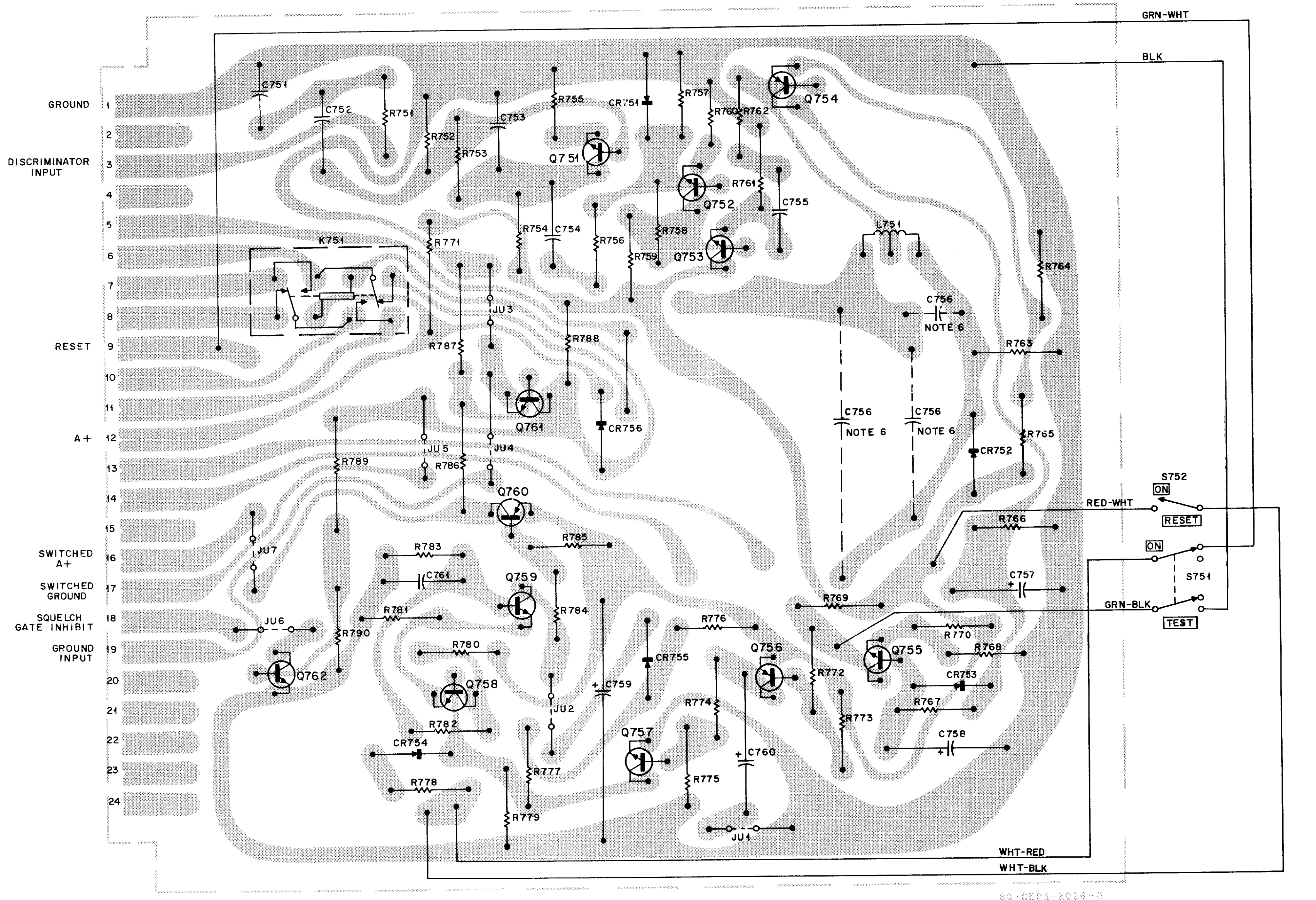
MODEL TLN1181A

FUNCTION -

Decodes audio freq. tone to control external circuitry with switched ground and/or voltage levels.

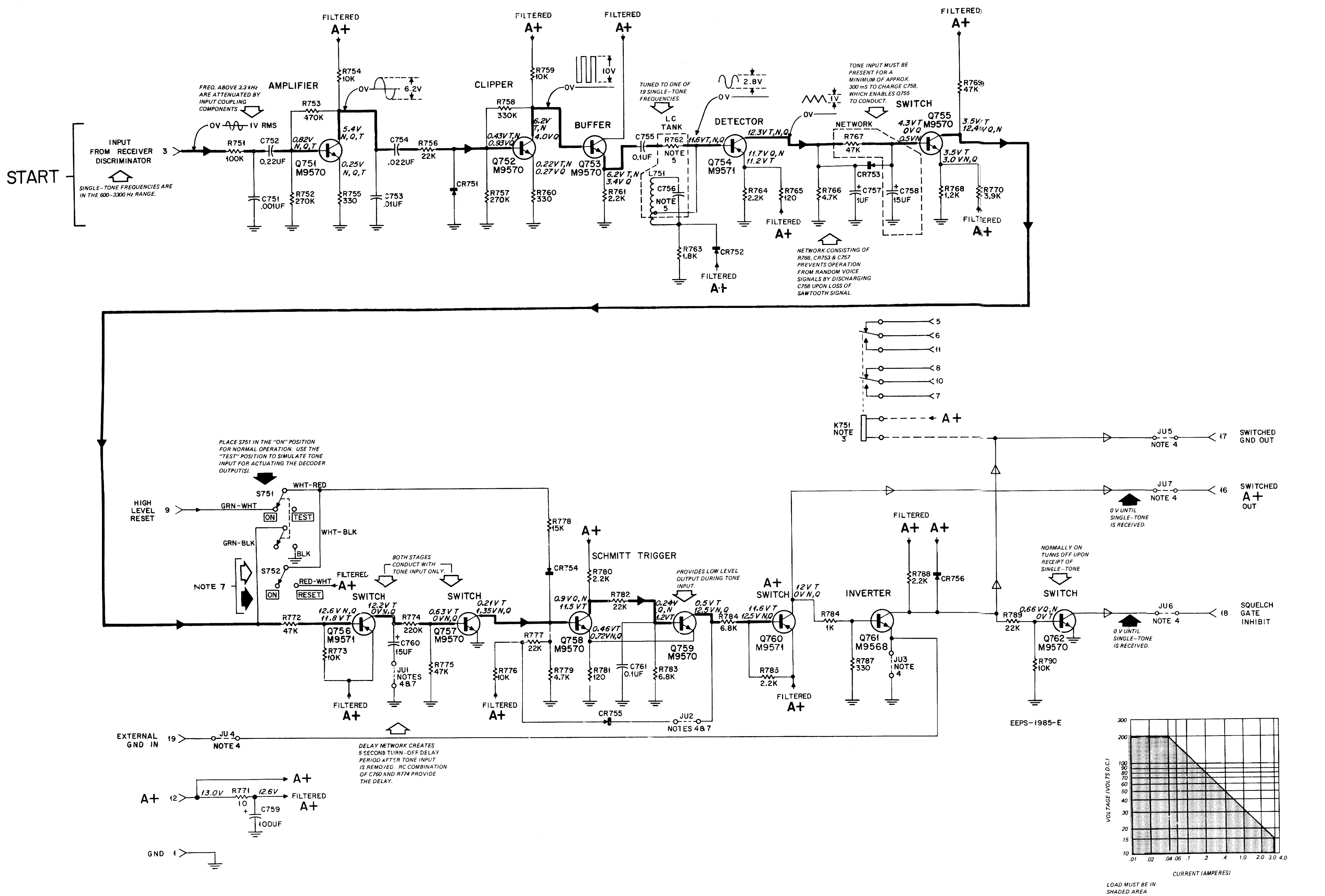
MODEL COMPLEMENT

Model	Version	Board	Version	Panel	Version
TLN1181A		TLN8773A		TLN8774A	
TLN4151A Relay (optional)		-	-	-	-

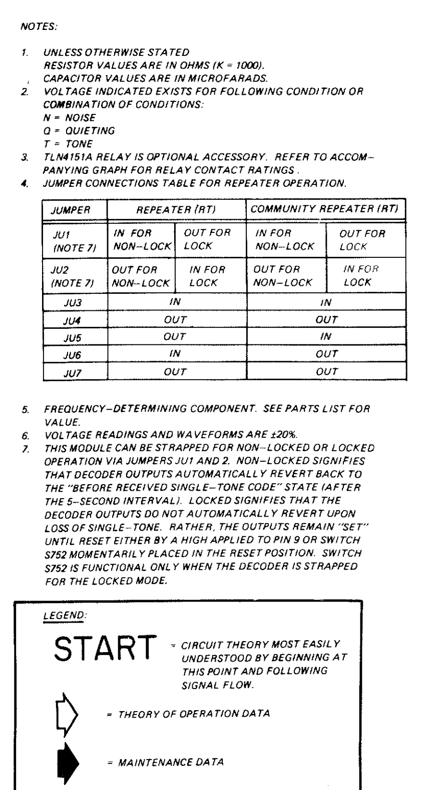


SHOWN FROM SOLDER SIDE

OL-DEPS-2027-8



EEPS-1985-E



MAINTENANCE AND TROUBLESHOOTING

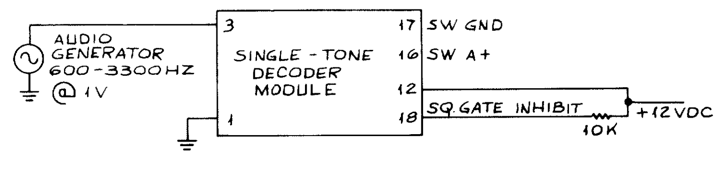
This module can be serviced either while in the control chassis or while out. The following procedure is for out-of-chassis servicing but it is functionally applicable to in-chassis servicing as well.

Step 1. Remove the single-tone decoder module and check the jumpers at this time for correctness in this module's mode of operation. Note any errors and continue with the test procedure.

Step 2. Connect jumpers in test scheme as follows:

OUT - JU1, JU2, JU4
IN - JU3, JU5, JU6, JU7

Step 3. Set-up test equipment as follows:



Step 4. Perform an overall module operation check by injecting the proper single-tone frequency on pin 3. Pin 18 should be at A+ and remain there after approximately 300 milliseconds.

Removal of the single-tone frequency should immediately cause pin 18 to go to ground potential.

If the output is abnormal, proceed to step 5.

Step 5. Place the on-test switch in the test position. Pins 16 and 18 should read A+ and pin 17 should read ground potential.

Return the switch to the ON position. Pins 16 and 18 should drop to near 0 volts and pin 17 should go to A+.

If all voltages are abnormal, check the dc voltages in switches Q756 and Q757, Schmitt trigger Q758 and Q759, and switch Q760. If pin 16 is normal but pins 17 and 18 are abnormal, check Q761. If only pin 18 is abnormal, check Q762. Correct the trouble and recheck step 4.

If all voltages are normal, stages Q756 through Q762 are operating satisfactorily. Proceed to step 6.

Step 6. Inject the proper single-tone frequency at pin 3. Measure waveforms and voltages as shown on the schematic diagram for stages Q751 through Q755. Correct any trouble and recheck step 4.

Step 7. Rearrange jumpers that were changed in step 2 (if any).

SINGLE-TONE DECODER MODULE

PARTS LIST SHOWN ON BACK
68P81002E96-M
11/5/76-NFC

PARTS LIST

TLN8773A Single-Tone Decoder Board — PL-456-A

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		CAPACITOR, fixed: uF ±10%; 50 v; unl. stated
C751	21D82187B29	.001; 100 v
C752	8D82905G11	0.22
C753	8D82905G01	.01
C754	8D82905G02	.022
C755, 761	8D82905G07	0.1
C756		(see "FREQUENCY-DETERMINING COMPONENTS")
C757	23D82783B08	1 ±20%; 35 v
C758, 760	23D83214C02	15 ±20%; 25 v
C759	23D82601A25	100 +150-10%; 20 v
		SEMICONDUCTOR DEVICE, diode: (SEE NOTE)
CR751 thru 756	48C82392B03	silicon
		COIL, AF:
L751	24C84200A01	1 H
		TRANSISTOR: (SEE NOTE)
Q751, 752, 753, 755, 757, 758, 759, 762	48R869570	N-P-N; type M9570
Q754, 756, 760	48R869571	P-N-P; type M9571
Q761	48R869568	N-P-N; type M9568
		RESISTOR, fixed: ±10%; 1/4 w; unl. stated
R751	6S129226	100K
R752, 757	6S129227	270K
R753	6S129148	470K
R754, 759, 773, 776, 790	6S129225	10K
R755, 787	6S6022	330; 1/2 w
R756, 777, 782	6S128685	22K
R758	6S129228	330K
R760	6S129775	330
R761, 764, 780, 785, 788	6S128689	2.2K
R762		(see "FREQUENCY-DETERMINING COMPONENTS)
R763	6S129269	1.8K
R765, 781	6S129617	120
R766, 779	6S127804	4.7K
R767, 769, 772, 775	6S128902	47K
R768	6S129235	1.2K
R770	6S129232	3.9K
R771	6S5621	10; 1/2 w
R774	6S129147	220K
R778	6S127805	15K
R783, 784	6S128687	6.8K
R786	6S6229	1K; 1/2 w
R789	6S6397	22K; 1/2 w

FREQUENCY DETERMINING COMPONENTS

The frequency-determining components of this decoder are C756 and R762. In some cases, C756 consists of two capacitors connected in parallel. Refer to the following table.

C756			R762	
FREQ. (Hz)	MOTOROLA PART NO.	CAPACITOR, fixed:	MOTOROLA PART NO.	RESISTOR, fixed: ±10%; 1/4 w;
600	8D84326A27	.0557uF ±20%; 50 v	6S127803	1.5K
	&8D84326A06	.0095 uF ±3%; 50 v		
750	8D84326A26	.0420 uF ±2%; 50 v	6S127803	1.5K
900	8D84326A24	.0261 uF ±2%; 50 v	6S128689	2.2K
	&8D84326A02	.0030 uF ±3%; 50 v		
1050	8D84326A23	.0213 uF ±2%; 50 v	6S129231	3.3K
1200	8D84326A08	.0158 uF ±3%; 50 v	6S129231	3.3K
	&21K859947	510 pF ±5%; 500 v		
1350	8D84326A20	.0129 uF ±2%; 50 v	6S127804	4.7K
1500	8D84326A18	.0098 uF ±2%; 50 v	6S128687	6.8K
	&21K848236	650 pF ±5%; 300 v		
1650	8D84326A17	.00865 uF ±2%; 50 v	6S128687	6.8K
1800	8D84326A05	.0073 uF ±3%; 50 v	6S129225	10K
1950	8D84326A14	.0062 uF ±2%; 50 v	6S129225	10K
2100	8D84326A30	.0045 uF ±1%; 50 v	6S127805	15K
	&21K873269	820 pF ±2%; 300 v		
2250	8D84326A30	.0045 uF ±1%; 50 v	6S127805	15K
	&21K840047	150 pF ±5%; 500 v		
2400	8D84326A03	.0042 uF ±3%; 50 v	6S128904	18K
2550	8D84326A02	.0030 uF ±3%; 50 v	6S128685	22K
	&21K848236	650 pF ±5%; 300 v		
2700	8D84326A02	.0030 uF ±3%; 50 v	6S128685	22K
	&21K859942	220 pF ±5%; 500 v		
2850	8D84326A02	.0030 uF ±3%; 50 v	6S128685	22K
3000	8D84326A01	.0021 uF ±5%; 500 v	6S127806	27K
	&21K859947	510 pF ±5%; 500 v		
3150	8D84326A01	.0021 uF ±5%; 50 v	6S127807	33K
	&21K859178	270 pF ±5%; 300 v		
3300	8D84326A01	.0021 uF ±5%; 500 v	6S127807	33K

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION

TLN4151A Relay Kit — PL-457-O

K751	80C84201A01	RELAY, armature: 2 form "C"; coil res. 200 ohms ±10%

TLN8774A Panel Kit, Single-Tone Decoder — PL-458-O

NON-REFERENCED ITEM		
	45B83914G01	GUIDE RAIL (slide-mount for circuit board); 2 req'd

NOTE:

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