MOTOROLA

MICOR®
Base and Repeater Stations
Control and Application

68P81025E60-F

THIS MANUAL HAS BEEN
DISCONTINUED

MUST BE USED WITH
Associated Station Manual

Instruction Manual

CONTENTS

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68P81025E60-F
7/15/83-PHI

MODULES

1. INTRODUCTION

Motorola base and repeater station applications are described in following paragraphs. The information is tailored to "Micor" "Compa-Station" and Upright type stations.

2. APPLICATIONS

2.1 BASE STATIONS

2.1.1 Typically, a base station is the core of a two-way communications system. It is the fixed point from which a dispatcher sends and receives messages from the mobile and portable radios of the communications system. In many systems, the station also transmits and receives from other base stations or repeaters at fixed points within communications range.

2.1.2 Remotely controlled Motorola base stations may be located at the most advantageous point for rf propagation, such as the top of a tall building or a mountain peak, while the dispatcher may be located elsewhere, even several miles away. A wire line (such as a leased telephone line) connects between the base station and a remote control console at the dispatcher's location. Received audio from the base station is sent over the wire line to a speaker in the remote control console. Likewise, microphone audio from the remote control console is sent over the wire line to the base station for modulating the transmitter's rf carrier signal. In addition, the remote control console generates the commands necessary to operate the base station, such as transmitter keying, frequency selection (on two- or four-frequency base stations), "Private-Line" disabling of "Private-Line" receivers to allow monitoring of all on-channel communications, and receiver muting of receiver No. 2 in two-receiver stations. Circuits in the base station sense the commands generated by the remote control console and perform the necessary switching to change the mode of operation.

2.1.3 Two basic types of remote control commands are used for base station control; dc control and tone control. DC control uses dc current of varying magnitude and polarity to initiate the various control functions such as transmitter keying. The wire line pair must have dc continuity to be used with a dc remote control system. In some areas, telephone line pairs with dc continuity are not available. Tone control uses audio tones of various frequencies to initiate the control functions. The audio tone used for transmitter keying is filtered out of the transmit audio so that the tone is not transmitted. Other commands require only a momentary application of the tone command to initiate the desired mode of operation. The wire line pair need not have dc continuity for tone remote control operation. Additionally, more functions can be remotely controlled with tone control since many different audio frequencies can be used.

2.1.4 A wide variety of station models are available. Models are available with various power output levels, with one-, two-, or four-frequency transmitters, one-, two-, or four-frequency receivers, with two separate receivers (for continuous monitoring of two channels), and with dc or tone remote control. In addition to the standard models offered, a wide variety of optional accessories are available to tailor the station to meet your communications system needs. Furthermore, the equipment was built to meet a wide flexibility of operational requirements without major

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equipment modification. For example, a station with two receivers can be (1) jumpered to provide receiver No. 1 priority, wherein receiver No. 2 is automatically muted whenever receiver No. 1 is receiving a signal; or (2) with a 4-wire audio line driver, receiver No. 2 audio can be carried to the dispatcher's location (or a completely separate location) on a separate wire line and no muting of receiver audio would occur; or (3) with an F2-R2 Mute module, the dispatcher could mute receiver No. 2 upon command from the console; or (4) with an F2-R2 Mute module, receiver No. 2 audio could be attenuated rather than fully muted upon command from the console. Jumper selection allows a preset attenuation of 10, 20 or 30 dB.

2.1.5 In all cases, the remote control console must be compatible with the base station. That is, it must generate the type of commands to which the base station control circuits will respond.

2.1.6 The remote control chassis can accept plug-in modules for dc or tone control, and a station may be equipped to operate with both types of control. This feature allows a station to be easily converted from one type of control to the other, if necessary.

2.2 REPEATER (RT) STATIONS (Refer to Figure 1)

2.2.1 Motorola 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 normally operated unattended and is used primarily for "mobile relay" or "one-way talk-back" repeater applications. Refer to the accompanying diagram for typical examples of these repeater systems.

2.2.2 In a "mobile relay" circuit, signals received by the repeater from one mobile unit are rebroadcast to other mobiles in the system. Mobiles in this system must use a transmitter and receiver operating on different frequencies. The repeater transmitter and receiver will consequently operate on exactly the reverse frequencies of those used for the mobile transmitter and receiver.

2.2.3 In a "one-way talk-back" repeater circuit, signals sent from a mobile unit in the vicinity of the repeater installations are picked up by the repeater and retransmitted to a distant base station in the system. Return signals transmitted by the base station are received directly by the mobile. The mobile transmitter and receiver normally operate on the same frequency in this type of system. The associated repeater receiver operates on the mobile transmitter frequency while the repeater transmitter operates on the frequency of the remote base station receiver. If the base station involved is equipped with a second receiver which operates on the frequency of the mobile transmitter, a mobile unit may talk directly to the base station when operating in the immediate base station area (see dotted detail on system diagram).

2.2.4 Repeater (RT) stations have the capability of functioning both with an rf input (RT) and with wire line control (base station). When the remote supervisory facilities are not used, the station functions automatically as a repeater (RT); i.e., all control functions for the station are initiated via the received rf carrier. As a signal is received, 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.

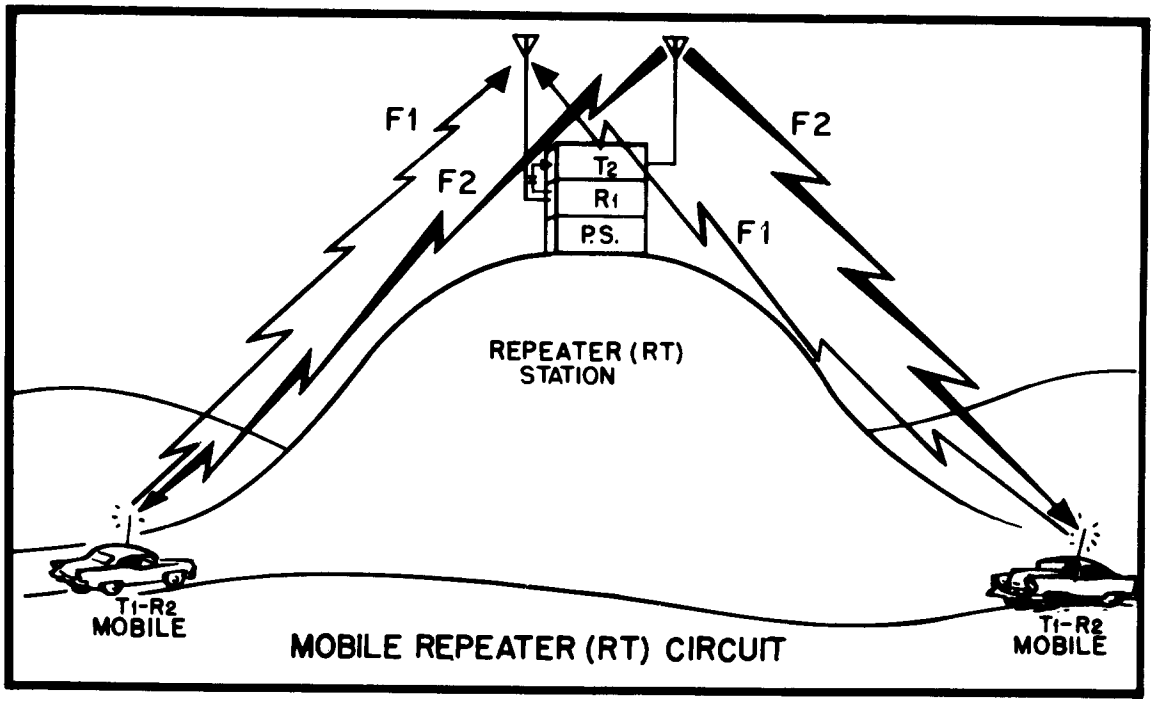
2.2.5 A station using supervisory remote wire line control can operate as an unattended repeater (RT) station or as a remotely controlled base station. The operator has priority over the operation of the station. The station operates as a repeater (RT) until the remote control operator initiates a transmission. In which case, the station operates as a conventional base station. The remote control operator may monitor all messages rebroadcast from the station during repeater (RT) operation.

2.2.6 A time-out timer module is supplied with all repeater (RT) stations. The time-out timer turns off the transmitter after a predetermined "on-the-air" time to prevent inadvertent continuous transmitter key-up. Jumper connections on the module provide a variable time limit that the transmitter may be keyed.

2.3 REPEATER (RA) STATIONS (Refer to Figure 2)

2.3.1 A Motorola repeater (RA) station features specific control facilities and circuitry to operate a companion base (RA) station in a two-way radio relay system.

TYPICAL REPEATER SYSTEMS USING A MOTOROLA REPEATER (RT) STATION



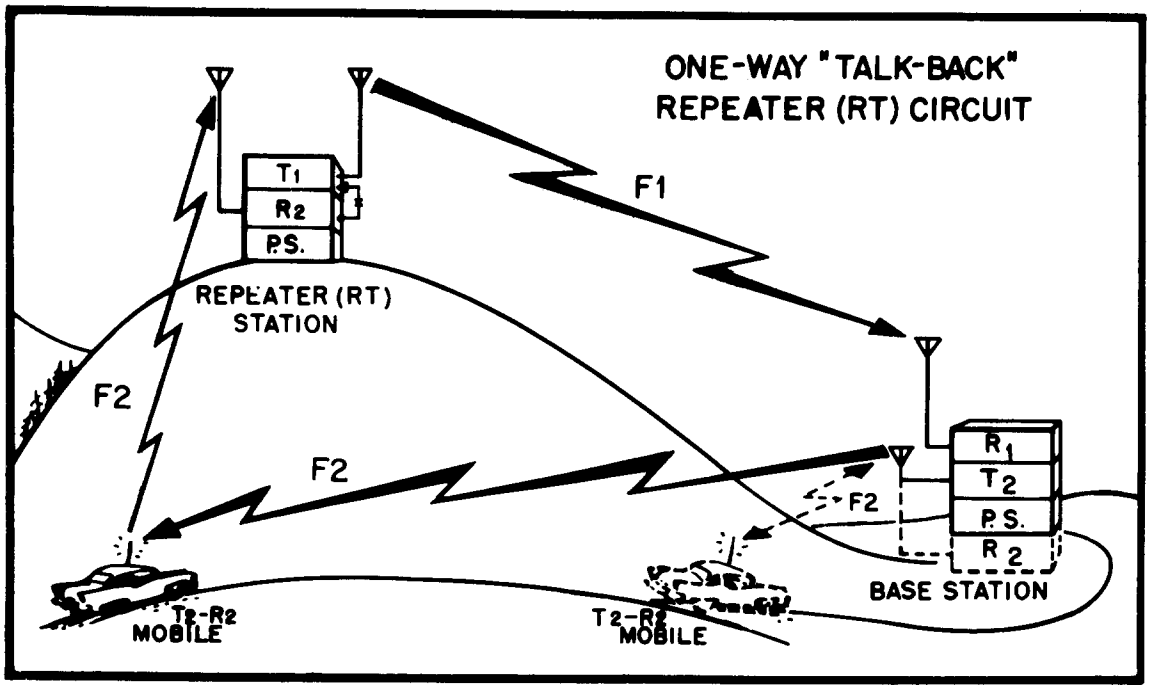


Figure 1.
Typical Repeater (RT) System

2.3.2 Motorola radio controlled relay stations are used 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 radio repeater (RA) system consists of a repeater (RA) - base (RA) combination and two or more remote stations such as control and mobile stations. The repeater (RA) - base (RA) combination consists of a repeater (RA) station and a base (RA) station connected by audio and control lines.

2.3.3 A standard Motorola base station of selected operating frequencies can be used as the control station for the repeater (RA)-base (RA) combination. To control the repeater (RA) - base (RA) combination from a single control terminal, the repeater (RA) - base (RA) combination antennas should be directional. However, to control the repeater (RA) - base (RA) combination from several terminals at different locations in the system, multi-directional antennas should be used.

2.3.4 By proper location of the repeater (RA) station, and by proper selection of operating frequencies, transmitter rf power output and antenna characteristics, radio signals can be relayed through mountainous or other obstructive terrain, or to an operational area located at an extended range from the control station.

2.3.5 The repeater (RA) - base (RA) combination has two modes of operation. It can: (1) receive and re-transmit a message from a control station to a mobile station and (2) receive and re-transmit a message from a mobile station to a control station.

2.3.6 The mobile units and the base (RA) station operate on frequency F1. The repeater (RA) station transmits on frequency T2 and receives on frequency R3. The control station transmits on frequency T3 and receives on frequency R2.

2.3.7 When the control station calls the mobile unit, the repeater (RA) turns on the base (RA) station transmitter. When receiver quieting of the repeater (RA) station reaches a predetermined level, the squelch gate in the repeater (RA) station actuates. This keys the transmitter in the base (RA) station. Audio is routed from the repeater (RA) station receiver to the base (RA) station transmitter audio input. The message is sent to the mobile units on frequency T1 by the base (RA) station transmitter.

2.3.8 When a mobile station calls the control station, the base (RA) station turns on the repeater (RA) transmitter. [When receiver quieting of the base (RA) station reaches a predetermined level, the squelch gate in the base

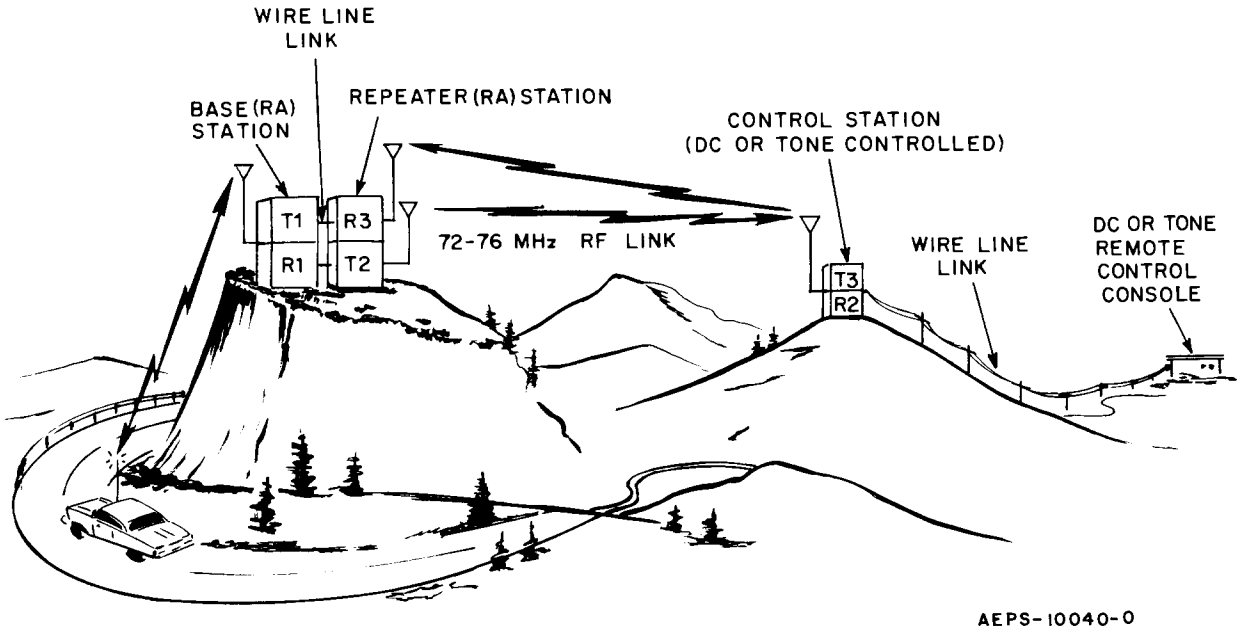


Figure 2.
Typical Repeater (RA) System

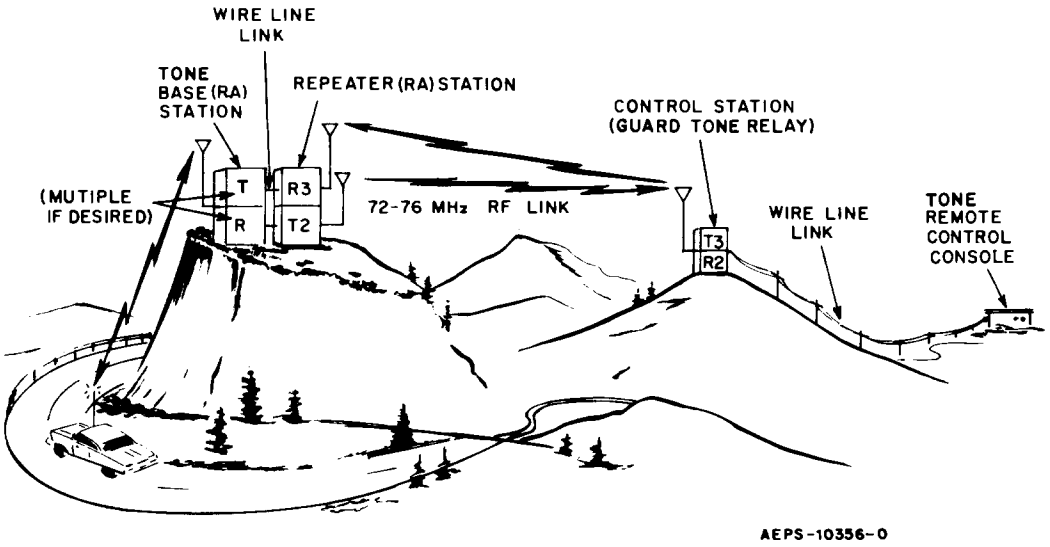


Figure 3.
Typical Guard Tone Relay System

(RA) station actuates. This keys the transmitter in the repeater (RA) station.] Audio is routed from the base (RA) station receiver to the repeater (RA) transmitter audio input. The message is sent to the control station on frequency T2 by the repeater (RA) transmitter.

2.4 GUARD TONE RELAY SYSTEM
(Refer to Figure 3)

2.4.1 A guard tone relay system is much like the usual "RA" system -- with greatly expanded control capability.

2.4.2 In the "RA" system (refer to Figure 2) a received message at the repeater (RA) station actuates the squelch gate in that station. This keys the companion base (RA) station which retransmits the message to mobile units. Only transmitter turn-on and turn-off control of the base (RA) station is possible in this system as is determined by receiver quieting/squelch gate module in the repeater (RA) station.

2.4.3 In the guard tone relay system (refer to Figure 3) the presence of an rf signal alone at the repeater (RA) station does not cause the companion station to transmit. Instead, the companion station is controlled via tone signals just as if it were connected directly to a remote control console by wire lines. This permits multiple frequency operation (of the companion base station), PL disable ("Private-Line" coded squelch models), unique function commands, etc.

2.4.4 For example, should the remote control console operator want to talk to a mobile unit on frequency T4, a high level guard tone signal is applied to the control station. The control station keys immediately on frequency T3 and transmits the remaining guard tone signal to the repeater (RA) station. The repeater (RA) station applies this high level guard tone signal to the audio input of the companion tone remote base (RA) station, which is then ready to accept and react to the forthcoming T4 function tone. The flexibility and number of functions in the guard tone relay system is limited only by the sophistication of the companion tone remote base station and the remote control console. It should be noted that a squelch gate is used in the repeater (RA) station in this guard tone application to give a transmitter channel element ground when the station is keyed. This is necessary since neither an F1 or F1-"PL" control module is used, which would otherwise supply the ground. The squelch gate is not used to key the companion base (RA) station.

NOTE

The high level guard tone burst sent by the remote control console should be lengthened to compensate for the delay time encountered in the keying of the guard tone relay station. Refer to the remote control console manual.

REMOTE CONTROL FUNCTIONAL DESCRIPTION

1. GENERAL

1.1 PURPOSE

1.1.1 The basic function of remote control is to allow operation of a base station or a repeater station from a remote control point. The station can be located a considerable distance from the control point; however, a compatible remote control console must be used at the control point in order to control the station. Remote control can be done using tones or dc line currents, which are converted into commands that perform such functions as:

--Transmitter turn on
--Selection of transmitter and receiver frequencies
--Mute and unmuting receiver audio
--Disable receiver "Private-Line" coded squelch circuit

1.2 DC CONTROL

In systems using dc control functions, a wire line must be connected between the control point and the station. Each different control function is originated by a dc current through the wire lines. By varying the dc current polarity and amplitude it is possible to remotely control several different functions:

--"PL" disable (receiver)
--Mute receiver #2 audio
--Turn on transmitter and select F1 or F2 channel element
--Unmute receiver #2
--Turn on the transmitter without "PL" (for paging applications).

1.3 TONE CONTROL

In systems using tone control functions, a wire line must be connected between the control point and the base station. Each different tone is detected in its own frequency-sensitive circuit and is then converted into a control signal (usually the output of a bistable or other switching device). By generating and detecting different tones, it is possible to remotely control several different functions:

--"PL" disable (receiver)
--Turn on transmitter and select F1 or F2 channel element
--Mute receiver #2 audio
--Unmute receiver #2 audio
--Two settings of squelch
--Repeater on-off
--"PL" on-off
--Turn on the transmitter without "PL" (for paging applications).
--Four additional on-off functions can be utilized by using a "Wild-Card" to control either relays or solid state switches.

2. DC CONTROL APPLICATIONS

Refer to the simplified and detailed functional diagrams at the end of this section.

2.1 TRANSMITTER TURN-ON; F1 OSCILLATOR

2.1.1 General Description

In this application only one transmitter frequency can be selected. In order to turn on the transmitter and energize the channel element, a +5.5 mA control line current is applied to the line 1 terminals of the remote control chassis, and fed to pins 19 and 20 in the line driver module. This current is then applied to the dc transfer module (pins 3 and 4) and activates the positive transfer oscillator. The positive transfer oscillator output level, which is a function of

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the dc input level and polarity, is detected within the module and provides low level PTT (pin 10). It also generates a delayed keyed A+ (pin 17) and F1 oscillator ground (pin 14) after a 60 millisecond delay.

2.1.2 Line PTT

Line PTT is applied to the station control module (pin 14), time-out timer (pin 6), squelch gate (pin 16), and F1 tone decoder (pin 19). In the station control module, line PTT initiates three important functions:

--keyed A+ (pin 8)
--keyed A- (pin 7)
--antenna switch/audio mute (pin 14)

In the time-out timer module, line PTT starts the timing action. In the squelch gate (repeaters only), line PTT inhibits squelch gate operation to give line priority (supervision) over repeater operation. The line PTT input to the F1 tone decoder has no effect unless the station is equipped for both tone and dc control. In this case, line PTT resets the PL disable circuit in the F1-PL tone decoder module.

2.1.3 Keyed A+ and A- Outputs

The keyed A+ and keyed A- outputs of the station control module apply operating voltages to the exciter and power control board of the transmitter, but the transmitter is not yet keyed because the channel element is not activated. The keyed A+ also gates the PL encoder output to the desired phase. The antenna switch/audio mute signal causes the antenna relay to energize, transferring the antenna from the receiver to the transmitter, and mutes receiver audio by disabling the line driver amplifiers.

2.1.4 F1 Channel Element Enable

About 60 milliseconds after PTT is developed at pin 10 of the dc transfer module, F1 oscillator ground (pin 14) is applied to the channel element of the exciter. The 60-millisecond delay allows time for antenna switching before high power transmitted rf energy is applied. Although dc power was applied to the transmitter, the amplifiers are biased Class C and depend upon signal drive from the channel element before rf power output is developed. Grounding the transmitter channel element completes the last step to key the transmitter. Other means of keying the transmitter (locally, repeater, tone control) are described later.

2.2 TRANSMITTER TURN-OFF

2.2.1 General Description

Transmitter turn-off is a sequence of steps which allow transmission of the reverse burst PL signal (tone "Private-Line" stations) or turn-off code ("Digital Private-Line" stations), shut-down of rf power, and finally, antenna switchover to the receiver.

2.2.2 Reverse Burst PL Transmission

2.2.2.1 When the positive line current is removed, the line PTT signal immediately reverts to a high. However, the delayed keyed A+ (pin 17 of dc transfer module) continues for approximately 200 milliseconds. During this 200 millisecond period, F1 oscillator ground is still provided to keep the transmitter keyed.

2.2.2.2 Loss of the line PTT signal causes the keyed A+ output of the station control module (pin 8) to be removed. This causes the "Private-Line" encoder to shift the phase of the PL tone for the reverse burst transmission or transmit the turn off code. In non-PL stations, the transmitter also continues to operate for 200 milliseconds.

2.2.3 RF Shut-Down

2.2.3.1 Keyed A- (station control pin 7) continues to be provided, as long as delayed keyed A+ is present.

2.2.3.2 Upon the loss of delayed keyed A+ and F1 oscillator ground (200 milliseconds after dc line current is removed), the transmitter shuts down because of loss of channel element ground and keyed A- power.

2.2.4 Antenna Switchover

2.2.4.1 Upon the loss of keyed A-, the antenna switch/audio mute circuit starts a 30-millisecond turn-off delay. At the end of this 30 millisecond period, the low at pin 2 of the station control module reverts to a high. This de-energizes the antenna relay and unmutes receiver audio, placing the station in the standby condition.

2.2.4.2 If the transmitter is keyed beyond the time duration set in the time-out timer, a T-O-T key inhibit signal (pin 4 of the T-O-T) inhibits the keyed A- in the station control module to shut down the transmitter. This allows the 30 millisecond delay before antenna switchover.

2.3 TRANSMITTER TURN-ON; F2 OSCILLATOR

In two-frequency transmitter applications, a different channel element is selected for each operating frequency. In order to turn on the transmitter and select the second (F2) channel element, a +12.5 mA control line current is applied to pins 19 and 20 in the line driver module. This current is then applied to the dc transfer module (at pins 3 and 4) and activates the positive transfer oscillator. The positive transfer oscillator output level, which is a function of the dc input level and polarity, is detected within the module. The detection results in a low level line PTT (pin 10) and an F2 oscillator ground output (pin 16). Circuit operation from this point on is the same as described for transmitter turn-on with F1 oscillator except that a ground is provided to the F2 channel element of the transmitter.

2.4 RECEIVER #2 MUTE

In this application, receiver #2 can be muted independent of any other operation. A momentary -5.5 mA control line current is applied to pin 19 and 20 in the line driver module. This current is then applied to the dc transfer module (at pins 3 and 4) to activate the negative transfer oscillator. The negative transfer oscillator output is detected within the module and provides an R2 mute output at pin 20 to mute receiver #2 audio in the line driver module. Receiver #2 remains muted until the transmitter turn-on F2 oscillator function is activated at which time the R2 mute function is no longer generated.

2.5 RECEIVER "PRIVATE-LINE" DISABLING

In this application, the receiver "Private-Line" coded squelch circuit is disabled prior to the transmission for channel monitoring purposes. A -2.5 mA control line current is applied to pins 19 and 20 in the line driver module. This current is then applied to the dc transfer module (at pins 3 and 4) to activate the negative transfer oscillator. The negative transfer oscillator output is detected within the module and produces a low PL disable control output. The low is inverted to a high in the station control module (pin 23), from which it is applied to the receiver (both receivers in 2-receiver stations). The PL disable control output remains active until the transmitter is keyed by one of the dc control applications described above. Immediately after the control point furnishes the transmitter turn on command, the PL disable control output reverses and again enables the receiver PL-coded squelch circuit.

2.6 C2-R2 FREQUENCY SELECTION

2.6.1 Stations equipped with a two-frequency receiver and a two-frequency transmitter use a C2-R2 dc transfer module which selects a receiver channel element whenever selecting a transmitter channel element (paired switching). A +5.5 mA line current selects the F1 oscillator ground described for transmitter turn-on. It also activates an R1 bistable which provides an R1 oscillator ground (pin 21 of dc transfer module) which is routed to the R1 channel element in the receiver.

2.6.2 A +12.5 mA line current selects F2 oscillator ground for the transmitter as described previously. It also activates an R2 bistable which provides an R2 oscillator ground (pin 22 of dc transfer module) which is routed to the R2 channel element in the receiver.

2.6.3 The R1 and R2 bistables are mutually resetting so that only one can be activated at any given time. Unlike the F1 and F2 bistables, the R1 and R2 bistables do not turn off when the dc control current is removed, but remain in the selected state until changed.

2.7 PAGING (TRANSMITTING WITHOUT PL)

In this application, the transmitter can be keyed with or without PL coded modulation. To transmit with PL coded modulation, a +5.5 mA line current is applied which turns on the transmitter (F1) as described previously. To transmit without PL coded modulation, a -12.5 mA line current is applied. The dc transfer module converts this command to line PTT and F1 oscillator ground as described previously, but it also places a low on the page output (pin 20). A jumper is connected from pin 701 of the "Private-Line" encoder (Q704 base) to the page output in paging stations. This permits the PL encoder output to be inhibited while a low is provided from the paging module.

2.8 REPEATER TRANSMITTER TURN-ON

2.8.1 A repeater transmitter is turned on by the squelch gate module. Discriminator output from the receiver is applied to the squelch gate (pin 10). A quieted signal (reduced noise because of an incoming rf signal) actuates the

squelch gate, which in turn, keys the transmitter for retransmission of the audio. In PL stations, a PL indicator (pin 14) is also required before the module is activated (correct PL tone must be decoded to produce the PL indicator signal).

2.8.2 The output of the squelch gate module, repeater PTT (pin 18) is applied to the station control module (pin 15). This input produces PTT control (pin 10), keyed A+ (pin 8), keyed A- (pin 7) and inhibits antenna switch/audio mute (pin 2). The PTT control signal is applied to the dc transfer module to activate the F1 oscillator. The remainder of transmitter turn-on and turn-off circuit operation is as described for remote control base stations.

2.8.3 In a non-wire line controlled repeater, jumpers JU5 and JU6 in the squelch gate module are connected, which permits keyed A+ from the station control module to enable channel element switch Q8. Q8 provides the F1 oscillator ground. In this mode, transmitter turn-off uses the delayed keyed A+ of the "Private-Line" encoder to provide the delayed keyed A+ (pin 7 of squelch gate).

2.8.4 Receiver audio is gated through the squelch gate module (pin 17 input, pin 11 output) to the exciter. The exciter audio path through the station control module is inhibited by audio gate driver Q6 when the PTT control signal is low.

2.9 REPEATER SET-UP AND KNOCKDOWN

Repeater stations may be equipped for wireline control from the remote control point. This permits the repeater function to be disabled (knocked down) for base operation. Line operation has priority over repeater operation. Line keying produces a line PTT input (pin 14, station control module) which inhibits the PTT control signal (pin 10) as well as inhibiting the squelch gate (pin 16).

2.9.1 Repeater Set-Up

In this application, an enabling +12.5 mA control current is generated that allows the repeater to operate. Repeater turn-on (repeater set-up) is similar to transmitter turn-on F2 Oscillator except:

- --A high level repeater set-up output is provided at pin 20 of the DC control module.
- --Jumpers are connected so that pin 20 (of the DC control module) is connected to pin 21 of the squelch gate module.
- --The squelch gate module provides a repeater PTT output at pin 8. This output is applied to the station control at pin 15 (instead of line PTT at pin 14) to key the transmitter.

2.9.2 Repeater Knockdown

The -5.5 mA repeater turn-off current causes operation similar to Receiver #2 Mute except the low output at pin 20 is applied to pin 21 of the squelch gate module. This low input at pin 21 inhibits the repeater PTT circuits in the squelch gate module.

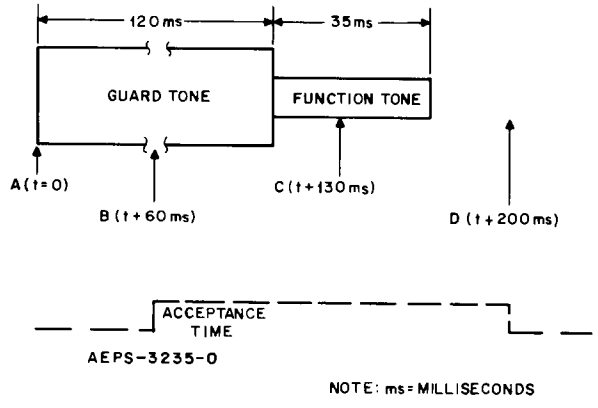


Figure 1.
Tone Control Format, Non-Transmit Command

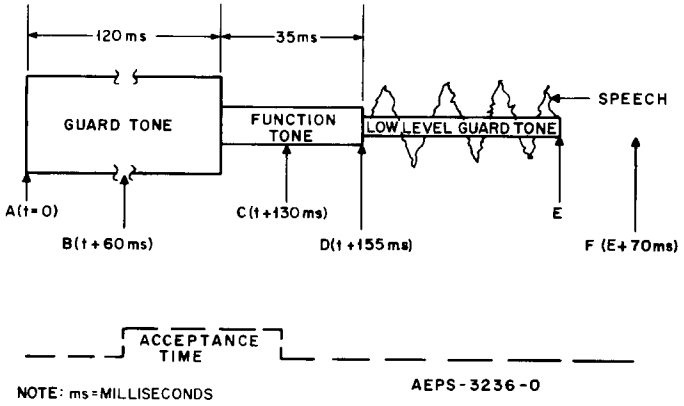


Figure 2.
Tone Control Format, Transmit Command

3. TONE CONTROL APPLICATIONS

Refer to the simplified and detailed functional diagrams at the end of this section.

3.1 TONE CONTROL FORMAT

3.1.1 In all tone control applications, the tones are sent from the control point in a particular timing sequence (tone control format). All tones must be preceded by a 2175-Hz guard tone. The guard tone is used to activate circuits which detune a 2160-Hz band pass filter in the guard tone decoder module. With the 2160-Hz band pass detuned, all tones can pass through the guard tone decoder and then be routed to their respective decoders. The tone control format is shown in figures 1 and 2.

3.1.2 As shown in the format, there are two distinct types of commands; transmit commands, and non-transmit commands. As shown in the format illustration, the 2175-Hz guard tone always precedes the function tone(s); however, in the case of transmit commands the guard tone continues (at a 30 dB lower level) in order to keep the transmitter keyed.

3.2 TRANSMITTER TURN-ON; F1 OSCILLATOR

3.2.1 General Description

In this application, only one transmitter frequency can be selected. In order to turn on the channel element, the F1 transmit command format (2175 Hz guard tone followed by 1950 Hz F1) is applied to pins 19 and 20 in the line driver module. The tones are then routed out of the line driver module on pin 10 and are applied to pin 9 of the guard tone decoder.

3.2.2 Line PTT

3.2.2.1 The guard tone decoder detects the 2175-Hz guard tone and uses a portion of the detected voltage to effectively disconnect the 2160-Hz band pass filter at the guard tone decoder input. In addition, the guard tone decoder also provides a line PTT output at pin 16 and a decoder bias output at pin 15; both resulting from the 2175-Hz tone.

3.2.2.2 The line PTT output at pin 16 is used as described for dc controlled stations, energizing the antenna relay and muting receiver audio, and applying keyed A- to the transmitter.

3.2.2.3 The 2175-Hz guard tone signal continues to be received as long as the transmitter is being keyed; however, the level is decreased by 30 dB. Circuits within the guard tone decoder compensate for the lower guard tone level and insure that line PTT output is provided even during the lower level input.

3.2.3 F1 Channel Element Enable

With the 2160-Hz band pass filter disconnected, the F1 tone (1950 Hz), which follows the high level guard tone, is allowed to pass through the guard tone decoder via the function hi output at pin 11. The 1950-Hz portion of the signal is applied to the F1-PL (or F1) Module for detection. (Although the 1950-Hz tone is applied to other modules, it can only be detected in the F1-PL or F1 Module.) When the 1950-Hz tone is detected in the F1-PL Module, the F1 bistable produces a low F1 Osc output at pin 3 which provides a ground enable for the transmitter F1 channel element to completely key the transmitter.

3.2.4 Function Tone Enable

In order for the tone detector circuits to function, an enable signal must be provided during the control format time. This signal originates in the guard tone decoder module as the decoder bias output at pin 15 and is the result of guard tone detection. The decoder bias signal is a high-level, 350-millisecond window that is applied to the F1 tone decoder (pin 15). The F1 module converts the signal to a low-level function enable output at pin 20. The 350 millisecond low-level function enable is applied to all of the tone detector circuits (in four different tone modules) so that tones can only be detected during the 350-millisecond window.

3.3 TRANSMITTER TURN-OFF

3.3.1 General Description

When low level 2175-Hz guard tone ends, transmitter turn-off begins. First, the guard tone loss is detected by activity checker Q20 in the guard tone decoder. After a 75 millisecond turn-off delay, the line PTT output (pin 16) reverts to a high.

3.3.2 Reverse Burst PL Transmission

Loss of the line PTT causes loss of keyed A+ in the station control module (pin 8). In turn, loss of keyed A+ starts the PL reverse burst transmission (turn off code in a digital system) via the "Private-Line" encoder. The PL encoder provides delayed keyed A+ for an additional

150 milliseconds while the reverse burst or code is transmitted. The delayed keyed A+ keeps the F1 bistable on (F1-PL module) to continue providing F1 channel element ground.

3.3.3 RF Shut-Down

After the 150 millisecond reverse burst period, delayed keyed A+ is removed which turns off the F1 bistable and removes keyed A-. This turns off the channel element which removes the signal drive to the Class C rf amplifiers.

3.3.4 Antenna Switchover

30 milliseconds after keyed A- is removed, the antenna switch/audio mute signal (station control, pin 2) allows the antenna relay to de-energize and unmutes audio in the line driver.

3.4 TRANSMITTER TURN-ON; F2 OSCILLATOR

3.4.1 F2 Control

In this application a different transmit channel element is selected for each of the two operating frequencies. In order to turn on the transmitter and select the second (F2) channel element, the F2 transmit command format (2175-Hz) guard tone followed by 1850-Hz F2) is applied to pins 19 and 20 in the line driver module. From this point the circuit operation is the same as that described for F1 selection except that the F2 channel element is selected by detection of the 1850-Hz tone in either the C2-R2, F2-R2 Mute, or F2 Control Module. The low level (ground) F2 channel element output at pin 4 is then applied to the transmitter.

3.4.2 Paging Control

When the station is equipped with an optional paging control module instead of an F2 control module, the 1850 Hz command keys the transmitter on F1 and prevents transmission of the "Private Line" code. The 1850 Hz command is detected in the paging control module by Q1, which sets paging disable bistable Q2, Q3. The $\overline{Q}$ output of the bistable provides a "PL" inhibit output which prevents "Private-Line" code from being generated.

-- The F2 output has no effect since the transmitter is not equipped with an F2 channel element.

-- The local F1 output is applied to the F1 control module, which activates the F1 bistable and keys the transmitter on frequency F1.

3.5 RECEIVER "PRIVATE-LINE" DISABLING

3.5.1 General Description

3.5.1.1 In this application a transmit channel element is not selected, therefore, the transmitter is not keyed. In order to generate a PL disable signal, the PL monitor command format (2175-Hz guard tone followed by 2050-Hz PL disable) is applied to pins 19 and 20 in the line driver module. The tones are then routed out of the line driver module on pin 10 and are applied to pin 9 of the guard tone decoder.

3.5.1.2 The guard tone decoder detects the 2175-Hz guard tone and uses a portion of the detected voltage to effectively disconnect the 2160-Hz bandpass filter at the guard tone decoder input. In addition, the guard tone decoder provides a bias output at pin 15 which is the result of the 2175-Hz tone. (A line PTT is also generated, however, it cannot key the transmitter because a channel element is not selected.)

3.5.2 PL Disable Function

With the 2160-Hz bandpass filter disconnected, the PL disable tone (2050-Hz) passes through the guard tone decoder via the function hi output at pin 11. The 2050-Hz signal is applied to the F1-PL module for detection. (Although the 2050-Hz tone is applied to other modules, it can only be detected in the F1-PL module.) When the 2050-Hz signal is detected in the F1-PL Module, the PL disable bistable provides a low level PL disable control output at pin 21. The low level PL disable control is applied to the station control module at pin 20. This results in a high level PL disable output, at pin 23, to disable the "Private-Line" operation of the receiver for channel monitoring before transmission. The PL disable condition remains until a line PTT input is applied to pin 19; this occurs when the transmitter is next keyed.)

3.5.3 Function Tone Enable

In order for the tone detector to function, the guard tone decoder generates a 350-millisecond, high-level, decoder bias signal (at pin 15). The decoder bias signal is originated by the 2175-Hz guard tone detection and is present during the 350-millisecond time period that follows. The F1-PL module converts the decoder bias signal into a 350-millisecond, low-level, function enable signal that enables the detectors within the module during the 350-millisecond window. In addition, the function enable is also applied to other modules so that their detectors can also function during the 350-millisecond window.

3.6 R2 MUTE OR RECEIVE F1

3.6.1 In this application, a transmit channel element is not selected, therefore, the transmitter is not keyed. In order to generate the R2 mute signal, the non-transmit format (2175-Hz guard tone followed by a 1750-Hz R2 mute) is applied to pins 19 and 20 in the line driver module. The tones are then routed out of the line driver module on pin 10 and are applied to pin 9 of the guard tone decoder.

3.6.2 Circuit operation from pin 9 of the guard tone decoder is similar to that previously described for Receiver "Private-Line" Disabling except:

--Either the C2-R2 control module, or the F2-R2 mute control module detects the tone.

--The R2 mute output is applied to the line driver.

3.6.3 When the 1750-Hz tone is detected in the control module (C2-R2, or F2-R2 mute) the R2 mute bistable provides a low level R2 mute output at pin 7. This output is applied to the line driver module. The R2 mute signal disables the R2 audio line in the line driver.

3.6.4 If the C2-R2 module is used, the R2 mute bistable also initiates a low level (ground) output at pin 15 to activate the receiver F1 oscillator.

3.7 R2 UNMUTE OR RECEIVE F2

3.7.1 In this application, a transmit channel element is not selected, therefore, the transmitter is not keyed. In order to generate the R2 unmute signal, the non-transmit format (2175-Hz guard tone followed by a 1650-Hz R2 unmute) is applied to pins 19 and 20 in the line driver module. The tones are then routed out of the line driver module on pin 10 and are then applied to pin 9 of the guard tone decoder.

3.7.2 Circuit operation from pin 9 of the guard tone decoder is similar to that previously described for Receiver "Private-Line" Disabling except:

--Either the C2-R2 control module, or the F2-R2 mute control module detects the tone.

--The R2 mute output is open circuited.

3.7.3 When the 1650-Hz tone is detected in the control module (C2-R2 or F2-R2 mute) the R2 unmute bistable provides a cross-coupling to the F2 mute bistable. This causes the F2 mute bistable to open circuit the F2 mute output which, in turn, removes the F2 mute input to line driver. This allows R2 audio to pass through the line driver R2 audio line.

3.7.4 If the C2-R2 module is used, the R2 unmute bistable also initiates a low level (ground) output at pin 17 to activate the receiver F2 oscillator.

3.8 "WILD CARD" ON-OFF

3.8.1 The optional "Wild Card" provides up to four solid state low-high switched outputs or optional relay contact closure outputs. Four different tones are used to control the four circuits. Each circuit is identical, therefore, only one of the four is described; the 1050-Hz. (The others are 1150-Hz, 1250-Hz, and 1350-Hz.) The 1050-Hz tone is applied to the line driver pins 19 and 20 in the non-transmit format (2175-Hz guard tone followed by a 1050-Hz tone). They are routed out of the line drive module on pin 10 and are applied to pin 9 of the guard tone decoder.

3.8.2 Circuit operation from pin 9 of the guard tone decoder is similar to that previously described for Receiver "Private-Line" Disabling except:

--The tone is detected in the "Wild Card" module.

--The output is either a relay contact or bistable output.

3.8.3 When the 1050-Hz tone is detected in the "Wild Card" module, the #1 bistable provides a ground output at the Q side. This ground is normally applied through JU1 to pin 3 where it can be used as a control line. If a relay is used, JU1 is disconnected and the relay contacts are connected to the control line.

3.9 REPEATER SET-UP

3.9.1 In this application, the repeater keying circuits are enabled, thus allowing the repeater to be keyed by the squelch gate module. In order to generate a repeater turn on enable signal, the non-transmit format (2175-Hz guard tone followed by a 1450-Hz repeater on) is applied to pins 19 and 20 in the line driver module. The tones are then routed out of the line driver module on pin 10 and are applied to pin 9 of the guard tone decoder.

3.9.2 The guard tone decoder detects the 2175-Hz guard tone and uses a portion of

the detected voltage to effectively disconnect the 2160-Hz bandpass filter at the guard tone decoder input. In addition, the guard tone decoder provides a 350-millisecond decoder bias output gate at pin 15 which is the result of the 2175-Hz tone.

3.9.3 With the 2160-Hz bandpass disconnected, the repeater on tone (1450-Hz) passes through the guard tone decoder via the function hi output at pin 11. The 1450-Hz tone is applied to the repeater control module for detection. When the 1450-Hz tone is detected, the repeater turn on bistable is set and the low $\overline{Q}$ output is cross-coupled to the clear side of the repeater turn off bistable. The cross-coupling produces a high level output at pin 9, and because this output is high, the function becomes repeater turn-on instead of repeater turn-off.

3.9.4 The high output from pin 9 in the repeater control is applied to pin 21 of the squelch gate module. This high level is an enabling input which allows the squelch gate module to produce the repeater PTT output at pin 18 when the receiver quiets because of an incoming rf signal.

3.10 REPEATER TURN-OFF

In this application, the repeater keying circuits are disabled in order to generate the repeater turn-off function. The circuit operation is similar to that described for repeater turn-on except:

- --A 1550-Hz tone is used.
- --When the repeater control module detects the 1550-Hz tone, it generates a low output at pin 9 that disables the repeater keying function, preventing the repeater from being keyed.

3.11 MAX SQUELCH AND MIN SQUELCH

In these two applications, an attenuator is either switched in or out of the squelch control circuit. The squelch control module is used in place of the repeater control module and is the same except that only jumper JU2 is connected. Circuit operation for this application is similar to that described above for repeater turn-on and turn-off except:

- --When a 1450-Hz tone is detected, the turn-on bistable switches the attenuator into the circuit for threshold squelch.
- --When a 1550-Hz tone is detected, the turn-off bistable cross-couples to the turn-on bistable which then switches the attenuator out of the circuit for maximum squelch.
- --The squelch attenuator output at pin 18 reflects the condition of the attenuator; squelch ratio changes.

3.12 RECEIVER "PL" ON - "PL" OFF

3.12.1 In these two applications the type of squelch is selected; "Private-Line" coded squelch or carrier squelch. The "Private-Line" control module is used instead of the repeater control module, and only jumpers JU3 and JU4 are connected. Circuit operation for this application is similar to that described above for repeater turn-on and turn-off except:

- --When a 1450-Hz tone is detected, the operate carrier squelch bistable provides a low output on pin 20 (high on pin 5) which disables the receiver PL coded squelch circuit.
- --When a 1550-Hz tone is detected, the operate PL bistable provides a low output on pin 5 (high on pin 20) which enables the receiver PL coded squelch circuit.

3.12.2 The low PL disable output on pin 20 (pin 5 high) is applied to the station control module pin 5. This produces a high PL disable output from this module, at pin 23, to disable the PL and change operation to the carrier squelch mode.

3.12.3 The low PL enable output on pin 5 is applied to the F1-PL module to produce high PL disable and function enable outputs from this module. This insures that no other function tones can be excepted and that operation remains in the PL mode.

3.13 SINGLE TONE DECODER

3.13.1 The single tone decoder may be used in repeater systems to key a specific repeater. The single tone decoder can detect one of 19 different audio frequencies between 600 and 3300-Hz, with a 150 Hz spacing. The input, containing the particular tone, is applied from the receiver at pin 3 of the single tone decoder module. The module detects the tone and removes the ground output at pin 16 (squelch gate inhibit). This removes the inhibiting function from the squelch gate module allowing it to function normally. The single tone decoder is reset by the squelch gate module upon loss of received rf carrier signal. The single tone decoder can also be used for receiving enabling. Switched A+

output is applied to the PL indicator output of the receiver, enabling the receiver squelch circuit only when the proper single tone frequency has been received. The PL disable function may be used for monitoring the channel.

3.13.2 The single tone decoder can also be used for remote monitoring and control of external equipment by plugging it into the options decoder (repeater control module) position and connecting the output of the decoder to the external equipment.

3.14 FOUR-FREQUENCY SELECTION

3.14.1 General Description

3.14.1.1 The 4-frequency module converts a function tone signal from a remote source to a switched ground function for transmit and receive channel element selection. The function tone is applied to a clipper amplifier and passed to resonant tank circuits which are tuned to respond to a specific frequency: 1250 Hz, 1350 Hz, 1850 Hz, or 1950 Hz.

3.14.1.2 The tone signal passes through the resonant tank circuit to a detector circuit where it is converted, upon application of a function enable signal from the guard tone decoder module, from a function tone to a dc voltage. This dc signal is inverted and applied to the transmit and receive latches. These latches, upon application of a clock pulse, activate the channel element drivers to provide a switched ground to the selected transmit and receive channel elements.

3.14.2 Transmit Frequency Selection

3.14.2.1 Since all frequency selection circuits are the same except for the specific frequency to which they respond, only one circuit is described, the F2 (1850 Hz) circuit. When an 1850 Hz function tone is sent from the remote control console, it is received at pin 11 of the four-frequency control module. It is then amplified and passed through the respective tank circuit. The signal is detected by the F2 detector and is converted from a 1850 Hz function tone to a logic low dc voltage. The F2 detector is enabled by the presence of the function enable signal at pin 13 from the bias switch in the F1 or F1-PL control module. This signal is developed only after the high level guard tone has been detected.

3.14.2.2 The logic low detector output is inverted and applied to transmit latch flip-flop U11B and to the transmit latch clock. The clock pulse is applied to the F2 flip-flop which changes state and produces a high level Q output. This output is inverted to a logic low and is applied to the T2 transmitter channel element. As this happens, the other transmit latch flip-flops reset, cancelling any previous frequency selection.

3.14.3 Receive Frequency Selection

3.14.3.1 The logic high from the F2 transmit latch flip-flop is also applied to the receiver latch clock circuit and receiver latch flip-flop U2B. The receiver latch clock sends a pulse to receiver latch flip U2B which causes the Q output to become high. The receive latch flip-flop now remains in this state until reset. AND gate U3B applies a high to inverter Q23. The output of Q23 is a ground which selects the R2 receiver channel element.

3.14.3.2 After transmission has been completed and PTT has been released, switched 9.6 V is removed from pin 8, causing C14 to discharge. The discharge of this capacitor turns on the transmit clock causing a second pulse to be applied to the multivibrator which resets the transmit latch back to its original state (all Q outputs low).

3.14.3.3 The receiver latch does not reset after transmission has been completed. The receiver channel, in this explanation R2, remains activated. When transmission is changed to F1, F3, or F4, the receiver clock will pulse the receiver flip-flop, thus resetting R2 and turning on the appropriate receiver frequency for proper communications.

3.14.3.4 The power on reset circuit pulses receiver latch U2A, resetting the multivibrator to R1 channel element select any time power is lost due to removal of the card or power outage.

3.15 EXCITER AUDIO

3.15.1 Exciter audio is defined as the audio used to modulate the transmitter. It is applied to the transmitter and can originate from several sources depending upon the modules that are used in the station.

3.15.2 Audio from the remote control point is applied to pins 19 and 20 of the line driver module, and is routed out of this module on pin 24. From this point, the audio is applied to the control station module pin 6 for level control setting and gating (must be gated by PTT control). The audio leaves from this module at pin 16 (as unnotched mic hi). From the station control module, it is applied to local microphone input metering and the F1-PL (or F1) module pin 18. The F1-PL module contains a notch filter that greatly attenuates any 2175-Hz signals to insure a guard tone is not transmitted "on-the-air". After filtering, the mic hi output at pin 22 is applied to the transmitter.

3.16 RECEIVE AUDIO

3.16.1 Receiver R1 and R2 audio (discriminator output) is applied to the line driver module at pins 13 and 22, respectively. In repeater operation, R1 audio is applied to squelch gate module pin 17.

3.16.2 The receiver audio is routed through the line driver module; however, the output point depends upon the model used and the jumper connections.

3.16.3 Normally, the audio is routed through the line 1 level set control and line amplifiers and exits on pins 19 and 20. The wire line carries this audio back to the remote control point.

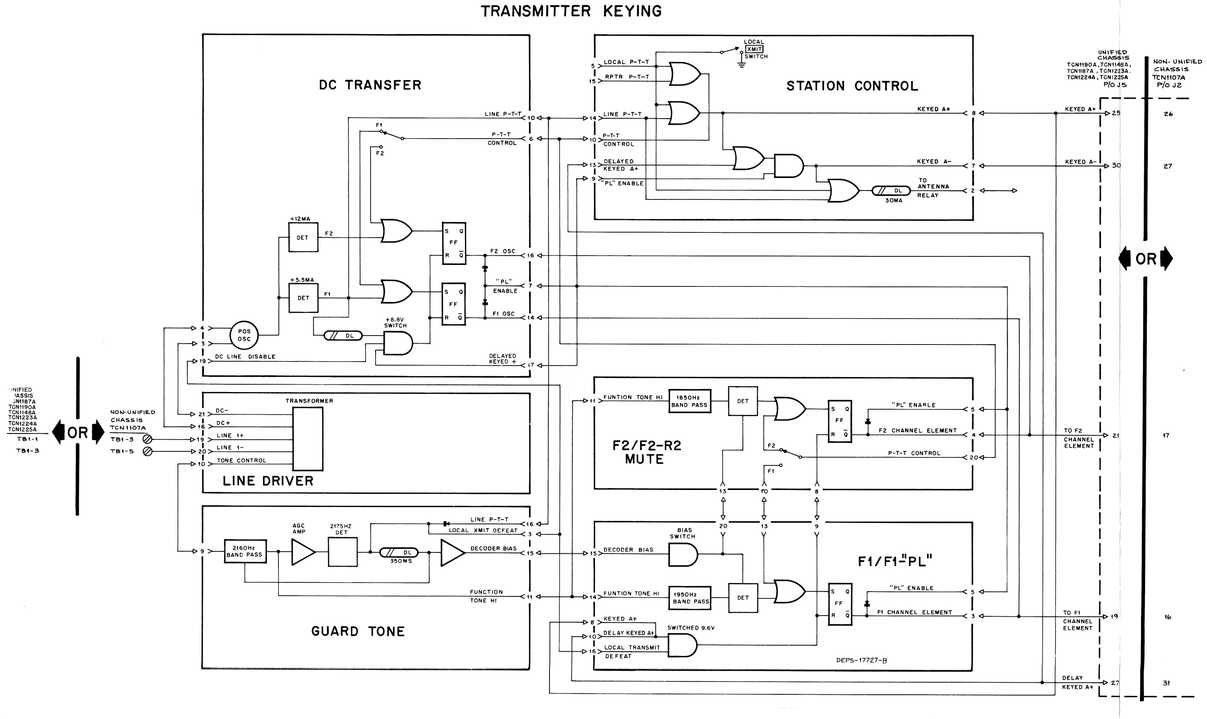
3.16.4 R1 audio may be routed to the line 1 output while R2 audio may be routed through the line 2 level set control and line amplifiers and exit the module on pins 7 & 8. Both lines carry audio to a remote point.

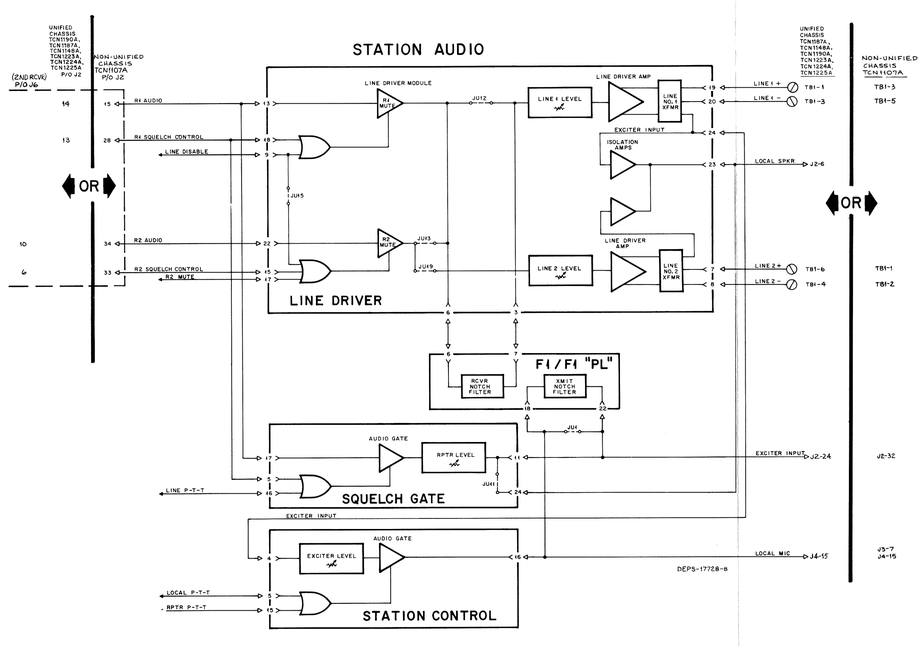
3.16.5 The audio from the receiver(s) can be routed to the line 2 output when line 1 is to be used for transmit audio and line 2 is to be used for receive audio.

3.16.6 In tone controlled stations, the R1 audio is routed from the receiver through the F1-PL module which contains a 2175-Hz receiver notch filter to remove any 2175-Hz tone, then to the line driver module.

3.16.7 Any audio that is routed to line 1 or line 2 is sampled from the line transformer and exits the line driver module on pin 23. This audio is routed to the audio power amplifier of the receiver for local speaker audio.

3.16.8 In repeater configurations, R1 audio is applied to pin 17 in the squelch gate module for gating and level setting. The audio output at pin 11 (repeater audio) is then to transmitter audio in repeater operation.





Simplified Functional Diagrams
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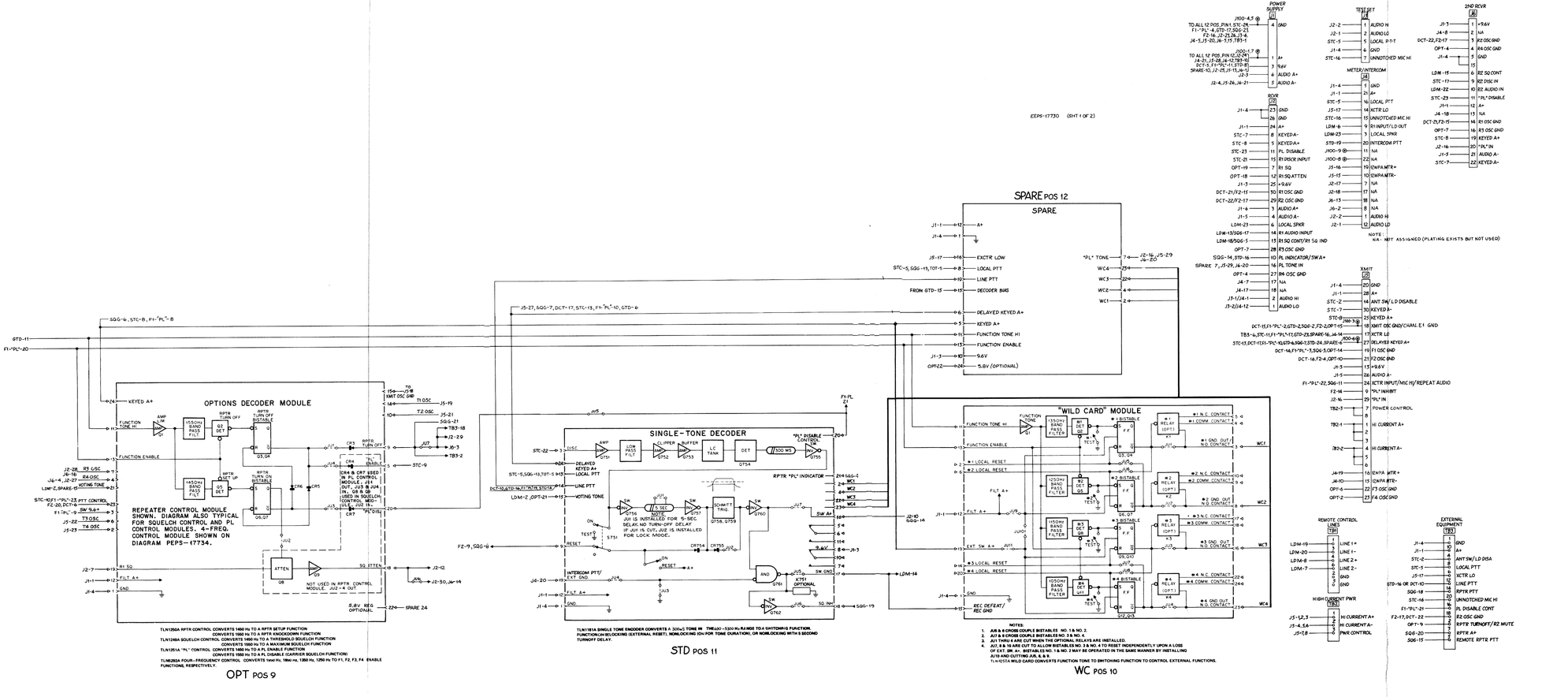
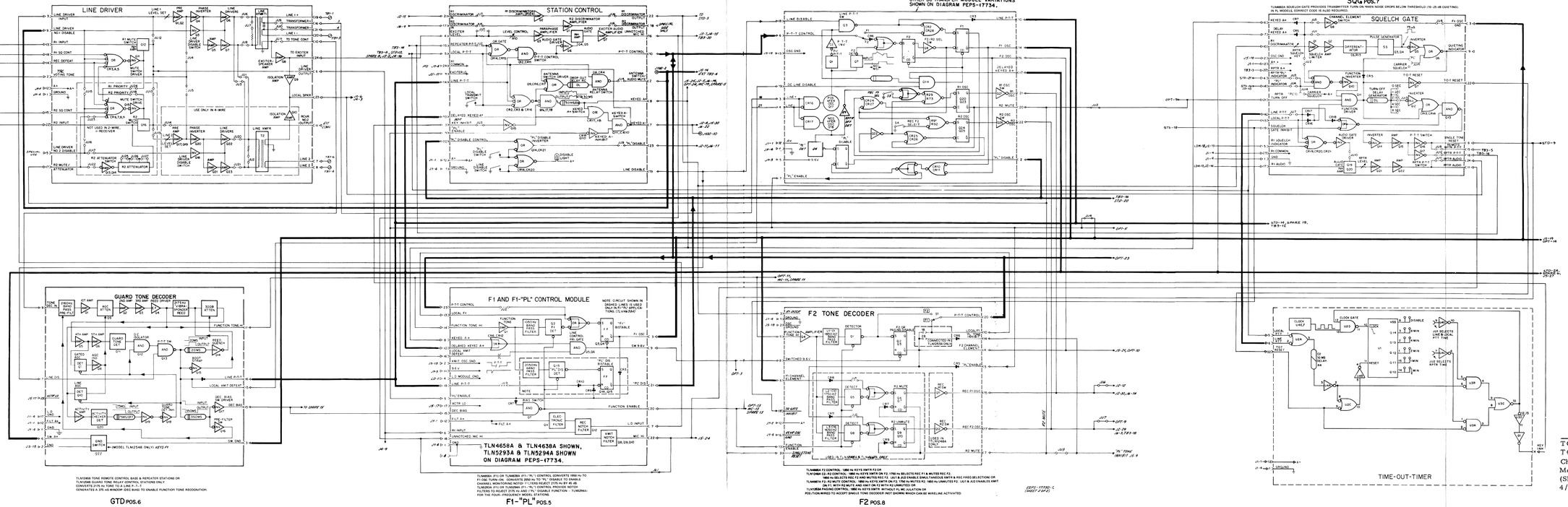
12/4/76-PHI

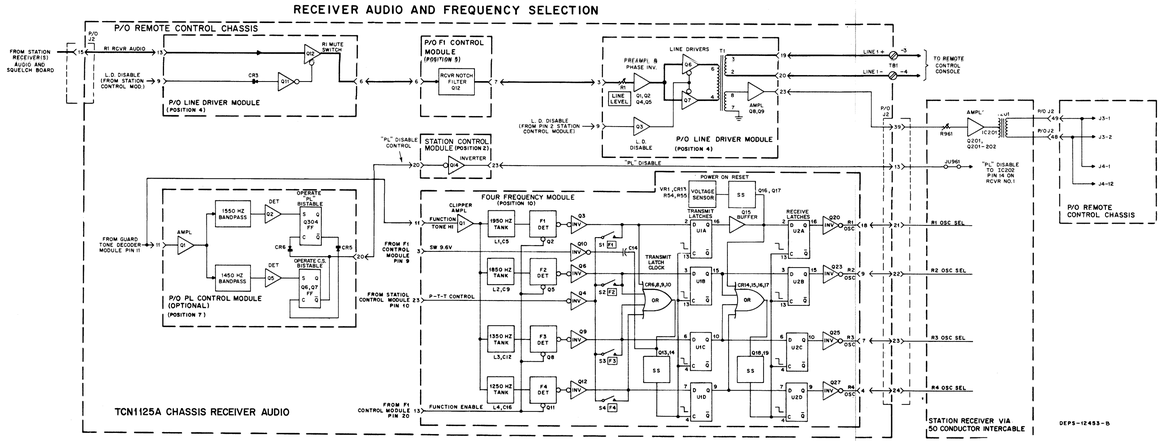


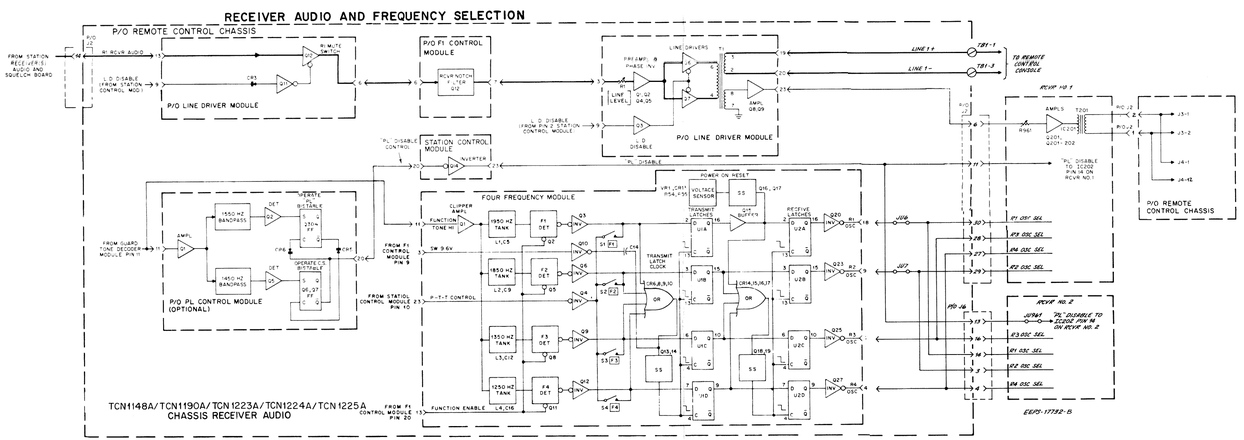
TCN1187A/TCN1148A/TCN1190A/TCN1223A/
TCN1224A/TCN1225A Unified Remote Control
Chassis Detailed Functional Diagram
Motorola No. PEPS-20790-C
(Sheet 1 of 2)
4/15/81-PHI

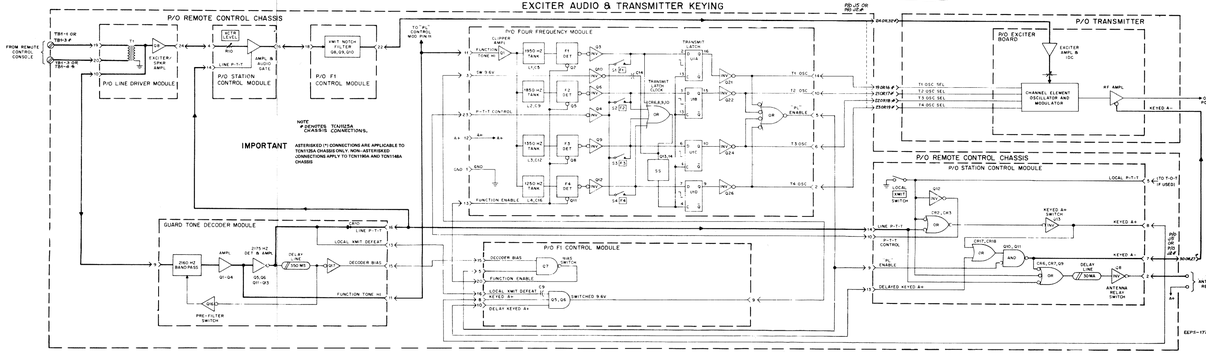


TCN1187A/TCN1148A/TCN1190A/TCN1223A/
TCN1224A/TCN1225A Unified Remote Control
Chassis Detailed Functional Diagram
Motorola No. PEPS-20790-C
(Sheet 2 of 2)
4/15/81-PHI

FUNCTIONAL DESCRIPTION







Simplified Functional Diagrams
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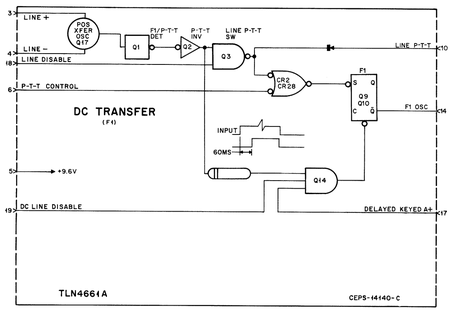
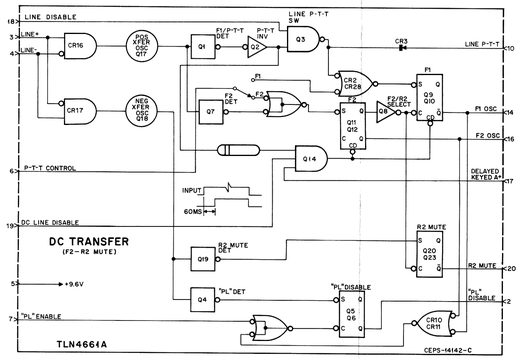
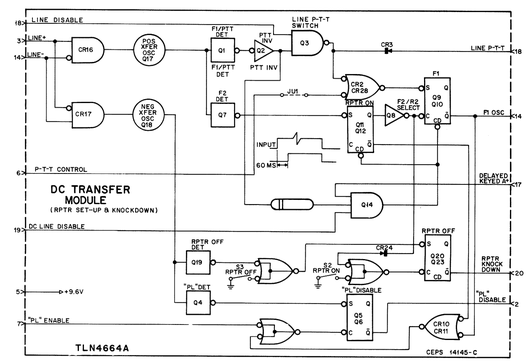
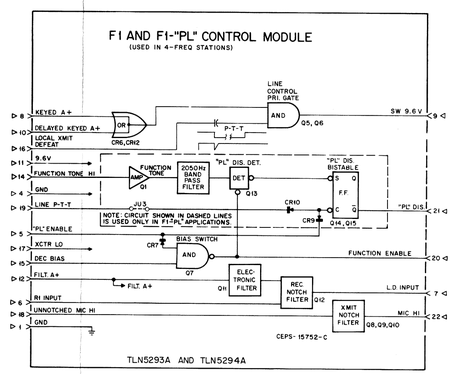
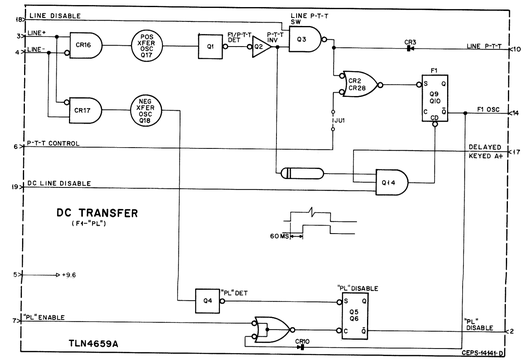
Motorola No. PEPS-17733-B
12/4/76-PHI

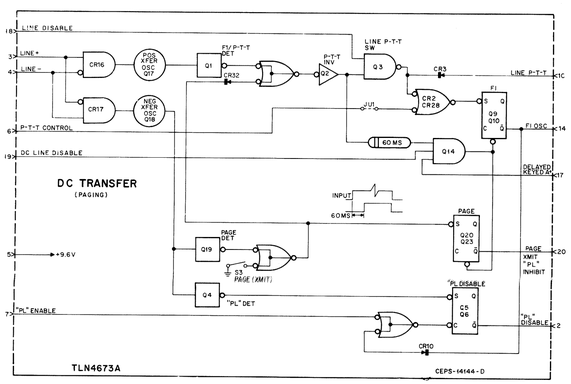


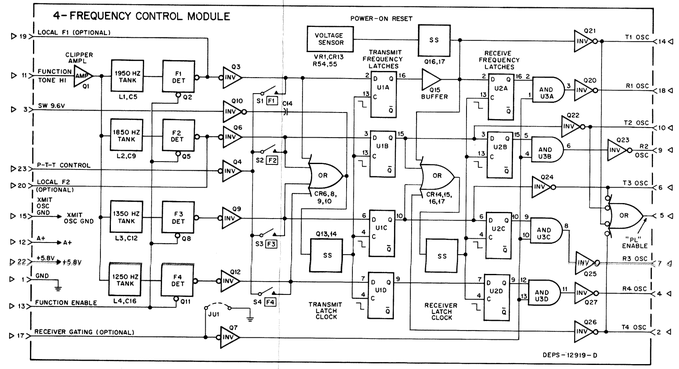










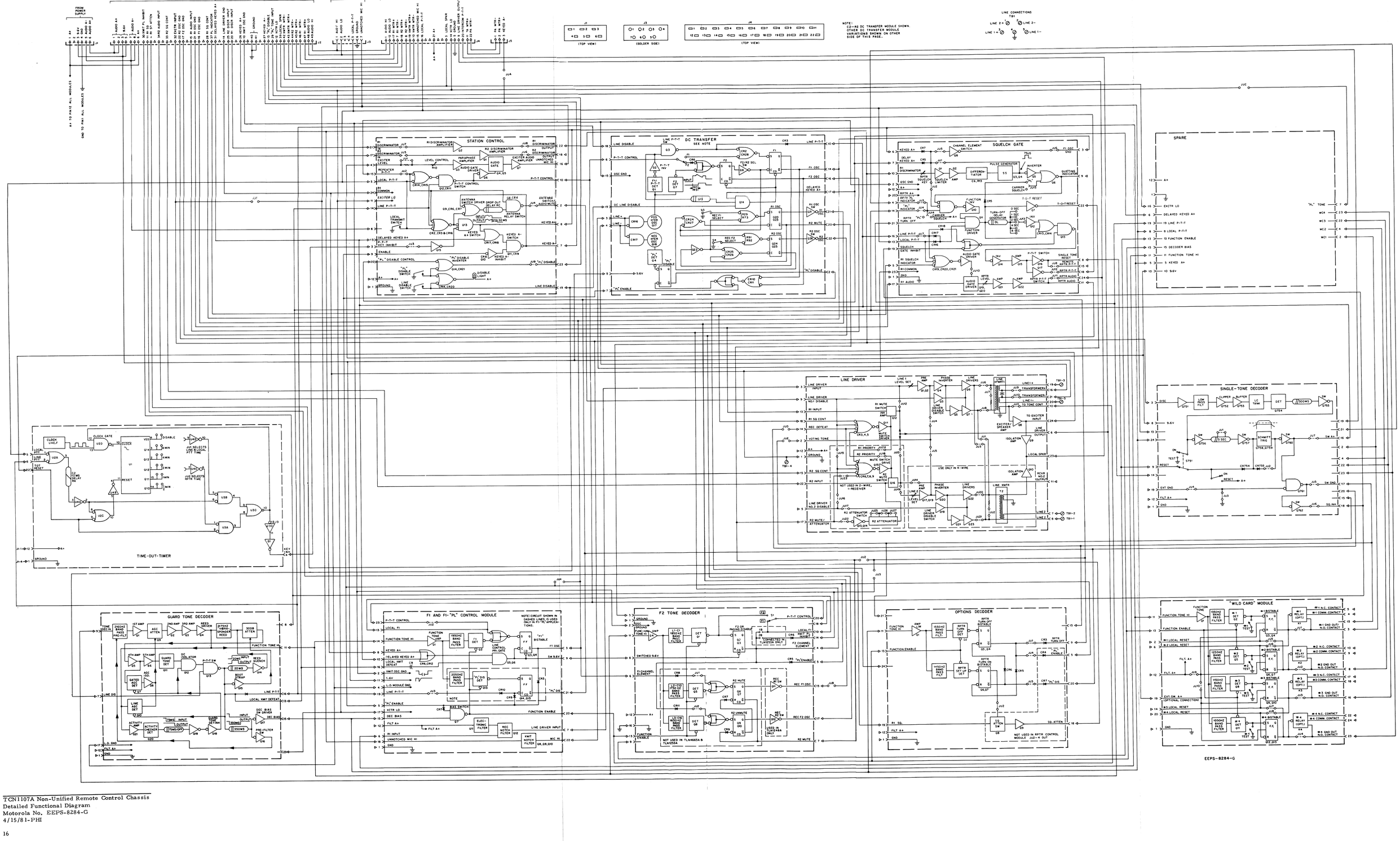


FUNCTIONAL DESCRIPTION

TCN1107A/TCN1128A REMOTE CONTROL
CHASSIS DETAILED FUNCTIONAL DIAGRAM
SHOWN ON BACK OF THIS DIAGRAM

Simplified Functional Diagrams
of DC Transfer Modules and Four-Frequency
Control Modules
Motorola No. PEPS-17734-B
4/6/76-PHI

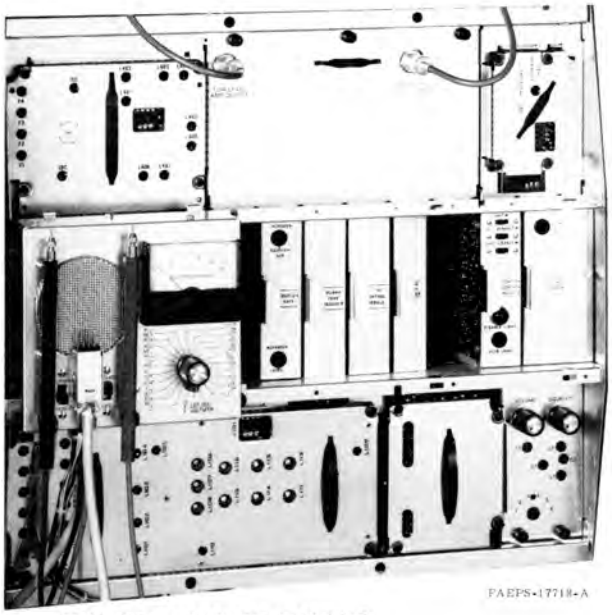
DETAILED FUNCTIONAL DIAGRAM



TCN1107A Non-Unified Remote Control Chassis
Detailed Functional Diagram
Motorola No. EEPS-8284-G
4/15/81-PHI

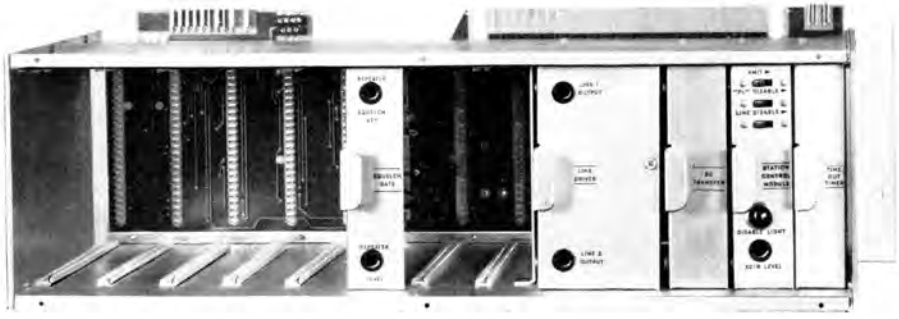
REMOTE CONTROL CHASSIS

METERING/INTERCOM NOT SUPPLIED WITH ALL STATIONS



FAEPS-17718-A

TYPICAL UNIFIED CHASSIS



AEPS-8280-O

TYPICAL NON–UNIFIED CHASSIS

MOTOROLA INC.
Communications Division

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

MOTOROLA

DETAIL MODEL BREAKDOWN CHART FOR
UNIFIED CONTROL CHASSIS
AND
NON-UNIFIED CONTROL CHASSIS

CODE:

[X] = ONE ITEM SUPPLIED.

* = INDICATES ITEM COVERED IN ASSOCIATED STATION MANUAL.

NOTE:

THE MISCELLANEOUS KITS ARE PART OF OR OPTIONS TO THE STATION MODEL BUT MOUNT ON THE CONTROL CHASSIS. USAGE OF THESE KITS ARE AS FOLLOWS:

TRN6571A -- 800 MHz MODELS ONLY
TLN5148A -- NON-UNIFIED MODELS ONLY
TRN6338A -- 4 FREQ. UNIFIED MODELS ONLY

MODEL NO.	DESCRIPTION	TYPE OF STATION
TCN1187A	UNIFIED CONTROL CHASSIS	RPTR
TCN1148A	UNIFIED CONTROL CHASSIS	BASE
TCN1190A	UNIFIED (FULL FILTERING OPTION)	RPTR & BASE
TCN1223A	UNIFIED CONTROL CHASSIS	BASE
TCN1224A	UNIFIED CONTROL CHASSIS	RPTR
TCN1225A	UNIFIED (FULL FILTERING OPTION)	RPTR & BASE
TCN1107A	NON-UNIFIED	1- & 2-FREQ.
TCN1125A	NON-UNIFIED	4-FREQUENCY
	MISCELLANEOUS KIT (SEE NOTE)	
TRN6571A	TRANSMIT INHIBIT KIT	
TLN5148A	REPEATER (RA) BRACKET KIT	
TRN6338A	5 V REGULATOR KIT	

KIT NO.	DESCRIPTION	TCN1187A	TCN1148A	TCN1190A	TCN1223A	TCN1224A	TCN1225A	TCN1107A	TCN1125A
TLN5644A	INTERCONNECT BOARD	X	X	X	X		X		
TLN5645A	*TRANSMITTER INTERCONNECT BOARD (RPTR)	X	X						
TLN5646A	*RECEIVER INTERCONNECT BOARD (RPTR)	X	X						
TLN5649A	CHASSIS & HARDWARE KIT	X	X	X		X			
TLN5647A	*TRANSMITTER INTERCONNECT BOARD (BASE)	X		X	X				
TLN5648A	*RECEIVER INTERCONNECT BOARD (BASE)	X		X					
TRN6195A	*TRANSMITTER INTERCONNECT BOARD (FULL FILTERING OPTION)				X				
TRN6196A	*RECEIVER INTERCONNECT BOARD (FULL FILTERING OPTION)				X				
TKN6570A	*RF CABLE ASSEMBLY, RECEIVER					X			
TLN5892A	CHASSIS & HARDWARE KIT					X			
TLN5893A	*TRANSMITTER INTERCONNECT BOARD (BASE)					X			
TLN5894A	*TRANSMITTER INTERCONNECT BOARD (RPTR)						X		
TLN4666A	INTERCONNECT BOARD							X	X
TLN4808A	CHASSIS & HARDWARE KIT							X	X
TLN4957A	INTERCONNECT BOARD								
TLN4958A	5 V REGULATOR BOARD								
TLN4959A	*CHASSIS & HARDWARE KIT								
TLN5895A	*TRANSMITTER INTERCONNECT BOARD (FULL FILTERING OPTION)								

EPS-22525-O

1. DESCRIPTION

1.1 Eight remote control chassis are described in this manual section (see model chart). Unified models utilize a unified chassis which includes and interconnects (without wire) the remote control chassis modules to the transmitter and receiver interconnect boards. A single large circuit board interconnects the control modules directly to the transmitter and receiver. Non-unified models utilize a 50-conductor flat cable to interconnect the control modules to the transmitter and receiver circuits.

1.2 The remote control chassis mounts plug-in modules that perform switching functions for station operation. Nylon guide rails in the chassis align the modules with the mating connecting pins on the interconnect circuit board at the rear of the chassis.

2. APPLICATION

2.1 TONE OR DC REMOTE CONTROL

The remote control chassis, togehter with the associated plug-in modules, permits a station to be operated from a remote location and performs various control or operational functions for the station. Tones or dc line currents generated at a remote location(3) are carried over wire lines to the station remote control chassis to implement the desired type of operation. The remote control chassis and its modules convert the tones or dc line currents into switching functions to perform any or all of the operations listed in Tables 1, 2 and 3 depending on the modules used:

TABLE 1. DC COMMANDS

DC LINE CURRENT (mA)	OPERATION
0	Transmitter standby, receiver operative
-2.5	"PL" disable (receiver)
-5.5	Mute receiver No. 2 audio
+5.5	Turn-on transmitter F1 oscillator; Select R1 receiver oscillator
+12.5	Turn-on transmitter F2 oscillator; Repeater turn-on; Select R2 receiver oscillator
+12.5 (momentary)	Unmute receiver No. 2 audio
-12.5	Turn-on transmitter F1 oscillator without PL modulation (paging)

TABLE 2. TONE COMMANDS

TONE FREQ. (Hz)	OPERATION
2050	Disable Receiver PL
1950	Transmit F1 or Select F1
1850	Transmit F2 or Select F2 or Transmit F1 w/o PL
1750	R2 Mute or (Receive F1)*
1650	R2 Unmute or (Receive F2)*
1550	"MAX" SQUELCH or REPEATER "OFF" or "PL" ON
1450	"MIN" SQUELCH or REPEATER "ON" or "PL" OFF
1350	"Wild Card" ON #1 or Select F3
1250	"Wild Card" OFF #1 or Select F4
1150	"Wild Card" ON #2
1050	"Wild Card" OFF #2

*C2-R2 Receiver Frequency Selection

TABLE 3. GUARD TONE

Tone Freq. (Hz)	Operation
2175	Function Tone Enable

2.2 PLUG-IN MODULES

2.2.1 All stations are equipped with a basic complement of modules as follows:

DC CONTROL
DC Transfer Module
Station Control Module
Line Driver Module

TONE CONTROL
Guard Tone Decoder Module
F1 Decoder Module
F2, or C2-R2, Decoder (2-Frequency stations)
Station Control Module
Line Driver Module

2.2.2 Repeater Stations are also equipped with a Squelch Gate Module and Time-Out Timer Module. Repeaters without wire-line control may have the modules that are associated with line control operation omitted. For base stations and repeaters, additional space is provided for optional accessory modules.

3. SERVICE AND MAINTENANCE

3.1 LOCAL STATION OPERATION

WARNING

Always line disable this station when performing local maintenance duties. Failure to do so may result in personal injury or equipment damage. Selection of frequency at the remote control console momentarily keys this station even though the microphone push-to-talk switch has not been depressed. Upon completion of local testing, return line disable switch to its normal position.

3.2 REMOVAL AND REPLACEMENT OF MODULES

3.2.1 Modules may be removed by simply pulling outward on the module, and may be replaced by pusing the module into is position in the panel. The modules are labelled and the mounting positions are marked on the interconnect board at the inside rear of the module housing.

CAUTION

1. Never attempt to plug a module into the pins on the back of the remote control unit.
2. Always be sure of the correct module position before plugging in a module.

3.2.2 Technicians who service many of these stations may wish to carry spares 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 troubleshooting technique.

3.3 INSTALLATION OF ADDITIONAL MODULES

When new functions (optional modules) are added, refer to the pertinent module section in this manual for proper jumpering information.

3.4 IN-CIRCUIT MODULE SERVICING

The Motorola Model TLN8799A Service Board Kit can be used for extending the module to provide access for service and maintenance without interrupting the power and signal connections when taking readings. See Figure 1.

3.5 OUT-OF-CIRCUIT MODULE SERVICING

A Motorola TEK-38 Base Station Module Servicing Adapter, shown in Figure 2, can be used for convenient bench testing or repair of base station modules. The board provides an easy method of connecting a 12-volt power supply and an audio oscillator and allows jumpering and strapping between any pins on the module.

3.6 5-VOLT REGULATOR TROUBLESHOOTING (TCN1125A MODEL ONLY)

3.6.1 Set-Up Instructions

Connect a 2 ohm, 20 watt resistor from the regulator output at the brown-yellow lead to ground. Disconnect CR1 from the circuit to preclude crowbar action during troubleshooting. Connect 10 to 16 V dc to the input terminals of the regulator.

3.6.2 Symptoms

3.6.2.1 No Output

Step 1. Check series elements F1, R1, Q5.

Step 2. Check for open components in regulator stages; Q1, Q2, Q3, CR5, etc.

3.6.2.2 Output Voltage Same as Input

Check for Q5 shorted collector to emitter

3.6.2.3 Improper Regulation

Step 1. Check values of R5, R7, R8 and R9.

Step 2. Check Q3 emitter voltage. If not 4.7 ±0.3 volts check CR5.

Step 3. Check Q1, Q2 and Q3.

3.6.2.4 Crowbar Circuit Inoperative

Step 1. Adjust output voltage to 7.5 volts with R8. Check junction of R10-R11 for 6.3 volts.

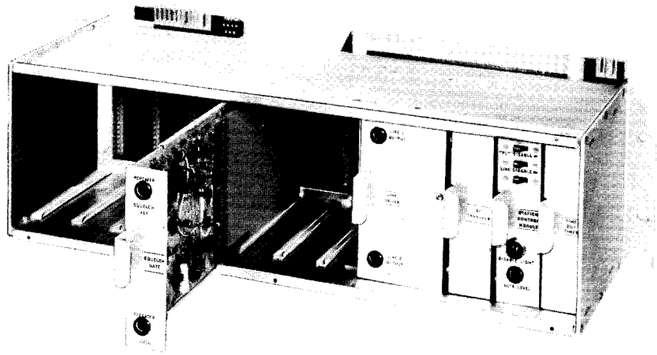
Step 2. Check Q4, CR1, R11, R12 and R6.

Step 3. Check C1.

Step 4. After fault is located and corrected, readjust R8 to obtain 5.8 volts ±0.1 V output from the regulator.

4. SPECIAL MODIFICATIONS

To change the Tone Decoder frequencies from the standard value, change those parts indicated in Figure 3 and Table 4.



AEPS-8279-O

Figure 1. Typical In-Circuit Module Servicing (TCN1107A/TCN1125A Remote Control Chassis Shown)

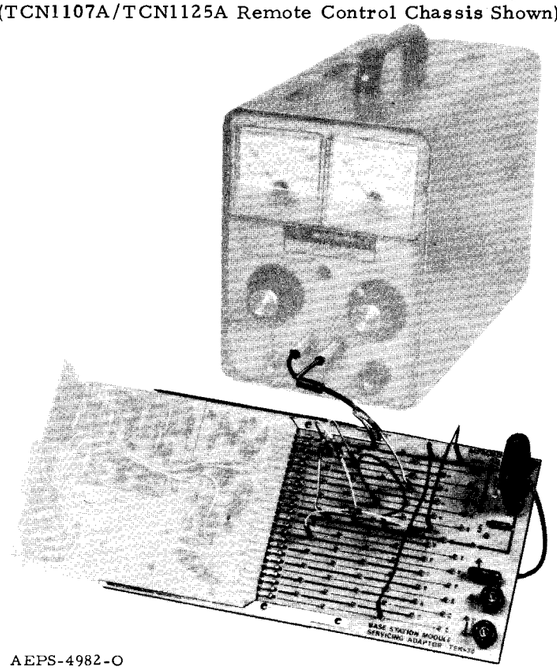


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Figure 2. Out-of-Circuit Module Servicing

TABLE 4. FUNCTION TONE MODIFICATION TABLE

To Change Function Tone Tank Freq. To	R1 ±5% (In Ohms)	R2 ±5% (In Ohms)	R3 ±1% (In Ohms)	R4 ±1% (In Ohms)	C1 ±2% (In uF)	Capacitor Part No.
2050	27k, 33k*	1.5k	2.7k**	221	.0056	8D84326A13
1950	22k, 27k*	1k	2.2k**	221	.0062	8D84326A14
1850	18k, 22k*	1.5k	2.7k**	221	.0069	8D84326A15
1750	22k	1k	2.43k	221	.0077	8D84326A16
1650	18k	1k	2.21k	221	.00865	8D84326A17
1550	15k	1k	2.21k	221	.0098	8D84326A18
1450	12k	1k	2.21k	221	.0112	8D84326A19
1350	10k	1k	2.21k	221	.0129	8D84326A20
1250	9.1k	1k	2.43k	221	.015	8D84326A21
1150	8.2k	1k	2.43k	221	.0178	8D84326A22
1050	6.8k	1k	2.43k	221	.0213	8D84326A23

*Values for "Wild Card" only.
**±5% is allowable.

EXAMPLE: Changing "Wild Card" frequency to 1850 Hz

FREQ.	R1	R2	R3	R4	C1
1850	22k ±5%	1.5k ±2%	2.7k ±5%	221 ±1%	.0069 uF ±2%

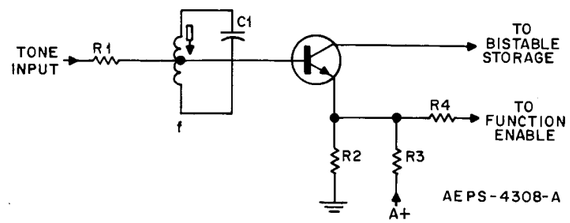


Figure 3.
Typical Function Tone Detector

Module	Position	Ground, Line Driver Ground	A+	Ant. Sw/L. D. Disable	TOT Reset	Key Inhibit	Xctr/Spkr Level	Keyed A-	Keyed A+	PTT Control	Local PTT	Xmit Osc Gnd/Chan Elem Gnd	Xctr Lo	Delayed Keyed A+	Line PTT	Rptr PTT	Unnotched Mic Hi
Line Driver	1	1	12	9			24*										
Station Control	2	1,24	12	2*		3	4	7*	8*	10*	5*		11	13	14	15	16*
DC Transfer	3	1	12							6		15		17	10*		
Time-Out Timer	4	1	12		22	4*					5				6		
F1/F1-"PL"	5	1, 4	12						8	23		2	17	10	19		18
Guard Tone Dec.	6	1,17	12									2	23	6	16*		
Squelch Gate	7	1,23	12		22*				6		13	2		7	16	18*	
F2/Paging/S. T. Dec.	8	1,16	12							20		2					
Options	9	1	12						24	23		15					
"Wild Card"	10	1	12						19								
Single Tone Dec./Voting	11	1	12								13			24	14		
Spare	12	1	12						5		8		16	6	19		
Jumpers			8					10									1
J1 Power Supply		4*	1*														
J2 Rcvr		23,26	24					8	5								
J3 Test Set Meter		6									5						7
J4 Metering		5	21								16*		14				15
J5 Xmtr		20	28	14				30	25			18*	17*	27*			
J6 2nd Rcvr		5,15	12					22	19								
TB1 Remote Control Lines																	
TB2 High Current																	
TB3 External		1	10	4							8		6		12	14	20
Individual Pins		J100-4,-5	J100-1,-7	J100-2				J100-10				J100-3		J100-6			

Module	Position	Line +/Xfmr +	Line -/Xfmr -	Line Disable	"PL" Disable Cont.	"PL" Disable	R1 Discr Input	R1 Discr Out/Disc.	R1 Sq	R1 Sq Atten.	F1 Osc Gnd/F1 Chan Elem	F2 Osc Gnd/F2 Chan Elem	9.6 Volt	DC Line Disable/Loc Xmtr Defeat	R2 Mute/Page/Rptr On/R2 Mute Atten.	R1 Osc Gnd	R2 Osc Gnd	Audio A+	Audio A-	L. D. Input	R1 Input L. D. Out	Local Spkr	Tone Control In	R1 Audio Input	R2 Audio Input	R1 Sq Cont/R1 Sq Indic
Line Driver	1	16*	21*												17					3	6*	23*	10*	13	22	18
Station Control	2			19*	20	23*	21	22*																		
DC Transfer	3	3	4	18	2*						14*	16*	5	19	20*	21*	22*									
Time-Out Timer	4																									
F1/F1-"PL"	5				21*						3*		11	16						7*	6					
Guard Tone Dec.	6			7							3			13*									9			
Squelch Gate	7							10			3*											24*		17		5
F2/Paging/S. T. Dec.	8							3			6	4*			7*	15*	17*									
Options	9								19*	18*	14*	10*														
"Wild Card"	10																									
Single Tone Dec./Voting	11				20			3					8													
Spare	12												10													
Jumpers					5					6	4				2/3	6	7									
J1 Power Supply													3*					6*	5*							
J2 Rcvr						11	15*		7	12			25			30	29	3	4			6		14*		13*
J3 Test Set Meter																										
J4 Metering																					9	3				
J5 Xmtr											19	21	13						26							
J6 2nd Rcvr						11							1			14	3		2*						10*	
TB1 Remote Control Lines																										
TB2 High Current																										
TB3 External					16												18									
Individual Pins																										

Module	Position	"PL" Enable	Sw 9.6 Volt	Local F1	Function Tone H1	Decoder Bias Sw	Function Enable	Xmtr Input/Mic Hi/Repeat Audio	R3 Osc Gnd	Single Tone Reset	"PL" Indicator/Sw A+	R2 Sq Control	Sq Gate Inhibit	XMIT "PL" Inhibit	Rptr Turn-Off/R2 Mute	R2 Disc Input	"PL" Tone In	WC1	WC2	WC3	WC4	Rec Defeat/Rec Gnd	Intercom PTT	Voting Tone	R4 Osc Gnd	NA	NA
Line Driver	1											15										14		2			
Station Control	2	9														17											
DC Transfer	3	7*																									
Time-Out Timer	4																										
F1/F1-"PL"	5	5*	9*	13	14	15	20*	22*																			
Guard Tone Dec.	6				11*	15*																					
Squelch Gate	7							11*		8*	14		19		21												
F2/Paging/S. T. Dec.	8	5*	8	10*	11		13			9			18*	14*													
Options	9	5	3		11		13		7*						9*									21	4*		
"Wild Card"	10				11		13											3*	8*	16*	23*	15					
Single Tone Dec./Voting	11									9	16		18*					2	4	22	23	17*	19	15*			
Spare	12				11	15	13										7*	2	4	22	23						
Jumpers		4						1						3	2/7											10	
J1 Power Supply																											
J2 Rcvr									28		10*						16*								27		
J3 Test Set Meter																											
J4 Metering																							20*			11	22
J5 Xmtr								24						9			29										
J6 2nd Rcvr									16			6*				9*	20								4		
TB1 Remote Control Lines																											
TB2 High Current																											
TB3 External															2												
Individual Pins																										J100-9	J100-8

Module	Position	ADL Output	High Current A+	High Current A-	12 W PA MTR +	12 W PA MTR -	NA	NA	NA	NA	Audio Hi	Audio Lo	Line 1 +	Line 1 -	Line 2	Line 2	Rptr "PL" Indic	Rptr A+	Remote Rptr PTT	"PL" Disable Cont	5.8 V Reg (Opt)	F3 Osc Gnd	F4 Osc Gnd	NA	Rec Unsq Indic
Line Driver	1												19	20	8	7									4
Station Control	2																							6	
DC Transfer	3																								
Time-Out Timer	4																								
F1/F1-"PL"	5																								
Guard Tone Dec.	6																							18	
Squelch Gate	7																4	20*	15*						
F2/Paging/S. T. Dec.	8																								
Options	9																			20*	22	6*	2*		
"Wild Card"	10																								
Single Tone Dec./Voting	11																21*								11
Spare	12																				24*				
Jumpers																				5	8				
J1 Power Supply																									
J2 Rcvr							17	18			2*	1*													
J3 Test Set Meter											1	2													
J4 Metering					19	10	7	17	18	8	1	12													
J5 Xmtr		7,8*	1,2,3	4,5,6	16*	15*																22	23		
J6 2nd Rcvr									13	2															
TB1 Remote Control Lines													1*	3*	4*	6*									
TB2 High Current		3	1*	2*																					
TB3 External																		3	5						
Individual Pins																									

EPS-17719-C

HOW TO READ CHART

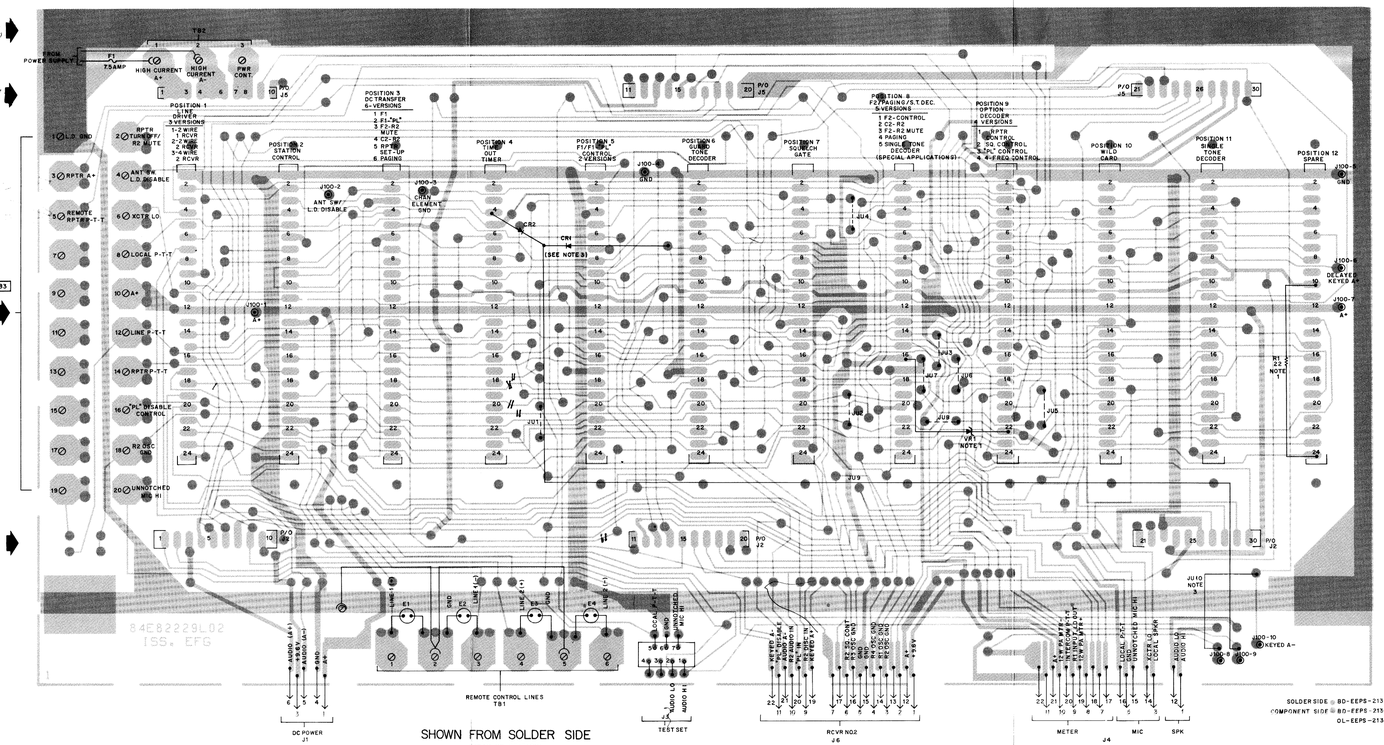
1. This chart shows all interconnections made by the plating on both sides of the interconnect board and by wire jumpers.
2. All pin numbers in each vertical column are electrically common (interconnected by circuit board plating).
3. To trace interconnections from any starting point to all other common points proceed as follows:

Step 1. Find the module position or connector in the left hand column of the chart.
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.
Step 5. NA Not Assigned (Plating exists between points but not used.)

EXAMPLE:
Station control module (module position 2), pin 10 has a function of P-T-T Control, which is interconnected to DC transfer module position 3 (pin 6), F1/F1-PL module position 5 (pin 23), F2/PAGING/S.T. DEC. position 8 (pin 20) and OPTIONS position 9 (pin 23).

USES TCN5644A BOARD

TCN1148A/TCN1187A/TCN1190A/
TCN1223A/TCN1224A/TCN1225A
Unified Remote Control Chassis
Interconnect Chart
Motorola No. EPS-17719-E
4/15/81-PHI



SHOWN FROM SOLDER SIDE
(REAR OF STATION)

INHIBIT KIT TABLE

MODEL	APPLICATION	CR1	JU9	JU10
TRN6571A	800 MHZ STATIONS	IN	IN	OUT
TRN8579A	UHF HI–POWER 806RCB SERIES STATIONS	IN	IN	IN

JUMPER TABLE

TYPE OF STATION	JUMPER							
	1	2	3	4	5	6	7	8
BASE — DC CONTROLLED	IN	CUT	IN	OUT	IN	OUT	OUT	OUT
BASE — TONE CONTROLLED	OUT	CUT	OUT	OUT	IN	OUT	OUT	OUT
BASE — TONE CONTROLLED, FOUR–FREQ	OUT	OUT	OUT	OUT	OUT	IN	IN	OUT
BASE (RA)	IN	OUT	OUT	IN	IN	OUT	OUT	OUT
BASE (RA) (USED IN GUARD TONE RELAY SYSTEM)	OUT	OUT	OUT	OUT	IN	OUT	OUT	OUT
RPTR (RT) — NON WIRE–LINE	IN	OUT	OUT	IN	IN	OUT	OUT	OUT
RPTR (RT) — DC CONTROLLED	IN	OUT	IN	OUT	IN	OUT	OUT	OUT
RPTR (RT) — TONE CONTROLLED	OUT	OUT	OUT	IN	IN	OUT	OUT	OUT
RPTR (RA)	IN	OUT	OUT	IN	IN	OUT	OUT	OUT

* IN WHEN TLN4664A REPEATER CONTROL MODULE IS USED.

NOTES:

1. DIODE VR1 AND RESISTOR R1 ARE PART OF TRN1238A 5–VOLT REGULATOR KIT USED ONLY WITH FOUR–FREQUENCY STATIONS.
2. E3 AND E4 ARE PART OF 4–WIRE LINE DRIVER MODULE.
3. SEE INHIBIT KIT TABLE ABOVE.
4. SPARK-GAP GROUNDING CABLE PART OF TLN5644A.

MODEL TABLE

MODEL	SUFFIX	SUB–MODEL	SUFFIX	DESCRIPTION
TCN1148A		TLN5644A		INTERCONNECT BOARD
		TLN5647A		INTERCONNECT BASE (XMTR)
		TLN5648A		INTERCONNECT BASE (RCVR)
		TLN5649A		CHASSIS
TCN1187A		TLN5644A		INTERCONNECT BOARD
		TLN5645A		REPEATER INTERCONNECT BOARD (XMTR)
		TLN5646A		REPEATER INTERCONNECT BOARD (RCVR)
		TLN5649A		CHASSIS
TCN1190A		TLN5644A		INTERCONNECT BOARD
		TLN5649A		CHASSIS
		TRN6195A		INTERCONNECT FILTER BOARD (XMTR)
		TRN6196A		INTERCONNECT FILTER BOARD (RCVR)
TCN1223A		TLN5644A		INTERCONNECT BOARD
		TLN5893A		INTERCONNECT BASE (XMTR)
		TLN5648A		INTERCONNECT BASE (RCVR)
		TLN5892A		CHASSIS
		TKN6570A		RF CABLE (RCVR)
TCN1224A		TLN5644A		INTERCONNECT BOARD
		TLN5894A		REPEATER INTERCONNECT BOARD (XMTR)
		TLN5646A		REPEATER INTERCONNECT BOARD (RCVR)
		TLN5892A		CHASSIS
		TKN6570A		RF CABLE (RCVR)
TCN1225A		TLN5644A		INTERCONNECT BOARD
		TLN5895A		INTERCONNECT FILTER BOARD (XMTR)
		TRN6196A		INTERCONNECT FILTER BOARD (RCVR)
		TLN5892A		CHASSIS
		TKN6570A		RF CABLE

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION

PARTS LIST

TLN5644A Interconnect Board PL-5121-A

E1, 2 E3, 4	80-83029H01 80-83029H01	SPARK GAP: 240 V 240 V (P/O TLN4668B Line Driver)
J3	9-84207B01	CONNECTOR, receptacle: 7-contact
		NON-REFERENCED ITEMS
	29-84785A 1-80756B31	LUG, slotted tongue; 3 used CIRCUIT BOARD ASSEMBLY includes:
	3-84482M01	SCREW, machine: 6-32 x 5/16"; 29 used
	28-84269C01	TERMINAL, contact: low profile; 23 used
	28-84269C02	TERMINAL, contact: high profile; 20 used
	29-83362G01	TERMINAL, 6-32 threaded; 29 used
	29-84028H09 39-10184A10	PIN, terminal: 348 used CONTACT, male: 10 used

TRN6338A 5-V Regulator Kit PL-3453-O

R1	17-83122D09	RESISTOR, fixed: 22 ±5%; 3 W
VR1	48-83461E34	VOLTAGE REGULATOR Zener type; 5.6 V

TRN6571A, TRN6755A, TRN8579A Transmit Inhibit Kit PL-4435-C

CR1, 2	48-82392B03	DIODE: silicon; 2 used

TLN5892A Chassis & Hardware Kit PL-5130-A

	1-80775B02	§BRACKET ASSEMBLY includes:
	1-80775B01	BRACKET SUBASSEMBLY includes:
	7-82172K01	BRACKET, mounting
	2-7018	NUT, hex: 3/8-32 x 1/2 x 3/32"; 2 used
	3-138162	SCREW, tapping: 4-40 x 3/8"; 4 used
	4-7698	WASHER, lock: #3/8 (Internal tooth); 2 used
	36-82629H02	KNOB, control: 2 used
	37-82603D60	SLEEVE, numbered (blank); 6 used
	39-10184A24	CONTACT, female; 6 used
	42-10217A02	STRAP, cable harness
	42-84284B01	RETAINER, screw; 4 used
	1-80775B06	COVER ASSEMBLY, xmtr channel element includes:
	1-80775B05	COVER SUBASSEMBLY includes:
	27-82873K01	COVER
	42-84284B01	RETAINER, screw: 2 used
	3-138162	SCREW, tapping: 4-40 x 3/8"; 2 used
	75-82902K01	PAD, rubber
	3-139495	SCREW, tapping: 6-20 x 5/16"; 12 used
	7-82612F01	§BRACKET, mounting: 7 x 1"
	7-82625K01	§BRACKET, mounting: 11.12 x 1.60"
	15-82178K02	§HOUSING
	27-82624K01	CHASSIS, exciter
	54-83570F01	LABEL, module location

NOTE:

Electrical components for TLN1892A are listed in the associated station manual.

parts list

TLN5649A Chassis & Hardware Kit PL-3366-C

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
C921, 922	21-82372C07	**capacitor, fixed:** .05 µF; 25 V
P1002	15-83498F04 29-83499F01 46-84549F01	**connector, plug:** includes: HOUSING, connector CONTACT, connector; 3 req'd. PLUG, polarizing
Q902	48-869701	**transistor: (see note)** PNP; type M9701
R960, 961	18-82515B50	**resistor, variable:** 25k (receiver volume & squelch controls
		non-referenced items
	1-80775B02	BRACKET, assy. (receiver control) includes ref. items R906, 961
	1-80775B01	BRACKET, control
	2-7018	NUT, hex; 3/8-32 x 1/2"; 2 used
	4-7698	WASHER, lock: #3/8 int; 2 used
	36-82629H02	KNOB, control; 2 used
	42-84284B01	RETAINER
	42-10217A02	STRAP, tie
	1-80775B04	BRACKET, assy. (power control) includes: ref. items C921, 922, P1002 and Q901
	3-125913	SCREW, tapping: 6-18 x 1/2"; 2 used
	4-7666	WASHER, lock: #6 ext; 2 used
	14-83575A01	INSULATOR, transistor
	1-80775B03	BRACKET & SOCKET
	42-10217A02	STRAP, tie
	1-80775B06	COVER, assy. (XMTR channel element) includes:
	1-80775B05	COVER, eyeletted
	3-138162	SCREW, tapping: 4-40 x 3/8"; 2 used
	42-84284B01	RETAINER; 2 used
	75-82303N04	RUBBER ADHESIVE PAD
	1-80775B08	COVER, assy. (RCVR channel element) includes:
	3-139495	SCREW, tapping: 6-20 x 5/16"; 55 used
	7-83564J01	BRACKET, receiver
	15-84612L01	HOUSING
	27-82624K01	CHASSIS, exciter
	46-84703E01	GUIDE, circuit board; 12 used

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

REMOTE CONTROL CHASSIS

TCN1148A/TCN1187A/TCN1190A/
TCN1223A/TCN1224A/TCN1225A
Unified Control Chassis
Circuit Board Detail
Motorola No. PEPS-17720-H
7/15/83-PHH

Module	Position	Ground	A+	Ant. SW	T-O-T Reset	Key Inhibit	Xctr/Spkr Level	Keyed A-	Keyed A+	P-T-T Control	Local P-T-T	Xmit Osc Gnd	Xctr Lo	Delayed Keyed A+	Line P-T-T	Rptr P-T-T	Unnotched Mic Hi	Line+/Xfmr+	Line-/Xfmr-	Line disable	"PL" Disable Cont	"PL" Disable	R1 Discr Input	R1 Discr Out/Disc	R1 Sq	R1 Sq Atten	F1 Osc Gnd/F1 Chan Elem	F2 Osc Gnd/F2 Chan Elem	L.D. Gnd
Time Out Timer		1	12		22	4					5				6														
Station Control	2	1	12	2		3	4	7	8	10	5		11	13	14	15	16			19	20	23	21	22					24
D.C. Transfer	3	1	12							6		15		17	10			3	4	18	2						14	16	
Line Driver	4	1	12	9			24											16	21										1
F1-"PL"	5	1	12						8	23		2	17	10	19		18				21						3		4
Guard Tone	6	1	12									2	23	6	16					7							3		17
Squelch Gate	7	1	12		22				6		13	2		7	16	18								10			3		23
F2/S.T. Dec/Page		1,16	12							20		2												3			6	4	
Options	9	1	12						24												20				19	18			
Wild Card	10	1	12						19																				
Single Tone/VOTING	11	1	12								13			24	14						20			3					
Spare	12	1	12						5		8		16	6	19														
Jumpers																	1												
Connector J2		40 41	6					27	26			10	12	31								13	20		11	4	16	17	14
Connector J1		4	1																										
Terminal Board TB1									JUA																				
Connector J3		6									5						7												
Connector J4		5	21								16		14				15												
Connector J5								3																					

Module	Position	9.6 Volt	D.C. Line Disable/Loc Xmtr Defeat	R2 Mute/Page/RptrOn/R2 Mute Atten	R1 Osc Gnd	R2 Osc Gnd	Audio A+	Audio A-	L.D. Input	Rcvr Notch Input	Local Spkr	Tone Control In	R1 Audio Input	R2 Audio Input	R1 Sq. Cont/R1 Sq. Indic	PL Enable	SW 9.6 Volt	Local F1	Function Tone Hi	Decoder Bias SW	Function Enable	Xctr Input		Single Tone Reset	"PL" Indicator/SW A+	R2 Sq. Control	Sq Gate Inhibit	XMIT "PL" Inhibit	Rptr Turn-Off/R2 Mute
Time Out Timer																													
Station Control	2							6								9													
D.C. Transfer	3	5	19	20	21	22										7													
Line Driver	4			17					3	6	23	10	13	22	18											15			
F1-"PL"	5	11	16						7	6						5	9	13	14	15	20	22							
Guard Tone	6		13									9							11	15								8	
Squelch Gate	7					JUB					24		17		5							11		8	14		19		21
F2/S.T. Dec/Page				7	15	17										5	8	10	11		13			9			18	14	
Options	9															5			11		13								9
Wild Card	10																		11		13								
Single Tone/VOTING	11	8																						9	16		18		
Spare	12	10																	11	15	13								
Jumpers				2																		1						3	3/2
Connector J2		3,5			21	22	1,2	7,8			39		15	34	28							32			37	33		30	
Connector J1		3					6	5																					
Terminal Board TB1																													
Connector J3																													
Connector J4										9	3																		
Connector J5																													

Module	Position	R2 Disc Input	"PL" Tone In	WC 1	WC 2	WC 3	WC 4	Rec Defeat	Intercom P-T-T	Voting Tone			R1 Mtr+	R1 Mtr-	R2 Mtr+	R2 Mtr-	Xmtr Mtr+	Xmtr Mtr-	PA Mtr+	PA Mtr-	Audio Hi	Audio Lo	Line 1 +	Line 1 -	Line 2	Line 2	Rptr "PL" Indic
Time Out Timer																											
Station Control	2	17																									
D.C. Transfer	3																										
Line Driver	4							14		2													19	20	8	7	
F1-"PL"	5																										
Guard Tone	6										JUE																
Squelch Gate	7						JUD																				4
F2/S.T. Dec/Page																											
Options	9							15		21																	
Wild Card	10			3	8	16	23	15																			
Single Tone/VOTING	11			2	4	22	23	17	19	15																	21
Spare	12		7	2	4	22	23																				
Jumpers				JUC																							
Connector J2		25	29										47	46	45	44	43	42			49	48					
Connector J1																											
Terminal Board TB1																							3	5	1	2	
Connector J3																					1	2					
Connector J4									20				17	7	18	8	19	10	11	22	1	12					
Connector J5																			2	1							

EPS-8277-F

HOW TO READ CHART

1. This chart 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 or wire jumpers).
3. Jumpers JU-A thru JU-E are always installed as shown in the chart.
4. To trace interconnections from any starting point to all other common points:

   First - find the module position or connector in the left hand column of the chart.

   Second - find the desired pin number. All pins of a specific connector are listed in the line that extends to the right.

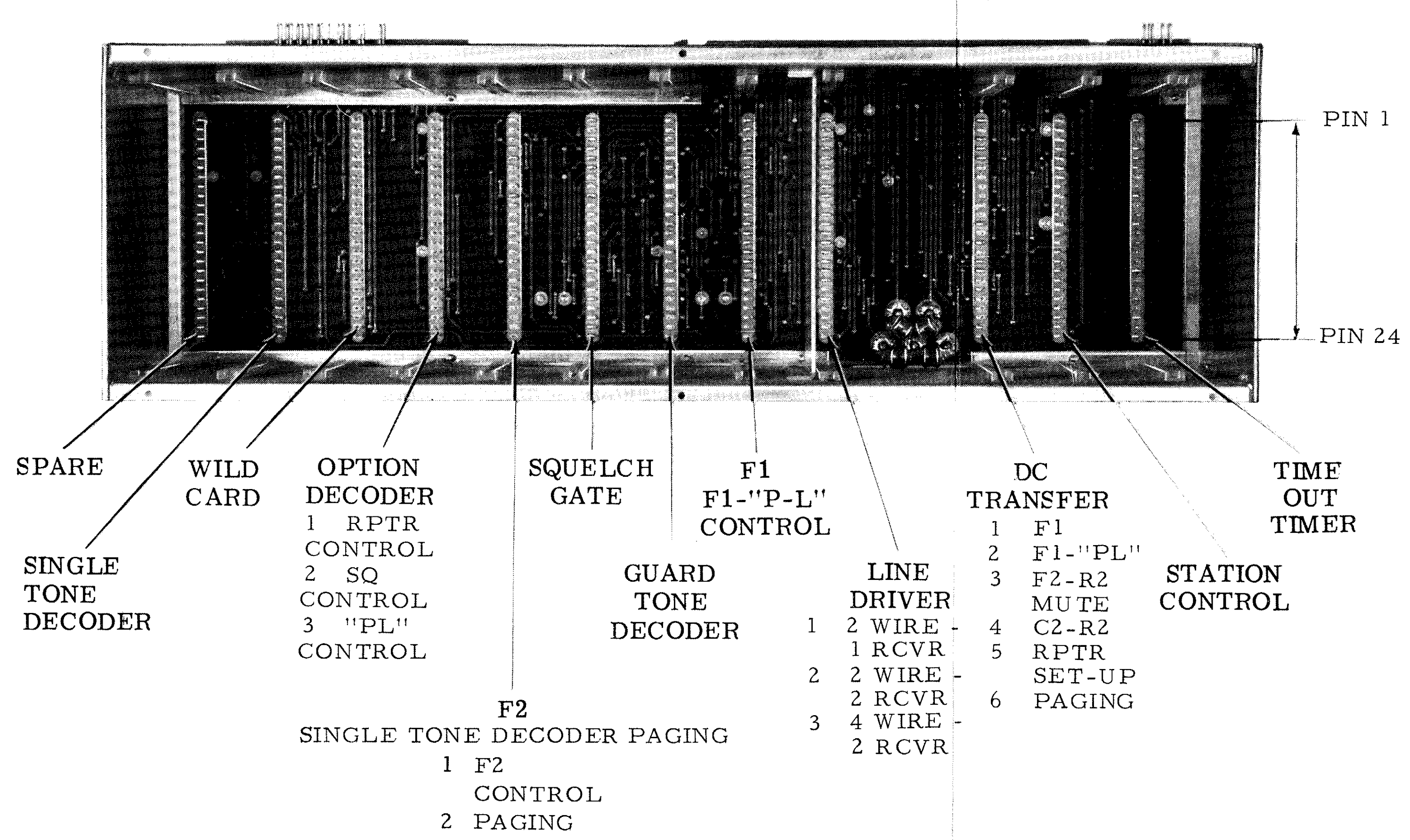
   Third - note the function of the desired pin. The function is listed at the top of the column in which the pin number appears. All other pins listed in the same function column are interconnected. For each entry in the function column, trace back to the left hand column to find the module or connector number. (See Examples 1 and 2)
5. Jumpers JU1 thru JU4 are optional, depending upon operational requirements. See example 2 for tracing interconnections through jumpers.

EXAMPLE 1:

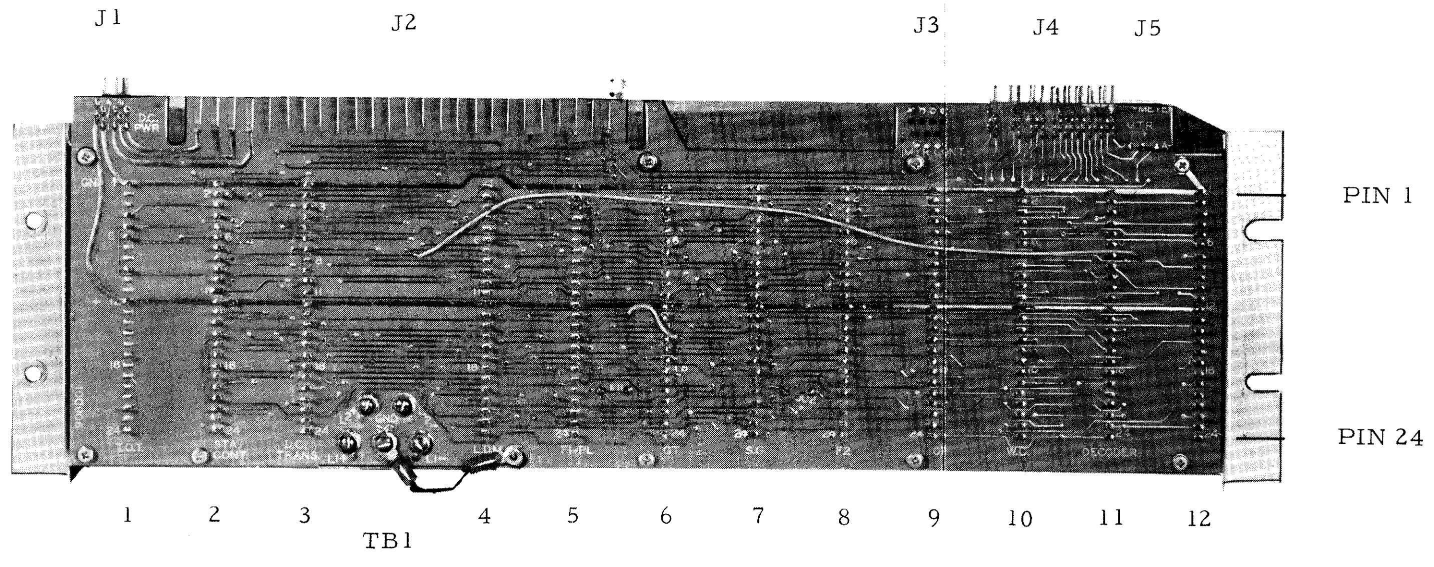
Station control module (module position 2), pin 10 has a function of P-T-T Control, which is interconnected to the dc transfer module (pin 6), F1-"PL" module (pin 23) and the F2/STD/Page module (pin 20).

EXAMPLE 2:

Squelch gate module (module position 7), pin 11 has a function of Xctr. input/mic hi/repeat audio, which is interconnected to the F1-"PL" module (pin 22), connector J2 (pin 32) and one end of jumper #1. If jumper #1 is installed, the other end of jumper #1 appears in the "unnotched mic hi" function column which is interconnected to station control module (pin 16) F1-PL module (pin 18), connector J3 (pin 7) and connector J4 (pin 15). When using JU1, all these points are interconnected.



AEPS-8281-B



AEPS-8278-O

TCN1107A Remote Control Chassis
Interconnect Chart and
Chassis Layout Diagram
Motorola No. 63P81015E29-G
4/15/81-PHI

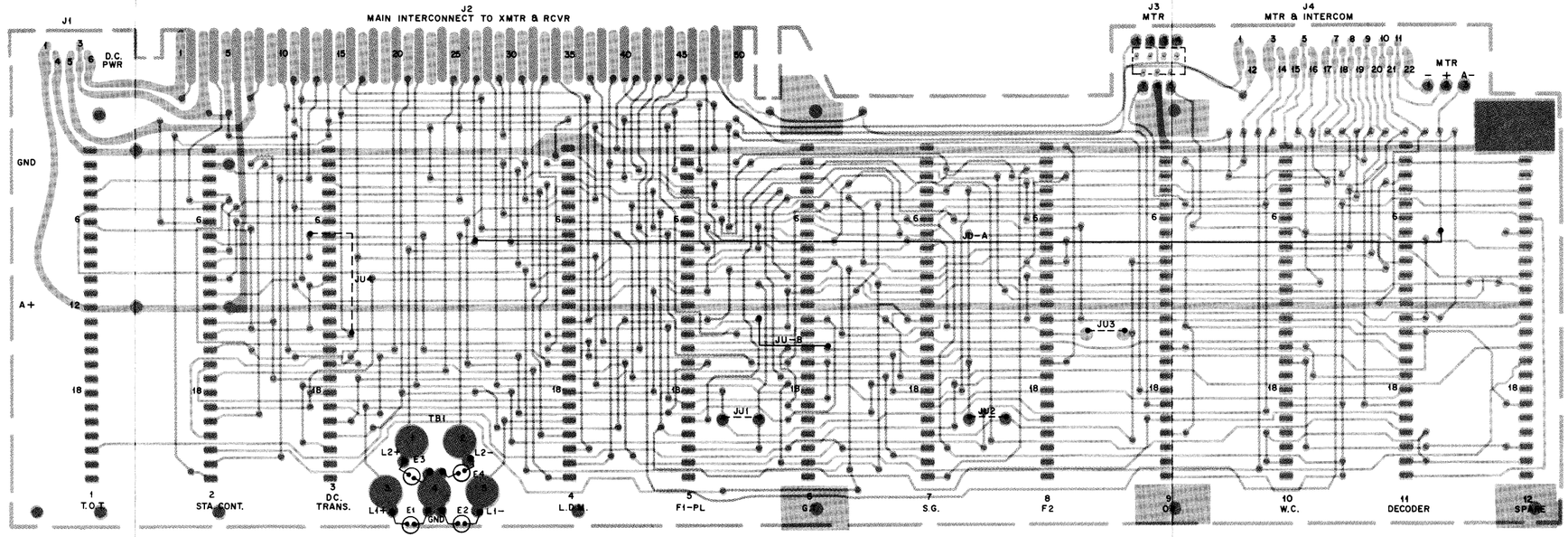
PARTS LIST

TLN4666A Interconnect Board — PL-5122-O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		SPARK GAP:
E1, 2	80-83029H01	250 V
E3, 4	80-83029H01	250 V (P/O TLN4668B Line Driver)
		CONNECTOR, receptacle:
J3	9-84207B01	7-contact
	NON-REFERENCED ITEMS	
	29-847854	LUG, slotted tongue; 2 used
	3-115613	SCREW, machine; 4-40 x 1/4"; 5 used
	1-80750B53	CIRCUIT BOARD ASSEMBLY includes:
	28-84269C01	TERMINAL, contact; low profile; 13 used
	28-84269C01	TERMINAL, contact; high profile; 10 used
	29-83462G01	TERMINAL, 6-32 threaded; 7 used
	29-84028H09	PIN, terminal; 254 used
	39-10184A30	CONTACT, male; 5 used

TLN4808A Chassis & Hardware Kit — PL-5123-O

	3-134184	SCREW, tapping: 4-40 x 5/16"; 10 used
	46-84703E01	GUIDE, circuit board; 12 used
	54-84961A06	LABEL, chassis
	1-80728B37	CHASSIS ASSEMBLY includes:
	7-83189H01	BRACKET, spacer
	15-84377D01	PLATE, end (w/round mtg. holes)
	15-84377D02	PLATE, end (w/slotted mtg. holes)
	15-84378D01	PLATE, top
	15-84379D01	PLATE, bottom



VIEWED FROM BACK OF CHASSIS

OL: DEPS-12844-B
BD: DEPS-12843-O
BD: DEPS-12842-O

INTERCONNECT BOARD JUMPER CHART

	STATION TYPE	JUMPER JU1	JU2	JU3	JU4
	BASE - DC WIRE LINE CONTROL	IN	IN	IN	OUT
	BASE - TONE WIRE LINE CONTROL	OUT	IN	IN	OUT
	BASE - TONE & DC WIRE LINE CONTROL	OUT	IN	IN	OUT
NOTE 1	BASE (RA)	IN	IN	IN	IN
	BASE (RA) - USED IN GUARDTONE RELAY SYSTEM	OUT	IN	OUT	OUT
NOTE 2	REPEATER (RT) - NONWIRE LINE CONTROL	IN	IN	IN	IN
NOTE 2	REPEATER (RT) - DC WIRE LINE CONTROL	IN	IN	OUT	OUT
NOTE 2	REPEATER (RT) - TONE WIRE LINE CONTROL	OUT	IN	OUT	OUT
NOTE 2	REPEATER (RT) - TONE & DC WIRE LINE CONTROL	OUT	IN	OUT	OUT
	REPEATER (RA)	IN	IN	IN	IN

NOTES:
1. BASE (RA) STATION IF CONNECTED TO REMOTE CONTROL CONSOLE & CONTROLLED VIA DC LINE CURRENTS -- LEFT SIDE OF JU2 MUST BE CONNECTED TO LEFT SIDE OF JU3 AS VIEWED FROM REAR OF INTERCONNECT BOARD. JU2 AND JU3 MUST BE REMOVED.
2. ALL REPEATER (RT) STATIONS EQUIPPED WITH PAGING CAPABILITY -- LEFT SIDE OF JU2 MUST BE CONNECTED TO LEFT SIDE OF JU3 AS VIEWED FROM REAR OF INTERCONNECT BOARD. JU2 AND JU3 MUST BE REMOVED.
3. E3 AND E4 ARE PART OF TLN4668B 4-WIRE LINE DRIVER MODULE.

EPS-12845-A

MODEL TABLE

MODEL	SUFFIX	SUB-MODEL	SUFFIX	DESCRIPTION
TCN1107A		TLN4666A		INTERCONNECT BOARD
		TLN4808A		CHASSIS

EPS-22573-O

REMOTE CONTROL CHASSIS

TCN1107A Remote Control Chassis
Circuit Board Detail and
Parts Location Detail
Motorola No. PEPS-8288-D
4/15/81-PHI

Module	Position	Ground	A+ (13.8 Volts DC)	Line Driver Disable	+5.8 Volts DC	Key Inhibit	Exciter Level	Keyed A-	Keyed A+	P-T-T Control	Local P-T-T	Xmit Osc Gnd/Chan Elem Gnd	Exciter Low	Delayed Keyed A+	Line P-T-T	**Receiver Select Inhibit	Unnotched Mic Hi
Time Out Timer	1	1	12			4*					5				6		
Station Control	2	1	12	2*		3	4	*7	*8	*10	5		11	13	14		*16
Spare	3	1	12		5					21					19	22	
Line Driver	4	1	12	9			*24										
F1 or F1 PL Control	5	1	12						8	23		2	17	10	19		18
Guard Tone Decoder	6	1	12												16*		
PL Control	7	1	12														
Spare	8	1								6		15		17	10		
Spare	9	1	12							20		9				*22	
4-Frequency	10	1	12		[illegible]				24	23		15		21		17	
Spare	11	1	12		5												
Spare	12	1	12		5												
Spare	13	1	12		5				6					16			
(J2)		40, 41	6					27	26			*10	*12	31*			
(J1) To Power Supply		4*	1*														
(TB1)																	
(J3)		4									6						2
(J4)		5	21								16*		14				15
(J5)								3									
Jumpers (JU-)																	1
Pin Tips		A, B	D E F	C	*J			R									G

Module	Position	Line +/Xfmr +	Line -/Xfmr -	**Line Disable	"PL" Disable Cont	"PL" Disable	R1 Discriminator Input	R1 Discriminator Out	R1 "PL" Ind/Intercom High	R2 "PL" Ind	T1 Oscillator Select	T2 Oscillator Select	Line Driver Ground	+9.6 Volts DC	Local Transmit Defect	R2 Mute/Attenuator	R1 Oscillator Select	R2 Oscillator Select
Time Out Timer	1																	
Station Control	2			19	20	23*	21	22*					24					
Spare	3													9			16	8
Line Driver	4	*16	*21										1			17		
F1 or F1 PL Control	5										3		4	11	16			
Guard Tone Decoder	6			7									17		*13	20		
PL Control	7				8, 20*													
Spare	8	3	4	18*	8						14	16		5		*20		
Spare	9											6						
4-Frequency	10										*14	*10					*18	*9
Spare	11				20			3	17									
Spare	12				20					17								
Spare	13																	
(J2)						13	20*		37*	38*	16	17	14	3, 5			21	22
(J1) To Power Supply													*4	*3				
(TB1)																		
(J3)																		
(J4)																		
(J5)																		
Jumpers (JU-)																		
Pin Tips																		

Module	Position	Audio A+	Audio A-	Line Driver Input	R1 Audio From Line Driver	Local Speaker Audio	Not Assigned	R1 Audio Input	R2 Audio Input	R1 Sq. Cont/R1 Sq. Indic/R1 Mute	PL Enable	SW 9.6 Volts DC	**Local F1	Not Assigned	Not Assigned	Function Enable	Xctr Input/Mic Hi	T3 Oscillator Select	T4 Oscillator Select
Time Out Timer	1																		
Station Control	2		6								9								
Spare	3																		
Line Driver	4			3	*6	*23	*10	13	22	18									
F1 or F1 PL Control	5			*7	6						5	*9	13	14	15	*20	22		
Guard Tone Decoder	6						9							*11	*15				
PL Control	7													11		13			
Spare	8									19	7			11		2, 13			
Spare	9										5	8	*10	11		13			
4-Frequency	10										*5	3	19	11		13		*6	*2
Spare	11																		
Spare	12																		
Spare	13										4								
(J2)		1, 2	7, 8			39		*15	*34	*28							32	18	19
(J1) To Power Supply		*6	*5																
(TB1)																			
(J3)																			
(J4)					9	3													
(J5)																			
Jumpers (JU-)																	1		
Pin Tips																	H*		

Module	Position	**Local F2	R2 Squelch Control	XMIT "PL" Inhibit	R2 Discriminator Output	R2 Discriminator Audio	R3 Oscillator Select	R4 Oscillator Select	**R1 Unmute	**R2 Unmute	R1 Squelch	R1 Squelch Atten. (Remote)	Voting Tone	R1 Mtr +	R1 Mtr -	**R2 Mtr +	**R2 Mtr -	Xmtr Mtr +	Xmtr Mtr -	PA Mtr +	PA Mtr -	Audio High	Audio Low	Line 1 +	Line 1 -	Line 2 +	Line 2 -
Time Out Timer	1																										
Station Control	2				*18	17																					
Spare	3						6	3			24	20										14	17				
Line Driver	4		15										*2											19	20	8	7
F1 or F1 PL Control	5																										
Guard Tone Decoder	6																										
PL Control	7																									3	4
Spare	8			23					9	24																	
Spare	9	*7		14																							
4-Frequency	10	20					*7	*4																			
Spare	11								*18																		
Spare	12				3					*18																	
Spare	13												14														
(J2)			*33	*30		*25	23	24			*11	*4		*47	*46	*45	*44	*43	*42			*49	*48				
(J1) To Power Supply																											
(TB1)																								*3	*4	*6	*7
(J3)																						1	3				
(J4)														17	7	18	8	19	10	11	22	1	12				
(J5)																				2	1						
Jumpers (JU-)																											
Pin Tips																				*Q	*P			*M	*N	*L	*K

Footnotes:

* Indicates Point of Origin of Function
** Indicates a function that is not available with 4-frequency operation. The function is shown for reference purposes as an aid for servicing similar remote control chassis.

NEPS-15686-A

HOW TO READ THIS CHART

1. This chart 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 or wire jumpers).
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 hand column of the chart.
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 Examples 1 and 2.)

EXAMPLE 1:

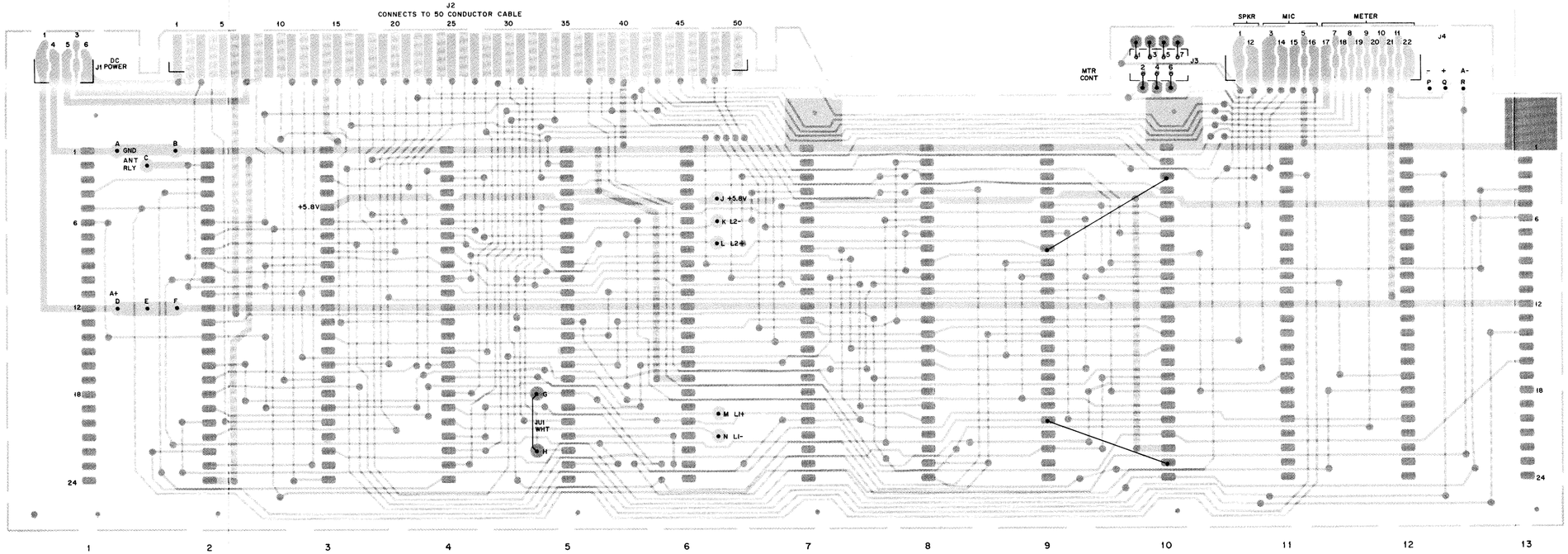
Station control module (module position 2), pin 10 has a function of P-T-T Control, which is interconnected to spare module position 3 (pin 21), F1 control module pin 23, spare module position 8 (pin 6), spare module position 9 (pin 20) and 4-frequency module pin 23.

EXAMPLE 2:

Modulation audio is applied to the transmitter exciter via connector J2 (pin 32) and one end of jumper #1. If jumper #1 is installed, the other end of jumper #1 appears in the "unnotched mic hi" function column which is interconnected to station control module (pin 16), connector J3 (pin 2), connector J4 (pin 15), and F1 control module (pin 18). When using JU1, all these points are interconnected.

NEPS-15687-O

TCN1125A Remote Control Chassis
Interconnect Chart
Motorola No. PEPS-15685-B
4/15/81-PHI



SHOWN FROM SOLDER SIDE (REAR OF STATION)

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION

PARTS LIST

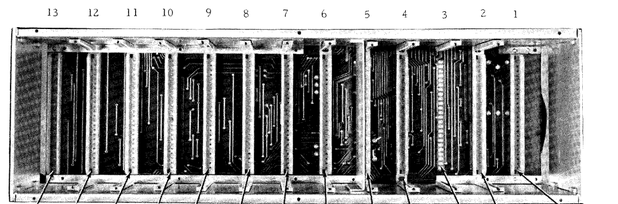
TLN4957A Interconnect Board PL-5124-O

J3	9-84207B01	CONNECTOR, receptacle: 7-contact
NON-REFERENCED ITEMS		
	1-80735B13	CIRCUIT BOARD ASSEMBLY includes:
	28-84269C01	TERMINAL, contact; low profile; 13 used
	28-84269C02	TERMINAL, contact; high profile; 10 used
	29-84028H09	PIN, terminal; 239 used
	39-10184A30	CONTACT, male; 14 used

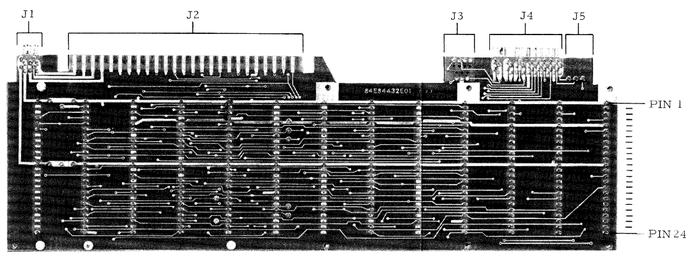
MODEL TABLE

MODEL	SUFFIX	SUB-MODEL	SUFFIX	DESCRIPTION
TCN1125A		TLN4957A		INTERCONNECT BOARD
		TLN4958A		5 V REGULATOR BOARD
		TLN4959A		CHASSIS

EPS-22574-O



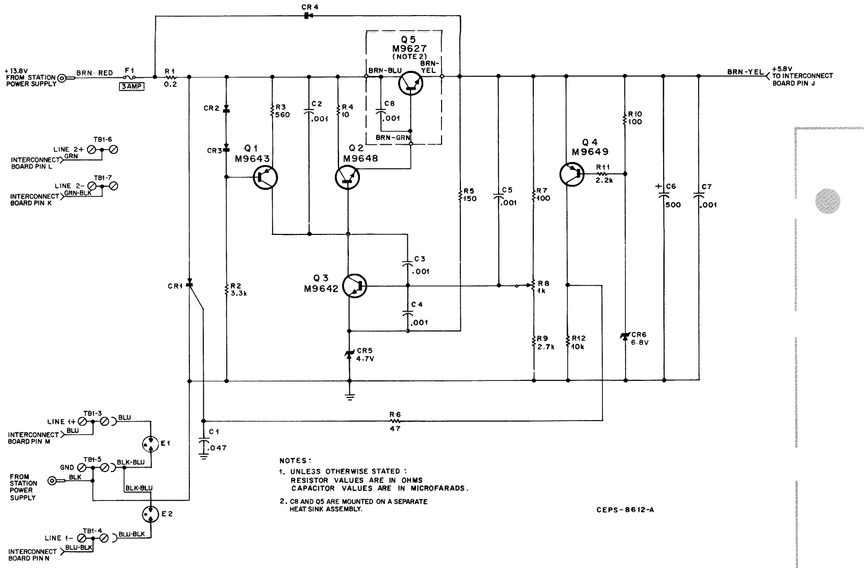
FAEPS-15689-O



AEPS-10504-O

REMOTE CONTROL CHASSIS

TCN1125A Remote Control Chassis
Interconnect Board and Chassis Layout
Motorola No. PEPS-15688-C
4/15/81-PHI

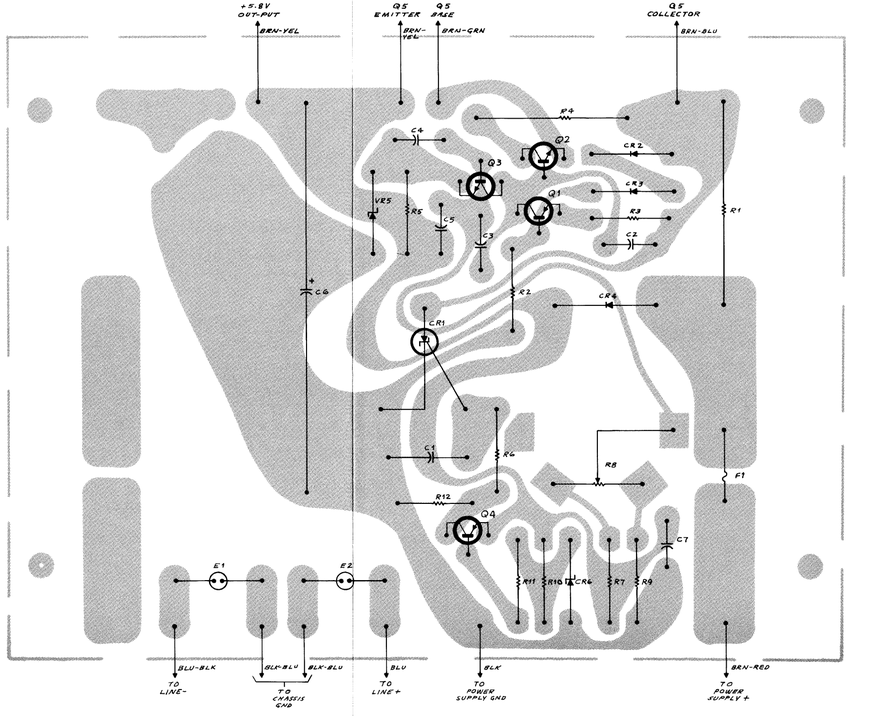


NOTES:
1. UNLESS OTHERWISE STATED :
   RESISTOR VALUES ARE IN OHMS
   CAPACITOR VALUES ARE IN MICROFARADS.
2. C8 AND Q5 ARE MOUNTED ON A SEPARATE HEAT SINK ASSEMBLY.

CEPS-8612-A

REVISIONS 68P81018E09-D

CHASSIS AND SUFFIX NO.	REF. SYMBOL	CHANGE	LOCATION
TLN4958A FROM SUFFIX-0 TO SUFFIX-1	R8	FROM 18-83083G04 1k ±30%; CHANGED TO 18-83168C03 1k ±20%	PARTS LIST
		EXTENSIVE PLATING CHANGES	



SHOWN FROM SOLDER SIDE

OL-CEPS-17278-A

PARTS LIST

TLN4958A 5 V Regulator Board PL-2098-A

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		CAPACITOR, fixed: uF ±10%; 100 V unless otherwise stated
C1	8-82905G03	.047; 50 V
C2 thru C5	21-82187B20	.001
C6	23-83210A19	500 -10 +100%; 20 V
C7	21-82187B20	.001
		SEMICONDUCTOR DEVICE, diode: (SEE NOTE)
CR1	48-82605H02	silicon controlled rectifier
CR2,3	48-83654H01	silicon
CR4	48-82525G07	silicon
CR5	48-82256C03	Zener; 4.7 V
CR6	48-82256C47	Zener; 6.8 V
		SPARK GAP:
E1,2	80-83029H01	230 V dc ±15%
		TRANSISTOR: (SEE NOTE)
Q1	48-869643	N-P-N; type M9643
Q2	48-869648	P-N-P; type M9648
Q3	48-869642	P-N-P; type M9642
Q4	48-869649	N-P-N; type M9649
		RESISTOR, fixed: ±10%; 1/4 W unless otherwise stated
R1	17-82586H01	0.2 ±5%; 5 W
R2	6-129231	3.3k
R3	6-129620	560
R4	6-488022	10; 1 W
R5	6-129862	150
R6	6-129233	47
R7	6-129753	100
R8	18-83168C03	variable: 1k ±20%
R9	6-128688	2.7k
R10	6-129753	100
R11	6-128689	2.2k
R12	6-129225	10k
		NON-REFERENCED ITEM
	42-82690A01	CLIP, fuse; 2 req'd.

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION

TLN4959A Chassis & Hardware Kit PL-2099-B

C8	21-82187B14	CAPACITOR, fixed: .001 uF ±10%; 100 V
F1	65-20404	FUSE, cartridge: 3 A; 250 V
Q5	48-869627	TRANSISTOR: (SEE NOTE) PNP; type M9627
TB1	31-82272B08	TERMINAL BOARD: 9-terminal
NON-REFERENCED ITEMS		
	1-80728B37	CHASSIS ASSEMBLY includes:
	15-84378D01	PANEL, top
	15-84379D01	PANEL, bottom
	15-84377D01	PANEL, end (w/round mtg. holes)
	15-84377D02	PANEL, end (w/slotted mtg. holes)
	7-83187H01	BRACKET, spacer
	1-80740B54	BRACKET ASSEMBLY, regulator, includes:
	1-80735B15	HEAT SINK ASSEMBLY includes:
	1-80737B31	HEAT SINK SUBASSEMBLY includes:
	4-844093	WASHER, shoulder
	9-82673A01	SOCKET, transistor
	26-84212E02	HEAT SINK
	3-122921	SCREW, machine; 6-32 x 9/16"; 2 used
	14-865875	INSULATOR, transistor CAPACITOR C8 TRANSISTOR Q5
	3-131367	SCREW, tapping: 8-32 x 5/16" 4 used
	3-136850	SCREW, tapping: 6-32 x 1/2" 3 used
	4-7651	WASHER, lock: #8 (split); 4 used
	7-84414E01	BRACKET
	29-812979	LUG, solderless; 2 used
	29-824456	LUG, ring tongue: #10; 2 used
	29-865067	LUG, ring tongue: #5
	37-82603D60	SLEEVE, numbered: blank; 5 used
	39-10184A24	CONTACT, female; 5 used
	42-10217A02	STRAP, cable harness; 5 used
		TERMINAL BOARD TB1

5-Volt Regulator
(used with TCN1125A Remote Control Chassis)
Schematic Diagram & Circuit Board Detail
Motorola No. 63P81018E09-E
4/15/81-PHI

REMOTE CONTROL CHASSIS MODULES

1. INTRODUCTION

The remote control modules permit remote wire line control of base station and repeater (RT) stations. The following modules are provided with the station dependent upon the type of station control and operation.

2. STANDARD MODULE DESCRIPTION

2.1 STATION CONTROL MODULE
(DC and Tone Controlled Station)

This module provides the necessary integration of control functions from other modules in the remote chassis to key the station transmitter. Exciter audio amplification is also provided with amplitude adjustment by means of a potentiometer which is accessible through the front panel. Amplifiers are also provided to amplify the receiver discriminator output which is used externally.

2.2 LINE DRIVER MODULE
(DC and Tone Controlled Stations)

2.2.1 The line driver module amplifies the receiver audio which is routed to the remote control point over wire line, and amplifies audio from the remote control point which is to be transmitted. Thus, it also provides monitoring of all repeater messages. For a repeater (RT) station that is not to be wire line controlled, this module can be omitted.

2.2.2 The line driver module is available in three models: 1-receiver, 2-wire (standard); 2-receiver, 2-wire (standard with 2-receiver base stations); and 4-wire (optional). The 4-wire line driver permits the transmit and receive audio to be carried on separate wire lines, or permits receive No. 2 audio to be carried on a separate wire line.

2.3 DC TRANSFER MODULE
(DC Controlled Stations)

The dc transfer module converts dc line currents to control functions for use by a remote control console operator via wire lines. Six dc transfer module versions are available and perform the functions shown in Table 1.

2.4 GUARD TONE DECODER
(Tone Controlled Stations)

The guard tone decoder converts a 2175 Hz guard tone signal received from a remote control source to a line push-to-talk voltage. The decoder also amplifies and distributes received function tones to other function decoders.

2.5 F1 AND F1-PL CONTROL MODULES
(Tone Controlled Stations)

This module converts a 1950 Hz tone signal from a remote control source to a switched ground to turn on the transmitter channel element. The PL module also converts a 2050 Hz tone signal to a switched ground to disable the PL operation of the receiver for channel monitoring before transmitting. In carrier squelch stations, the PL disable function is not required and is therefore not used.

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Communications Division

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

Table 1. DC Transfer Module Application

MODULE VERSION	LINE CURRENT (mA)	FUNCTION
F1 (CARRIER SQUELCH)	+5.5	Keys transmitter on F1.
F1-PL	+5.5	Keys transmitter on F1.
	-2.5	PL disables receiver.
C2-R2	+5.5	Keys transmitter on F1 and selects R1.
	+12.5	Keys transmitter on F2 and selects R2.
	-2.5	PL disables receiver.
F2-R2 MUTE	+5.5	Keys transmitter on F1.
	+12.5	Keys transmitter on F2 and unmutes R2.
	-2.5	PL disables receiver.
	-5.5	Mute R2.
PAGING (OPTIONAL)	+5.5	Keys transmitter on F1 with PL tone.
	-12.5	Keys transmitter on F1 without PL tone.
	-2.5	PL disables receiver.
REPEATER CONTROL (OPTIONAL FOR REPEATERS ONLY)	+5.5	Keys transmitter on F1.
	+12.5	Repeater turn-on.
	-2.5	PL disables receiver.
	-5.5	Repeater turn-off.

2.6 F2 TONE DECODER MODULES (Tone Controlled Stations)

The F2 tone decoder module is available in four versions which perform the functions shown in Table 2.

Table 2. F2 Tone Decoder Application

MODULE VERSION	FUNCTION TONE (Hz)	FUNCTION
F2	1850	Keys transmitter on F2
C2-R2	1850	Keys transmitter on F2
	1750	Selects R1, inhibits R2
	1650	Selects R2, inhibits R1
F2-R2 MUTE (OPTIONAL)	1850	Keys transmitter on F2
	1750	Mutes R2
	1650	Unmutes R2
PAGING	1850	Keys transmitter on F1 without PL modulation

2.7 SQUELCH GATE MODULE (Repeater Stations)

The squelch gate module is used in all repeater (RT) stations, dc or tone controlled, or non-wire line controlled. The squelch gate module produces an output to activate the transmitter when a carrier signal is received that has sufficiently high signal-to-noise ratio. "Private-Line" stations also require decoding of the proper PL code in addition to receiving a strong carrier signal.

2.8 TIME-OUT TIMER MODULE (Repeater Stations)

The time-out timer (T-O-T) module is standard in all repeater (RT) models and is an optional accessory for base station models. It limits the period of time the transmitter can be keyed. It can be set to limit the continuous transmission time from line controlled operation, and to limit the transmission time of individual users of the repeater. The time-out start of each is independent of the other. The unit can be preset for 1/2, 1, 2, 4 or 8 minutes by connecting jumpers to the corresponding time multiplier output.

2.9 FOUR-FREQUENCY CONTROL MODULE (Tone Controlled Stations)

The four-frequency control module converts the proper function tones into frequency selection commands for selection of the station operating frequency. Refer to Table 3 for a listing of the necessary function tones. This control module also includes front chassis mounted switches which permit local frequency selection, when desired. The four-frequency control module operates with a F1 or F1-PL control module compatible with four-frequency operation. These F1 control modules provide biasing voltage for the four-frequency module and include the 2175 Hz notch filters.

Table 3. Four-Frequency Selection Tones

FUNCTION TONE	FREQUENCY SELECTED
1950 Hz	F1: Transmitter keys on frequency T1. Receiver operates in standby mode on frequency R1.
1850 Hz	F2: Transmitter keys on frequency T2. Receiver operates in standby mode on frequency R2.
1350 Hz	F3: Transmitter keys on frequency T3. Receiver operates in standby mode on frequency R3.
1250 Hz	F4: Transmitter keys on frequency T4. Receiver operates in standby mode on frequency R4.

3. OPTIONAL MODULE DESCRIPTION

3.1 SINGLE-TONE DECODER MODULE (DC and Tone Controlled Stations)

3.1.1 The single-tone decoder module provides a transistor switched output (logic low or high) or an optional relay closure upon receipt of the proper tone. The module responds only to a specific audio tone of at least 300 milliseconds duration. Nineteen different frequencies from 600 to 3300 Hz at 150 Hz intervals are available. The module can be jumpered so the output is latched on (must be reset by an external command), momentary on, or 5 seconds on. The single-tone decoder module can be used to control other functions as described in the following examples.

3.1.2 In repeater (RT) stations, the module may be used to inhibit repeater operation until the correct audio tone is received by the receiver. In this application, it is operated in the latched mode and is reset by the squelch gate upon loss of received carrier signal.

3.1.3 In base or repeater stations, the output of the module can be wired to inhibit (mute) receiver audio until the proper tone is received.

3.1.4 In either base or repeater stations, the single-tone decoder may be plugged into the F2 tone decoder slot of the remote control chassis (an F2 tone decoder module cannot be used at the same time). A single-tone command from the remote control console via the wire line will activate the module. The module's output can be wired to perform any desired function at the base station site such as turning on the antenna tower lights.

3.2 OPTIONS DECODERS

A tone controlled station may use one of the following decoders:

3.2.1 Squelch Control Module

This module converts the 1450 Hz and 1550 Hz function tone burst to two levels of squelch sensitivity in the carrier squelch mode of receiver operation.

3.2.2 "Private-Line" Control Module

This module converts the 1450 Hz and 1550 Hz function tone bursts to PL or carrier squelch mode of operation. It differs from the PL disable function of the F1-PL module in that the receiver does not revert to PL operations when the transmitter is keyed. When this module is operated in the PL mode, the PL disable function of the F1-PL module is unaffected to allow monitoring before transmitting.

3.2.3 Repeater Control Module

This module may be used in a repeater (RT) station only. It converts a 1450 Hz function tone to a repeater enable command (repeater "set-up") and a 1550 Hz function tone to repeater disable (repeater "knock-down"). In the repeater "knock-down" mode the station operates as a conventional base station only.

3.3 "WILD CARD" CONTROL MODULE

This module may be added to any model station. It provides four tone-activated transistor switched outputs which may be used to control the operation of four relays in response to function tone commands of 1350, 1250, 1150 and 1050 Hz. The circuits may be cross-connected to two on-off outputs if desired. The outputs may be used for any desired remotely controlled switching at the base station site such as on-off control of antenna tower lights, emergency power generating equipment, etc.

3.4 RELAY KITS

The relay kits are for use in the "Wild Card" module, single-tone decoder module, or squelch gate module. They provide a form "C" output circuit which is isolated from the module board circuitry, with higher voltage and current switching capability than provided by the normal transistor output.

STATION CONTROL MODULE

parts list

TLN4635B Station Control Module — PL-3235-B

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		capacitor, fixed: uF ± 10%; 50 V: unless otherwise stated
C1, 2	23-865136	15 ± 20%; 25 V
C3	8-82905G05	0.15
C4	23-865136	15 ± 20%; 25 V
C5	21-82187B29	.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 thru 17	21-82187B20	.001; 100 V
C18	23-82783B24	15 ± 10%; 25 V
		semiconductor device; diode: (see note)
CR1 thru 4	48-83654H01	silicon
CR5	48-82466H13	silicon
CR6 thru 24	48-83654H01	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	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	48-869642	NPN; type M9642
Q15, 16	48-869643	PNP; type M9643
Q17	48-869642	NPN; type M9642
Q18	48-869643	PNP; type M9643
		resistor, fixed: ± 5%; 1/4 W: unless otherwise stated
R1	6-11009D02	150k
R2	6-11009C87	39k
R3	6-11009C39	390
R4	6-11009C09	1k
R5	6-11009D02	150k
R6	6-11009C87	39k
R7	6-11009C39	390
R8	6-11009C09	1k
R9	6-11009C97	100k
R10	18-83083G03	var; 25k
R11	6-11009C09	1k
R12	6-11009C85	33k
R13	6-11009C93	68k
R14	6-11009D14	470k
R15	6-11009C55	1.8k
R16	6-11009C83	27k
R17	6-11009C25	100
R18	6-11009C87	5.8k
R19	6-11009D22	1 meg
R20	6-11009C91	56k
R21	6-11009D22	1 meg
R22	6-11009C73	10k
R23	6-11009C97	100k
R24	6-11009C73	10k
R25	6-11009C69	8.8k
R26	6-11009C95	82k
R27	6-11009C63	27k
R28	6-11009C51	1.2k
R29	6-11009C43	560
R30	6-11009C19	56
R31	6-11009C89	47k
R32	6-11009C47	820
R33	6-11009C33	220
R34	6-11009C37	330
R35	6-11009C61	3.3k
R36	6-11009C45	680
R37	6-11009C01	10
R38	6-11009C59	2.7k
R39	6-11009C73	10k
R40	6-11009C59	2.7k
R41 thru 43	6-11009C73	10k
R44	6-11009C57	2.2k
R45	6-11009C81	3.3k
R46, 47	6-11009C53	1.5k
R48 thru 50		NOT USED
R51, 52	6-11009C57	2.2k
R53	6-11009C49	1k
R54, 55	6-11009C73	10k
R56	6-11009C61	3.3k
R57	6-11009C45	680
R58	6-11009C01	10
R59	6-11009C89	47k
R60, 61	6-11009C71	8.2k
R82	6-11009C45	680
R63	6-11009C61	3.3k
R64	6-11009C45	680
R65	6-11009C01	10
		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: For optimum performance, diodes, transistors, and integrated circuits must be ordered by Motorola part numbers.

REVISIONS 68P81015E31-K

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

THIS HAS BEEN SUPERSEDED BY TLN 4635C

STATION CONTROL MODULE

* MODEL TLN4635B

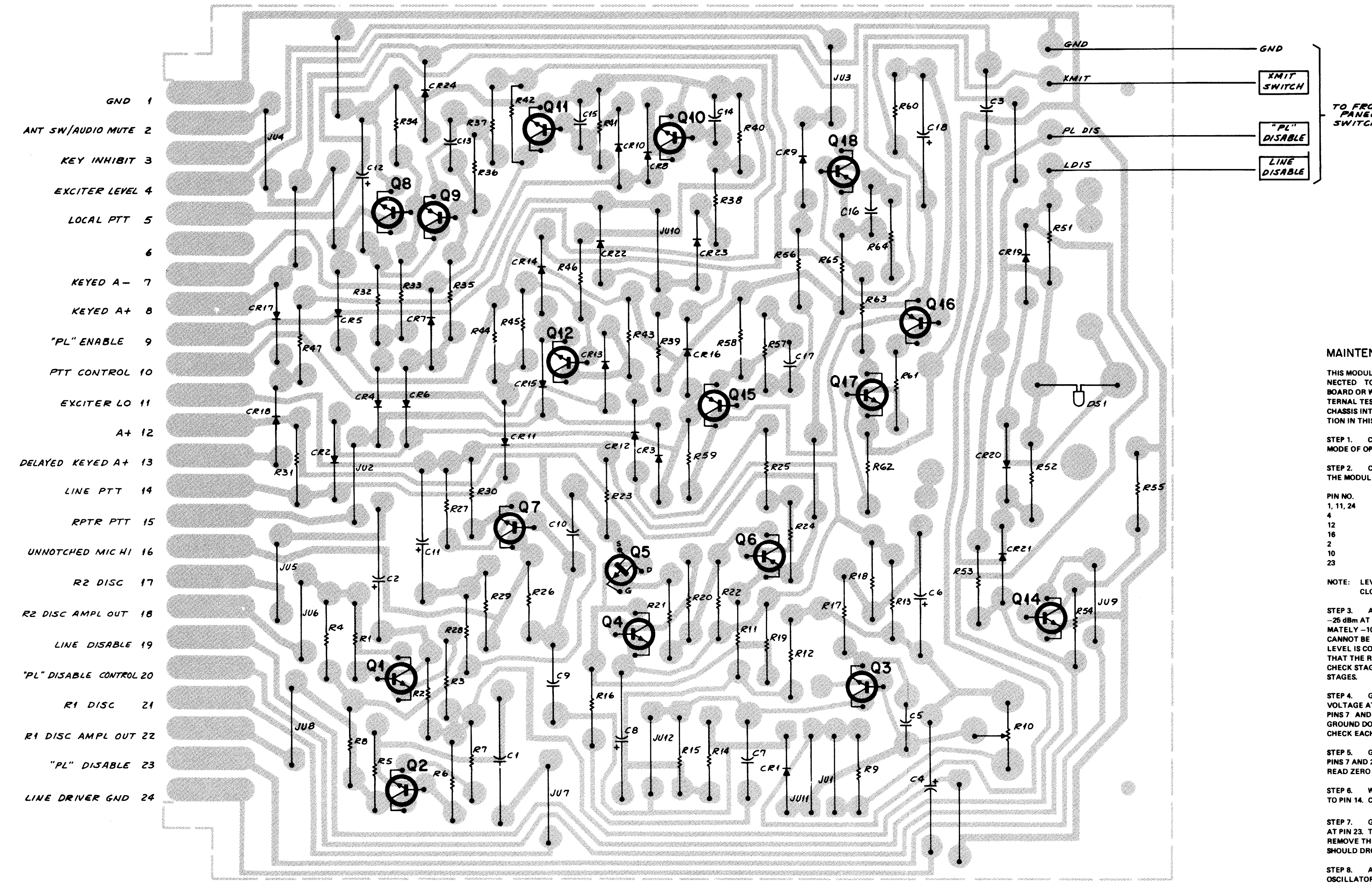
FUNCTION

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

--Adjusts exciter audio level.

--Amplifies receiver discriminator signals which are used externally.

* DO NOT TRY TO USE TLN5970A SCM MODULE! IT ONLY WORKS WITH DVP BACKPLANE.



SHOWN FROM SOLDER SIDE

BD-DEPS-16750-B
OL-DEPS-16751-B

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 16 SHOULD MEASURE APPROXIMATELY −10 dBm WITH JU1 CONNECTED. IF THIS LEVEL CANNOT BE ACHIEVED CHECK STAGES Q3 AND Q7. IF THE LEVEL IS CORRECT, GROUND PIN 5 OR PIN 15 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 9. 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.

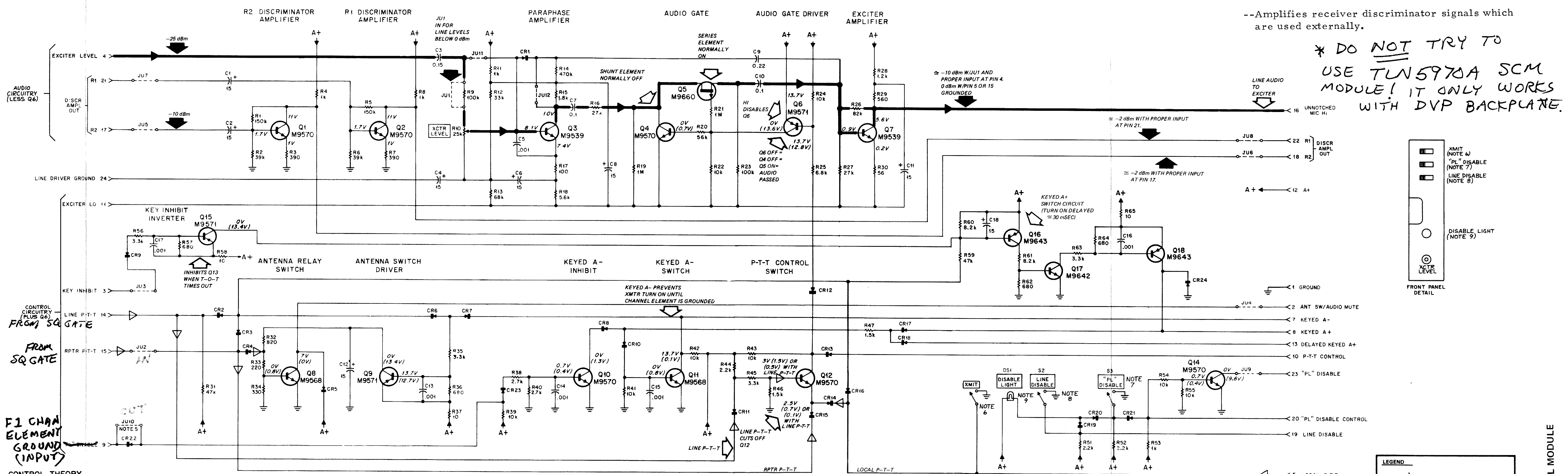
STEP 5. GROUND PIN 15. MEASURE THE DC VOLTAGE AT PINS 7 AND 2. EACH SHOULD READ +12 VOLTS. PIN 10 SHOULD READ ZERO VOLTS.

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 30 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.

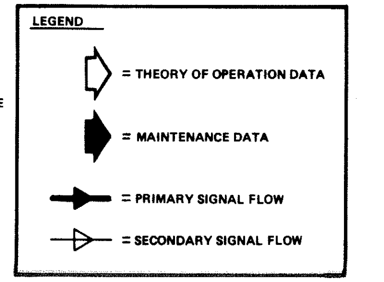
WHEN XMIT SWITCH S1 IS ACTUATED, A GROUND IS SUPPLIED TO THE EMITTER OF Q12 WITH THE SAME RESULT AS A LOW APPLIED TO PIN 5 OR 15. ACTUATING LINE DISABLE SWITCH S2 APPLIES A GROUND OUTPUT TO PIN 19. S2 ALSO PROVIDES A GROUND TO THE DISABLE LIGHT DS1, WHICH CAUSES IT TO ILLUMINATE. WHEN "PL" DISABLE SWITCH 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.

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 (RT) REPEATERS.
3. JU9 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 OUT FOR NON–WIRE LINE REPEATERS. (NOTE →)
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 (NORMAL) POSITION (TO THE LEFT), THE "PRIVATE–LINE" FUNCTION 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 NORMAL 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-16749-E



STATION CONTROL MODULE

LINE DRIVER MODULES

1. LINE DRIVER MAINTENANCE & TROUBLESHOOTING

This module may be serviced either while connected to the control chassis or while connected to separate external test equipment. Refer to Control Chassis Servicing information in this manual for additional "set-up" details.

1.1 TLN4668A LINE DRIVER/4-WIRE AUDIO MODULE SERVICING

1.1.1 General

If servicing the module out of the chassis, make the connections shown in the following chart. If servicing in the chassis use the service extension.

PIN NO.	FUNCTION
1	Ground
12	+12 volts dc
19, 20	600 ohm load
7, 8	600 ohm load
As Instructed	Audio Oscillator
As Instructed	AC Voltmeter

1.1.2 Receive Audio (Line Amplifier No. 1)

Step 1. Inject a 1000 Hz tone at pin 3 and adjust the oscillator output for 150 mV.

Step 2. Adjust the LINE 1 LEVEL control for +14 dBm across the 600 ohm load at pins 19 and 20. If this level cannot be obtained, check preamplifier stages Q1 and Q2. Next check phase inverter Q4, amplifier Q5, line drivers Q6 and Q7, line 1 transformer T1, and line driver disable switch Q3. Check that the proper jumpers are installed.

Step 3. Connect the ac voltmeter between pin 23 and ground. The voltage should be approximately one volt. If the level in the previous step (2) is satisfactory and this level is not correct, check exciter/speaker amplifier Q8, isolation amplifier Q9, and transformer T1.

Step 4. Apply a ground to pin 9. The outputs measured in steps (2) and (3) should drop to zero. If they do not drop to zero, check diode CR1 and line driver disable switch Q3.

1.1.3 Receive Audio (Line Amplifier No. 2)

Step 1. Inject a 1000 Hz tone at pin 22 and adjust the oscillator output for 150 mV.

Step 2. Adjust the line 2 level control for +14 dBm across the 600-ohm load at pins 7 and 8. If +14 dBm cannot be obtained, check preamplifier stages Q17 and Q19. Next check phase inverter Q20, amplifier Q21, line drivers Q22 and Q23, line 2 transformer T2, and line driver disable switch Q18. Check that the proper jumpers are connected.

NOTE

If the output is extremely low (70 dB below the +14 dBm level) check if jumper JU24 (first receiver priority) is in. If JU24 is in, apply ground to pin 18 to defeat the R1 priority.

Step 3. Connect an ac voltmeter between pin 23 and ground. The voltage should be approximately one volt. If the level in the previous step (2) is satisfactory and this level is not correct, check isolation amplifier Q10 and transformer T2.

Step 4. Apply a ground to pin 5. The outputs measured in steps (2) and (3) should drop to zero. If they do not drop to zero, check diode CR10 and line driver disable switch Q18.

1.1.4 Transmit Audio

Step 1. Inject a 1000 Hz tone between pins 19 and 20 and adjust the oscillator output to zero dBm.

Step 2. The voltage measured between pin 10 and ground should be at least 0.77 V ac. If this reading is incorrect, check transformer T1.

Step 3. The voltage between pin 24 and ground should be approximately 0.36 V ac. If the reading in step (2) is correct and this reading is incorrect, check exciter/speaker amplifier Q8.

Step 4. The voltage measured between pin 23 and ground should be approximately 0.18 V ac. If the reading in step (3) is correct and this reading is incorrect, check isolation amplifier Q9.

1.1.5 Receive Audio Mute Switches

Step 1. Inject a 1000 Hz tone between pin 13 and ground and adjust the oscillator output for 150 mV.

Step 2. The voltage measured between pin 6 and ground should be approximately 145 mV. However, if jumper JU18 is in (second receiver priority) the voltage reading should be zero. If jumper JU18 is in, apply a ground to pin 15. The voltage measured between pin 6 and ground should go to 145 mV. If the voltage between pin 6 and ground is considerably below 145 mV, check R1 mute switch Q12 and R1 mute switch driver Q11. The output between pin 6 and ground should also go to zero if a ground is applied to pins 9, 14, or 18. If the voltage does not go to zero, check OR gate diodes CR3 and CR5, R1 switch driver Q11, and R1 mute switch Q12.

Step 3. Inject a 1000 Hz tone between pin 22 and ground and adjust for 150 mV output.

Step 4. The voltage measured between pins 7 and 8 should be approximately +14 dBm. However, if this voltage is extremely low (such as -56 dBm), the R2 mute switch might be turned off due to receiver priority jumpering. If JU24 (first receiver priority) is in, connect pin 18 to ground and check that pins 15 and 17 are not grounded. If the priority jumpering and/or grounding connections are made to pass R2 audio and the output at pins 7 and 8 is still low, check R2 mute switch Q16, R2 mute switch driver Q15, and the R2 attenuator switch stage Q13 and Q14.

Step 5. Connect pin 15 to ground and check that the signal level at pins 7 and 8 decreases by approximately 70 dB.

1.2 TLN4669A LINE DRIVER/2-WIRE 1-RECEIVER AUDIO MODULE SERVICING

1.2.1 General

If servicing the module out of the chassis, make the connections shown in the following chart. If servicing in the chassis, use the service extension.

PIN NO.	FUNCTION
1	Ground
12	+12 volts dc
19, 20	600 ohm load
As Instructed	Audio Oscillator
As Instructed	AC Voltmeter

1.2.2 Receive Audio (Line Amplifier No. 1)

Perform the Line Amplifier No. 1 procedure for the 4-wire audio module (paragraph 1.1.2), except that the level at pin 23 should be approximately 2 volts.

1.2.3 Transmit Audio

Perform the Transmit Audio procedure described for the 4 wire audio module (paragraph 1.1.4).

1.2.4 Receive Audio Mute Switch

Step 1. Inject a 1000 Hz tone between pin 13 and ground and adjust the oscillator output for 150 mV.

Step 2. The voltage measured between pin 6 and ground should be approximately 145 mV. If the voltage is considerably below 145 mV, check R1 mute switch Q12 and R1 mute switch driver Q11. The output voltage between pin 6 and ground should drop to zero if a ground is applied to pins 9, 14, or 18. If it does not drop to zero, check OR gate diodes CR3 and CR5, R1 mute switch Q12, and R1 mute switch driver Q11.

1.3 TLN4670A LINE DRIVER/2-WIRE 2-RECEIVER AUDIO MODULE

1.3.1 General

Make the same connections as described for the 2-wire 1-receiver module (paragraph 1.2.1).

1.3.2 Receive Audio (Line Amplifier No. 1)

Perform the Line Amplifier No. 1 procedure described for the 4-wire audio module (paragraph 1.1.2), except that the level at pin 23 should be approximately 2 volts.

1.3.3 Transmit Audio

Perform the Transmit Audio procedure described for the 4-wire audio module (paragraph 1.1.4).

1.3.4 Receiver Audio Mute Switches

Step 1. Inject a 1000 Hz tone between pin 13 and ground and adjust the oscillator output for 150 mV.

Step 2. The voltage measured between pin 6 and ground should be approximately 145 mV. However, if jumper JU18 is in (second receiver priority) the voltage reading should be zero. If jumper JU18 is in, apply a ground to pin 15. The voltage measured between pin 6 and ground should go to 145 mV. If the voltage between pin 6 and ground is considerably below 145 mV, check R1 mute switch Q12 and R1 mute switch driver Q11. The output between pin 6 and ground should also decrease by approximately 70 dB if a ground is applied to pins 9, 14, or 18. If the voltage does decrease by this amount, check OR gate diodes CR3 and CR5, R1 mute switch driver Q11, and R1 mute switch Q12.

Step 3. Inject a 1000 Hz tone between pin 22 and ground and adjust the oscillator for 150 mV output.

Step 4. The voltage measured between pin 6 and ground should be approximately 140 mV. However, if jumper JU24 (first receiver priority) is in, the voltage reading should be approximately 70 dB below this level. If jumper JU24 is in, apply a ground to pin 18. The voltage measured between pin 6 and ground should go to 140 mV. If the voltage between pin 6 and ground is considerably below 140 mV, check R2 mute switch Q16 and R2 mute switch driver Q12. With jumper JU15 in, the output pin 6 should also decrease by approximately 70 dB when a ground is applied to pins 5, 9, 14, or 15. With jumper JU23 in, the output at pin 6 should decrease by approximately 70 dB when a ground is applied to pin 17. If the output at pin 6 does not decrease by the 70 dB, check OR gate diodes CR6, CR7, CR8, and CR9, mute switch driver Q15 and mute switch Q16.

If a ground is present at pin 17 and jumper JU22 is in, the voltage at pin 6 will be attenuated. The amount of attenuation is determined by selection of jumpers JU25, JU26, and JU27. If the voltage is not attenuated check mute/attenuator switch Q13 and Q14.

parts list

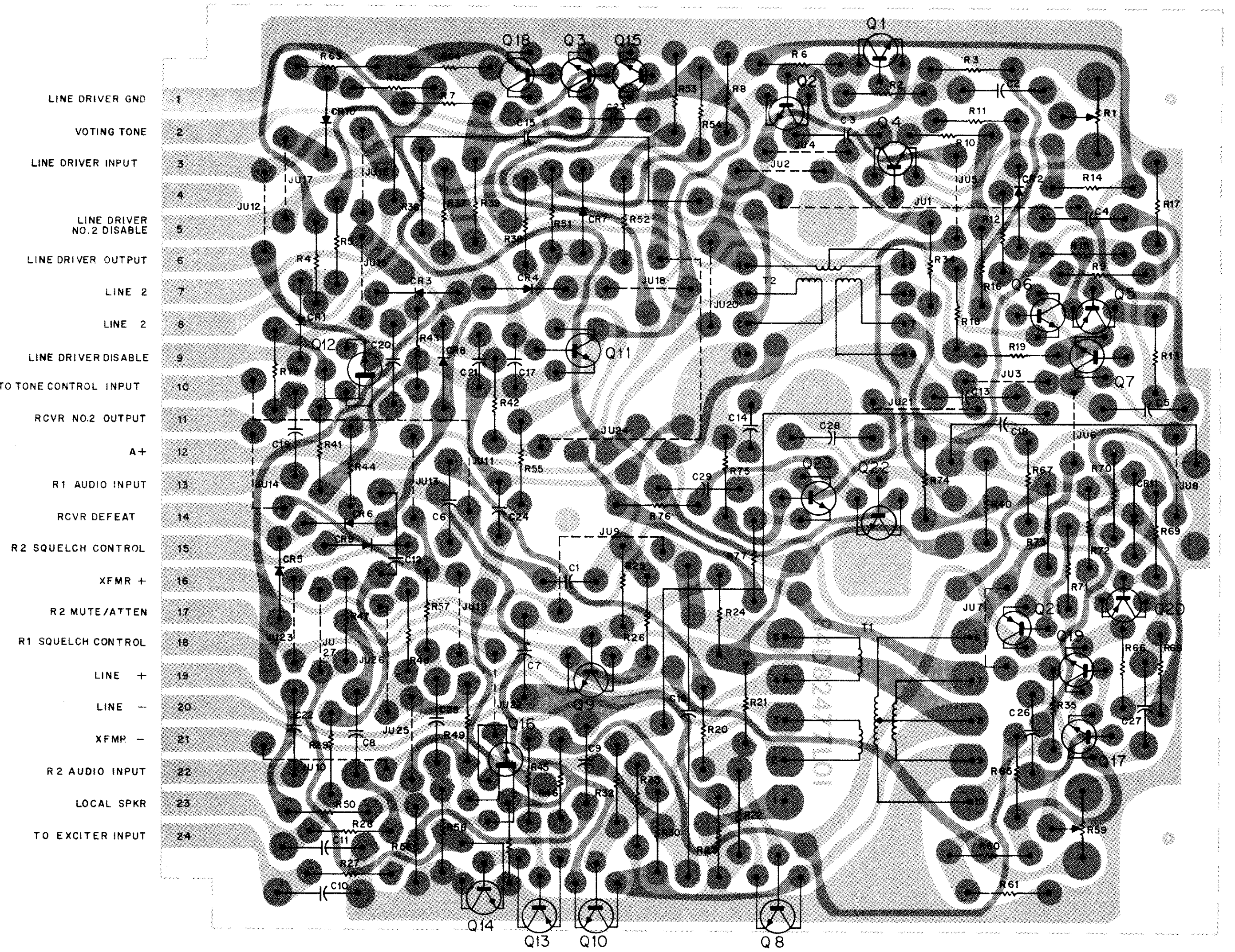
TLN4668A & TLN4668B Line Driver Module (4-Wire)
TLN4669A & TLN4669B Line Driver Module (2-Wire; 1-Rcvr.)
TLN4670A & TLN4670B Line Driver Module (2-Wire; 2-Rcvr.) PL 1702 E

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		capacitor, fixed: uF ± 10%; 50 V: unless otherwise stated
C1	21-82187B29	.001; 100 V
C2, 3	8-82905G11	0.22
C4	8-82905G08	.033
C5	8-82905G01	.01; 25 V
C6 thru 9	8-82905G11	0.22
C10, 11	8-82905G26	.0047; 100 V
C12, 13	8-82905G11	0.22
C14	21-82187B29	.001; 100 V
C15, 16	8-82045E05	2; 350 V
C17	21-82428B25	.002 ± 20%; 500 V
C18	23-84669A19	100; 20 V
C19, 20	8-82905G11	0.22
C21	21-82428B27	.0047; 100 V
C22	8-82905G11	0.22
C23	21-82428B25	.002 ± 20%; 500 V
C24	21-82428B27	.0047; 100 V
C25 thru 27	8-82905G11	0.22
C28, 29	8-82905G08	.033
		semiconductor device, diode: (see note)
CR1 thru 11	48-82392B03	silicon
		translstor: (see note)
Q1, 2	48-869570	NPN; type M9570
Q3	48-869568	NPN; type M9568
Q4, 5	48-869571	PNP; type M9571
Q6, 7	48-869491	NPN; type M9491
Q8 thru 11	48-869570	NPN; type M9570
Q12	48-869660	field effect; type M9660
Q13	48-869571	PNP; type M9571
Q14, 15	48-869570	NPN; type M9570
Q16	48-869660	field effect; type M9660
Q17	48-869570	NPN; type M9570
Q18	48-869568	NPN; type M9568
Q19	48-869570	NPN; type M9570
Q20, 21	48-869571	PNP; type M9571
Q22, 23	48-869491	NPN; type M9491
		resistor, fixed: ± 5%; 1/4 W: unless otherwise stated
R1	18-83083G03	var; 25k
R2	6-11009D18	680k
R3	6-11009D14	470k
R4, 5	6-11009C61	3.3k
R6	6-11009C59	2.7k
R7	6-11009C49	1k
R8	6-11009C35	270
R9	6-11009C83	27k
R10	6-11009D02	150k
R11, 12	6-11009C79	18k
R13	6-11009D02	150k
R14, 15	6-11009C41	470
R16, 17	6-11009C57	2.2k
R18, 19	6-11009C21	68 now 182 ± 1% 1/4W 6-10621B23
R20	6-11009C83	27k
R21, 22	6-11009C85	33k
R23	6-11009C49	1k
R24	6-11009C83	27k
R25, 26	6-11009C85	33k
R26	6-11009C49	1k
R27 thru 29	6-11009C55	1.8k
R30	6-11009C85	33k
R31	6-11009C49	1k
R32	6-11009C83	27k
R33	6-11009C85	33k
R34, 35	6-11009C51	1.2k
R36	6-11009C73	10k
R37	6-11009C63	3.9k
R38	6-11009C73	10k
R39	6-11009C53	1.5k
R40	6-11009C25	100
R41, 42	6-11009D22	1 meg
R43	6-11009C61	3.3k
R44 thru 46	6-11009C73	10k
R47	6-11009C21	68
R48	6-11009C31	180
R49	6-11009C47	820
R50	6-11009C57	2.2k
R51	6-11009C73	10k
R52	6-11009C63	3.9k
R53	6-11009C53	1.5k
R54	6-11009C73	10k
R55, 56	6-11009D22	1 meg
R57	6-11009C61	3.3k
R58	6-11009C73	10k
R59	18-83083G03	var; 25k
R60	6-11009D18	680k
R61	6-11009D14	470k
R62, 63	6-11009C61	3.3k
R64	6-11009C49	1k
R65	6-11009C59	2.7k
R66	6-11009C35	270
R67	6-11009C83	27k
R68	6-11009D02	150k
R69, 70	6-11009C79	18k
R71	6-11009D02	150k
R72, 73	6-11009C41	470
R74, 75	6-11009C57	2.2k
R76, 77	6-11009C21	68 now 182 ± 1/4W 1% 6-10621B23
R78	6-11009C57	2.2k
		transformer:
T1	25-83000H01	pri #1 pin 2 & 3 res. 25 ohms pri #2 pin 4 & 5 res. 150 ohms sec #1 pin 6 & 10 res. 50 ohms sec #2 pin 7 & 9 res. 160 ohms
T2	25-84202A02	pri: pin 2 & 3 res. 50 ohms sec #1 pin 4 & 6 res. 50 ohms sec #2 pin 7 & 8 res. 150 ohms

notes:
1. Replacement diodes and transistors must be ordered by Motorola part number only for optimum performance.
2. "A" suffix and "B" suffix models differ only in front panel width ("B" is narrower).

REVISIONS 68P81016E18-N

CHASSIS AND SUFFIX NO.	REF. SYMBOL	CHANGE	LOCATION
TLN4668A-1 TLN4669A-1 TLN4670A-1	C5	FROM 8-82905G08 .033 uF TO 8-82905G01 .01 uF	Q6 LINE DRIVER
TLN4668A-2 TLN4669A-2 TLN4670A-2	R78	ADDED 8-128698, 22K	Q12 MUTE SWITCH
TLN4668B TLN4669B TLN4670B		NEW MODELS	



SHOWN FROM SOLDER SIDE

NOTE:

THIS BOARD DETAIL IS APPLICABLE TO ALL THREE LINE DRIVER MODELS. PLATING RUNS ARE IDENTICAL TO ALL THREE. PART LOCATIONS ARE ALSO IDENTICAL EXCEPT FOR APPLICABLE DELETIONS AS INDICATED ON THE SCHEMATIC DIAGRAM (e.g., R20 IS LOCATED IN THE SAME PLACE FOR ALL MODELS).

SOLDER SIDE BD-DEPS-21343-A
COMPONENT SIDE BD-DEPS-21344-A
OL-DEPS-21345-O

SCHEMATIC NOTES:

1. UNLESS OTHERWISE STATED:
   RESISTOR VALUES ARE IN OHMS (K = 1000)
   CAPACITOR VALUES ARE IN MICROFARADS
2. EXACT AUDIO ROUTING AND DISABLING IN THE LINE DRIVER MODULE IS DEPENDENT ON THE JUMPER PLACEMENTS. REFER TO JUMPER TABLE.
3. AT POINTS SHOWING TWO VOLTAGES, THE VOLTAGE IN PARENTHESES IS A RESULT OF A LOGIC LOW AT THE CONTROL FUNCTION INPUT.
4. PARTIAL OR COMPLETE R2 AUDIO MUTING IS ACCOMPLISHED AS FOLLOWS:

R2 AUDIO ATTENUATION	JUMPER CONFIGURATION (JU)
10 dB	JU22 IN; JU23, 25, 26, 27 OUT
20 dB	JU22, 25 IN; JU23, 26, 27 OUT
30 dB	JU22, 25, 26 IN; JU23, 27 OUT
COMPLETE	JU22 OUT; JU23 IN

5. R57 IS REMOVED IN THE 4-WIRE; 1 REC APPLICATION.
6. RECEIVER PRIORITY IS ACCOMPLISHED AS FOLLOWS:

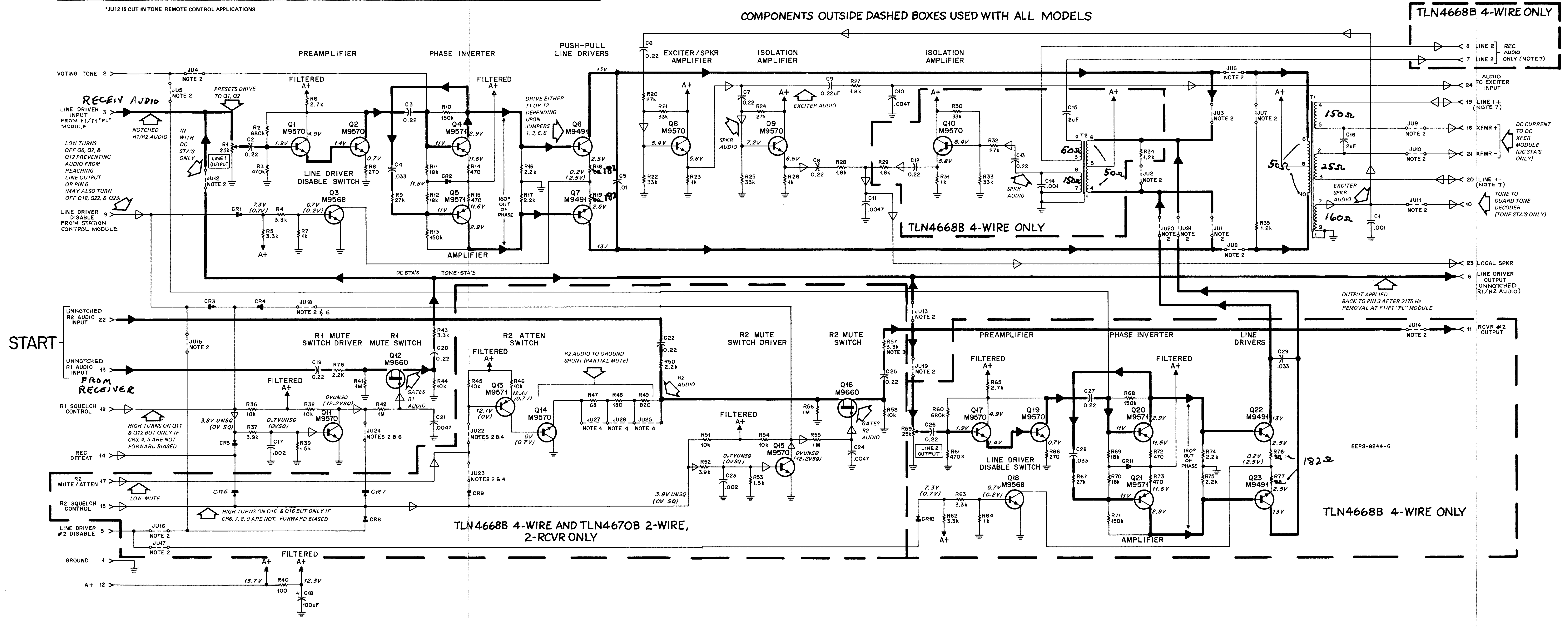
PRIORITY	JUMPER CONFIGURATION
RCVR NO. 1	JU18 OUT; JU24 IN
RCVR NO. 2	JU18 IN; JU24 OUT
FIRST COME, FIRST SERVED	JU18 & 24 IN

7. CONTROL CURRENT CONTROL TONES AND EXCITER (XMIT) AUDIO FUNCTIONS ARE ALWAYS CARRIED ON LINE 1. LINE 2, WHEN USED, ONLY CARRIES REC AUDIO.

JUMPER TABLE

LINE DRIVER		JU1	JU2	JU3	JU4	JU5	JU6	JU7	JU8	JU9	JU10	JU11	JU12*	JU13	JU14	JU15	JU16	JU17	JU18	JU19	JU20	JU21	JU22	JU23	JU24
TLN4668B 4–WIRE	4-WIRE; 1 REC REC AUDIO ON LINE 2 (NOTE 5)	OUT	IN	OUT	OUT	IN	OUT	IN	OUT	IN	IN	IN	OUT	IN	OUT	IN	IN	IN	OUT	IN	IN	IN	OUT	OUT	OUT
	4–WIRE; 2 REC R1 PRIORITY REC AUDIO ON LINE 2	OUT	IN	OUT	OUT	IN	OUT	IN	OUT	IN	IN	IN	OUT	IN	OUT	IN	IN	IN	OUT	IN	IN	IN	OUT	IN	IN
	4–WIRE; 2 REC R1 AUDIO LINE 1 R2 AUDIO LINE 2	OUT	IN	OUT	OUT	IN	IN	IN	IN	IN	IN	IN	*IN	OUT	OUT	IN	IN	IN	OUT	IN	IN	IN	OUT	IN	OUT
TLN4670B	2–WIRE, 2 RCVR	OUT	OUT	OUT	OUT	OUT	IN	IN	IN	IN	IN	IN	*IN	IN	OUT	IN	OUT	OUT	OUT	OUT	OUT	OUT	OUT	IN	IN
TLN4669B	2–WIRE, 1 RCVR	OUT	OUT	OUT	OUT	OUT	IN	IN	IN	IN	IN	IN	*IN	OUT	OUT	OUT	OUT	OUT	OUT	OUT	OUT	OUT	OUT	OUT	OUT

*JU12 IS CUT IN TONE REMOTE CONTROL APPLICATIONS



LINE DRIVER MODULES

MODEL TLN4668B 4-WIRE AUDIO
MODEL TLN4669B 2-WIRE AUDIO, 1 RCVR
MODEL TLN4670B 2-WIRE AUDIO, 2 RCVR

FUNCTION

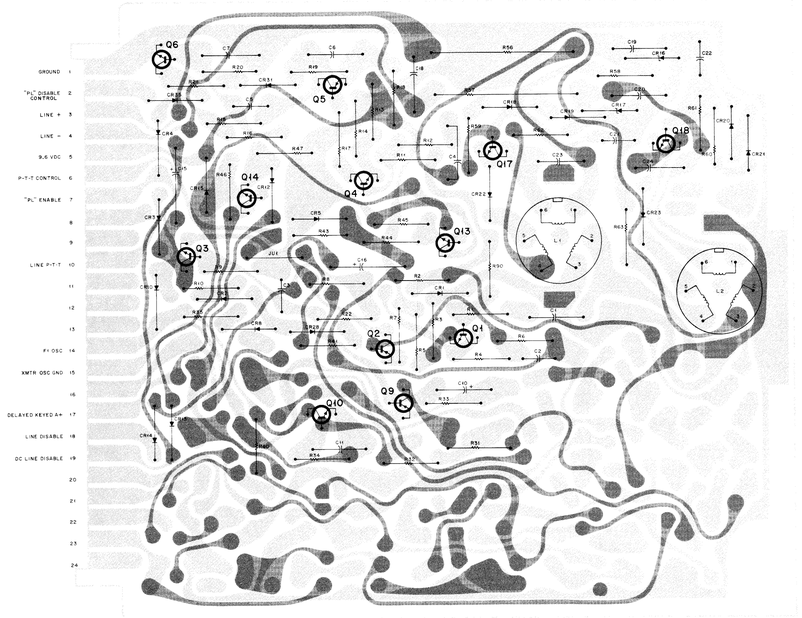
TLN4668B 4-Wire Audio Module-
Accepts audio from up to two different receivers. Amplifies the audio and routes it out to either of (two line outputs, or the local speaker); two transformers are provided. One is used for accepting the transmit audio and control signals, and the other is used to provide line audio to a remote point; gating circuits allow external control of R1 mute, R2 mute, and line driver disable functions.

TLN4669B 2-Wire 1-Receiver Audio Module-
Accepts audio from one receiver, amplifies the audio and routes it either through an amplifier section or as a direct output; a single transformer is used to accept the transmit audio and control signals and also provide line audio to a remote point; gating circuits allow external control of R1 mute and line driver disable functions.

TLN4670B 2-Wire 2-Receiver Audio Module-
Accepts audio from up to two different receivers, and routes it either through an amplifier section or as a direct output. A single transformer is used to accept the transmit audio and control signals and also provide line audio to a remote point; gating circuits allow external control of R1 mute, R2 mute, and line driver disable functions.

START	CIRCUIT THEORY MOST EASILY UNDERSTOOD BY BEGINNING AT THIS POINT AND FOLLOWING SIGNAL FLOW.
(open arrow)	THEORY OF OPERATION DATA
(heavy arrow)	PRIMARY SIGNAL FLOW
(light arrow)	SECONDARY SIGNAL FLOW

DC TRANSFER MODULES

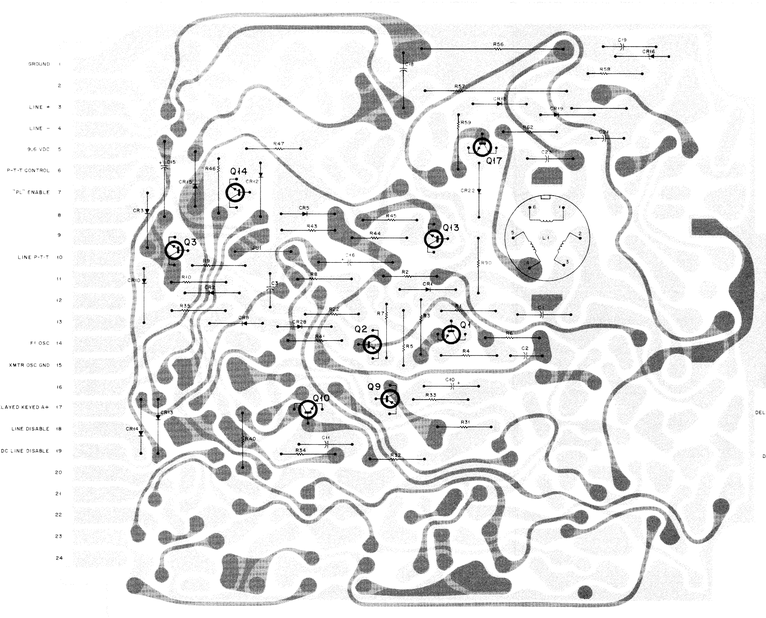


TLN4659A
F1–"PL" DISABLE

SHOWN FROM SOLDER SIDE

SOLDER SIDE
COMPONENT SIDE

80-DEPS-14147-H
OL-DEPS-14149-B

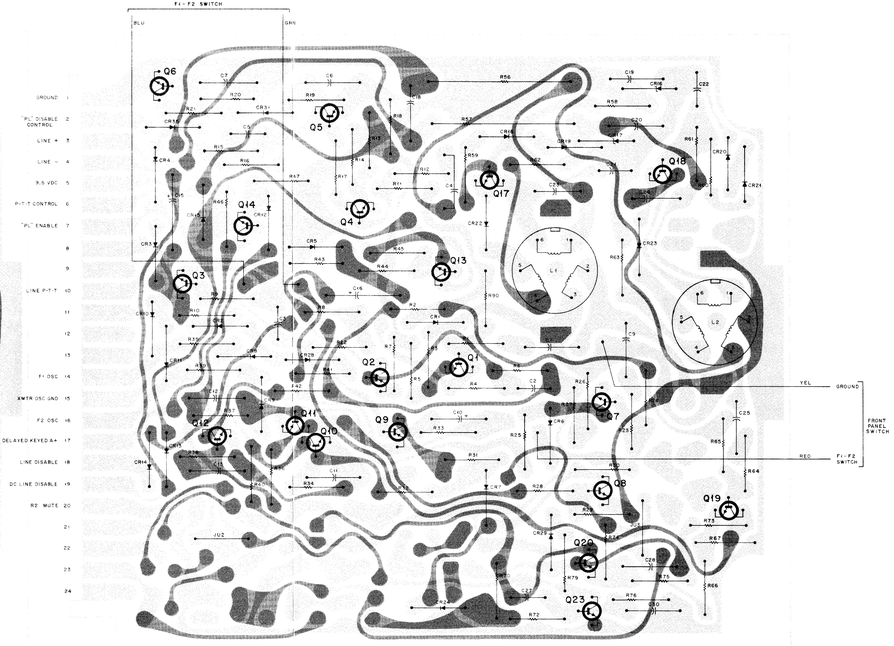


TLN4661A
F1 CONTROL

SHOWN FROM SOLDER SIDE

SOLDER SIDE
COMPONENT SIDE

80-DEPS-14147-H
OL-DEPS-14148-B



TLN4660A
F2–R2 MUTE

SHOWN FROM SOLDER SIDE

SOLDER SIDE
COMPONENT SIDE

80-DEPS-14147-H
OL-DEPS-14150-B

68P81016E04-N
(Sheet 1 of 4)
7/15/83-PHI

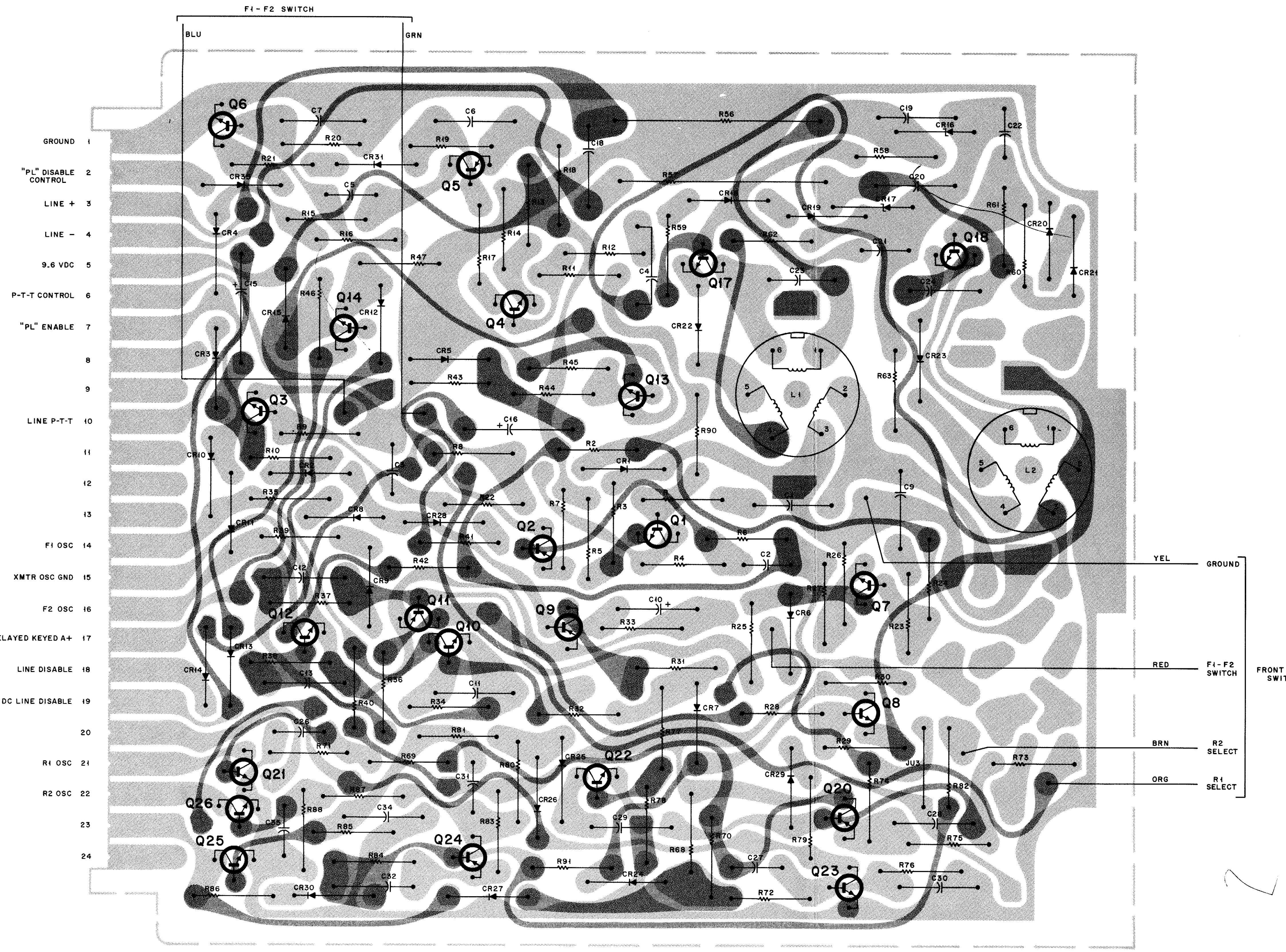
DC TRANSFER MODULES

MODELS TLN4659A F1-"PL"
TLN4660A F2-R2 MUTE
TLN4661A FI
TLN4663A C2-R2

For Optional Models See Sheets 3 And 4

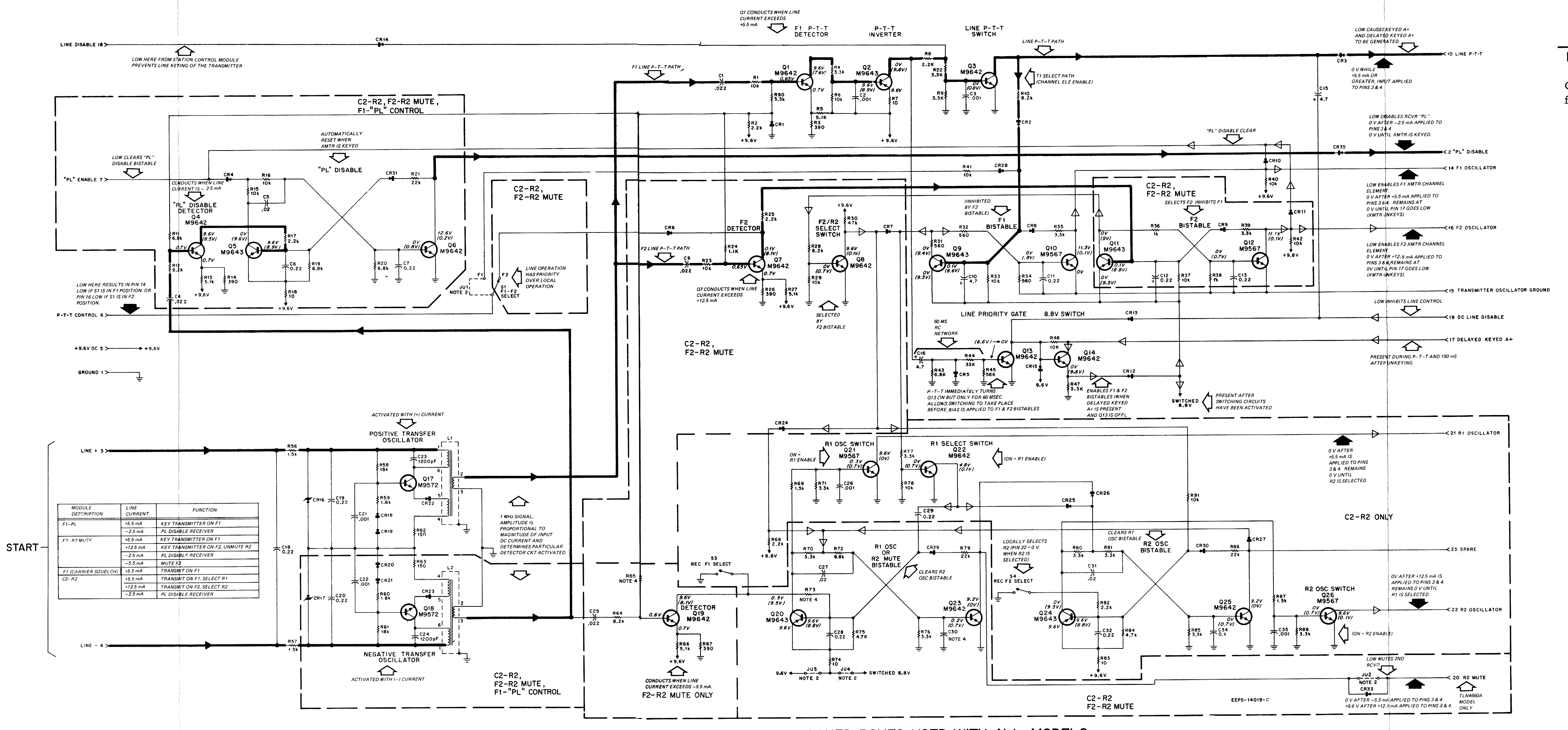
FUNCTION

Converts dc line currents to station control functions.



TLN4663A
C2-R2

SHOWN FROM SOLDER SIDE



MODULE DESCRIPTION	LINE CURRENT	FUNCTION
F1–PL	+5.5 mA	KEY TRANSMITTER ON F1
	–2.5 mA	PL DISABLE RECEIVER
F2–R2 MUTE	+5.5 mA	KEY TRANSMITTER ON F1
	+12.5 mA	KEY TRANSMITTER ON F2, UNMUTE R2
	–2.5 mA	PL DISABLE RECEIVER
	–5.5 mA	MUTE R2
F1 (CARRIER SQUELCH)	+5.5 mA	TRANSMIT ON F1
C2–R2	+5.5 mA	TRANSMIT ON F1, SELECT R1
	+12.5 mA	TRANSMIT ON F2, SELECT R2
	–2.5 mA	PL DISABLE RECEIVER

CIRCUITRY OUTSIDE DASHED BOXES USED WITH ALL MODELS

BENCH TESTING SET–UP

PIN NO.	CONNECT
1, 15	GROUND
10,2	10K OHMS TO 9.6 VOLTS DC
3	THROUGH 0 TO 15 DC MILLIAMETER TO 70 TO 100 VOLTS DC CURRENT SOURCE
4	TO NEGATIVE (–) OF CURRENT SOURCE
5	9.6 VOLTS
17	12 VOLTS DC

NOTES:

1. UNLESS OTHERWISE STATED: CAPACITOR VALUES ARE IN MICROFARADS:
2. JUMPER CHART

	MODEL	JU1	JU2	JU3	JU4
F1–"PL"	TLN4659A	IN	OUT	OUT	OUT
F1-R2 MUTE	TLN4660A	OUT	IN	IN	OUT
F1 CONT	TLN4661A	IN	OUT	OUT	OUT
C2–R2	TLN4663A	OUT	OUT	IN	OUT

3. VOLTAGES SHOWN IN PARENTHESES ARE NORMALLY MEASURED WHEN FUNCTION IS ACTIVATED. VOLTAGES NOT IN PARENTHESES ARE NORMALLY MEASURED WHEN FUNCTION IS DEACTIVATED.
4. SEE PARTS LIST FOR COMPONENT VALUES.
5. ALL BISTABLES ARE COMPLEMENTARY, THEREFORE BOTH BISTABLE TRANSISTORS ARE ON OR OFF SIMULTANEOUSLY
6. NA
7. WHILE EITHER PINS 18 OR 19 ARE GROUNDED, LINE CURRENTS WILL NOT ACTIVATE THE MODULE.

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

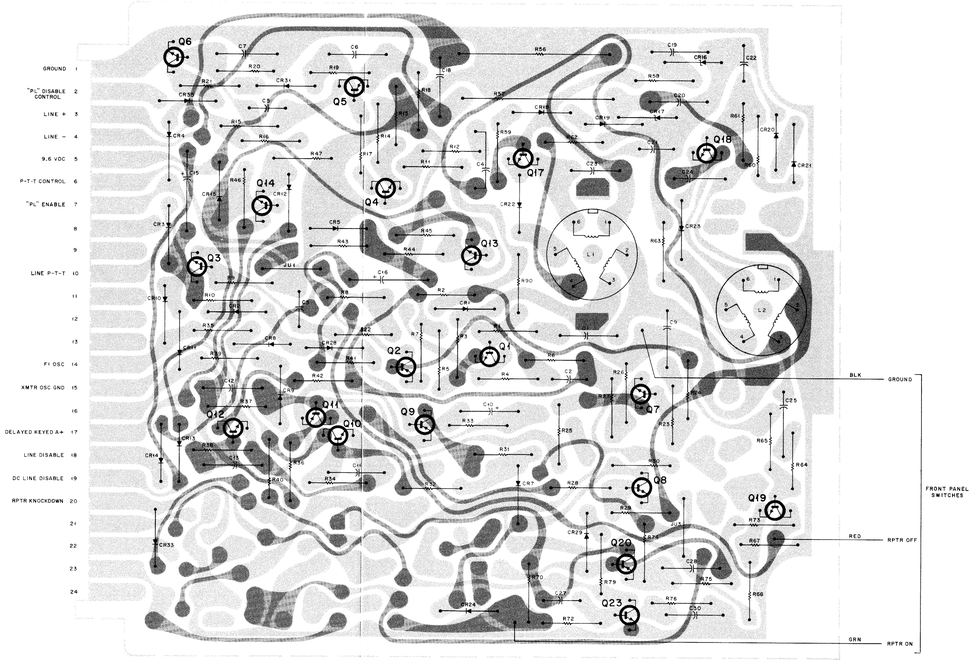
(heavy line arrow) = PRIMARY SIGNAL FLOW

(light line arrow) = SECONDARY SIGNAL FLOW

PARTS LIST SHOWN ON BACK OF SHEET 4

68P81016E04-N
(Sheet 2 of 4)
7/15/83-PHI

OPTIONAL DC TRANSFER MODULES

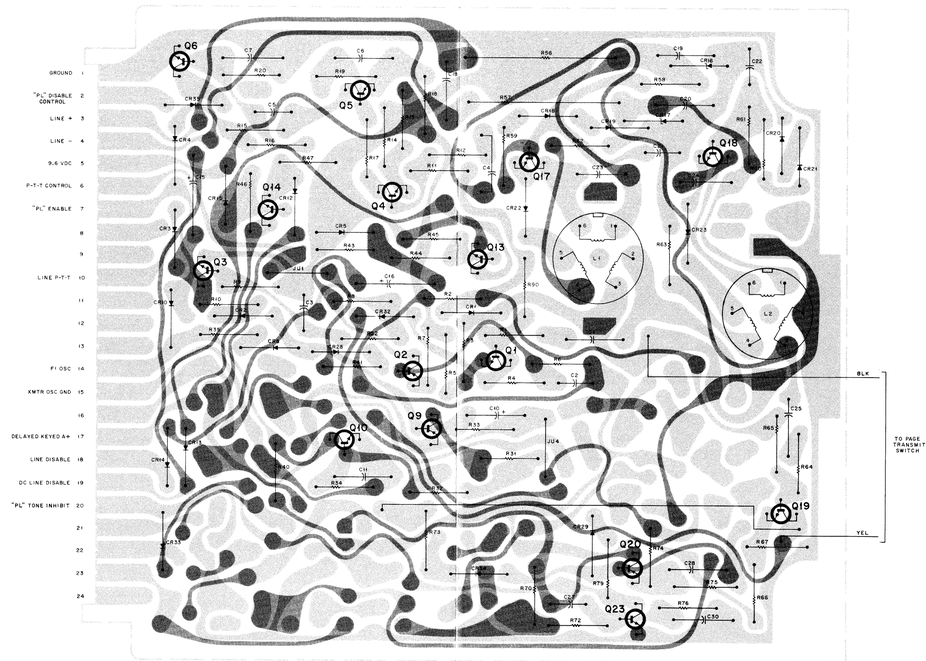


TLN4664A
REPEATER CONTROL

SHOWN FROM SOLDER SIDE

SOLDER SIDE
COMPONENT SIDE

GL-DEPS-14152-B



TLN4637A
PAGING

SHOWN FROM SOLDER SIDE

SOLDER SIDE
COMPONENT SIDE

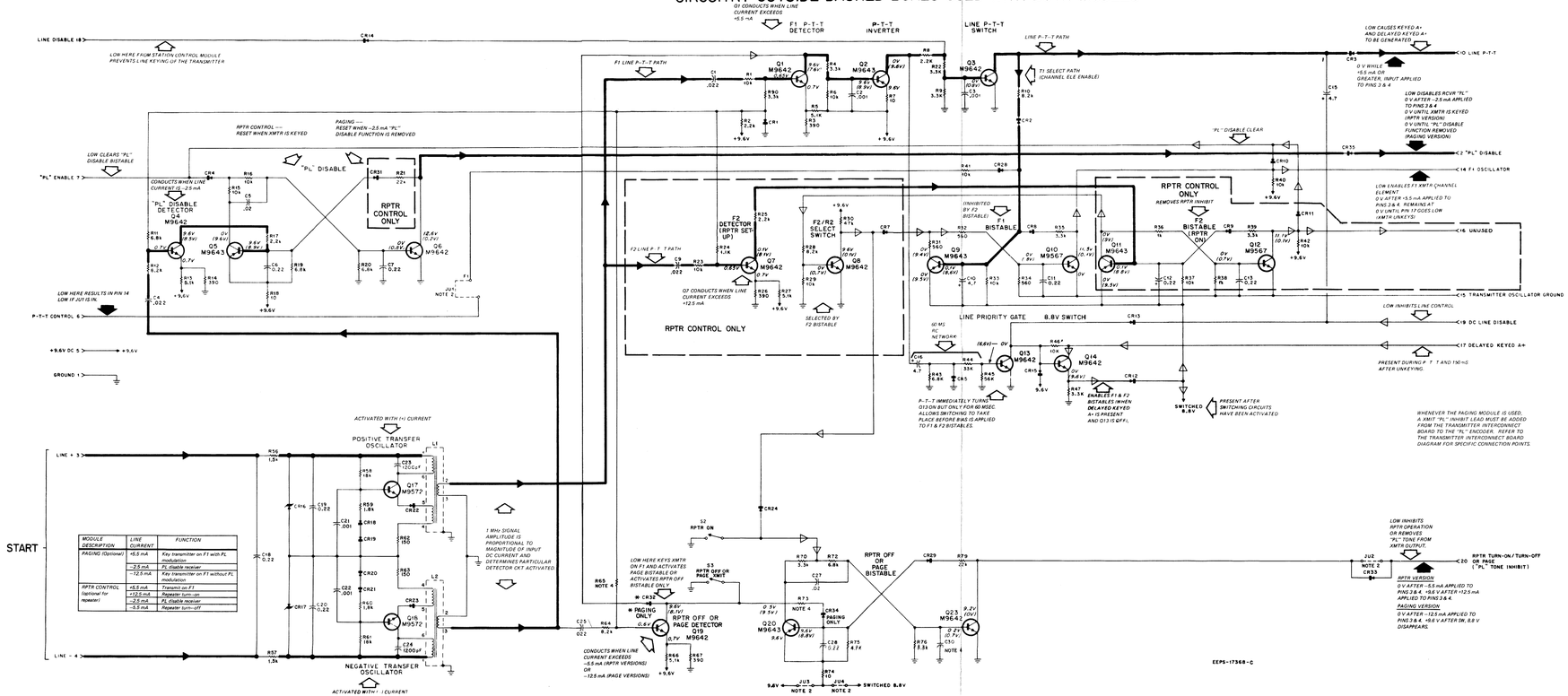
GL-DEPS-14151-B

OPTIONAL DC TRANSFER MODULES

MODELS TLN4664A RPTR CONTROL
TLN4637A PAGING

FUNCTION

Converts dc line current to station control function.



MODULE DESCRIPTION	LINE CURRENT	FUNCTION
PAGING (Optional)	+5.5 mA	Key transmitter on F1 with PL modulation
	-2.5 mA	PL disable receiver
	-12.5 mA	Key transmitter on F1 without PL modulation
RPTR CONTROL (Optional for repeater)	+5.5 mA	Transmit on F1
	+12.5 mA	Repeater turn-on
	-2.5 mA	PL disable receiver
	-5.5 mA	Repeater turn-off

BENCH TESTING SET UP

PIN NO.	CONNECT
7, 15	GROUND
10,20	10K OHMS TO 9.6 VOLTS DC
3	THROUGH 0 TO 15 DC MILLIAMETER TO 70 TO 100 VOLTS DC CURRENT SOURCE
4	TO NEGATIVE (-) OF CURRENT SOURCE
5	7+ VOLTS
17	12 VOLTS DC

NOTES:
1. UNLESS OTHERWISE STATED: CAPACITOR VALUES ARE IN MICROFARADS.
2. JUMPER CHART

	MODEL	J1/1	J2/2	J3/3	J4/4
PAGING	TLN4637A	IN	OUT	OUT	IN
RPTR CONT.	TLN4664A	IN	OUT	IN	OUT

3. VOLTAGES SHOWN IN PARENTHESES ARE NORMALLY MEASURED WHEN FUNCTION IS ACTIVATED; VOLTAGES NOT IN PARENTHESES ARE NORMALLY MEASURED WHEN FUNCTION IS DEACTIVATED
4. SEE PARTS LIST FOR COMPONENT VALUES.
5. ALL BISTABLES ARE COMPLEMENTARY: THERE FORE BOTH BISTABLE TRANSISTORS ARE ON OR OFF SIMULTANEOUSLY
6. NA
7. WHILE EITHER PINS 16 OR 19 ARE GROUNDED, LINE CURRENTS WILL NOT ACTIVATE THE MODULE

LEGEND:
START - CIRCUIT THEORY MOST EASILY UNDERSTOOD BY BEGINNING AT THIS POINT AND FOLLOWING SIGNAL FLOW.
= THEORY OF OPERATION DATA
= MAINTENANCE DATA
= PRIMARY SIGNAL FLOW
= SECONDARY SIGNAL FLOW

OPTIONAL DC TRANSFER MODULES

PARTS LIST SHOWN ON BACK OF PAGE

parts list

TLN4673A, TLN4659A, TLN4660A, TLN4661A,
TLN4663A, TLN4664A DC Transfer Control Modules PL-2733-D

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		capacitor, fixed: uF ± 10%; 50 V: unless otherwise stated
C1	8-82905G02	.022
C2, 3	21-82187B29	.001; 100 V
C4	8-82905G02	.022
C5	21-82428B26	.02 + 80-20%; 200 V
C6, 7	8-82905G11	0.22
C9	8-82905G02	.022
C10	23-865137	4.7 ± 20%; 25 V
C11 thru 13	8-82905G11	0.22
C15, 16	23-865137	4.7 ± 20%; 25 V
C18 thru 20	8-82905G11	0.22
C21, 22	21-82187B29	.001; 100 V
C23, 24	21-874352	1200 pF ± 5%; 300 V
C25	8-82905G11	.022
C26	21-82187B29	.001; 100 V
C27	21-82428B26	.02 + 80-20%; 200 V
C28, 29	8-82905G11	0.22
C30	8-83813H09	.033; 100 V
C31	21-82428B26	.02 + 80-20%; 200 V
C32	8-82905G11	0.22
C34	8-83813H09	.033; 100 V
C35	21-82187B29	.001; 100 V
		semiconductor device, diode: (see note)
CR1	48-83654H01	silicon
CR2 thru 15	48-82392B03	silicon
CR16, 17	48-83461E12	silicon; Zener type 27 V
CR18 thru 21	48-82392B03	silicon
CR22, 23	48-83654H01	silicon
CR24 thru 31	48-82392B03	silicon
CR32	48-83654H01	silicon
CR33	48-82392B03	silicon (TLN4659A, TLN4660A, TLN4661A, TLN4663A and TLN4664A only)
	or 48-84616A01	silicon (TLN4637A only)
CR34	48-83654H01	silicon
		coil, rf:
L1, 2	24-83008H01	oscillator
		transistor: (see note)
Q1	48-869642	NPN; type M9642
Q2	48-869643	PNP; type M9643
Q3, 4	48-869642	NPN; type M9642
Q5	48-869643	PNP; type M9643
Q6 thru 8	48-869642	NPN; type M9642
Q9	48-869643	PNP; type M9643
Q10	48-869567	NPN; type M9567
Q11	48-869643	PNP; type M9643
Q12	48-869567	NPN; type M9567
Q13, 14	48-869642	NPN; type M9642
Q17, 18	48-869572	NPN; type M9572
Q19	48-869642	NPN; type M9642
Q20	48-869643	PNP; type M9643
Q21	48-869567	NPN; type M9567
Q22, 23	48-869642	NPN; type M9642
Q24	48-869643	PNP; type M9643
Q25	48-869642	NPN; type M9642
Q26	48-869567	NPN; type M9567
		resistor, fixed: ± 5%; 1/4 W: unless otherwise stated
R1	6-11009C73	10k
R2	6-11009C57	2.2k
R3	6-11009C39	390
R4	6-11009C61	3.3k
R5	6-11009C66	5.1k
R6	6-11009C73	10k
R7	6-11009C01	10
R8	6-11009C57	2.2k
R9	6-11009C61	3.3k
R10	6-11009C71	8.2k
R11	6-11009C69	6.8k
R12	6-11009C71	8.2k
R13	6-11009C66	5.1k
R14	6-11009C39	390
R15, 16	6-11009C73	10k
R17	6-11009C57	2.2k
R18	6-11009C01	10
R19, 20	6-11009C69	6.8k
R21	6-11009C81	22k
R22	6-11009C61	3.3k
R23	6-11009C73	10k
R24	6-11009C50	1.1k
R25	6-11009C57	2.2k
R26	6-11009C39	390
R27	6-11009C66	5.1k
R28	6-11009C71	8.2k
R29	6-11009C73	10k
R30	6-11009C89	47k
R31, 32	6-11009C43	560
R33	6-11009C73	10k
R34	6-11009C43	560
R35	6-11009C61	3.3k
R36	6-11009C49	1k
R37	6-11009C73	10k
R38	6-11009C49	1k
R39	6-11009C61	3.3k
R40 thru 42	6-11009C73	10k
R43	6-11009C69	6.8k
R44	6-11009C85	33k
R45	6-11009C91	56k
R46	6-11009C73	10k
R47	6-11009C61	3.3k
R56, 57	17-83027H03	1.5k; 3 W
R58	6-11009C79	1.8k
R59, 60	6-11009C55	1.8k
R61	6-11009C79	18k
R62, 63	6-11009C29	150
R64	6-11009C71	8.2k
R65	6-11009C53	1.5k (TLN4637A)
	or 6-11009C57	2.2k (TLN4660A & TLN4664A)
R66	6-11009C66	5.1k
R67	6-11009C39	390
R68	6-11009C57	2.2k
R69	6-11009C53	1.5k
R70, 71	6-11009C61	3.3k
R72	6-11009C69	6.8k
R73	6-11009C57	2.2k (TLN4660A, TLN4663A & TLN4664A)
	or 6-11009C49	1k (TLN4637A only)
R74	6-11009C01	10
R75	6-11009C65	4.7k
R76, 77	6-11009C61	3.3k
R78	6-11009C73	10k
R79	6-11009C81	22k
R80, 81	6-11009C61	3.3k
R82	6-11009C57	2.2k
R83	6-11009C01	10
R84	6-11009C65	4.7k
R85	6-11009C61	3.3k
R86	6-11009C81	22k
R87	6-11009C53	1.5k
R88	6-11009C61	3.3k
R89	6-11009C71	8.2k
R90	6-11009C61	3.3k
R91	6-11009C73	10k
		switch:
S1	40-83204B01	slide
S2 thru 4	40-83468E01	slide

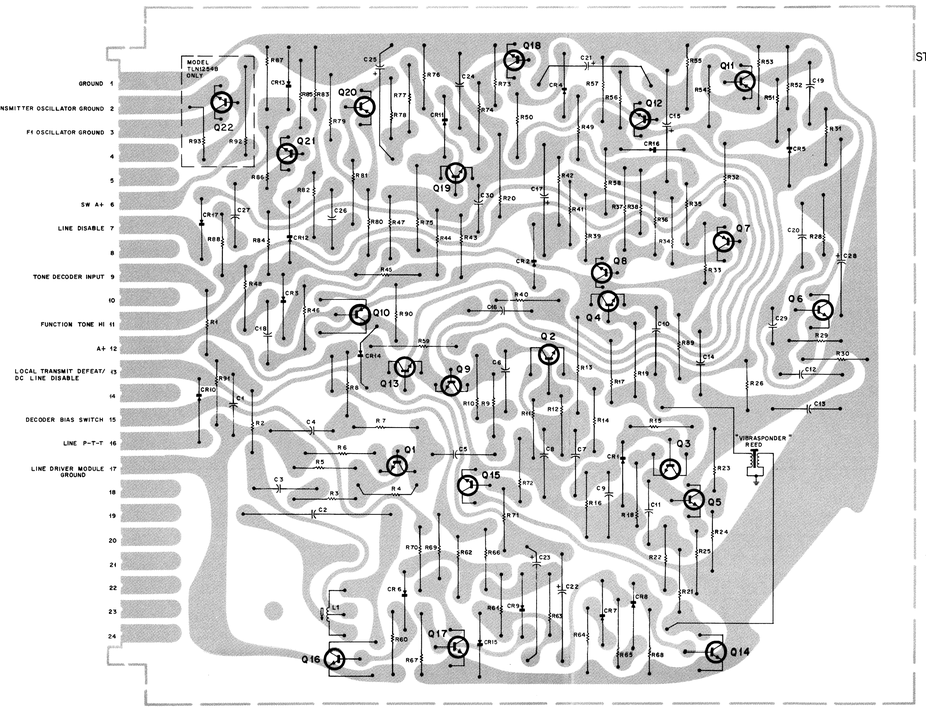
non-referenced items

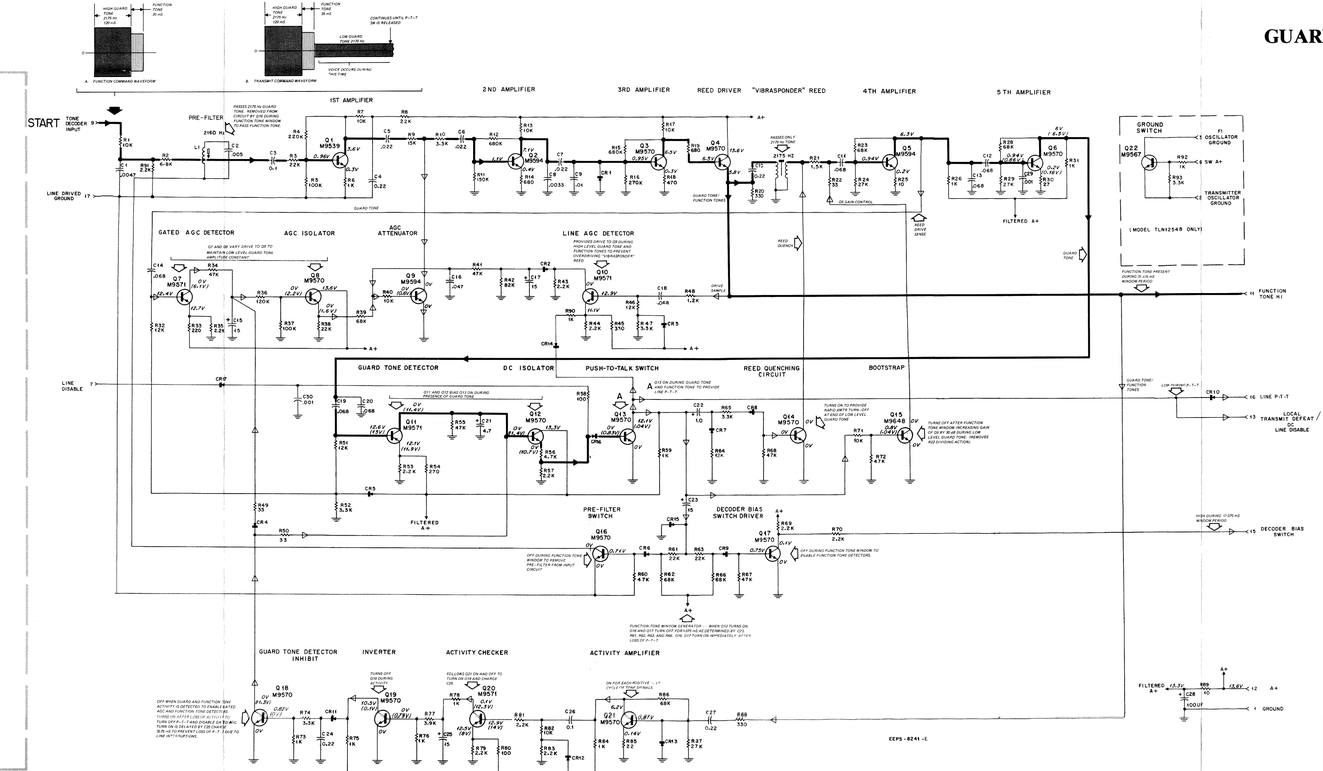
64-84397A01	PANEL, screened
9-83011H01	RECEPTACLE, female; 20 req'd.
43-865080	BUSHING, threaded; 2 req'd.
45-83914G01	GUIDE, card; 2 req'd.
26-858660	SHIELD, coil; 2 req'd.
76-83960B07	CORE, 6 req'd.

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

GUARD TONE DECODER MODULES

MODELS TLN1245B
TLN1254B





FUNCTION

- Converts 2175 Hz guard Tone Signal to line PTT signal.
- Amplifies and distributes received function tones to other function decoders.
- Provides security against remote control chassis falsing from function tone signals outside predetermined time frame.
- Turns transmitter off at end of PTT.
- Transmitter channel element ground provided with TLN1254B Module. (A guard tone relay control station does not include this circuitry on any other module.)

Model Complement

Model	Version	Module	Version	Reed (2175 Hz)
TLN1245B		TLN4852A		TLN6709BH
TLN1254B		TLN5458A		TLN6709BH

68P81016E22-K
(Sheet 1 of 2)
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GUARD TONE DECODER MODULES

MAINTENANCE & TROUBLESHOOTING

1. CONNECTIONS

This module may be serviced either while connected to the control chassis or while connected to separate external test equipment. Refer to control chassis servicing information in the manual for additional "Set-Up" details.

Make the following connections to the module.

Pin Number	Connection
1, 17	Ground
9	Audio oscillator through .1 uF
11	AC Voltmeter
12	A + 13.6 Volts DC

2. NORMAL CONDITIONS

Excessive deviations from these values indicate abnormal conditions.

Function	Typical Value
Pull-In Line Level @2175 Hz	– 31 dBm
Drop-Out Line Level @2175 Hz	– 51 dBm
PTT Turn-On Time	Less than 100 Milliseconds
PTT Turn-Off Time	Less than 100 Milliseconds
Prefilter Switch Time	375 Milliseconds
Gated AGC Threshold	– 45 dBm
Line AGC Threshold	– 18 dBm
Prefilter Frequency	2160 Hz
"Vibrasponder" Frequency	2175 Hz

3. MODULE MALFUNCTION LOCATION TECHNIQUES

Step 1. Inject a 15 millivolt, 2175 Hz audio tone into pin 9.

Step 2. Measure the dc voltage from pin 13 to ground as the tone input voltage reaches 15 millivolts, pin 13 should go to ground if the ground does not occur. Check voltages on transistors Q1 through Q6, Q11, Q12 and Q13.

Step 3. Connect an ac voltmeter across pin 11 and ground, and a dc voltmeter to pin 13 and ground. With an accurate 2175 Hz tone injected at pin 9, pin 13 should go to ground and remain. When pin 13 is at ground the output level at pin 11 should remain constant at 180 millivolts ±3 dB when the input level is slowly varied from 3 millivolts to 80 millivolts. If this does not occur, check Q1, Q2, Q3, Q4 and Q5, Q7, Q8, Q9.

Step 4. Ground the base of the Q16 prefilter switch. With the ac voltmeter connected to pin 11, inject a 2000 Hz tone into pin 9. As the input level is raised to 40 millivolts ±3 dB. The level measured at pin 11 should reach approximately 3 volts ac and then level off with proper operation, increasing the signal amplitude at pin 9 to 4 volts ac should cause only a 3 dB increase in the level at pin 11 from that with 40 millivolt input. If Step 3 was ok and Step 4 did not operate, check Q10.

Step 5. Repeat Steps 1 and 2 with an accurate 2175 Hz tone. To check the drop-out level, slowly reduce the signal amplitude at pin 9 until the voltage at pin 13 goes to the A+ level. Measure the ac voltage at pin 9. Extra attenuation may be required between the audio oscillator and pin 9, since the dropout level is typically less than – 60 dBm (1 mV).

parts list

TLN4852A Guard Tone Decoder
TLN5458A Guard Tone Decoder — PL-1771-E

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		capacitor, fixed: uF ±10%; 50 V: unless otherwise stated
C1	8-82905G26	.0047
C2	8-84326A29	.005 ±2%
C3	8-82905G07	0.1
C4	8-82905G11	0.22
C5 thru 7	8-82905G02	.022
C8	8-82905G25	.0033
C9	8-82905G01	.01
C10	8-82905G11	0.22
C11 thru 14	8-82905G04	.068
C15	23-865136	15 ±20%; 25 V
C16	8-82905G03	.047
C17	23-865136	15 ±20%; 25 V
C18 thru 20	8-82905G04	.068
C21	23-865137	4.7 ±20%; 25 V
C22	23-82783B08	1.0 ±20%; 35 V
C23	23-865136	15 ±20%; 25 V
C24	8-82905G11	0.22
C25	23-865137	15 ±20%; 25 V
C26	8-82905G07	0.1
C27	8-82905G11	0.22
C28	23-82601A25	100 + 150-10%; 20 V
C29, 30	21-82187B20	.001; 100 V
		semiconductor device, diode: (see note)
CR1 thru 17	48-82392B03	silicon
		coil, assembly; inductor:
L1	1-80702B11	1H; incl. ground clip
		transistor: (see note)
Q1	48-869539	NPN; type M9539
Q2	48-869594	NPN; type M9594
Q3, 4	48-869570	NPN; type M9570
Q5	48-869594	NPN; type M9594
Q6	48-869570	NPN; type M9570
Q7	48-869571	PNP; type M9571
Q8	48-869570	NPN; type M9570
Q9	48-869594	NPN; type M9594
Q10, 11	48-869571	NPN; type M9571
Q12 thru 14	48-869570	NPN; type M9570
Q15	48-869648	NPN; type M9648
Q16 thru 19	48-869570	NPN; type M9570
Q20	48-869571	PNP; type M9571
Q21	48-869570	NPN; type M9570
Q22	48-869567	NPN; type M9567 (TLN5458A only)
		resistor, fixed: ±5%; 1/4 W: unless otherwise stated
R1	6-11009C73	10k
R2	6-11009C69	6.8k
R3	6-11009C81	22k
R4	6-11009D06	220k
R5	6-11009C97	100k
R6	6-11009C48	1k
R7	6-11009C73	10k
R8	6-11009C81	22k
R9	6-11009C77	15k
R10	6-11009C61	3.3k
R11	6-11009D02	150k
R12	6-11009D18	680k
R13	6-5556	10k; 1/2 W
R14	6-11009C45	680
R15	6-11009D18	680k
R16	6-11009D08	270k
R17	6-11009C73	10k
R18	6-11009C41	470
R19	6-11009C45	680
R20	6-6022	330; 1/2 W
R21	6-11009C53	1.5k
R22	6-11009C13	33
R23	6-11009C93	68k
R24	6-11009C83	27k
R25	6-11009C01	10
R26	6-11009C49	1k
R28	6-11009C93	68k
R29	6-11009C83	27k
R30	6-11009C11	27
R31	6-11009C49	1k
R32	6-11009C75	12k
R33	6-11009C33	220
R34	6-11009C89	47k
R35	6-11009C57	2.2k
R36	6-11009C99	120k
R37	6-11009C97	100k
R38	6-11009C81	22k
R39	6-11009C93	68k
R40	6-11009C73	10k
R41	6-11009C89	47k
R42	6-11009C95	82k
R43, 44	6-11009C57	2.2k
R45	6-11009C37	330
R46	6-11009C75	12k
R47	6-11009C61	3.3k
R48	6-11009C51	1.2k
R49, 50	6-11009C13	33
R51	6-11009C75	12k
R52	6-11009C61	3.3k
R53	6-11009C57	2.2k
R54	6-11009C35	270
R55	6-11009C89	47k
R56	6-11009C65	4.7k
R57	6-11009C57	2.2k
R58	6-11009C25	100
R59	6-6229	1k; 1/2 W
R60	6-11009C89	47k
R61	6-11009C81	22k
R62	6-11009C93	68k
R63	6-11009C81	22k
R64	6-11009C75	12k
R65	6-11009C61	3.3k
R66	6-11009C93	68k
R67, 68	6-11009C89	47k
R69, 70	6-11009C57	2.2k
R71	6-11009C73	10k
R72	6-11009C89	47k
R73	6-11009C49	1k
R74	6-11009C61	3.3k
R75	6-6229	1k; 1/2 W
R76	6-11009C49	1k
R77	6-11009C63	3.9k
R78	6-11009C49	1k
R79	6-11009C57	2.2k
R80	6-11009C25	100
R81	6-11009C57	2.2k
R82	6-11009C73	10k
R83	6-11009C57	2.2k
R84	6-11009C49	1k
R85	6-11009C09	22
R86	6-11009C93	68k
R87	6-11009C83	27k
R88	6-11009C37	330
R89	6-11009C01	10
R90	6-11009C49	1k
R91	6-11009C57	2.2k
R92	6-6229	1k (TLN5458A only)
R93	6-11009C61	3.3k (TLN5458A only)
		non-referenced items
	64-84316A01	PANEL (screened)
	45-83914G01	GUIDE, card
	3-8022	SCREW, machine #4-40 x 1/4"; 2 used
	4-7683	LOCKWASHER: #4 int.; 2 used

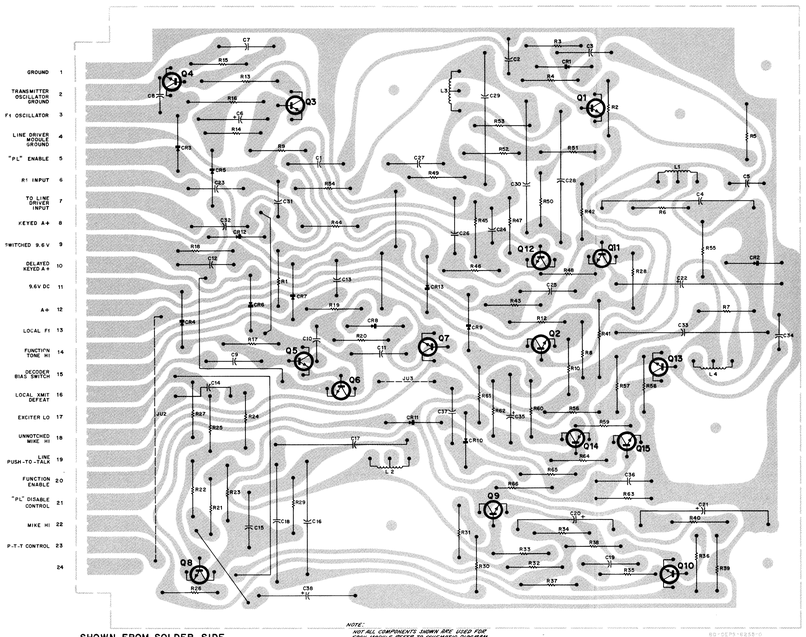
note: For optimum performance, diodes, transistors, and integrated circuits must be ordered by Motorola part numbers.

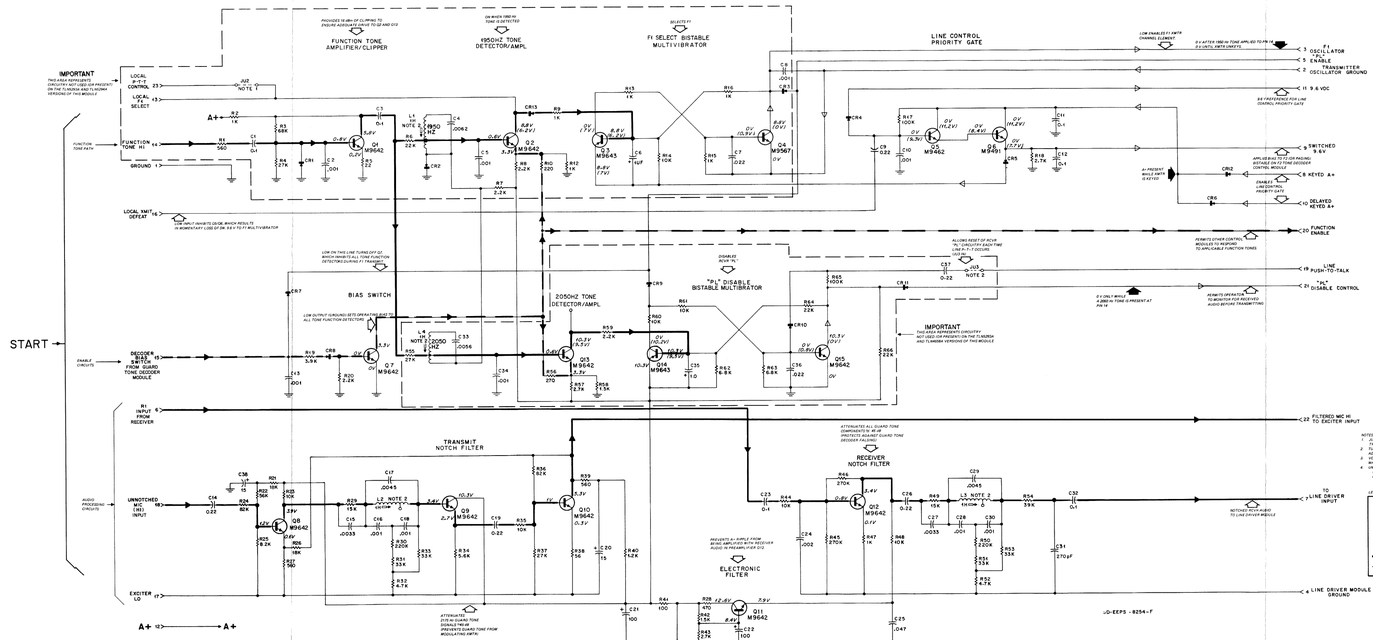
Vibrasponder Resonant Reed — PL-479-O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
	TLN6709BH	2175.0 Hz

REVISIONS 63P81016E22-K

CHASSIS AND SUFFIX NO.	REF. SYMBOL	CHANGE	LOCATION
TLN1254B	Q22	ADDED TYPE M9567	BOARD PINS 2, 3, 6
	R92	ADDED 6-6229 1K	Q22 BASE
	R93	ADDED 6-129231 3.3K	Q22 BASE
	Q15	FROM 48-869570 TYPE M9570 TO 48-869648 TYPE M9648	
	R64	FROM 6S129753 100 OHM TO 6S124 C75 12K OHM	





F1 & F1-PL TONE DECODER MODULES

MODELS TLN4638A F1-PL
TLN4658A F1
~~TLN5293A F1 (4F)~~
TLN5294A F1-PL (4F)

FUNCTION

TLN4658A F1 Control	Keys XMTR on F1.
TLN4638A F1-PL Control	Keys XMTR on F1 and PL disables RCVR.
TLN5293A F1 Control (4-Freq. Carrier Squelch Station)	Provides receive and transmit notch filters. Frequency selected on separate 4-Freq. control module (TLN5292A).
TLN5294A F1-PL Control (4-Freq. PL Squelch Station)	Provides receive and transmit notch filters and PL disables RCVR. Frequency selected on separate 4-Freq. control module (TLN5292A)

PARTS LIST SHOWN ON BACK OF THIS PAGE
68P81016E19-N
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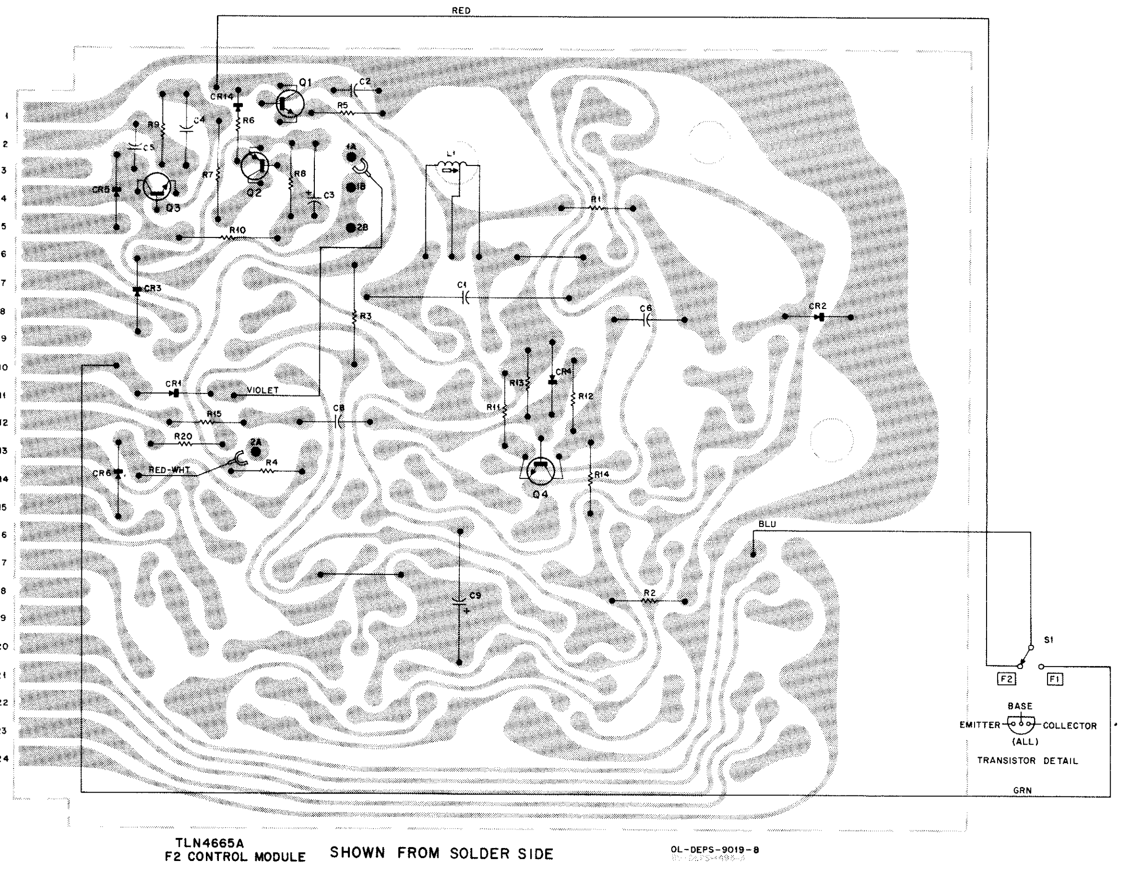
F1 & F1 "PL" TONE DECODER MODULES

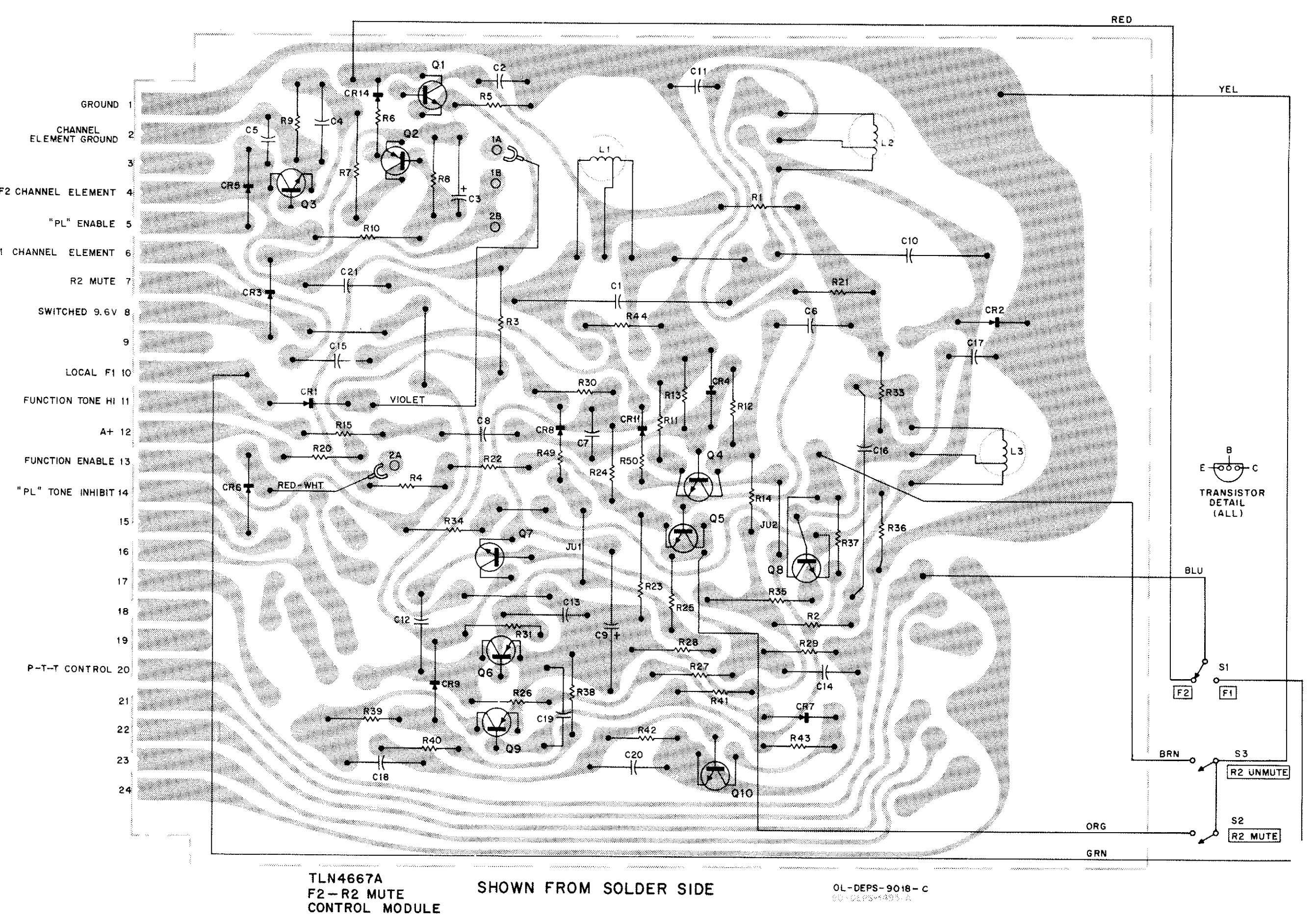
parts list

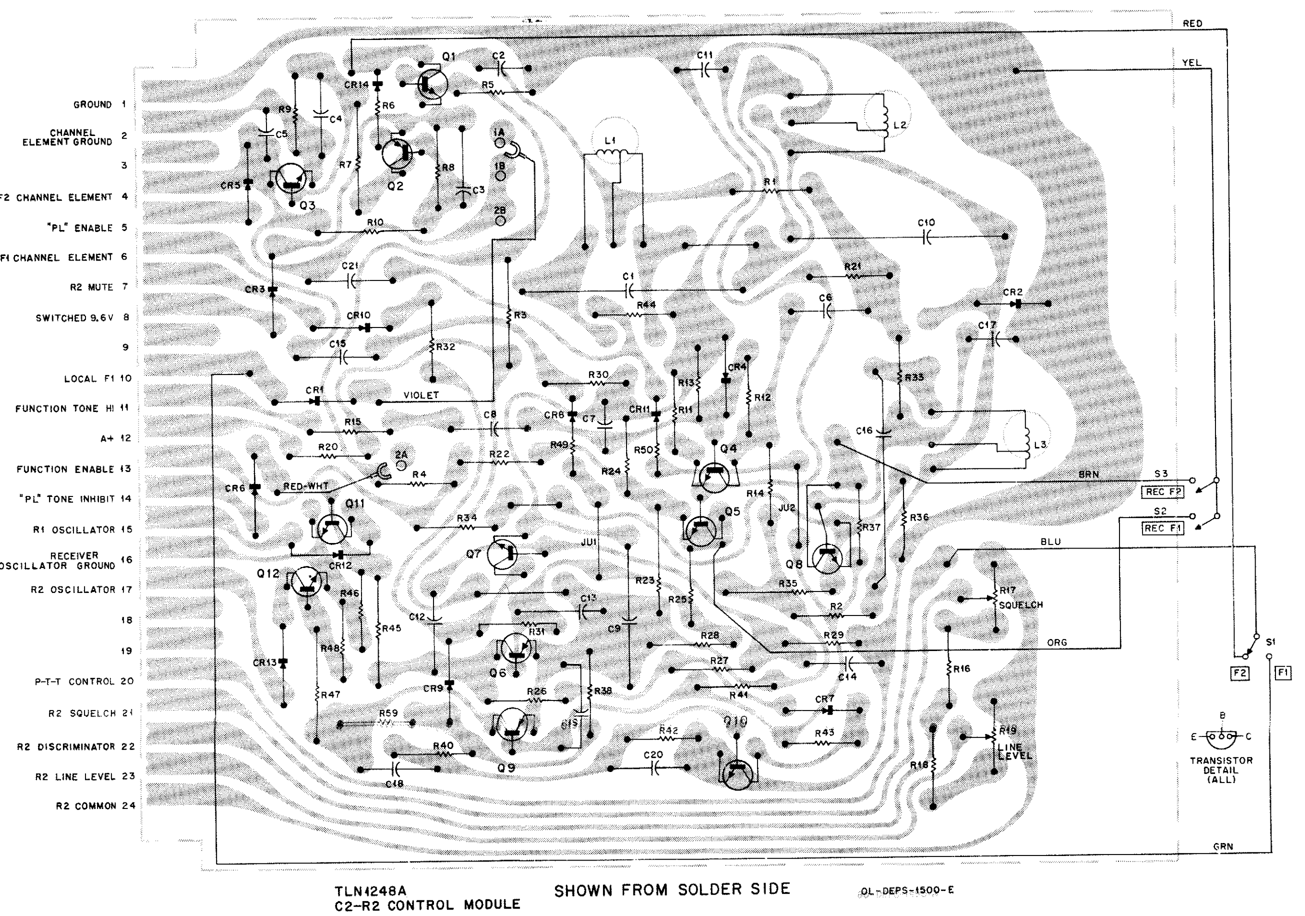
TLN4658A F1 Control Module
TLN4638A F1 *Private-Line* Control Module
TLN5293A F1 Control Module
TLN5294A F1 *Private-Line* Control Module PL-1798-G

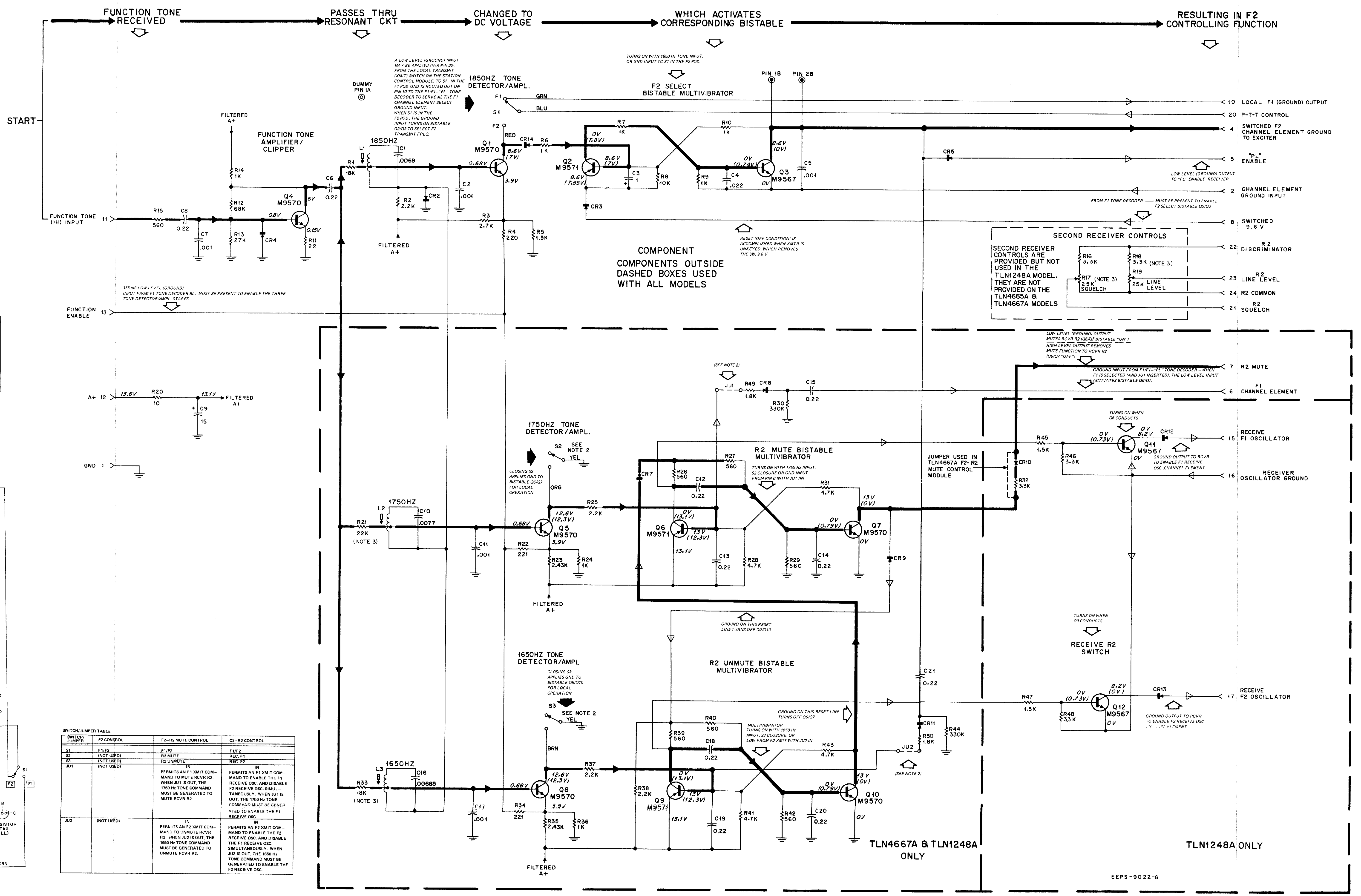
REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		capacitor, fixed: uF ± 10%; 50 V unless otherwise stated:
C1	8-82905G07	0.1
C2	21-82187B29	.001; 100 V
C3	8-82905G07	0.
C4	8-84326A14	.006 ± 2%
C5	21-82187B29	.001; 100 V
C6	23-82783B08	1 ± 20%; 35 V
C7	8-82905G02	.022
C8	21-82187B29	.001; 100 V
C9	8-82905G11	0.22
C10	21-82187B29	.001; 100 V
C11, 12	8-82905G07	0.1
C13, 14	21-82187B29	.001; 100 V
C15	8-82905G25	.0033
C16	8-82284C01	.001
C17	8-84326A30	.0045 ± 1%
C18	8-82284C01	.001
C19	8-82905G11	0.22
C20	23-865136	15 ± 20%; 25 V
C21	23-84669A19	100 + 150-10%; 20 V
C22	23-82601A25	100 + 150-10%; 20 V
C23	8-82905G07	0.1
C24	21-82187B27	.002; 100 V
C25	8-82905G03	.047
C26	8-82905G11	0.22
C27	8-82905G25	.0033
C28	8-82284C01	.001
C29	8-84326A30	.0045 ± 1%
C30	8-82284C01	.001
C31	21-82187B22	270 pF; 200 V
C32	8-82905G07	0.1
C33	8-84326A13	.0056 ± 2%
C34	21-82187B29	.001; 100 V
C35	23-82783B08	1 ± 20%; 35 V
C36	8-82905G02	.022
C37	8-82905G11	0.22
C38	23-865136	15 ± 20%; 25 V
		semiconductor device, diode (see note)
CR1 thru 13	48-83654H01	silicon
		reactor:
L1 thru 4	1V80702B11	(factory-adjusted) res. 40 ohms ± 10%; includes grounding clip
		transistor: (see note)
Q1, 2	48-869642	NPN; type M9642
Q3	48-869643	PNP; type M9643
Q4	48-869567	NPN; type M9567
Q5	48-869642	NPN; type M9642
Q6	48-869491	NPN; type M9491
Q7, 8, 9, 10, 11, 12, 13	48-869642	NPN; type M9642
Q14	48-869643	PNP; type M9643
Q15	48-869642	NPN; type M9642
		resistor, fixed; ± 5%; 1/4 W; unless otherwise stated:
R1	6-11009C43	560
R2	6-11009C49	1k
R3	6-11009C93	68k
R4	6-11009C83	27k
R5, 6	6-11009C81	22k
R7, 8	6-11009C57	2.2k
R9	6-11009C49	1k
R10	6-11009C33	220
R11		NOT USED
R12	6-11009C49	1k
R13	6-124A49	1k; 1/2 W
R14	6-11009C73	10k
R15	6-11009C49	1k
R16	6-124A49	1k; 1/2 W
R17	6-11009C97	100k
R18	6-11009C59	2.7k
R19	6-11009C63	3.9k
R20	6-11009C57	2.2k
R21	6-11009C79	18k
R22	6-11009C91	56k
R23	6-11009C73	10k
R24	6-11009C95	82k
R25	6-11009C71	8.2k
R26	6-11009C79	18k
R27	6-11009C43	560
R28	6-11009C41	470
R29	6-11009C77	15k
R30	6-11009D06	220k
R31	6-11009C85	33k
R32	6-11009C65	4.7k
R33	6-11009C85	33k
R34	6-11009C67	5.6k
R35	6-11009C73	10k
R36	6-11009C95	82k
R37	6-11009C83	27k
R38	6-11009C19	56
R39	6-11009C43	560
R40	6-11009C51	1.2k
R41	6-124A25	100; 1/2 W
R42	6-11009C53	1.5k
R43	6-11009C59	2.7k
R44	6-11009C73	10k
R45	6-11009D08	270k
R46	6-124B08	270k ± 5%
R47	6-11009C49	1k
R48	6-11009C73	10k
R49	6-11009C77	15k
R50	6-11009D06	220k
R51	6-11009C85	33k
R52	6-11009C65	4.7k
R53	6-11009C85	33k
R54	6-11009C87	39k
R55	6-11009C83	27k
R56	6-11009C35	270
R57	6-11009C59	2.7k
R58	6-11009C53	1.5k
R59	6-11009C57	2.2k
R60, 61	6-11009C73	10k
R62, 63	6-11009C69	6.8k
R64	6-11009C81	22k
R65	6-11009C97	100k
R66	6-11009C81	22k

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









F2 TONE DECODER MODULES

MODEL TLN4665A F2 CONTROL
MODEL TLN4667A F2-R2 MUTE CONTROL
MODEL TLN1248A C2-R2 CONTROL
(MODEL TLN1253A PAGING CONTROL
SHOWN ON SHEET 2)

FUNCTION

TLN4665A F2 Control	1850 Hz Function Tone Keys XMTR On F2
TLN4667A F2-R2 Mute Control	1. 1850 Hz Function Tone Keys XMTR on F2 2. 1750 Hz Function Tone Mutes RCVR R2 3. 1650 Hz Function Tone Unmutes RCVR R2
TLN1248A C2-R2 Control	1. 1850 Hz Function Tone Keys XMTR on F2 2. 1750 Hz Function Tone selects F1 Receive Osc. 3. 1650 Hz Function Tone selects F2 Receive Osc.

MODEL COMPLEMENT

Model	Version	Board	Version	Panel	Version
TLN1248A		TLN4048A		TLN4049A	
TLN1253A		TLN4044A		TLN4056A	
TLN4665A		—	—	—	—
TLN4667A		—	—	—	—

NOTES:
1. UNLESS OTHERWISE NOTED, ALL RESISTOR VALUES ARE IN OHMS AND CAPACITOR VALUES ARE IN MICROFARADS.
2. REFER TO SWITCH/JUMPER TABLE FOR IN AND OUT FUNCTIONAL DESCRIPTION.
3. RESISTORS R17, R18, R21, AND R33 ARE REMOVED IN MODEL RXB SERIES STATIONS HAVING C303AA OPTION.

PARTS LIST SHOWN ON BACK

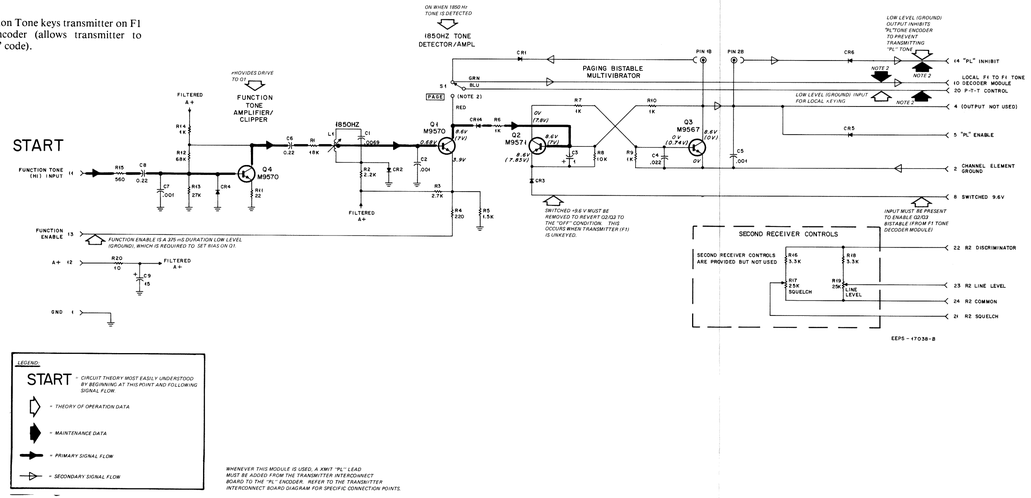
68P81016E39-J
(Sheet 1 of 2)
7/15/83-PHI

F2 TONE DECODER MODULE

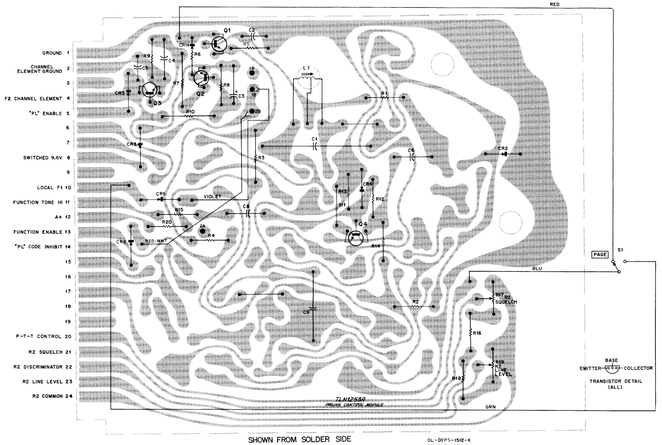
MODEL TLN1253A PAGING CONTROL

FUNCTION

Received 1850 Hz Function Tone keys transmitter on F1 and disables "PL" encoder (allows transmitter to transmit without a "PL" code).



WHENEVER THIS MODULE IS USED, A WIRE "PL" LEAD MUST BE ADDED FROM THE TRANSMITTER INTERCONNECT BOARD TO THE "PL" ENCODER. REFER TO THE TRANSMITTER INTERCONNECT BOARD DIAGRAM FOR SPECIFIC CONNECTION POINTS.



SHOWN FROM SOLDER SIDE

DL-DEPS-1502-K

parts list

CONTROL MODULES

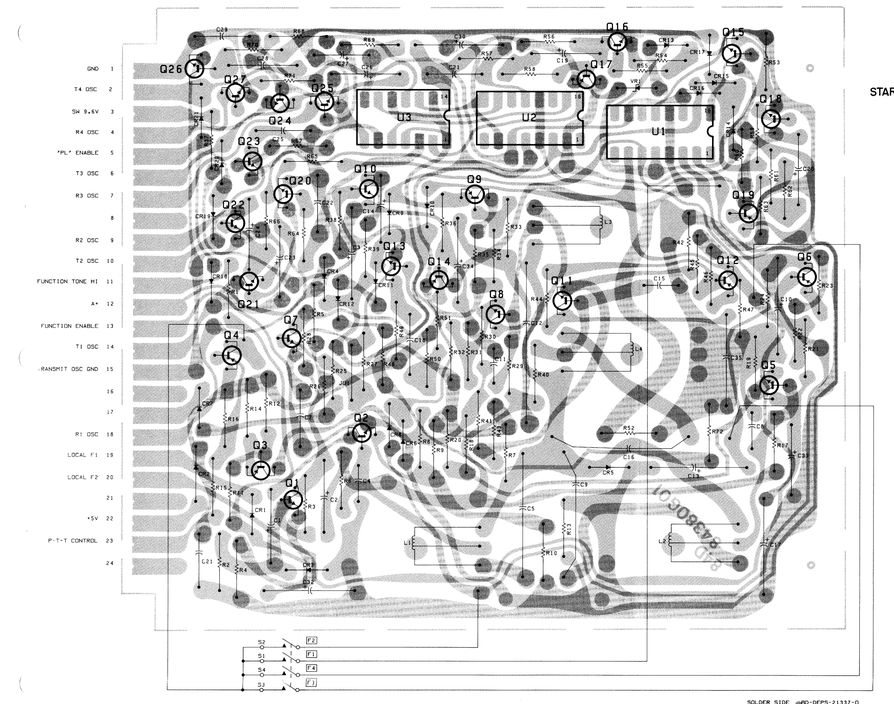
TLN1248A	CR2-R2
TLN1253A	Paging
TLN4665A	F2
TLN4667A	F2-R2 Mute

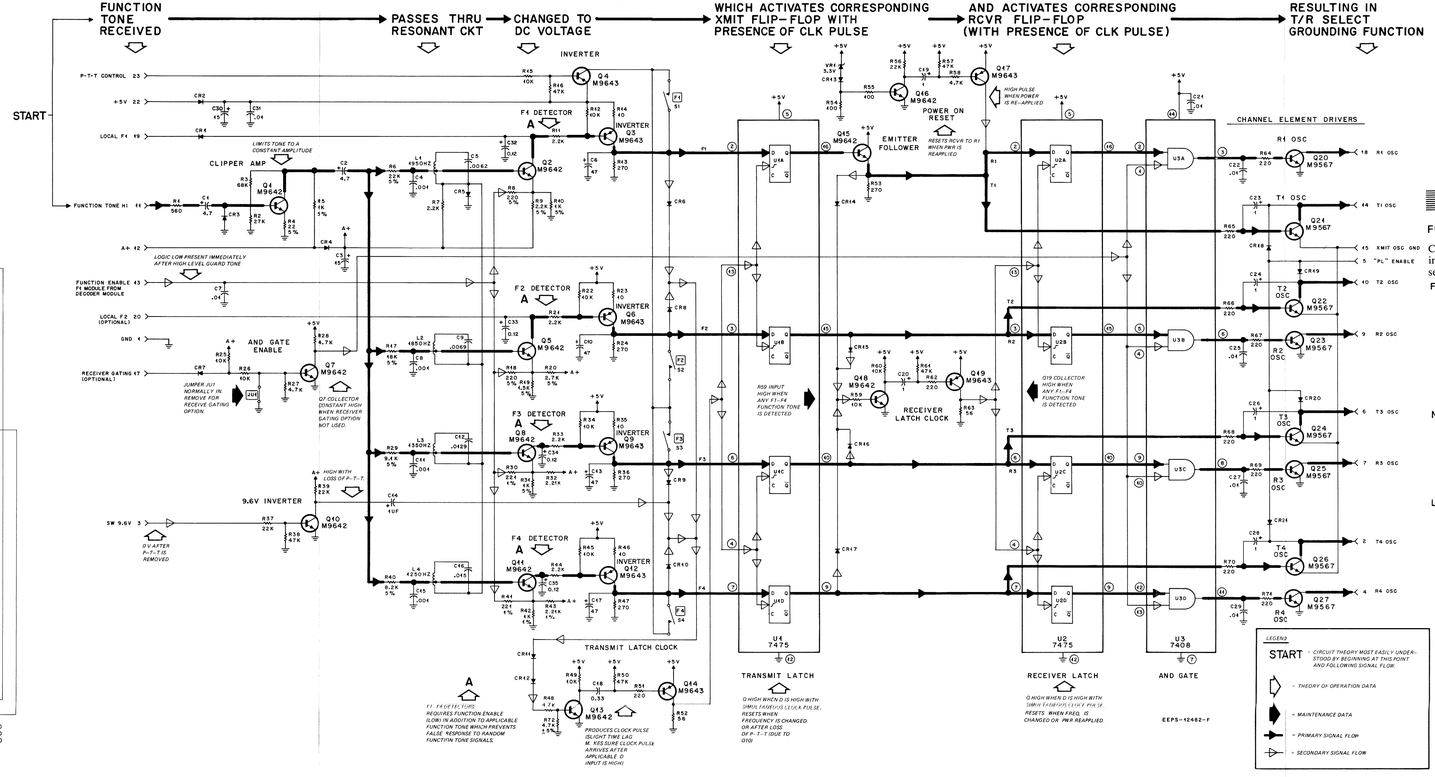
PL-1796-C

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		capacitor, fixed: uF ± 10%; 50 V: unless otherwise stated
C1	8-84326A15	.0069 ± 2%
C2	21-82187B29	.001; 100 V
C3	23-82783B08	1 ± 20%; 35 V
C4	8-82905G02	.022
C5	21-82187B29	.001; 100 V
C6	8-82905G11	0.22
C7	21-82187B29	.001; 100 V
C8	8-82905G11	0.22
C9	23-865136	15 ± 20%; 25 V
C10	8-84326A16	.0077 ± 2%
C11	21-82187B29	.001; 100 V
C12 thru 15	8-82905G11	0.22
C16	8-84326A17	.00865 ± 2%
C17	21-82187B29	.001; 100 V
C18 thru 21	8-82905G11	0.22
		semiconductor device, diode: (see note)
CR1 thru 14	48-82392B03	silicon
		coil assembly, inductor:
L1 thru 3	1-80702B11	1H; incl. ground clip
		transistor: (see note)
Q1	48-869570	NPN; type M9570
Q2	48-869571	PNP; type M9571
Q3	48-869567	NPN; type M9567
Q4, 5	48-869570	NPN; type M9570
Q6	48-869571	PNP; type M9571
Q7, 8	48-869570	NPN; type M9570
Q9	48-869571	NPN; type M9571
Q10	48-869570	NPN; type M9570
Q11, 12	48-869567	NPN; type M9567
		resistor, fixed: ± 5%; 1/4 W: unless otherwise stated
R1	6-11009C79	18k
R2	6-11009C57	2.2k
R3	6-5652	2.7k; 1/2 W
R4	6-11009C33	220
R5	6-11009C53	1.5k
R6	6-11009C49	1k
R7	6-6229	1k; 1/2 W
R8	6-11009C73	10k
R9	6-11009C49	1k
R10	6-6229	1k; 1/2 W
R11	6-11009C09	22
R12	6-11009C93	68k
R13	6-11009C83	27k
R14	6-11009C49	1k
R15	6-11009C43	560
R16	6-11009C61	3.3k
R17	18-83083G03	var; 25k
R18	6-11009C61	3.3k
R19	18-83083G03	var; 25k
R20	6-11009C01	10
R21	6-129667	22k
R22	6-84444A07	221 ± 1%
R23	6-84444A09	2.43 ± 1%
R24	6-11009C49	1k
R25	6-11009C57	2.2k
R26, 27	6-11009C43	560
R28	6-11009C65	4.7k
R29	6-11009C43	560
R30	6-11009D10	330k
R31	6-11009C65	4.7k
R32	6-11009C61	3.3k
R33	6-11009C79	18k
R34	6-84444A07	221 ± 1%
R35	6-84444A08	2.21k ± 1%
R36	6-11009C49	1k
R37, 38	6-11009C57	2.2k
R39, 40	6-11009C43	560
R41	6-11009C65	4.7k
R42	6-11009C43	560
R43	6-11009C65	4.7k
R44	6-11009D10	330k
R45	6-6038	1.5k; 1/2 W
R46	6-11009C61	3.3k
R47	6-6038	1.5k; 1/2 W
R48	6-11009C61	3.3k
		switch, slide:
S1	40-83204B01	spdt
S2, 3	40-83466E01	dpst
		non-referenced items
	1-80729B37	PANEL ASSY., incl. ref. parts S1, S2 & S3 (Model TLN4667A)
	1-80729B43	PANEL ASSY., incl. ref. part S1 (Model TLN4665A)

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
	1-80703B25	PANEL ASSY., incl. ref. part S1 (Model TLN1253A)
	1-80703B19	PANEL ASSY., incl. ref. parts S1, S2 and S3 (Model TLN1248A)
	45-83914G01	GUIDE, card; 2 req'd.
	46-84703E01	SHROUD

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





FOUR FREQUENCY CONTROL MODULE

MODEL TLN5292A

FUNCTION

Converts function tones from remote source to grounding functions for transmit and receive channel element selection.

FUNCTION TABLE

FUNCTION TONE	FREQUENCY SELECTED
1960 Hz	F1: TRANSMITTER KEYS ON FREQUENCY T1. RECEIVER OPERATES IN STANDBY MODE ON FREQUENCY R1.
1850 Hz	F2: TRANSMITTER KEYS ON FREQUENCY T2. RECEIVER OPERATES IN STANDBY MODE ON FREQUENCY R2.
1750 Hz	F3: TRANSMITTER KEYS ON FREQUENCY T3. RECEIVER OPERATES IN STANDBY MODE ON FREQUENCY R3.
1250 Hz	F4: TRANSMITTER KEYS ON FREQUENCY T4. RECEIVER OPERATES IN STANDBY MODE ON FREQUENCY R4.

NOTES:

1. RECEIPT OF A NEW FUNCTION TONE RESETS ANY SELECTION PREVIOUSLY MADE.
2. RECEIVER REMAINS LATCHED ONTO RESPECTIVE FREQUENCY UNTIL RESET BY A NEW FREQUENCY SELECTION. TRANSMITTER FREQUENCY IS RESET WITH LOSS OF SWITCHED 9.6 V.
3. TRANSMITTER KEYS ONLY MOMENTARILY WHEN THE FREQUENCY IS SELECTED.
4. TRANSMITTER REMAINS KEYED DURING A VOICE TRANSMISSION UNTIL THE PUSH-TO-TALK COMMAND IS INTERRUPTED.

LOCAL OPERATION

WARNING

ALWAYS LINE DISABLE THIS STATION BEFORE PERFORMING MAINTENANCE TO PREVENT UNEXPECTED KEYING OF THE STATION BY REMOTE CONTROL. ACTUATION OF THE FREQUENCY SELECT SWITCH MOMENTARILY KEYS THE STATION EVEN WITHOUT DEPRESSING THE MICROPHONE PUSH-TO-TALK SWITCH.

WHEN LOCAL KEYING OF THE STATION IS DESIRED THE FOLLOWING STEPS ARE NECESSARY.

STEP 1. LINE DISABLE THE STATION.

STEP 2. HOLD THE XMIT SWITCH, ON THE STATION CONTROL MODULE, TO THE RIGHT.

STEP 3. SELECT THE DESIRED FREQUENCY F1, F2, F3 OR F4 ON THE MODULE AND ACTUATE SWITCH MOMENTARILY.

STEP 4. AFTER TESTING ALWAYS RETURN LINE DISABLE SWITCH TO NORMAL POSITION.

NOTE

THE STATION TRANSMITTER IS NOT "ON-THE-AIR" UNTIL STEP 3 IS COMPLETED. THE FREQUENCY SELECT SWITCH MUST BE RELEASED BEFORE UNKEYING.

PARTS LIST SHOWN ON BACK

68P81022E04-H
7/15/82-PHI

FOUR FREQUENCY CONTROL MODULE

parts list

TLN5292A 4-Frequency Control Module — PL-2581-F

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		capacitor, fixed: uF ±20%; 50 V: unless otherwise stated
C1, 2	23-865137	4.7; 25 V
C3	23-865136	15; 25 V
C4	21-82187B29	.001 ± 10%; 100 V
C5	8-84326A14	.0062 ± 2%
C6	23-868446	47; 6 V
C7	8-82905G01	.01 ± 10%; 50 V
C8	21-82187B29	.001; 100 V
C9	8-84326A15	.0069 ± 2%; 50 V
C10	23-868446	47; 6 V
C11	21-82187B29	.001 ± 10%; 100 V
C12	8-84326A20	.0129 ± 2%
C13	23-868446	47; 6 V
C14	23-82783B08	1; 35 V
C15	21-82187B29	.001 ± 10%; 100 V
C16	8-84326A21	.015 ± 2%
C17	23-868446	47; 6 V
C18	8-82906G42	0.33 ± 10%
C19, 20	23-82783B08	1; 35 V
C21, 22	8-82905G01	.01 ± 10%
C23, 24	23-82783B08	1; 35 V
C25	8-82905G01	.01 ± 10%
C26	23-82783B08	1; 35 V
C27	8-82905G01	.01 ± 10%
C28	23-82783B08	1; 35 V
C29	8-82905G01	.01 ± 10%
C30	23-865136	15; 25 V
C31	8-82905G01	0.1 ± 10%
C32 thru 35	23-83214C23	0.12; 20 V
		semiconductor device, diode: (see note)
CR1	48-83654H01	silicon
CR2	48-82466H13	silicon
CR3 thru 21	48-83654H01	silicon
		coil, audio freq:
L1 thru 4	24-84200A01	1.005H ± 2%
		transistor: (see note)
Q1, 2	48-869642	NPN; type M9642
Q3, 4	48-869643	PNP; type M9643
Q5	48-869642	NPN; type M9642
Q6	48-869643	PNP; type M9643
Q7, 8	48-869642	NPN; type M9642
Q9	48-869643	PNP; type M9643
Q10, 11	48-869642	NPN; type M9642
Q12	48-869643	PNP; type M9643
Q13	48-869642	NPN; type M9642
Q14	48-869643	PNP; type M9643
Q15, 16	48-869642	NPN; type M9642
Q17	48-869643	PNP; type M9643
Q18	48-869642	NPN; type M9642
Q19	48-869643	PNP; type M9643
Q20 thru 27	48-869567	NPN; type M9567
		resistor, fixed: ± 5%; 1/4 W: unless otherwise stated
R1	6-11009C43	560
R2	6-11009C83	27k
R3	6-11009C93	68k
R4	6-10401A09	22
R5	6-10401A49	1k
R6	6-10401A81	22k
R7	6-11009C57	2.2k
R8	6-10401A33	220
R9	6-10401A57	2.2k
R10	6-10401A49	1k
R11	6-11009C57	2.2k
R12	6-11009C73	10k
R13	6-11009C35	270
R14	6-11009C01	10
R15	6-11009C73	10k
R16	6-11009C89	47k
R17	6-10401A79	18k
R18	6-10401A33	220
R19	6-10401A53	1.5k
R20	6-10401A59	2.7k
R21	6-11009C57	2.2k
R22	6-11009C73	10k
R23	6-11009C01	10
R24	6-11009C35	270
R25, 26	6-11009C73	10k
R27, 28	6-11009C65	4.7k
R29	6-10401A72	9.1k
R30	6-84444A07	221
R31	6-10401A49	1k
R32	6-84444A08	2.21k ± 1%
R33	6-11009C57	2.2k
R34	6-11009C73	10k
R35	6-11009C01	10
R36	6-11009C35	270
R37	6-11009C81	22k
R38	6-11009C89	47k
R39	6-11009C81	22k
R40	6-10401A71	8.2
R41	6-84444A07	221 ± 1%
R42	6-10401A49	1k
R43	6-84444A08	2.21k ± 1%
R44	6-11009C57	2.2k
R45	6-11009C73	10k
R46	6-11009C01	10
R47	6-11009C35	270 ± 10%
R48	6-124C65	4.7k
R49	6-10401C73	270 ± 10
R50	6-11009C89	47k
R51	6-11009C33	220
R52	6-11009C19	56
R53	6-11009C35	270
R54, 55	6-11009C25	100
R56	6-11009C81	22k
R57	6-11009C89	47k
R58	6-11009C65	4.7k
R59, 60	6-11009C73	10k
R61	6-11009C89	47k
R62	6-11009C33	220
R63	6-11009C19	56
R64 thru 71	6-11009C33	220
R72	6-124A65	4.7
		switch, slide:
S1 thru 4	40-83468E01	spdt
		integrated circuit: (see note)
U1, 2	51-84371K25	type 7475
U3	51-84371K09	type 7408
		semiconductor device, diode: (see note)
VR1	48-82256C26	Zener
		non-referenced items
	45-83914G01	GUIDE, card; 2 req'd.
	64-83931G01	PANEL, screened
	42-84315A01	CLIP, grounding
	46-84703E01	SHROUD

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

REVISIONS

68P81022E04-H

CHASSIS AND SUFFIX NO.	REF. SYMBOL	CHANGE	LOCATION
TLN5292A-1	C32 THRU 35, R72	ADDED	PARTS LIST
TLN5292A-2		PLATING CHANGE	
TLN5292A-3	R48	FROM 6-10401C73, 10k TO 6-124C65, 4.7k	TRANSMIT LATCH CLOCK
	U1,2	FROM 51-48084D36, TYPE 7475 TO 51-84371K25, TYPE M7475	TRANSMIT AND RECEIVE LATCH
	U3	FROM 51-84084D20, TYPE 7408 TO 51-84371K09, TYPE 7408	AND GATE

JU3 is irrelevant if single-tone decoder is not in Slot 11

THIS HAS BEEN SUPERSEDED BY TRN 6689B

SQUELCH GATE MODULE

MODEL TLN4662A

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

0 1 1 D 0 1 0 0 1 0 1 2 1 1

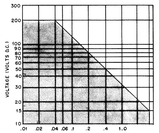
JUMPER TABLE

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	OUT	SELECTED DELAY	IN "CS"	IN "PL"
BASE (RA) STATION	IN	OUT	IN	IN "PL"	IN	IN	*	*	*	OUT	OUT	OUT	SELECTED DELAY	IN "CS"	IN "PL"
REPEATER (RA) STATION	OUT	OUT	IN	IN "PL"	IN	IN	*	*	*	OUT	OUT	OUT	SELECTED DELAY	IN "CS"	IN "PL"
COMMUNITY REPEATER (AT) STATION	OUT	OUT	IN	IN	IN	IN	IN	IN	IN	IN	IN	IN	SELECTED DELAY	OUT	IN

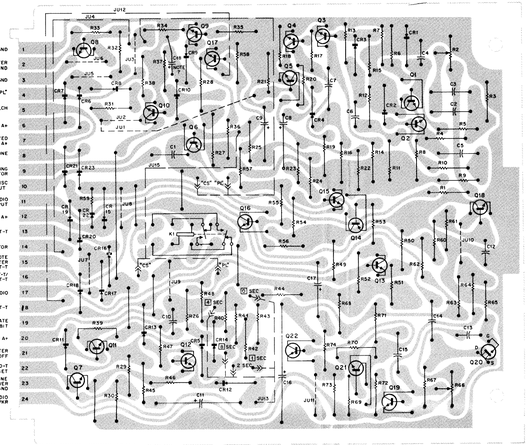
5. VOLTAGE READING SHOWN ARE FOR TWO CONDITIONS:
   USQ = UNSQUELCHED
   FSQ = FULLY SQUELCHED
6. JUMPERS JU8 & JU9 ARE USED IN DC-CONTROLLED "L" REPEATER STATIONS WHEN SUCH STATIONS CONTAIN AN UNSUPPLIED DC TRANSFER MODULE.
7. CAPACITOR C16 IS .01 uF IN STANDARD APPLICATIONS. CAPACITOR C16 IS CHANGED TO 10 uF WHEN THE C145 TAC ENCODER OPTION IS INSTALLED.

* RELAY APPLICATION CHART

TLN4915A RELAY KIT	DIODE CR15	JU8
NOT USED	OUT	IN
USED	IN	OUT



LOAD MUST BE IN SHADED AREA — TLN4915A RELAY KIT RELAY CONTACT RATING



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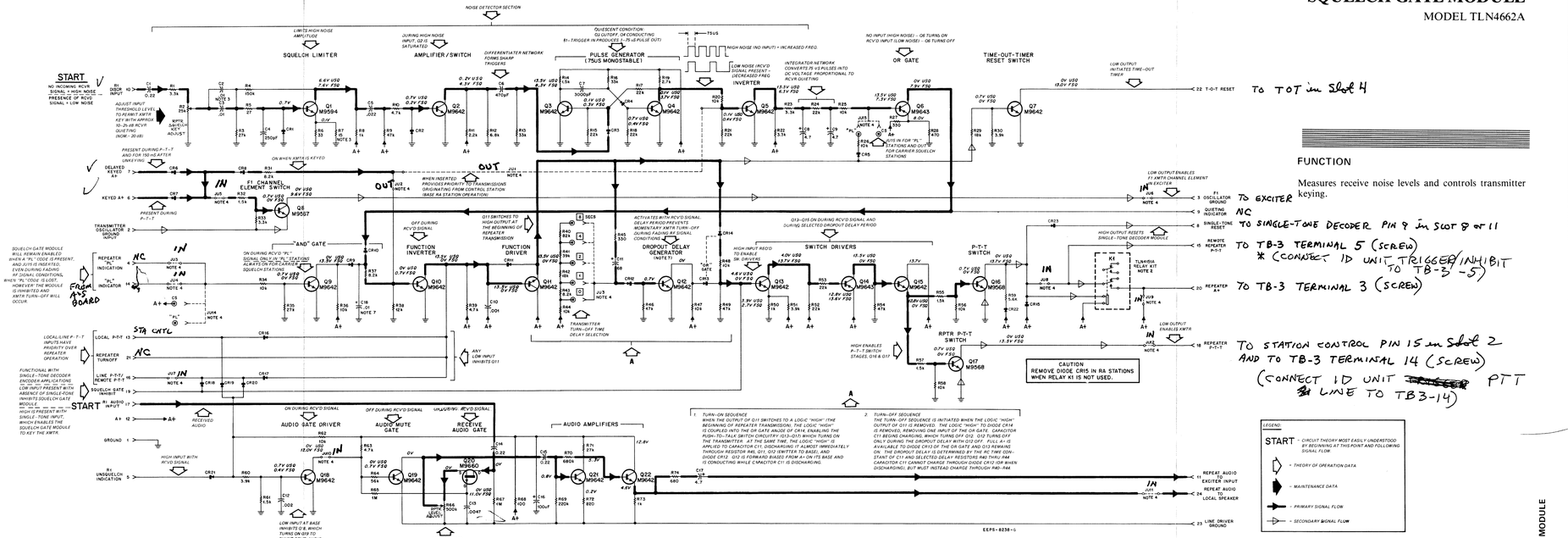
OL-DEPS-8240-A



FUNCTION

Measures receive noise levels and controls transmitter keying.

* REMOVE CR15, ESTABLISH JU8 IS IN

SQUELCH GATE MODULE

PARTS LIST SHOWN ON BACK

68P81015E33-L

7/15/83- PHI

parts list

TLN4662A Squelch Gate Module — PL-1697-D

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		capacitor, fixed: pF ± 10%; 50 V: unless otherwise 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 8	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	NPN; type M9594
Q2 thru 5	48-869642	NPN; type M9642
Q6	48-869643	PNP; type M9643
Q7	48-869642	NPN; type M9642
Q8	48-869567	NPN; type M9567
Q9 thru 13	48-869642	NPN; type M9642
Q14	48-869643	PNP; type M9643
Q15	48-869642	NPN; type M9642
Q16, 17	48-869568	NPN; type M9568
Q18, 19	48-869642	NPN; type M9642
Q20	48-869660	field-effect; type M9660
Q21, 22	48-869642	NPN; type M9642
		resistor, fixed: ± 5%; 1/4 W: unless otherwise stated
R1	6-11009C61	3.3k
R2	18-83083G03	variable: 25k ± 30%
R3	6-11009C83	27k
R4	6-11009D02	150k
R5	6-11009C11	27
R6	6-11009C13	33
R7	6-11009C05	15
R8	6-11009C49	1k
R9	6-11009C89	47k
R10	6-11009C65	4.7k
R11	6-11009C57	2.2k
R12	6-11009C69	6.8k
R13	6-11009C85	33k
R14	6-11009C53	1.5k
R15	6-11009C81	22k
R16	6-11009C85	33k
R17, 18	6-11009C81	22k
R19	6-11009C59	2.7k
R20	6-11009C73	10k
R21	6-11009C81	22k
R22, 23	6-11009C61	3.3k
R24	6-11009C81	22k
R25, 26	6-11009C73	10k
R27	6-11009C37	330
R28	6-11009C41	470
R29	6-11009C79	18k
R30	6-11009C63	3.9k
R31	6-11009C71	8.2k
R32	6-11009C53	1.5k
R33	6-11009C61	3.3k
R34	6-11009C73	10k
R35	6-11009C83	27k
R36	6-11009C73	10k
R37	6-11009C71	8.2k
R38	6-11009C75	12k
R39	6-11009C65	4.7k
R40	6-11009C95	82k
R41	6-11009C87	39k
R42	6-11009C79	18k
R43	6-11009C71	8.2k
R44	6-11009C73	10k
R45	6-11009C37	330
R46	6-11009C89	47k
R47, 48	6-11009C73	10k
R49	6-11009C89	47k
R50	6-11009C49	1k
R51	6-11009C63	3.9k
R52, 53	6-11009C81	22k
R54	6-11009C89	47k
R55	6-11009C53	1.5k
R56	6-11009C73	10k
R57	6-11009C53	1.5k
R58	6-11009C73	10k
R59	6-11009C67	5.6k
R60	6-11009C63	3.9k
R61	6-11009C53	1.5k
R62	6-11009C73	10k
R63	6-11009C65	4.7k
R64	6-11009C91	56k
R65	6-11009D22	1 meg
R66	18-83083G02	variable; 500k ± 30%
R67	6-11009D22	1 meg
R68	6-11009C25	100
R69	6-11009D06	220k
R70	6-11009D18	680k
R71	6-11009C83	27k
R72	6-11009C47	820
R73	6-11009C49	1k
R74	6-11009C45	680

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

TLN4055A "Wild Card" Module Panel — PL-474-B

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		switch, slide:
S1 thru 4	40-83468E01	spdt
		non-referenced items
	1-80702B24	PANEL ASSEMBLY, includes
	64-84321A01	PANEL, switches S1 thru S4
	3-8022	SCREW, machine: 4-40 × 1/4"; 2 req'd.
	45-83914G01	GUIDE, card; 2 req'd.
	4-7683	WASHER, lock #4 (internal tooth); 2 req'd.

TLN4151A Relay Kit — PL-455-A

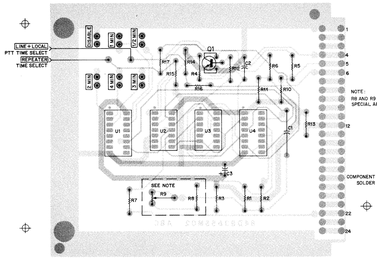
REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		diode:
CR11	48-82392B03	silicon
		relay, armature:
K1	80-84201A01	2 form "C", coil res. 200 ohms
		non-referenced items
	43-84920H01	SPACER, relay

REVISIONS 68P81015E33-L

CHASSIS AND SUFFIX NO.	REF. SYMBOL	CHANGE	LOCATION
TLN4662A-1	CR22, 23	ADDED 48-83654H01	P-T-T SWITCH CIRCUIT
TLN4662A-2	CR9, 10	FROM 48-82392B03, TO 48-83654H01	GATE CIRCUIT Q9
	C18	ADDED 21-82428B62, .01 uF	

CMOS TIME-OUT-TIMER

MODEL TRN8684B



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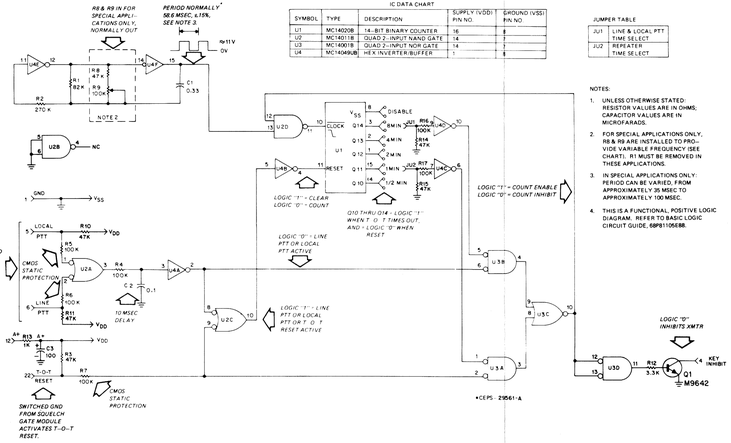


IC DATA CHART

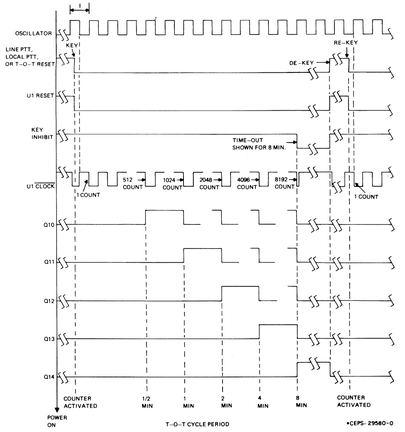
SYMBOL	TYPE	DESCRIPTION	SUPPLY (VDD) PIN NO	GROUND (VSS) PIN NO
U1	MC14020B	14-BIT BINARY COUNTER	16	8
U2	MC14011B	QUAD 2-INPUT NAND GATE	14	7
U3	MC14001B	QUAD 2-INPUT NOR GATE	14	7
U4	MC14049UB	HEX INVERTER/BUFFER	1	8

JUMPER TABLE

JU1	LINE & LOCAL PTT TIME SELECT
JU2	REPEATER TIME SELECT

NOTES:

1. UNLESS OTHERWISE STATED: RESISTOR VALUES ARE IN OHMS; CAPACITOR VALUES ARE IN MICROFARADS.
2. FOR SPECIAL APPLICATIONS ONLY, R8 & R9 ARE INSTALLED TO PROVIDE VARIABLE FREQUENCY (SEE CHART). R1 MUST BE REMOVED IN THESE APPLICATIONS.
3. IN SPECIAL APPLICATIONS ONLY: PERIOD CAN BE VARIED, FROM APPROXIMATELY 35 MSEC TO APPROXIMATELY 100 MSEC.
4. THIS IS A FUNCTIONAL, POSITIVE LOGIC DIAGRAM. REFER TO BASIC LOGIC CIRCUIT GUIDE, 68P81105E88.



VARIABLE TIMING CHART (SPECIAL APPLICATIONS ONLY)

		Q10	Q11	Q12	Q13	Q14	DISABLE
FACTORY FIXED (±15%)		1/2 MIN.	1 MIN.	2 MIN.	4 MIN.	8 MIN.	INFINITY
VARIABLE TIMING	MAXIMUM	99.6 MSEC OR 10.0 HZ	51 SEC OR 0.85 MIN	102 SEC OR 1.7 MIN	204 SEC OR 3.4 MIN	408 SEC OR 6.8 MIN	816 SEC OR 13.6 MIN	INFINITY
	MINIMUM	35.2 MSEC OR 28.4 HZ	18 SEC OR 0.3 MIN	36 SEC OR 0.6 MIN	72 SEC OR 1.2 MIN	144 SEC OR 2.4 MIN	288 SEC OR 4.8 MIN	INFINITY

GENERAL FORMULA: $F = (1/t)(2^{N-1})$; WHERE t IS THE DESIRED TIME-OUT TIME IN SECONDS, N IS THE CHOSEN Q OUTPUT NUMBER, AND F IS THE REQUIRED OSCILLATOR FREQUENCY IN HERTZ.

FOR EXAMPLE, TO CALCULATE THE OSCILLATOR FREQUENCY NEEDED TO PRODUCE A 3 MINUTE T-O-T PERIOD, FIRST DETERMINE FROM THE ABOVE CHART WHICH OUTPUT MUST BE USED – Q12. SECOND, INSERT THE KNOWNS INTO THE GENERAL FORMULA, AND CALCULATE THE REQUIRED FREQUENCY:

$F = (1/t) \times (2^{N-1}) = (1/(3 \times 60)) \times (2^{(12-1)}) = (1/180) \times (2048) = 11.4$ HZ

FOR A 5 MINUTE T.O.T. PERIOD, $F = (1/t) \times (2^{N-1}) = (1/(5 \times 60)) \times (2^{(13-1)}) = 13.7$ HZ

•BEPS–27258–A

FUNCTION

Limits the period of time the transmitter may be keyed.

parts list

TRN8684B CMOS Time-Out-Timer — PL-6821-B

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		capacitor, fixed:
C1	8-83813H29	0.33 uF ± 10%; 50 V
C2	21-82372C01	0.1 uF ± 80-20%; 25 V
C3	23-84665F03	100 uF + 100-10%; 25 V
		transistor: (see note)
Q1	48-869642	NPN; silicon
		resistor, fixed: ± 5%; 1/4 W: unless otherwise stated
R1	6-11009C95	82k
R2	6-11009D08	270k
R3	6-11009C89	47k
R4-7	6-11009C97	100k
R8	6-11009C89	47k (used for special applications only)
R9	18-84944C07	var. 100k ± 20%; 0.1 W (used for special applications only)
R10, 11	6-11009C89	47k
R12	6-11009C61	3.3k
R13	6-11009C49	1k
R14, 15	6-11009C89	47k
R16, 17	6-11009C97	100k
		integrated circuit: (see note)
U1	51-82884L42	type MC14020B (14-bit binary counter)
U2	51-82884L05	type MC14011B (Quad, 2-input NAND gate)
U3	51-82884L04	type MC14001B (Quad, 2-input NOR gate)
U4	51-82884L02	type MC14049UB (HEX inverter/buffer)
		non-referenced items
	29-83167C01	TERMINAL, strain relief; 2 used
	39-10184A24	CONTACT, receptacle; 2 used
	9-83011H01	RECEPTACLE, board mounting; 9 used
	39-10184A10	CONTACT, plug; 12 used
	43-865080	BUSHING, threaded; 2 used
	3-134212	SCREW, tapping; 4-40 x 5/16"; 2 used
	45-83914Q01	GUIDE, card; 2 used
	64-82125L01	PANEL, screened
	66-84703E01	GUIDE, circuit board

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

revisions

CHASSIS AND SUFFIX NO.	REF. SYMBOL	CHANGE	LOCATION
TRN8684B-2	C1	FROM 8-82096J21, 0.33 uF ± 10%; 250 V TO 8-83813H29, 0.33 uF ± 10%; 50 V	BETWEEN U4F AND R9
	C3	FROM 21-83250Z, 0.1 uF + 60-40%; 250 V TO 23-84665F02, 100 uF + 100-10%; 25 V	BETWEEN PIN 12 AND R1
	R12	FROM 6-1244731, 10k ± 5%; 1/4 W TO 6-1244A61, 3.3k ± 5%; 1/4 W	BASE OF Q1
	R13	ADDED 6-1244C49, 1k ± 10%;1/4 W	PIN 12 A + AND C3
	R14	ADDED 6-1244C89, 47k ± 10%; 1/4 W	U4D-9 AND U1-14
	R16	ADDED 6-1244C97 100k ± 10%; 1/4 W	
	R15	ADDED 6-1244C89 47k ± 10%; 1/4 W	U47-7 AND U1-15
	R17	ADDED 6-1244C97 100k ± 10%; 1/4 W	
		FROM 84-83655M01 CIRCUIT BOARD TO 84-83655M02	

GENERAL

The time-out-timer (T-O-T) module is standard in all repeater (RT) models and is an optional accessory for base station models. It limits the period of time the transmitter can be keyed. It can be set to limit transmission time from line controlled operation, and to limit the transmission time of individual repeater users. The timing period of each is independent of the other. The unit can be preset for 1/2, 1, 2, 4, or 8 minutes or unlimited continuous keying by jumper selection.

CIRCUIT DESCRIPTION

The initial condition of the time-out-timer module is: local PTT, line PTT and T-O-T reset at a high (logic "1") level, with A + applied to the module.

The high local and line PTT inputs to U2A cause its output to be low. This low is inverted by U4A producing a high input to U2C-8. This high input, plus the high T-O-T reset input to U2C-9, forces the output at U2C-10 low. This low is inverted by U4B, producing a high at counter U1 reset input. The high reset input clears the counter by forcing and holding all of the outputs low.

Jumpers JU1 and JU2 connect two low outputs of U1 to the inputs of U4D and U4C, respectively. A local or line PTT input (base station) executes the T-O-T timing function via JU1. A T-O-T reset input (repeater PTT) executes the T-O-T timing function via JU2.

The low outputs of U1 are inverted by U4D and U4C, producing high inputs at U3B-5 and U3A-1, respectively. These high inputs, plus the highs from the T-O-T reset input and U4A-2, cause the outputs of U3B and U3A to be low. These low inputs are applied to U3C and cause its output to be high. This high is applied to U2D, enabling it, and to U3D, resulting in a high at the key inhibit output of the module. This high output allows the station transmitter to operate if keyed.

The timing function is started by a low line PTT, a low local PTT, or a low T-O-T reset signal from the squelch gate module. A low on the local PTT or the line PTT input causes the output of U2A to be high. This high is delayed by R4, C2 and is inverted by U4A producing a low input to U2C-8. This low input, or a low T-O-T reset input to U2C-9, causes the output of U2C to be high which is inverted by U4B. The resulting low enables counter U1. The oscillator output passes through U2D to the clock input of U1. For every negative-going transition at the clock input of counter U1, the counter is advanced by one count.

Due to the period of the oscillator: 512 counts corresponds to 30 seconds (Q10 output); 1024 counts corresponds to 1 minute (Q11 output); 2048 counts corresponds to 2 minutes (Q12 output); 4096 counts corresponds to 4 minutes (Q13 output); and 8192 counts corresponds to 8 minutes (Q14 output). (See timing diagram.)

Assume that both time select jumpers are connected to the Q10 outputs of U1. The Q10 output goes high at the end of the 30 second timing period. This high is inverted by U4D and U4C, producing low inputs at U3B-5 and U3A-1, respectively. These low inputs, plus either the low from the T-O-T reset input or the low output of U4A-2, cause the output of U3A or U3B, respectively, to go high. The high output of either U3A or U3B causes the output of U3C to go low. This low is applied to U2D, which disables it and prevents any further transitions from reaching the clock input of U1.

The low U3C output is also applied to U3D, which functions as an inverter and causes Q1 to turn on. This results in a low at the key inhibit output of the module which inhibits the station transmitter.

The transmitter will remain inhibited until the switched ground start signal is removed from the module input. At that time, the module returns to its initial condition, which results in the counter being held in reset (all outputs low) and the station transmitter being uninhibited. When a start signal is again applied, another timing cycle begins.

If line and local PTT time select jumper JU1 is connected to the 30 second output, and repeater time select jumper JU2 is connected to the 2 minute output; then a start signal (switched ground) on either the line PTT or the local PTT input will inhibit the transmitter after 30 seconds, or a start signal on the T-O-T reset input will inhibit the transmitter after 2 minutes.

If either or both of the time select jumpers are connected to the DISABLE (ground) output of U1, the corresponding start signal input(s) will not inhibit the transmitter and unlimited continuous transmission is possible.

In special applications, it may be desirable to obtain a T-O-T cycle period other than those normally available. To vary the oscillator period, remove R1 and insert R8 and R9. Connect a + 13.8 V dc power supply between pin 12 and ground, pin 1. Monitor the oscillator output at U4F-15, with respect to ground.

Then, using the variable timing chart, choose an appropriate output and connect both time select jumpers to that output. Adjust R9 for the desired (calculated) period. An audio frequency counter or an oscilloscope may be used to monitor the oscillator output.

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 check-out procedure is intended for out-of-station servicing but is functionally applicable to in-station servicing also.

CAUTION

This module uses CMOS integrated circuits which can be damaged by excessive static charges. Handle module by edges only.

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 module pins 4 and 12.

Step 4. Connect time selection jumpers JU1 & JU2 to the "DISABLE" output (ground).

Step 5. Check the oscillator frequency with a counter connected between pin 15 of U4 and ground. The frequency should be 17.1 Hz ± 2.5 Hz. An oscilloscope may be used in place of the audio frequency counter. The oscillator period should be 58.6 msec, ± 9 msec.

Step 6. Connect a temporary jumper between module pins 5 and 1.

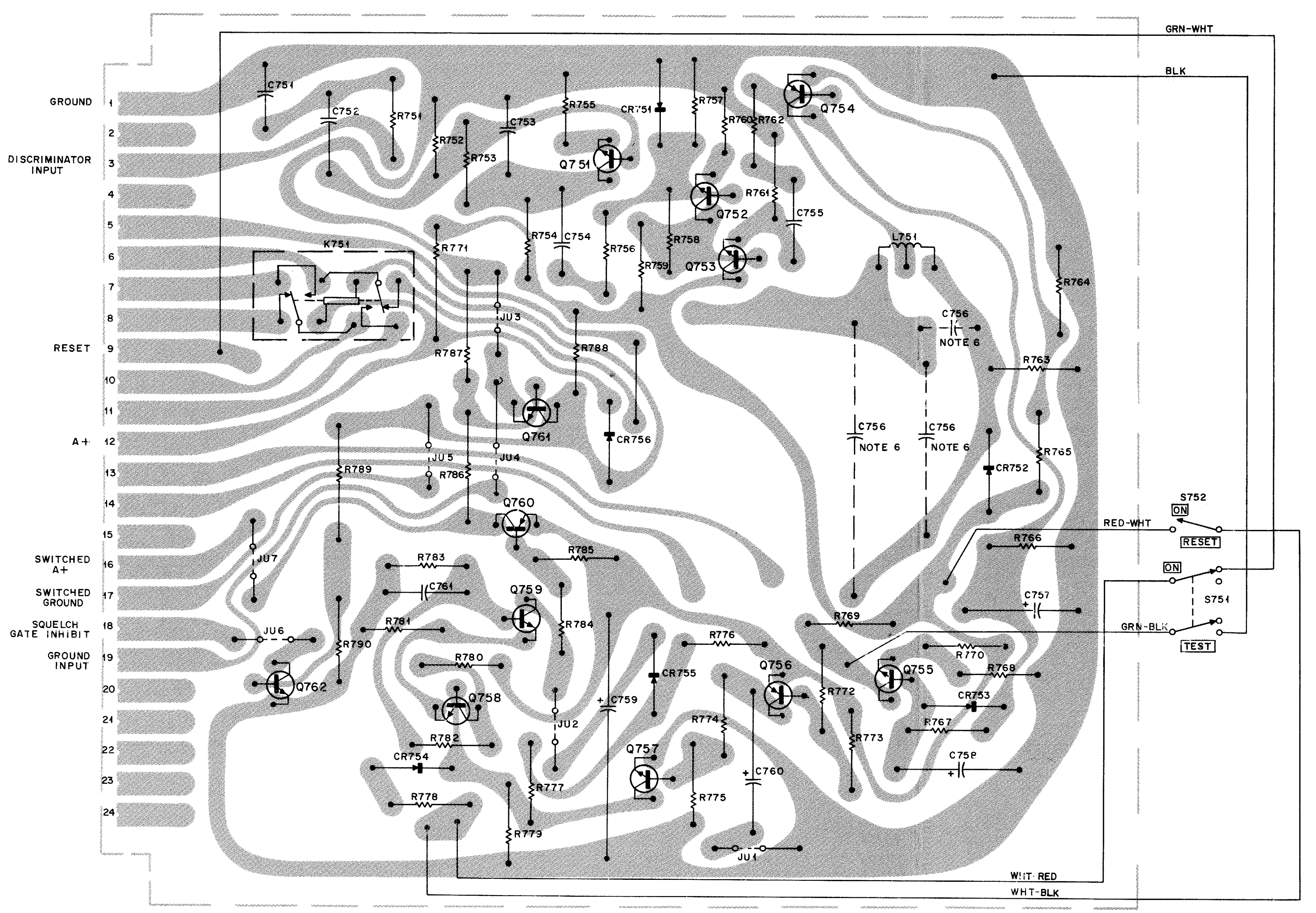
Step 7. Refer to the schematic and timing diagram and note the desired timing cycle for different outputs of the module. Use a stop-watch to compare the desired timing of highs and lows on a VTVM. Timing should be accurate to within ± 15%.

Step 8. Move the temporary jumper to pins 6 and 1 and repeat Step 7.

Step 9. Move the temporary jumper to pins 22 and 1 and repeat Step 7.

Step 10. Connect both time selection jumpers to "1/2 MIN" output. Module pin 4 should go low after 1/2 minute (± 4.5 sec.).

Step 11. If a defective output is not located, check connections and continuity of plating for opens and shorts.



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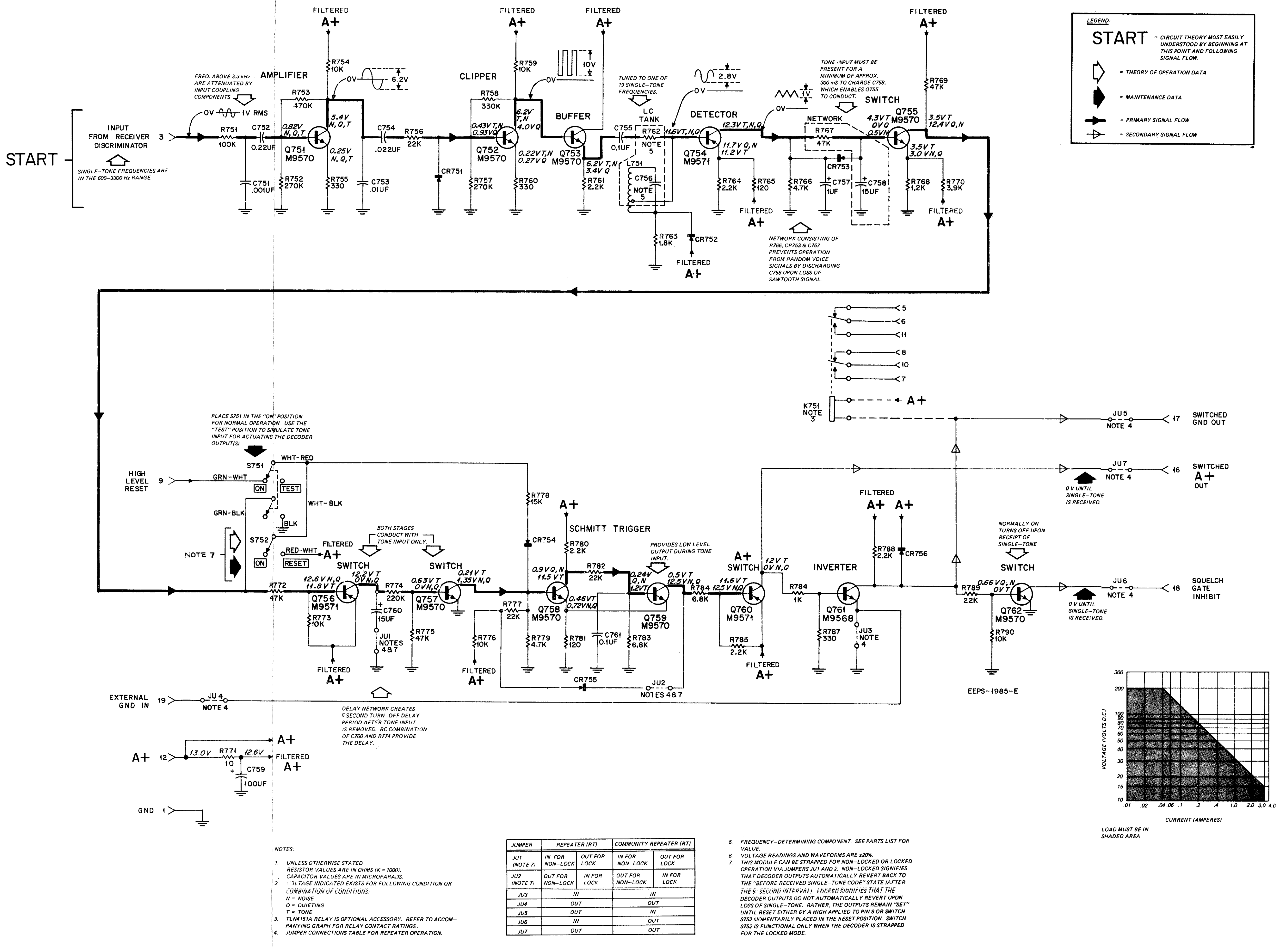


SINGLE TONE DECODER MODULE

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)		-	-	-	-

MAINTENANCE AND TROUBLESHOOTING

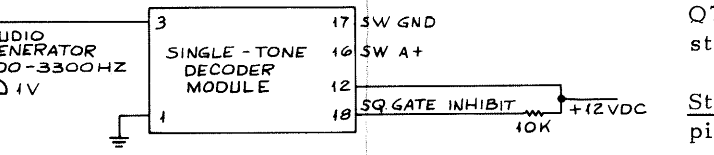
This module can be serviced either while in the control chassis or while out. The following procedure is for out-of-chassis servicing but it is functionally applicable to in-chassis servicing as well.

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-N
12/28/76-PHI

PARTS LIST

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

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
NON-REFERENCED ITEMS		
	1-80702B11	COIL ASSEMBLY, includes:
	42-84315A01	CLIP, grounding
		COIL L751
	1-80781A59	CIRCUIT BOARD ASSEMBLY, includes:
	9-83011H01	CONTACT, female; 16 req'd.
	43-865080	BUSHING, threaded; 2 req'd.
	42-10217A02	STRAP, cable harness; 2 req'd.

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	.0557 uF ±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

TLN4151A Relay Kit — PL-457-A

K751	80C84201A01	RELAY, armature: 2 form "C"; coil res. 200 ohms ±10%
NON-REFERENCED ITEMS		
	43-84920H01	SPACER, relay

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

NON-REFERENCED ITEMS		
	45B83914G01	GUIDE RAIL (slide-mount for circuit board); 2 req'd.
	3-8022	SCREW, machine: 4-40 x 1/4"; 2 req'd.
	4-7683	WASHER, lock: #4 (internal tooth); 2 req'd.
	1-80702B70	PANEL ASSEMBLY

parts list

TLN4054A "Wildcard" Module Board — PL-473-G

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		capacitor, fixed: uF ± 10%; 50 V: unless otherwise stated
C1	23-865137	4.7 ± 20%; 25 V
C2	23-82601A25	100 + 150-10%; 20 V
C3	23-865137	4.7 ± 20%; 25 V
C4	8-84326A20	.0129 ± 2%
C5, 6	8-82905G11	0.22
C7	8-82905G02	.022
C8	8-84326A21	.015 ± 2%
C9, 10	8-82905G11	0.22
C11	8-82905G02	.022
C12	8-84326A22	.0178 ± 2%
C13, 14	8-82905G11	0.22
C15	8-82905G02	.022
C16	8-84326A23	.0213 ± 2%
C17, 18	8-82905G11	0.22
C19	8-82905G02	.022
		semiconductor device, diode: (see note)
CR1 thru 11	48-82392B03	silicon
		coil assembly, inductor:
L1 thru 4	1-80702B11	1H; incl. ground clip 42-84315A01
		transistor: (see note)
Q1, 2	48-869642	NPN; type M9642
Q3	48-869643	PNP; type M9643
Q4	48-869568	NPN; type M9568
Q5	48-869642	NPN; type M9642
Q6	48-869643	PNP; type M9643
Q7	48-869568	NPN; type M9568
Q8	48-869642	NPN; type M9642
Q9	48-869643	PNP; type M9643
Q10	48-869568	NPN; type M9568
Q11	48-869642	NPN; type M9642
Q12	48-869643	PNP; type M9643
Q13	48-869568	NPN; type M9568
		resistor, fixed: ± 5%; 1/4 W: unless otherwise stated
R1	6-11009C43	560
R2	6-11009C83	27k
R3	6-11009C93	68k
R4	6-11009C09	22
R5	6-11009C49	1k
R7	6-11009C73	10k
R8	6-11009C57	2.2k
R9	6-11009C49	1k
R10	6-11009C57	1k
R11	6-84444A08	2.21k ± 1%
R12	6-84444A07	221 ± 1%
R13	6-11009C57	2.2k
R14, 15	6-11009C43	560
R16	6-11009C65	4.7k
R17	6-11009C43	560
R18	6-11009C65	4.7k
R19	6-11009C72	9.1k
R20	6-11009C49	1k
R21	6-84444A09	2.43k ± 1%
R22	6-11009C57	2.2k
R23	6-84444A07	221 ± 1%
R24, 25	6-11009C43	560
R26	6-11009C65	4.7k
R27	6-11009C43	560
R28	6-11009C65	4.7k
R29	6-11009C71	8.2k
R30	6-11009C49	1k
R31	6-84444A09	2.43k ± 1%
R32	6-11009C57	3.2k
R33	6-84444A07	221 ± 1%
R34	6-11009C57	2.2k
R35, 36	6-11009C43	560
R37	6-11009C65	4.7k
R38	6-11009C43	560
R39	6-11009C65	4.7k
R40	6-11009C69	6.8k
R41	6-11009C49	1k
R42	6-84444A09	2.43k ± 1%
R43	6-128689	2.2k
R44	6-84444A07	221 ± 1%
R45, 46	6-11009C43	560
R47	6-11009C65	4.7k
R48	6-11009C43	560
R49	6-11009C65	4.7k
		non-referenced items
	1-80702B23	CIRCUIT BOARD ASSEMBLY, includes
	9-83011H01	CONTACT, female; 24 req'd.
	43-865080	BUSHING, threaded; 2 req'd.

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

parts list

TLN4055A "Wild Card" Module Panel — PL-474-B

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		switch, slide:
S1 thru 4	40-83468E01	spdt
		non-referenced items
	1-80702B24	PANEL ASSEMBLY, includes
	64-84321A01	PANEL, switches S1 thru S4
	3-8022	SCREW, machine: 4-40 × 1/4"; 2 req'd.
	45-83914G01	GUIDE, card; 2 req'd.
	4-7683	WASHER, lock #4 (internal tooth); 2 req'd.

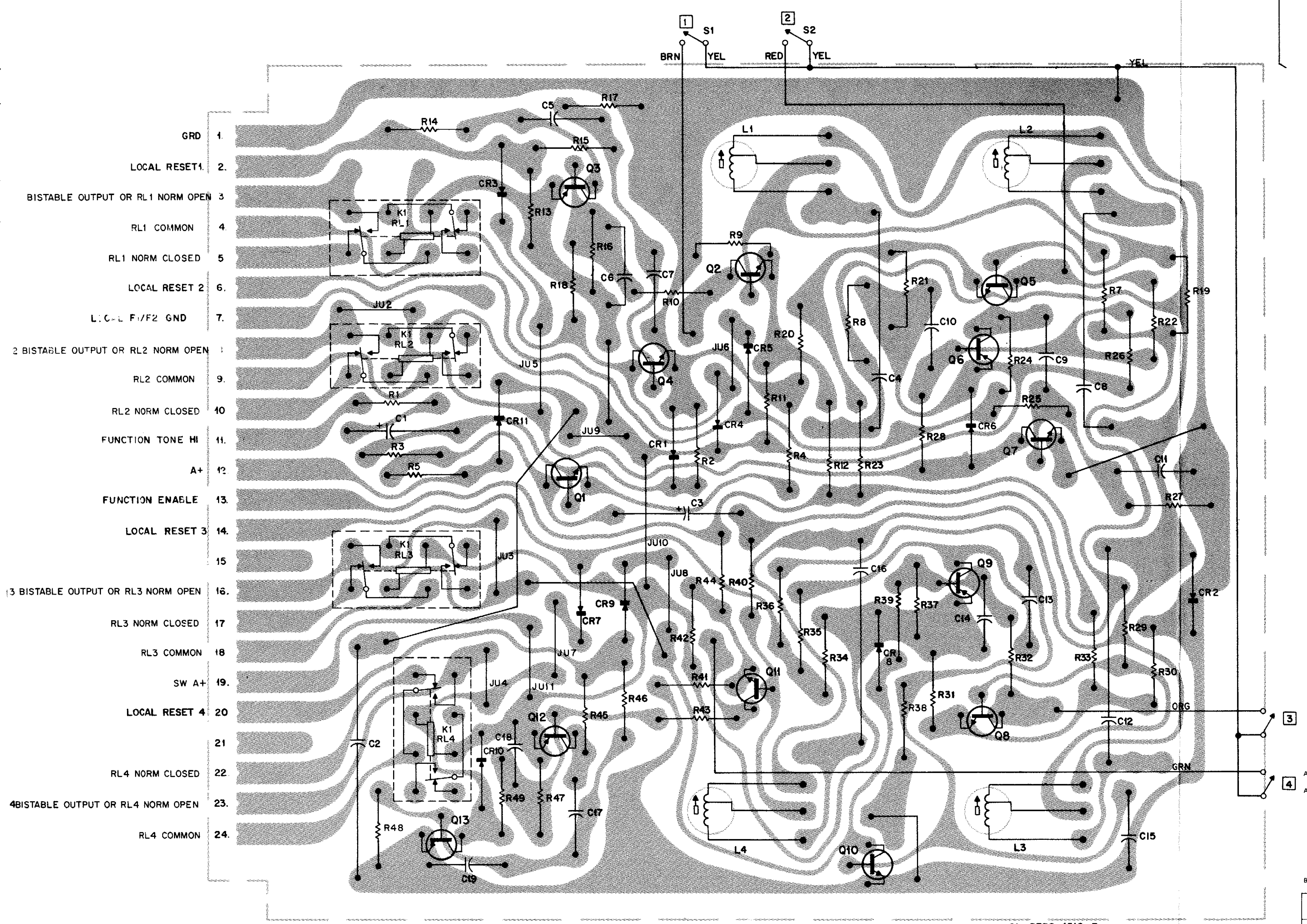
parts list

TLN4151A Relay Kit — PL-455-A

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		diode:
CR11	48-82392B03	silicon
		relay, armature:
K1	80-84201A01	2 form "C", coil res. 200 ohms
		non-referenced items
	43-84920H01	SPACER, relay

REVISIONS — 68P81003E13-Q

CHASSIS AND SUFFIX NO.	REF. SYMBOL	CHANGE	LOCATION
TLN4054A-1	C16	WAS 8D84326A33	PARTS LIST
	R7	WAS 6S129236 15K	L1 TAP
	R11	WAS 6S129804 2.2K ±5%	Q2 EMITTER
	R12	WAS 6S131275 220 ±5%	Q2 EMITTER
	R19	WAS 6S129236 15K	L2 TAP
	R21	WAS 6S129804 2.2K ±5%	Q5 EMITTER
	R23	WAS 6S131275 220 ±5%	Q5 EMITTER
	R29	WAS 6S129887 12K	L3 TAP
	R31	WAS 6S129804 2.2K ±5%	Q8 EMITTER
	R33	WAS 6S131275 220 ±5%	Q8 EMITTER
	R40	WAS 6S129887 12K	L4 TAP
	R42	WAS 6S129804 2.2K ±5%	Q11 EMITTER
	R44	WAS 6S131275 220 ±5%	Q11 EMITTER
TLN4054A-2	C6, C7, C10, C11, C14, C15, C18, C19	WERE 8D82905G02 .022 uF	BASE Q3, Q4, Q6, Q7, Q9, Q10, Q12, Q13
TLN4054A-3	C7	FROM 8D82905G11,	Q4 BASE
	C11	.22 uF	Q7 BASE
	C15	TO 8D82905G02,	Q10 BASE
	C19	.022 uF	Q13 BASE
	Q1	FROM 48R869570, M9570	TONE AMPLIFIER
	Q2, 5	TO 48R869642,	DETECTOR 1, 2, 3, 4
	Q8	M9642	
	Q11		
	Q3	FROM 48R869571,	BISTABLE 1, 2, 3, 4
	Q6	M9571	
	Q9	TO 48R869643, M9643	
	Q12		



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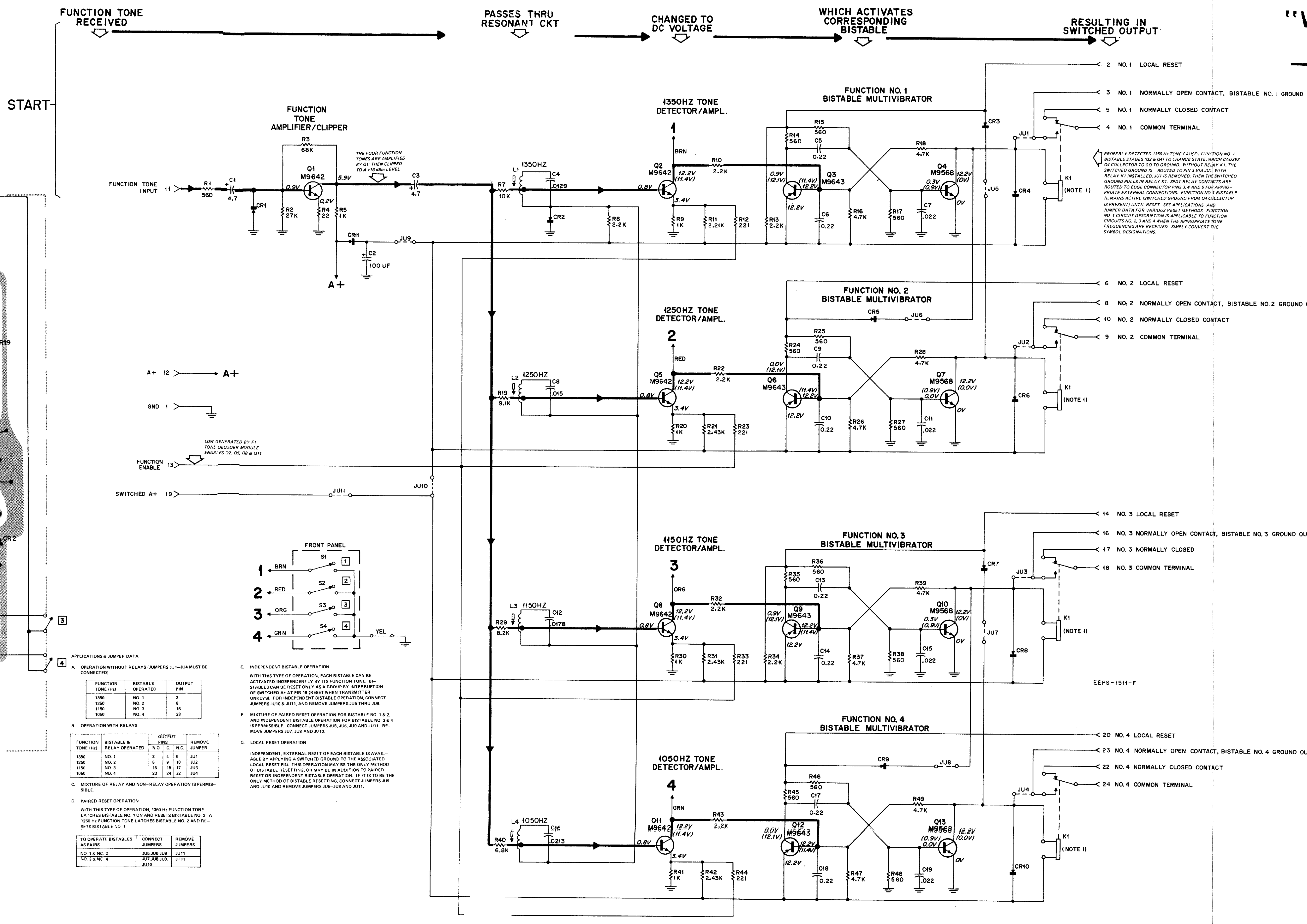


"WILD CARD" CONTROL MODULE

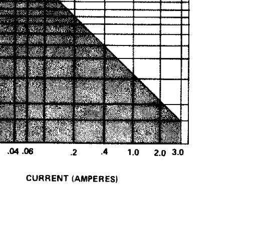
MODEL TLN1252A

FUNCTION

Converts function tones of 1050 Hz, 1150 Hz, 1250 Hz and 1350 Hz into transistor closures; relay closures optional. Allows remote control point to operate up to four universal on-off switches at the station site.

MODEL COMPLEMENT

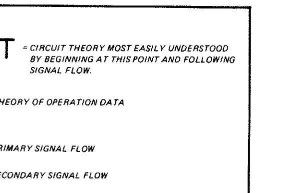
Model	Version	Board	Version	Panel	Version
TLN1252A		TLN4054A	-3	TLN4055A	
TLN4151A Relay (Optional)		-	-	-	-



LOAD MUST BE IN SHADED AREA

NOTES;

1. TLN4151A RELAY IS AN OPTIONAL ACCESSORY. REFER TO GRAPH FOR RELAY CONTACT RATING.
2. UNLESS OTHERWISE NOTED, ALL RESISTOR VALUES ARE IN OHMS AND CAPACITOR VALUES ARE IN MICROFARADS.



"WILD CARD" CONTROL MODULE/OPTIONS DECODER MODULE

OPTIONS DECODER MODULES

MODEL TLN1249A SQUELCH CONTROL
MODEL TLN1250A REPEATER CONTROL
MODEL TLN1251A "PRIVATE-LINE" CONTROL

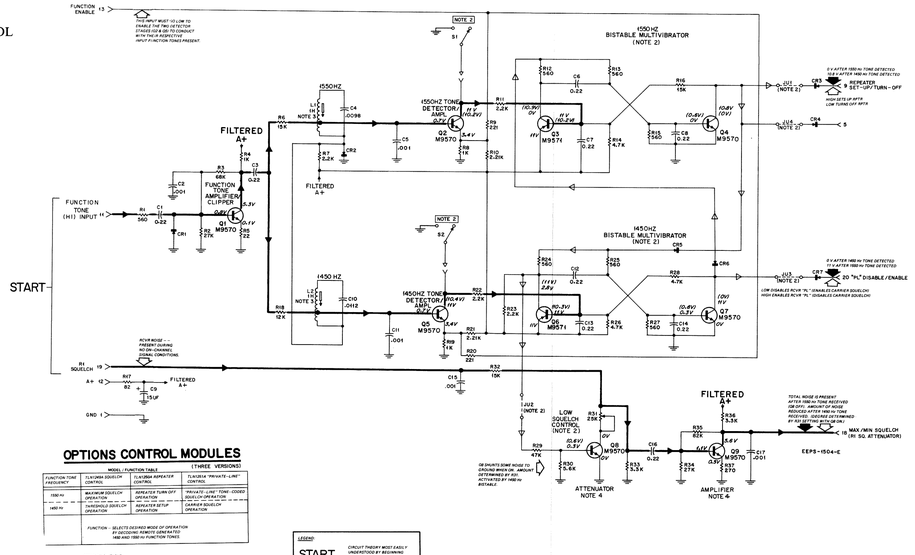
FUNCTION

Selects one of two modes of operation in response to 1450 Hz and 1550 Hz function tones as follows:

Function Tone (Hz)	TLN1249A	Repeater Turn-Off	PL Operation
1450	Threshold Squelch	Repeater Setup	Carrier Squelch Operation

MODEL COMPLEMENT

MODEL	VERSION	BOARD	VERSION	PANEL	VERSION
TLN1249A				TLN4051A	
TLN1250A		TLN4050A	-2	TLN4052A	
TLN1251A				TLN4053A	



OPTIONS CONTROL MODULES

(THREE VERSIONS)

FUNCTION TONE FREQUENCY	MODEL / FUNCTION TABLE: TLN1249A SQUELCH CONTROL	TLN1250A REPEATER CONTROL	TLN1251A "PRIVATE-LINE" CONTROL
1550 Hz	MAXIMUM SQUELCH OPERATION	REPEATER TURN OFF OPERATION	"PRIVATE-LINE" TONE-CODED SQUELCH OPERATION
1450 Hz	THRESHOLD SQUELCH OPERATION	REPEATER SETUP OPERATION	CARRIER SQUELCH OPERATION
	FUNCTION - SELECTS DESIRED MODE OF OPERATION IN RESPONSE TO EITHER 1550 HZ AND 1450 HZ FUNCTION TONES		

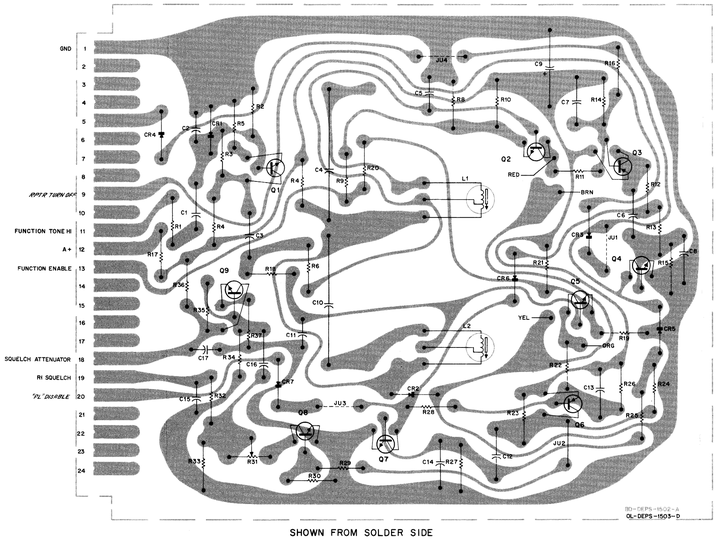
APPLICATION TABLE

	SQUELCH CONTROL MODULE	"PRIVATE-LINE" CONTROL MODULE	REPEATER CONTROL MODULE
S1	MAX SQ	OPERATE "PL"	RPTR ANCHORING
S2	MIN SQ	OPERATE CARRIER SQUELCH	RPTR SETUP
S1=M	OPERATE MAXIMUM SQUELCH	OPERATE "PL"	REPEATER TURN OFF
S1=S2	OPERATE THRESHOLD SQUELCH	OPERATE CARRIER SQUELCH	REPEATER SET UP
P27	LOW SQUELCH CONTROL	(NOT USED)	(NOT USED)
J27	OUT	OUT	IN
J22	IN	OUT	OUT
J23	OUT	IN	OUT
J24	OUT	OUT	OUT

NOTES:
1. VOLTAGES IN PARENTHESES ARE FOR ACTIVE STATE.
2. REFER TO TABLE FOR APPLICATION AND/OR DESCRIPTION.
3. FACTORS ADJUSTED TO REQUIRED FREQUENCY.
4. USED IN SQUELCH CONTROL MODELS ONLY.

LEGEND
START — CIRCUIT THEORY MOST EASILY UNDERSTOOD BY BEGINNING AT THIS POINT AND FOLLOWING SIGNAL FLOW.
= THEORY OF OPERATION DATA
= MAINTENANCE DATA
= PRIMARY SIGNAL FLOW
= SECONDARY SIGNAL FLOW

68P81005E01-K
3/15/81-PHI



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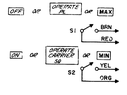

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION

PARTS LIST

TLN4050A Control Board PL-431-E

C1, 3, 6, 7, 8, 12, 13, 14, 16	8D82905G11	CAPACITOR, fixed: 0.22 uF ±10%; 50 V
C2, 5, 11, 15, 17	21D82187B29	.001 uF +10%, 100 V
C4	8D84326A18	.0098 uF ±2%; 50 V
C9	23K865136	15 uF ±20%; 25 V
C10	8D84326A19	.0112 uF ±2%; 50 V
CR1 thru 7	48C82392B03	SEMICONDUCTOR DEVICE, diode: (SEE NOTE) silicon
L1, 2	1V80702B11	REACTOR: AT bandpass: (preset at factory); res 140 ohms ±10%; incl, grounding clip 42-84315A01
Q1, 2, 4, 5, 7, 8, 9	48R869570	TRANSISTOR: (SEE NOTE) N-P-N; type M9570
Q3, 6	48R869571	P-N-P; type M9571
R1, 12, 13, 15, 24, 25, 27	6S129620	RESISTOR, fixed: ±10%; 1/4 W; uni, stated 560
R2	6S129886	27K ±5%
R3	6S129299	68K ±5%
R4, 8, 19	6S129805	1K ±5%
R5	6S124A09	22 ±5%
R6	6S129236	15K ±5%
R7, 11, 22, 23	6S128689	2.2K
R9, 20	6D84444A07	221 ±1%
R10, 21	6D84444A08	2,21K ±1%
R14, 26, 28	6S127804	4,7K
R16, 32	6S127805	15K
R17	6S129224	82
R18	6S129887	12K ±5%
R29	6S128902	47K
R30	6S129433	5,6K
R31	18C830893G03	var 25K ±30%
R33	6S129231	3,3K
R34	6S127806	27K
R35	6S129145	82K
R36	6S129981	3,3K
NON-REFERENCED ITEMS		
	1-80702B19	CIRCUIT BOARD ASSEMBLY, includes:
	9-83011H01	CONTACT, female; 9 req'd.
	43-865080	BUSHING, threaded; 2 req'd.

TLN4051A Squelch Control Panel PL-432-A

S1, 2	40B8346E01	SWITCH, slide: spdt; spring return
NON-REFERENCED ITEM		
	1-80702B20	PANEL ASSEMBLY, includes:
	64-84198A02	PANEL, SWITCHES S1 & S2
	3-8022	SCREW, machine; 4-40 x 1/4"; 2 req'd.
	4-7683	WASHER, lock; #4 (internal tooth); 2 req'd.
	45B83914C01	GUIDE RAIL (slide-mount for circuit board); 2 req'd.

TLN4053A PL Control Panel PL-434-A

S1, 2	40B8346E01	SWITCH, slide: spdt; spring return
NON-REFERENCED ITEM		
	1-80702B22	PANEL ASSEMBLY, includes:
	64-84198A01	PANEL, SWITCHES S1 & S2
	3-8022	SCREW, machine; 4-40 x 1/4"; 2 req'd.
	4-7683	WASHER, lock; #4 (internal tooth); 2 req'd.
	45B83914C01	GUIDE RAIL (slide-mount for circuit board); 2 req'd.

TLN4052A Repeater Control Panel PL-433-A

S1, 2	40B8346E01	SWITCH, slide: spdt; spring return
NON-REFERENCED ITEM		
	1-80702B21	PANEL ASSEMBLY, includes:
	64-84198A03	PANEL, SWITCHES S1 & S2
	3-8022	SCREW, machine; 4-40 x 1/4"; 2 req'd.
	4-7683	WASHER, lock; #4 (internal tooth); 2 req'd.
	45B83914C01	GUIDE RAIL (slide-mount for circuit board); 2 req'd.

REVISIONS
6TLN1005E01-K

CHASSIS AND SUFFIX NO.	REF. SYMBOL	CHANGE	LOCATION
TLN4050A	R6	WAS 6S133526, 18k	L1 TAP
	R9	WAS 6S133275, 220	Q2 EMITTER
	R20		Q5 EMITTER
	R10	WAS 6S129604, 2.2k	Q2 EMITTER
	R21		Q5 EMITTER
	R16	WAS 6S129230, 15k	L2 TAP
TLN4050A-1	C7, 9, 13, 14	WAS 8D82905G02 .022 uF	BASE OF Q1, Q4, Q6, Q7
TLN4050A-2			