

VOICE PROTECTION MODULES

MODEL TLN5976B
MODEL TLN5780B (PROPER CODE)

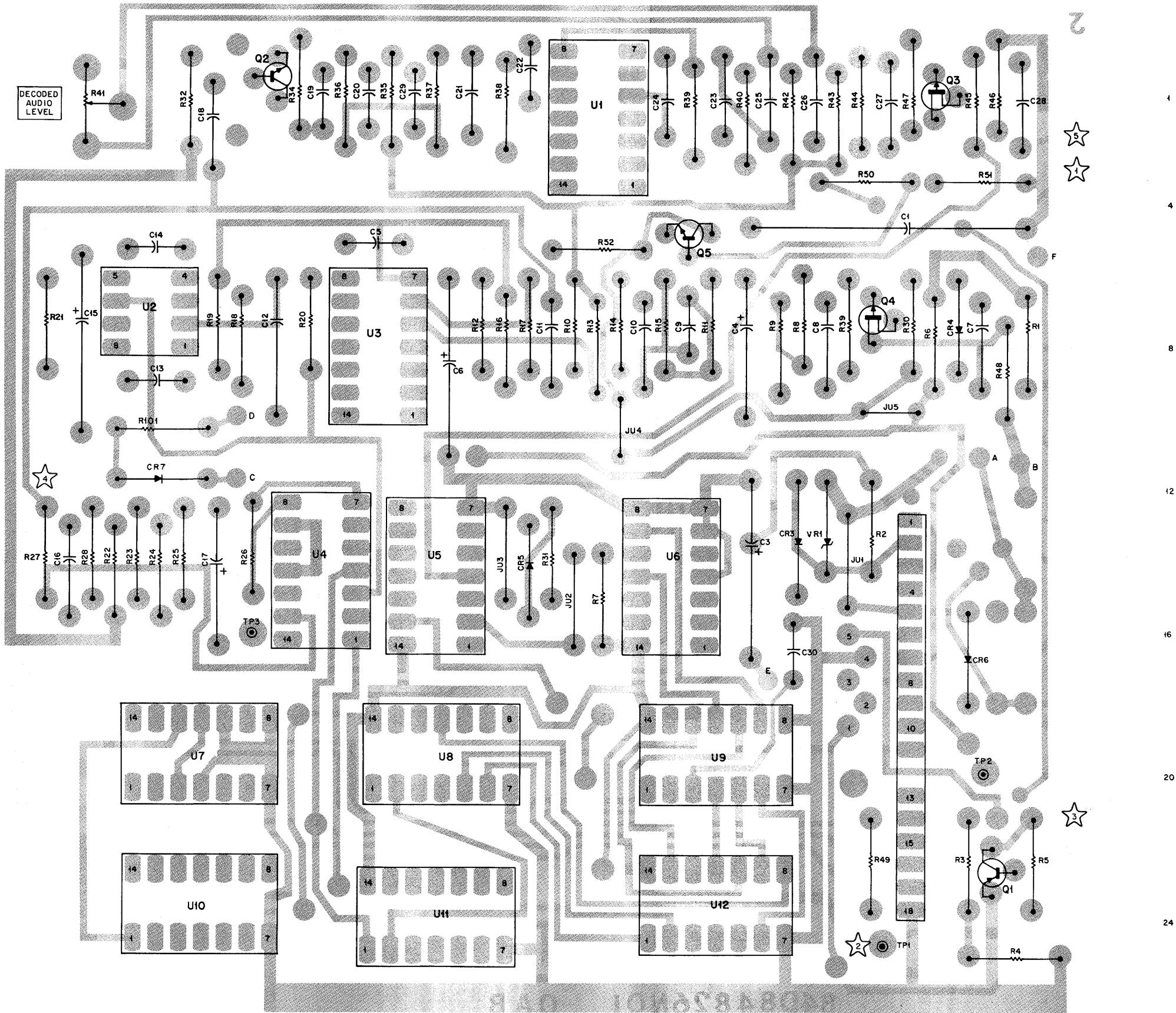
parts list

TLN5976B Voice Protection Module
TLN5780B Voice Protection Module w/Proper Code Detect
PL-5432-E

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		capacitors, fixed; uF: unless otherwise stated:
C1	23-82601A25	100 + 150-10%; 20 V
C3	23-865136	15 ± 20%; 25 V
C4	23-82783B14	1.0 ± 10%; 15 V
C5	21-83596E01	.001 ± 10%; 500 V
C6	23-82783B27	10 ± 10%; 25 V
C7, 8	21-82372C01	0.1 + 80-20%; 25 V
C9	21-82428B34	600 pF ± 10%; 500 V
C10, 11	21-82372C01	0.1 + 80-20% 25 V
C12	23-82783B14	1.0 ± 10%; 15 V
C13	21-82133G01	10 ± 5%; 500 V
C14	21-83596E01	.001 ± 10%; 500 V
C15	23-82783B27	10 ± 10%; 25 V
C16	8-82905G03	.047 ± 10%; 50 V
C17	23-82783B14	1.0 ± 10%; 15 V
C18	21-82372C01	0.1 + 80-20%; 25 V
C19, 20	21-82428B57	.0033 ± 10%; 200 V
C21	21-84426B49	1500 pF ± 5%; 500 V
C22	21-84426B18	130 pF ± 5%; 500 V
C23	21-84426B49	1500 pF ± 5%; 500 V
C24	21-84426B44	180 pF ± 5%; 500 V
C25 thru 28	21-82372C01	0.1 + 80-20%; 25 V
C29	21-84426B18	130 pF ± 5%; 500 V
C30	21-847065	500 pF; 25 V
		diode: (see note)
CR2	48-82258C15	Zener; 5.1 V
CR3, 7	48-82139G01	germanium
CR4, 5, 6	48-83654H01	silicon
		transistor: (see note)
Q1, 2	48-869642	NPN; type M9642
Q3, 4	48-869660	FET, type M9660
Q5	48-86748	NPN; type M9648
		resistor, fixed: ± 5%; 1/4 W: unless otherwise stated
R1	6-11009C01	10
R2	6-11009C31	180
R3, 4	6-11009C89	47k
R5, 6	6-11009C73	10k
R7	6-11009C89	47k
R8, 9	6-11009C87	39k
R10, 11	6-11009C73	10k
R12	6-11009C25	100
R13	6-11009D06	220k
R14	6-11009C73	10k
R15	6-11009C87	39k
R16	6-11009D06	220k
R17	6-11009C73	10k
R18, 19	6-11009C97	100k
R20	6-11009D22	1 meg
R21	6-11009C25	100
R22	6-11009C87	38k
R23	6-11009C92	62k
R24	6-11109C81	22k
R25, 26	6-11009C65	4.7k
R27, 28	6-11009C79	18k
R29	6-11009C89	47k
R30	6-11009D22	1 meg
R31	6-11009C89	47k
R32, 33	6-11009C93	68k
R34	6-11009C73	10k
R35	6-11009D12	390k
R36	6-11009D08	270k
R37, 38	6-11009D04	180k
R39	6-11009D02	150k
R40	6-1110D05	200k
R41	18-83083G26	var. 50k
R42	6-124C73	10k
R43	6-124C59	2.7k
R44	6-124C73	10k
R45	6-124D22	1 meg
R46	6-124C89	47k
R47, 48	6-124D22	1 meg
R49	6-124D06	220k
R50, R51	6-11009C89	4.7k
R52, 101	6-11009C73	10k
		integrated circuit: (see note)
U1	51-84561675	type M2121
U2	51-83629M15	type M2126
U3	51-84561L75	type M2121
U4	51-84768F31	type SC76831
U5	51-82884L05	type CD4011
U6, 7	51-82884L13	type CD4013 (TLN5780A only)
U8	51-82884L19	type 4024 (TLN5780A only)
U9	51-82884L18	type 4030 (TLN5780A only)
U10, 11	51-82884L19	type 4024 (TLN5780A only)
U12	51-82884L06	type CD4023 (TLN5780A only)

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
3-8022	4-7683	SCREW, machine: 4-40 x 1/4"; 2 used
9-82071K02	15-83061L02	WASHER, lock: #4 int.; 2 used
43-82721C01	45-83914G01	SOCKET, multi-contact
64-83363L01		HOUSING, receptacle
		BUSHING, snap
		GUIDE, card; 2 used
		PANEL

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



68P81035E56-E
(Sheet 1 of 3)
5/30/85- UP

SHOWN FROM COMPONENT SIDE

COMPONENT SIDE DEPS-35799-0
SOLDER SIDE DEPS-35800-0
OVERLAY-DEPS-35907-A

VOICE PROTECTION MODULES

MODEL TLN5976B
MODEL TLN5780B (PROPER CODE)

FUNCTION

- Processes transmit audio into a digital format for encoding.
- Encodes the digitized audio (data) for transmission.
- Decodes received data and processes this decoded data into an analog (audio) signal.
- The proper code detection version of this module, contains circuitry to inhibit the audio until the proper code is received.
- A connector on the front panel of this module mates with the code inserter whenever the code is to be changed.

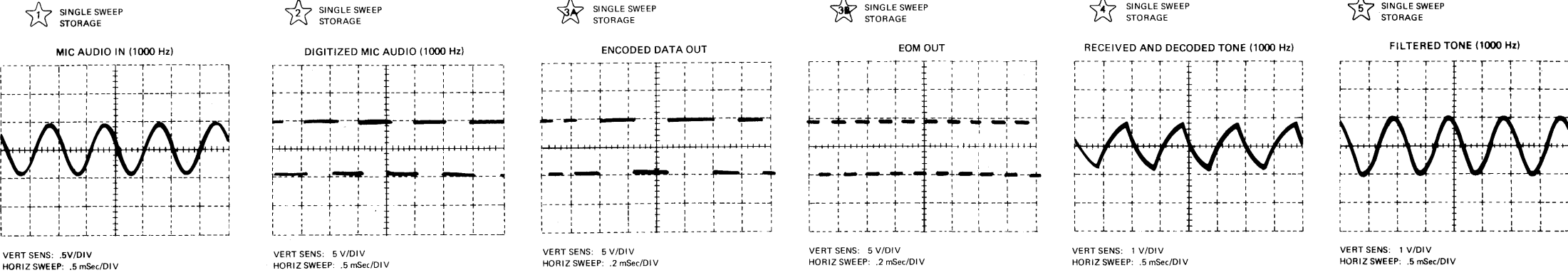
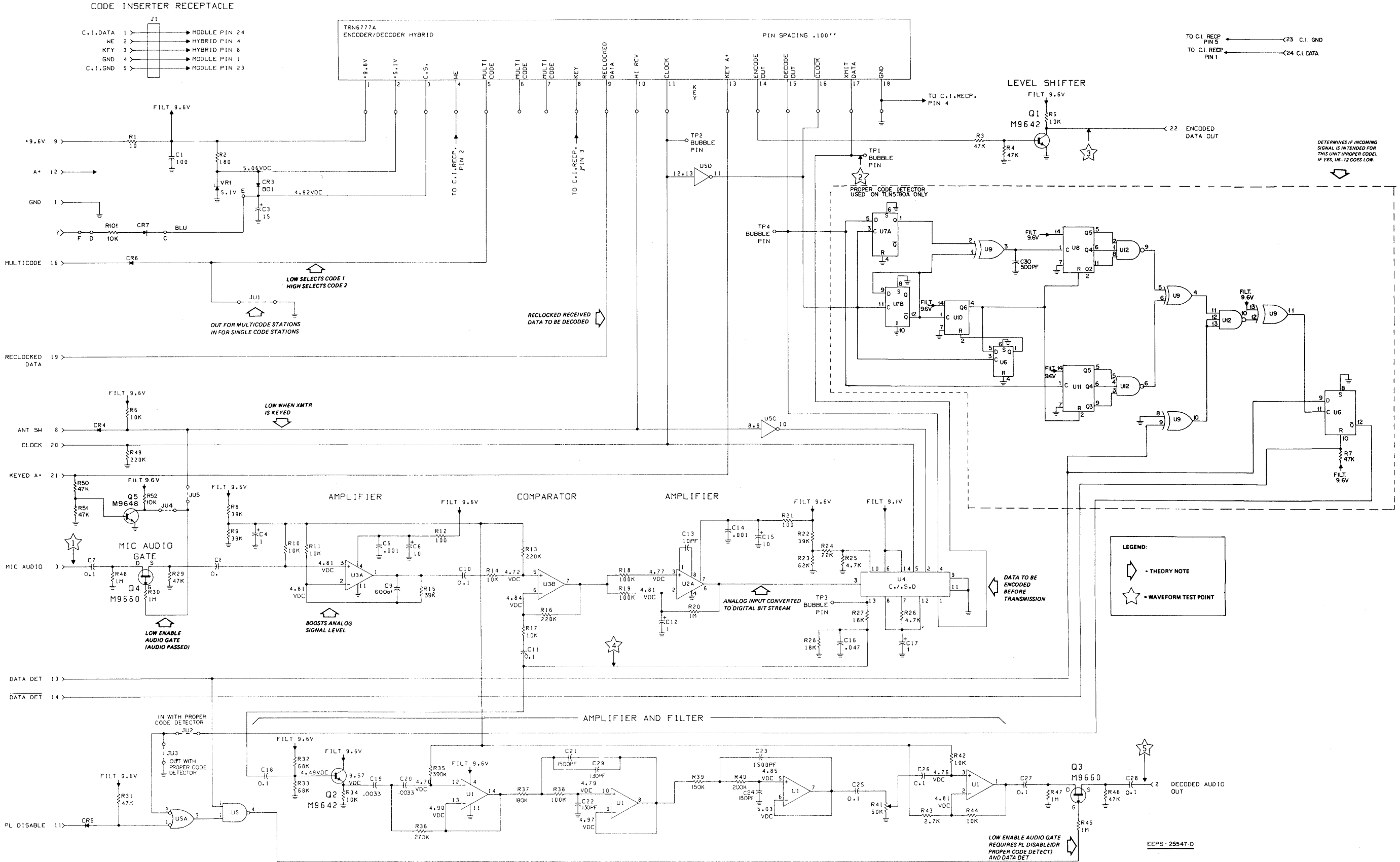
NOTES:

- Unless specified otherwise, resistor values are in ohms and capacitor values are in microfarads.
- Voltages are taken with a dc voltmeter referenced to ground.

Voice Protection Module IC Data Chart

IC Ref. Symbol	Description	Supply Voltage (VDD) Pin No.	Ground (VSS) Pin No.
U1, U3	Quad Operational Amplifier	4	11
U2	Dual Comparator	7	4
U4	CVSD	6 & 14	9 & 11
U5	Quad 2 Input NAND Gate	14	7
*U6, U7	Dual D Flip-Flop	14	7
*U8, U10, U11	7-Stage Ripple Counter	14	7
*U9	Quad Exclusive OR Gate	14	7
*U12	Triple 3 Input NAND Gate	14	7

* These items are part of proper code detector.



VOICE PROTECTION MODULES

MODEL TLN5976B
MODEL TLN5780B (PROPER CODE)



FUNCTIONAL DESCRIPTION

GENERAL

Voice coding is performed by sending microphone audio into a Continuously Variable Slope Delta Modulator (CVSD) which converts it into a digital waveform. This digitized audio is then clocked at a 12 kHz rate into an encoder/decoder hybrid which “scrambles” it via an internally programmed algorithm. The resulting digital waveform occupies a bandwidth from 10 to 6000 Hz. This signal modulates the transmitter channel element directly via the code processor module. Coded data from the receiver is “unscrambled” into clear voice via an inverse operation.

RECEIVE MODE

In the receive mode, pin 10 of the encoder/decoder hybrid (TRN6777A) is high, and pin 2 of the CVSD is low. Reclocked scrambled data is applied to pin 9 of the hybrid via module pin 19 (Reclocked Data). Decoded digital audio is routed from pin 15 of the hybrid to pin 4 of the CVSD (U4). The CVSD output at pin 13 of U4 (TP3) varies from 400 mV P-P (no modulation) to approximately 6.0 volts P-P (full modulation). This amplitude varying digital signal is filtered by integrator network (R27, R28, and C16), and filter network U1. This filtered signal is amplified and gated by Q3 to module pin 2. Q3 turns on only when a data detect input is present on pin 13. For TLN5780B models, a data detect input and a proper code detect input is required to gate Q3.

TRANSMIT MODE

In the transmit mode, hybrid pin 10 is low, hybrid pin 13 is high, and pin 2 of U4 is high. MIC audio is applied to pin 3 of the module and gated through Q4 to amplifier U3A. Once amplified the audio is sent to comparator U3B, where it is compared with the integrated output of the CVSD. The comparator output is a digital signal with a bit length dependent upon the amount of error between the CVSD output and the MIC audio input. The polarity and length of this bit controls the voltage on C17, which in turn controls the amplitude of the voltage fed back to the comparator. Using this type of feedback, the CVSD provides amplitude variations that correspond to the audio input. The output of the comparator is routed to the CVSD where it is reclocked, and routed via pin 1 to pin 17 of the hybrid for encoding. This encoded signal is routed from hybrid pin 14 to level shifter Q1, and then via pin 22 to the exciter where it directly modulates the transmitter channel element.

EOM

An EOM (End of Message Signal) consists of a 6 kHz square wave generated in the hybrid. The EOM signal is routed from pin 14 of the hybrid to module pin 22 (via level shifter Q1), when line PTT or local PTT is released. The duration of the EOM is determined by the delay provided by delayed keyed A + , which keeps the station on the air for approximately 150 msec after PTT is released.

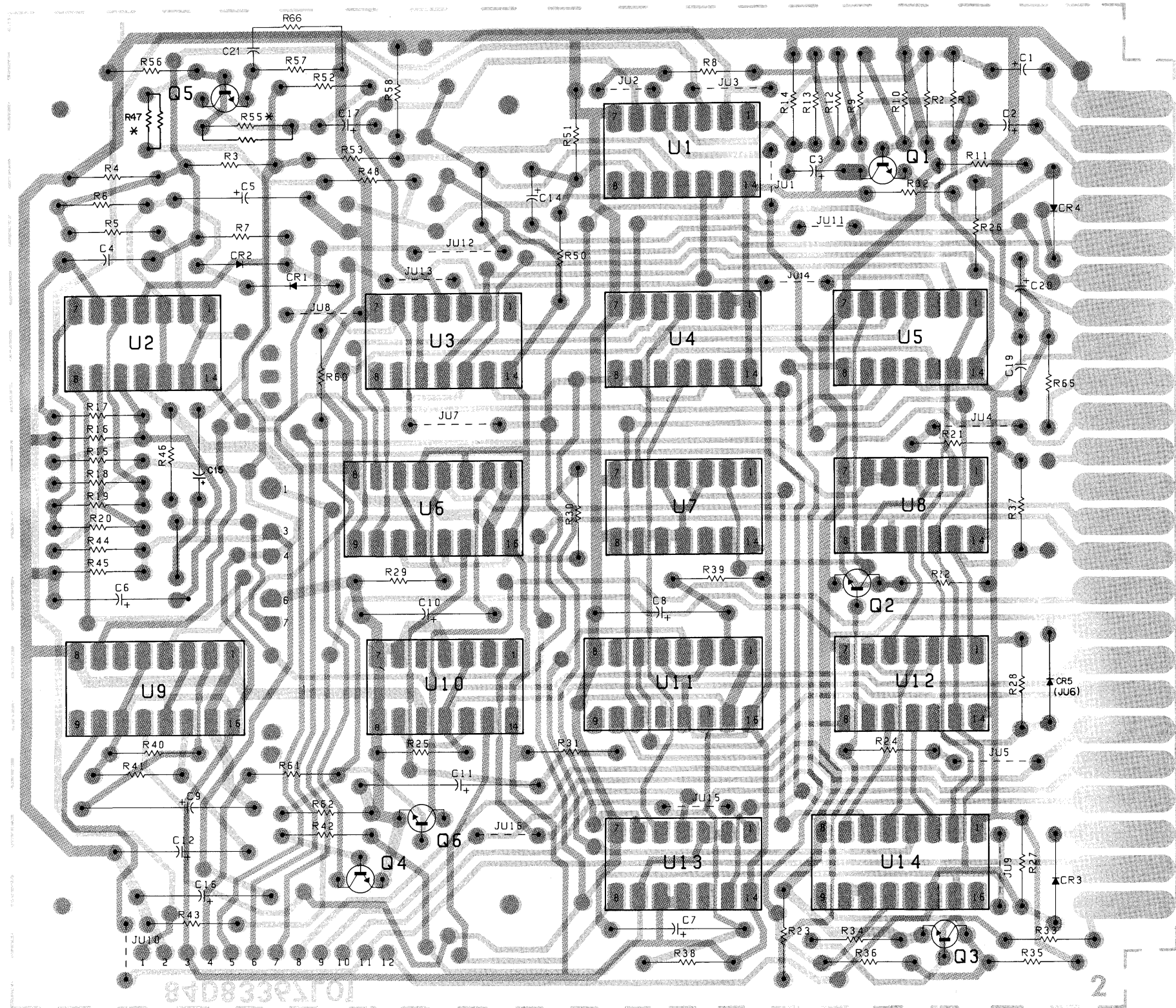
CODE INSERTION

When the code inserter (C1) plug is placed in receptacle J1, a ground (C1 ground) is produced at module pin 23, and upon activation of the code inserter C1 data is routed to the code processor module (via module pin 24) to be reclocked. After the C1 data is reclocked, it returns to the voice protection module on pin 19 which is directly connected to pin 9 of the hybrid. The WE (Write Enable) input on pin 4 of the hybrid pulses low during code insertion, and a digital signal is applied to pin 8 of the hybrid. After the code is loaded into the hybrid, a decoded digital tone followed by an EOM signal is routed from pin 15 of the hybrid to the CVSD, filtered by U1, and gated to pin 2 (Decoder Audio Out) by Q3. This tone is audible in the local speaker of the station, and on the 600 ohm line. The particular code loaded into the hybrid is retained as long as power is supplied to the station. If a power interrupt of less than 15 seconds occurs, the code storage capacitor (C3) prevents the hybrid from losing the programmed code.

PROPER CODE DETECTOR (MODEL TLN5780B ONLY)

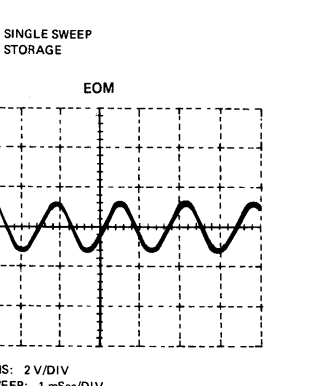
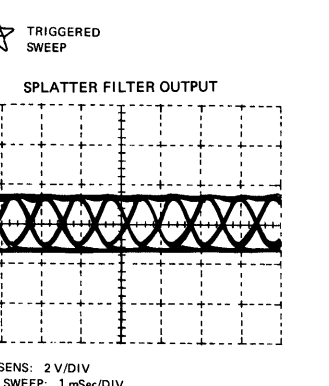
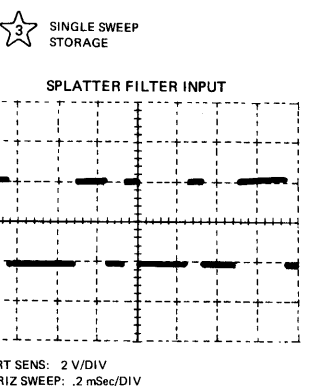
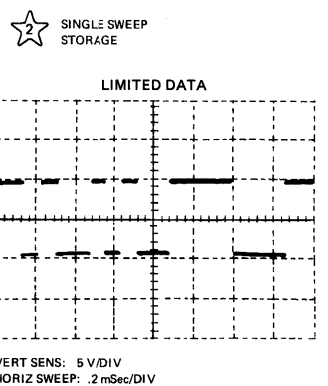
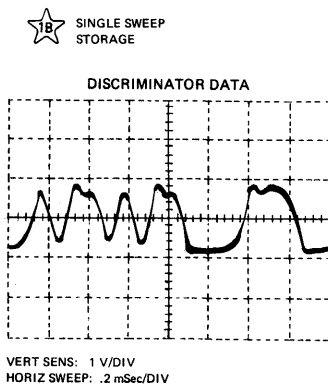
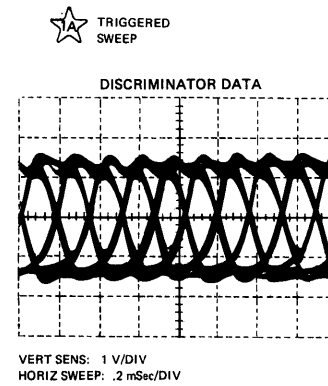
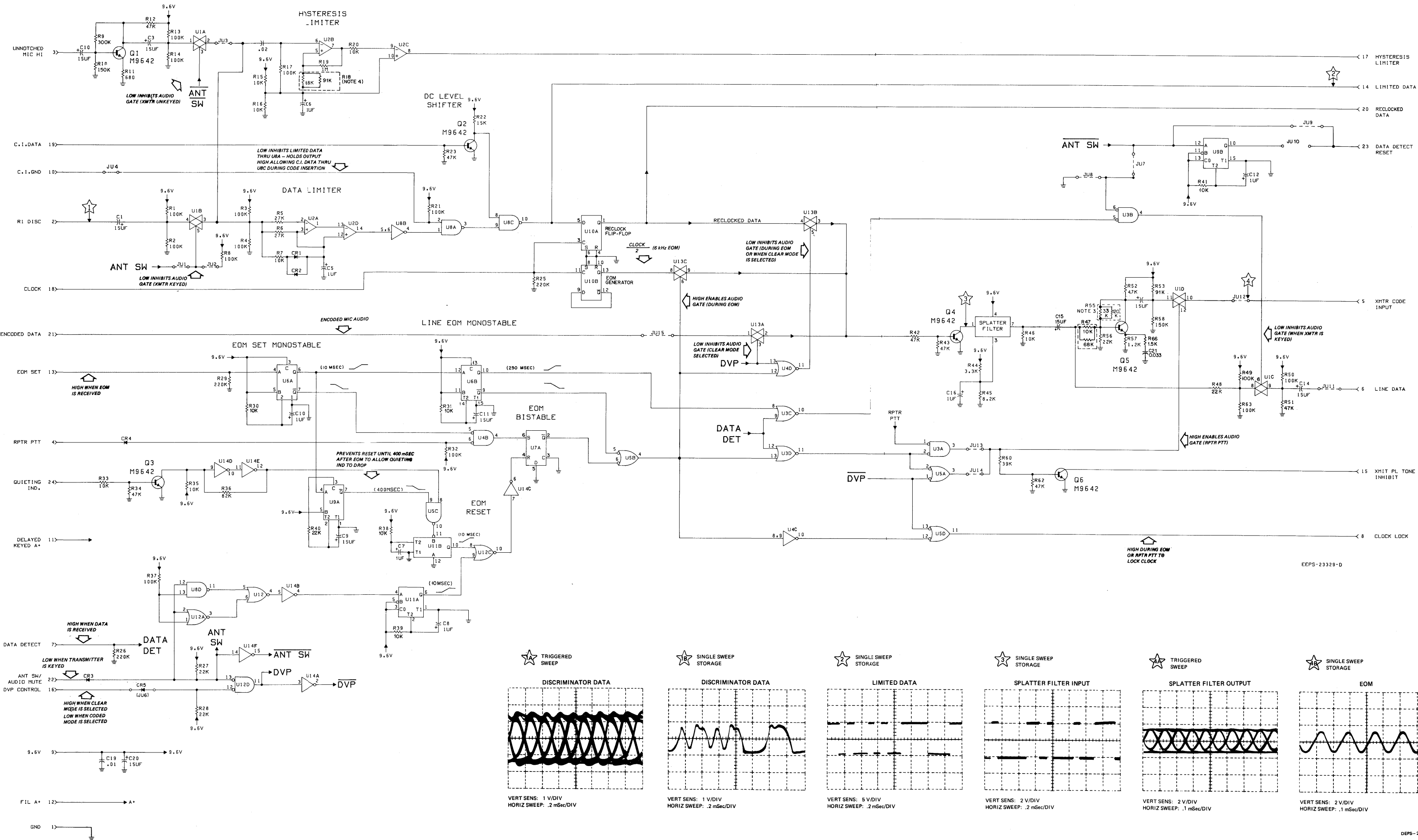
The proper code detector samples the frequency content of the decoded audio (pin 15 of the encode/decode hybrid) to determine if the digital signal present is decoded audio or decoded noise (present if not programmed for the code being transmitted to the station). If the pin 15 output is not decoded audio, a proper code detect input is not applied to U5A, and unwanted decoded noise is not gated to pin 2 (Decoded Audio Out).

Counter U8 triggers when the decoded frequency at pin 15 of the hybrid is 1.1 kHz or less. Counter U11 triggers if the decoded frequency is greater than 5.2 kHz. The two counter outputs at pin 9 of U12 and pin 6 of U12 are gated by U9. The output of U9 pin 11 is used to clock in the signal on the D input (U6 pin 9). The D input is data detect, therefore, the proper code detector will have an output only if there has previously been a data detect. The output (U6 pin 12) is fed to U5A pin 2 and used with the data detect input to enable audio gate Q3 coupling audio to pin 2 of the module.



* R47 AND R55 CONSISTS OF 2-RESISTORS EACH
SHOWN FROM COMPONENT SIDE

COMPONENT SIDE: BD-DEPS-23246-0
SOLDER SIDE: BD-DEPS-23247-0
OL-DEPS-23248-C



CODE PROCESSOR MODULE

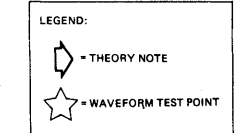
MODEL TLN5973A

FUNCTION

- Provides audio gating and gate control logic.
- Reshapes (reclocks) limited data so that data transitions coincide with the clock.
- Generates 180 msec end of message (EOM) signal when transmission is completed.

CODE PROCESSOR MODULE IC DATA CHART

IC REF SYMBOL	TYPE	DESCRIPTION	SUPPLY VOLTAGE (VDD) PIN NO.	GROUND (VSS) PIN NO.
U1, U13	MC14016	QUAD BILATERAL SWITCH	14	7
U2	MC14013	QUAD OPERATIONAL AMPLIFIER	14	11
U3, U4, U12	MC14001	QUAD 2 INPUT NOR GATE	14	7
U5, U8	MC14011	QUAD 2 INPUT NAND	14	7
U7, U10	MC14013	DUAL D FLIP-FLOP	14	7
U6, U9, U11	MC14028	DUAL MONOSTABLE MULTIVIBRATOR	16	8
U14	MC14049	HEX INVERTER/BUFFER	1	8



- NOTES:
- UNLESS SPECIFIED OTHERWISE, RESISTOR VALUES ARE GIVEN IN OHMS AND CAPACITOR VALUES ARE IN MICROFARADS.
 - JUMPER USAGE ON THIS MODULE IS GIVEN IN THE FOLLOWING CHART:

JUMPER	ENCODE/DECODE STATIONS	TRANSPARENT STATIONS (C288 OPTION)
JU1	OUT	IN
JU2	IN	OUT
JU3	OUT	IN
JU4	IN	OUT
JU5	IN	OUT
JU6	IN	OUT
JU7	OUT	IN
JU8	IN	OUT
JU9	OUT	IN
JU10	OUT	IN
JU11	OUT	IN
JU12	IN	IN
JU13	OUT	IN
JU14	IN	IN
JU15	IN	OUT
JU16	IN	OUT

- R55 IS FACTORY ADJUSTED TO OBTAIN THE PROPER DEVIATION LEVEL. IN SOME CASES THE 120K RESISTOR IS REMOVED.
- R18 CONSISTS OF 68K AND 91K FOR VHF MODELS. FOR UHF MODELS, 91K IS REMOVED.

PARTS LIST SHOWN ON BACK
68P81035E63-C
8/15/82-UP

FUNCTIONAL DESCRIPTION

GENERAL

The code processor module performs transmit and receive functions required to interface the voice coding circuitry to the radio. Received data is put into sync with the station's internal clock prior to decoding or retransmission. Data to be transmitted, in addition to being' relocked, it also low pass filtered to prevent excessive modulation splatter.

RECEIVE MODE

Data received from the radio discriminator, enters the module on pin 2 and is gated to two separate limiters via gate U1B. Gate U1B is enabled when the antenna switch signal (derived from pin 22) is high, indicating that the station is in the receive mode. The data limiter is a "hard" limiter that slices about the dc average of the input signal. This limited signal is routed to the code detect module via pin 14, and is also applied to flip-flop U10A, where it is put in sync with the station decoding clock (relocked). This relocked data is routed to the voice protection module, via pin 20, where it is decoded into clear voice. The hysteresis limiter is a lower gain circuit which requires a higher input level to block limiting. This lower gain prevents noise riding on the coded signal from being interpreted as data transitions. The limiter output is routed to the code detect module via pin 17 of this module.

In a repeater (RT) application, the relocked data is applied to level shifter Q4 and the data splatter filter through gate U13B. Gate U13B is enabled by a high output from U4D. This requires a low output from U12D (indicating that the line or local mic is not keying the station) and a low output from the end-of-message control gate U5B. This low condition will exist as long as the logic has not been commanded to send an end-of-message signal.

After passing through the low pass splatter filter, the relocked data is applied to amplifier Q5 and gated through U1D to the modulator. Gate U1D is enabled when (1) DVP indicating coded transmission in an encoder/decoder station applies a low, to gate U5A pin 1 or (2) either the data detect signal or the end-of-message signal is a high. In this case, for repeater (RT) usage, gate U3D applies a low to U5A pin 2, also causing U5A pin 3 to be high. Gate U5A also applies the high to transistor Q6 which supplies a switched low to prevent a PL tone from being applied to the modulator at the same time as code.

TRANSMIT MODE

An encode/decode type station supplies coded data for transmission to gate U13A via pin 21. Gate U13A is enabled when DVP is high which occurs for line or local keying in the coded mode. As in the clear mode, line or local keying takes priority over repeater operation.

The OR function provided by gate U12D provides transmit control and switching for coded mode operation. In stations having internal voice coding, the DVP control function (developed on the DVP control module) will be low for coded operation. For line or local keying of the station, the antenna switch signal (pin 22) will also go low, causing a high output at U12D and a low output at U14, the DVP and DVP supervisory signals.

For transparent type stations (those which send and accept coded signals on the wire line inputs) one additional input and one additional output are used. Module pin 3 receives coded data from the line driver module which is gated through U1A to the data and hystersis limiters. The gating function operates at the limiter inputs so that the limiters receive the receiver input (pin 2) when the station is not keyed, and the line input (pin 3) when the station is keyed. This is accomplished by using the antenna switch signal to control gates U1A and U1B. Once the line data has passed the data limiter, it is relocked in flip-flop U10A and passed on to pin 5 for transmission in the same manner as data during repeater operation. Received data in a transparent station will be limited, relocked, and splatter filtered as though it were about to be repeated but instead will be passed out to pin 6 of the code processor and sent to the line driver input.

EOM

The remaining circuitry on the module provides control of the end-of-message (EOM) signal sent at the end of every coded transmission. An encode/decode type station provides the EOM signal input from the voice protection module at pin 21 which is gated through U13A for as long as the transmitter remains on the air after PTT is released (approx. 150 msec).

The transparent type station begins to transmit the EOM signals as soon as a positive going pulse occurs at pin 13 (this is an indication from the code detector that the EOM signal from the encoding source has been detected). Monostable U6A provides a short pulse to the second monostable U6B, which then times for approximately 150

msec and controls two other functions. The Q output of U6B provides a negative pulse of 150 msec to gate U5B. The resulting high from U5B enables gate U13C and allows the clock/2 EOM (6 kHz) signal to pass on to the modulator via pin 5. The Q output of U6B provides a 150 msec positive pulse which through U3C and U3B, holds the line data gate U1C open so that the clock/2 EOM signal is routed to the line driver.

A repeater station transmits an EOM signal through the entire transmitter turn-off cycle. Since the repeater may be set up to transmit several seconds of drop out delay, the code processor in this cases latches into an EOM sending mode. If the station has been repeating (indicated by a low at pin 4 of the module) the EOM set pulse from U6A pin 7 provides a set pulse to U7A via U4B causing a low on the Q output of U7A. This low holds gates U13C and U1D enabled routing the EOM signal to the transmitter.

EOM reset circuitry has been incorporated so that the repeater may be reaccessed during the dropout cycle. This circuitry receives an indication on pin 24 (high to low transition) when the receiver has a new signal input. This transition causes a high to low transition at U5C triggering monostable U11B to reset EOM latch U7A via U12C and U14C. Resetting the EOM latch shuts off the EOM gate U13C and removes the clock lock signal (pin 8). Exchanges through the repeater may occur rapidly enough that quieting indicate (pin 24) is unable to make any transition, but will stay low throughout. In this case, the 400 msec monostable U9A provides a low to high transition after EOM has been detected. If U5C-8 is still high (indicating quieting) the edge from the time out of U9A provides a reset to the EOM latch, and the new message may commence.

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
TLN5973A Code Processor Module		PL-5433-C
		CAPACITORS , fixed: uF; unless otherwise stated
C1,2	23-82783B13	15 ±15%; 25 V
C3	23-84538G04	15 ±10%; 20 V
C4	8-82905G23	.02 ±10%; 100 V
C5 thru 8	23-82783B08	1.0 ±10%; 35 V
C9	23-84538G04	15 ±20%; 20 V
C10	23-82783B08	1.0 ±10%; 35 V
C11	23-84538G04	15 ±20%; 20 V
C12	23-82783B08	1.0 ±10%; 35 V
C14, 15	23-84538G04	15 ±20%; 20 V
C16	23-82783B08	1.0 ±10%; 35 V
C17, 18	23-84538G04	15 ±20%; 20 V
C18		NOT USED
C19	21-82428B12	.01 ±70-30%; 100 V
C20	23-84538G04	15 ±20%; 20 V
C21	8-83813H09	.033 ±10%; 50 V
		DIODES : (SEE NOTE 1)
CR1,2	48-84616A01	hot-carrier
CR3,4,5	48-83654H01	silicon
		TRANSISTORS : (SEE NOTE 1)
Q1 thru 6	48-869642	NPN; type M9642
		RESISTORS , fixed: ±10%; 1/4 W unless otherwise stated
R1 thru 4	6-124C97	100k
R5,6	6-124A83	27k ±5%
R7	6-124A73	10k ±5%
R8	6-124C97	100k
R9	6-124B09	300k ±5%
R10	6-124D02	150k
R11	6-124A45	680 ±5%
R12	6-124A65	4.7k ±5%
R13, 14	6-124C97	100k
R15, 16, 17	6-124A73	10k ±5%
R18	6-124A93	68k ±5% (SEE NOTE 2)
	6-124A96	91k ±5%
R19	6-124B22	1.0 meg ±5%
R20	6-124C73	10k
R21	6-124C97	100k
R22	6-124C77	15k
R23	6-124C89	47k
R24	6-124A93	68k ±5%
R25,26	6-124D06	220k
R27,28	6-124A81	22k
R29	6-124D06	220k
R30, 31	6-124A73	10k ±5%
R32	6-124C97	100k
R33	6-124C73	10k
R34	6-124C89	47k
R35	6-124C73	10k
R36	6-124C95	82k
R37	6-124C97	100k
R38,39	6-124A73	10k ±5%
R40	6-124A81	22k
R41	6-124C73	10k ±5%
R42,43	6-124C89	47k
R44	6-124A61	3.3k ±5%
R45	6-124A71	8.2k ±5%
R46	6-124A73	10k ±5%
R47	6-124A93	68k ±5%; (SEE NOTE 3)
	6-124A73	10k ±5%; (SEE NOTE 3)
R48	6-124A65	4.7k ±5%
R50	6-124C97	100k
R51	6-124C89	47k
R52	6-124C65	4.7k
R53	6-124A96	91k ±5%
R54		NOT USED
R55	6-124A85	33k } (SEE NOTE 3)
	6-124A99	120k }
R56	6-124A73	10k ±5%
R57	6-124A41	470 ±5%
R58	6-124D02	150k
R59		NOT USED
R60	6-124A87	39k ±5%
R61		NOT USED
R62	6-124C89	47k
R64, 65		NOT USED
R66	6-124A53	1500 ±5%

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		INTEGRATED CIRCUITS : (SEE NOTE) U1 51-82884L14 type 4016 U2 51-82884L75 type M2121 U3, 4 51-82884L04 type CD4001 U5 51-82884L05 type CD4011 U6 51-82884L53 type MC14538 U7 51-82884L13 type 4013 U8 51-82884L05 type 4011 U9 51-82884L53 type MC14538 U10 51-82884L13 type 4013 U11 51-82884L53 type MC14538 U12 51-82884L04 type CD4001 U13 51-82884L14 type CD4016 U14 51-82884L02 type CD4049 U15 1-80793B98 Hybrid Splatter Filter
MECHANICAL PARTS		
	1-80795B22	CIRCUIT BOARD ASSEMBLY includes: RECEPTACLE, board mounting 24 used BUSHING, threaded; 2 used SCREW, machine: 4-40 x 1/4"; 2 used WASHER, lock; #4 int.; 2 used
	3-8022	
	4-7683	

- NOTES:
- For optimum performance, diodes, transistors, and integrated circuits must be ordered by Motorola part numbers.
 - R18 consists of both resistors in VHF models; only 68k is used in UHF models.
 - R47 and R55 consists of 2 resistors; factory selects proper arrangement.

REVISIONS				
68P81035E63-C				
DIA.G. ISSUE	BOARD AND SUFFIX NO.	REF. SYMBOL	CHANGE	LOCATION
	TLN5973A-1	C13	DELETED 23-84538G04. 15 uF. REPLACED WITH JUMPER	Q5 CIRCUIT
		R49, 63	DELETED 6-124C97. 100k	
		R56	FROM 6-124C81. 22k TO 6-124A73. 10k	
		R57	FROM 6-124A51. 1.2k TO 6-124A41. 470	
		R48	FROM 6-124C81. 22k TO 6-124A65. 4.7k	
		R47	FROM 6-124A68. 6.2k TO 6-124A93. 68k and 6-124A73. 10k IN PARALLEL	

FUNCTIONAL DESCRIPTION

GENERAL

The code detect module contains a clock and three detector circuits. The clock is capable of tracking with an incoming coded signal within a certain lock range. This prevents possible errors due to differences in clock frequencies between transmitting and receiving units.

Two of the detector circuits are used to determine if the incoming signal is coded or clear. The transition detector output is in the "active" state on a coded signal, in the "off" state on noise, and in an indeterminant state on clear audio signals. The 6 kHz detector is in the active state on noise and coded signals, and off on clear audio signals. These detector outputs are gated together so that the data detector output (pins 19 and 5) will be active only on coded signals.

The third detector circuit operates when the 6 kHz end-of-message (EOM) signal is received. This signal is used to rapidly deactivate the data detector in a manner similar to the reverse burst in PL systems.

CLOCK CIRCUITRY (See Figure 1)

The clock reference is a 1.776 MHz crystal controlled oscillator consisting of U7B, U7C and Y1. The oscillator output is divided by U4B to produce the 888 kHz hi-speed clock reference which is applied to counter U1. The counter outputs are applied to gates U2A, U2B, U2C, and U5B which control the division rate.

Limited discriminator data enters the module on pin 22. An edge generator circuit (U7, U15, U12, U9) generates a pulse (1.1 usec) on every transition of the limited data. These edges are compared with CLK and CLK at U9B and U9A respectively. If the edge occurs during the positive portion of the CLK, U3B is set and the counter control gates limit the count to 36 which when divided by 2 (U4A) gives 12.333 kHz. If the edge occurs during the positive portion of CLK, U3A is set and the counter counts to 38 which when divided by U4A gives 11.684 kHz. If no edge occurs during CLK or CLK, the counter counts to 37 which when divided by 2 is exactly 12 kHz. The counter is reset every half cycle of the clock, so that the frequency can be increased or decreased slightly in order to track with the data that appears on the discriminator. In this manner, the clock "locks" to the data which is necessary due to differences in clock frequencies between transmitting and receiving units. Once the clock has achieved lock, the discriminator data can be reliably reclocked in the center of the bit and remove any erroneous information produced by phase shifts.

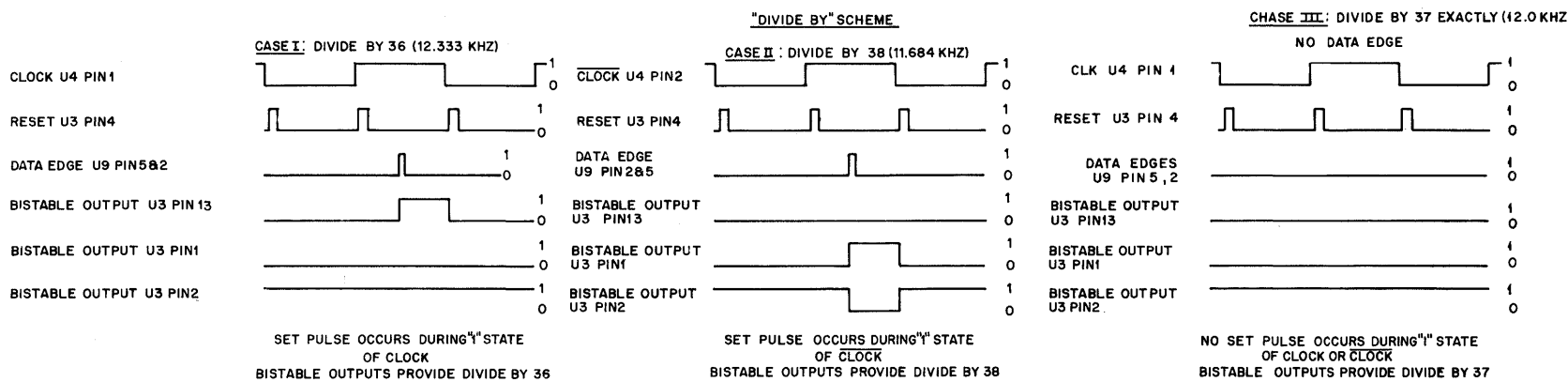
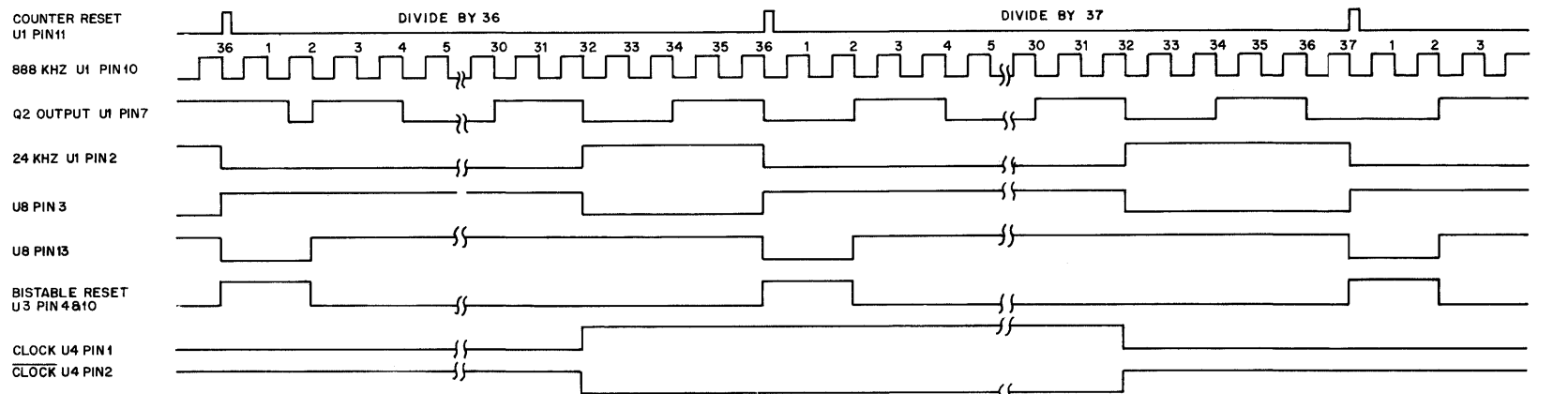


Figure 1. Clock Recovery Timing

CEPS-23333-0

NOTE

In the following paragraphs, certain component references are preceded by an asterisk (*). These items are located on the TLN5783A Auxiliary Board.

TRANSITION DETECTOR

The transition detector utilizes the fact that the 12 kHz clock locks to data in such a way that every transition of limited data lines up with the negative edge of clock. A pulse window with a duration of 13.5 usec is generated on the positive edge of clock. These pulse windows and the edges (discussed in the clock section) are applied to the D and C inputs of U14A respectively. On a strong RF signal modulated with code, the logic state of the D input at the time the C input goes high is a constant (provided the clock is locked). Therefore, the Q output of U14A which drives the reset of counter U11B via U10D, remains high during a strong code modulated RF signal. This allows counter U11B to count the reference #1 clock (2.75 msec) to the preselected count which produces a low on the output of U13D to reset the counter via flip-flop U14B and U10D. In this way, the status of U14A pin 1 can be checked after each count. The timing of events is such that when U13D pin 11 switches low, U10D pin 11 doesn't go low until U14B pin 13 goes high. This assures that *U1 pin 5 has been established prior to being clocked at pin 2. Thus again, on a strong RF signal, *U1A pin 2 is always clocked to a high which prevents counter *U15A from counting ref. #3 clock pulses (88 msec) by holding the reset (pin 7) high. This forces *U15A pin 6 low and *U15A pin 2 high. This point is brought back to the main board at U15A pin 13 to supply half the information necessary for a data detect output.

As the RF signal gets weaker, the limited data edges are no longer aligned with the negative transition of the clock as well as on the strong RF signal. The additional noise causes the output of flip-flop U14A (pin 1) to alternate between high and low. When there are enough pulses present at pin 1, counter U11B is not able to reach its preselected count before the reset appears at pin 15. This means that when flip-flop *U1A gets a positive going clock pulse at pin 3, the D input (pin 5) will be high which forces the reset on counter *U15A pin 7 low. This enables the counter to count ref. #3 clock pulses and after a count of 8, the Q3 output (pin 6) goes high. This high is inverted and applied to *U15A pin 2 which results in module pin 19 going low (via U15C and U10C) to indicate code is not being received.

6 kHz DETECTOR

Since the 6 kHz detector circuitry from *U7C pin 10 to U15B pin 12 is very similar to the transition detector circuitry (described previously), the discussion will be concentrated on the front end of the 6 kHz detector (U5, U16, U12, U11 on the auxiliary board). The hysteresis limiter input (module pin 24) is reclocked at *U5A pin 5 with the 12 kHz clock. The output of the flip-flop (*U5A pin 1) is applied to the D input (pin 7) of the 4-bit shift register *U16. Information is shifted through at a clock rate of 24 kHz (*U16A pin 9). If the limited signal is coded, the frequency content is such that there is a predominate alternating bit pattern seen at the outputs of the shift register. The exclusive OR gates (*U12) provide high going outputs which toggle the output (*U11C pin 10) when all three inputs are in a high state. The frequency of occurrence of these low going pulses is enough to keep counter *U14A from counting the ref. #1 clock pulses. This results in a logic high at pin 12 of U15B on the main board.

If the limited signal is clear audio, the frequency content is much lower than that of data and when clocked through shift register *U16A, long strings of zero's or one's are seen at the outputs of the shift register. This assures that at least one of the exclusive OR gates is in the off state and prevents any change at *U11 pin 10. This allows the counter U14A to count up which will result in a logic low at U15C pin 12, providing a low at pin 19 of the module to indicate the received signal is clear audio.

END OF MESSAGE (EOM) DETECTOR (See Figure 2)

At the end of every coded transmission, a burst of 6 kHz tone (EOM signal) is sent to rapidly shut down the data detector to a low state, similar to the way reverse burst is used in PL systems. The EOM detector is located on the auxiliary board and consists of U13, U7A, U5B, and U11. Reclocked hysteresis limited data from U5A is presented to *U13A pin 1 where the frequency content is sampled. Ref. #2 (44 msec) provides a sample window period in which the number of positive transitions are counted. If the count exceeds 160 (which only happens on a burst of 6 kHz), U5B pin 12 goes high when the ref. #2 pulse clocks flip-flop U5B. The detect time is between 15-44 msec on a strong RF signal. The output of the EOM detector is used to gate 12 kHz clock into the clock inputs of counters *U14A and *U15A instead of ref. #3 (88 msec clock). This provides a rapid switch to the standby condition (transition detect in a low state and the 6 kHz detect in a high state).

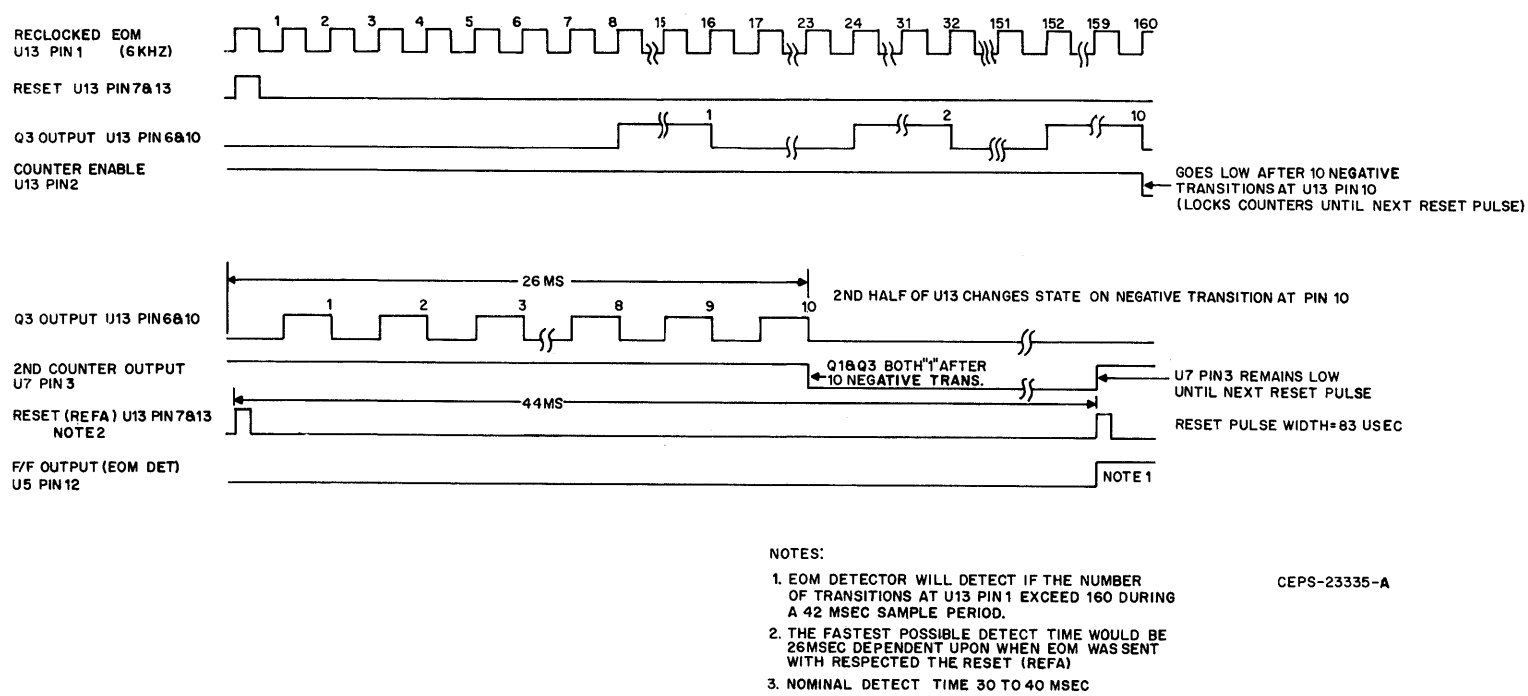


Figure 2. EOM Detector Timing

CEPS-23335-A

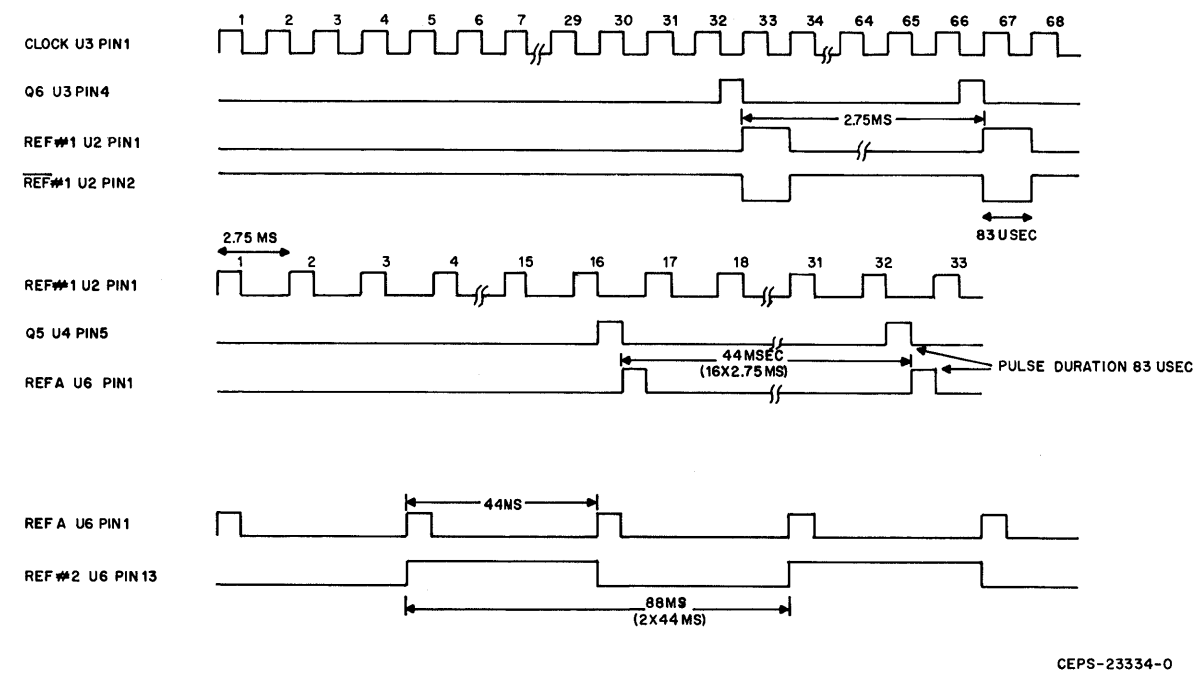


Figure 3. Clock Reference Generator

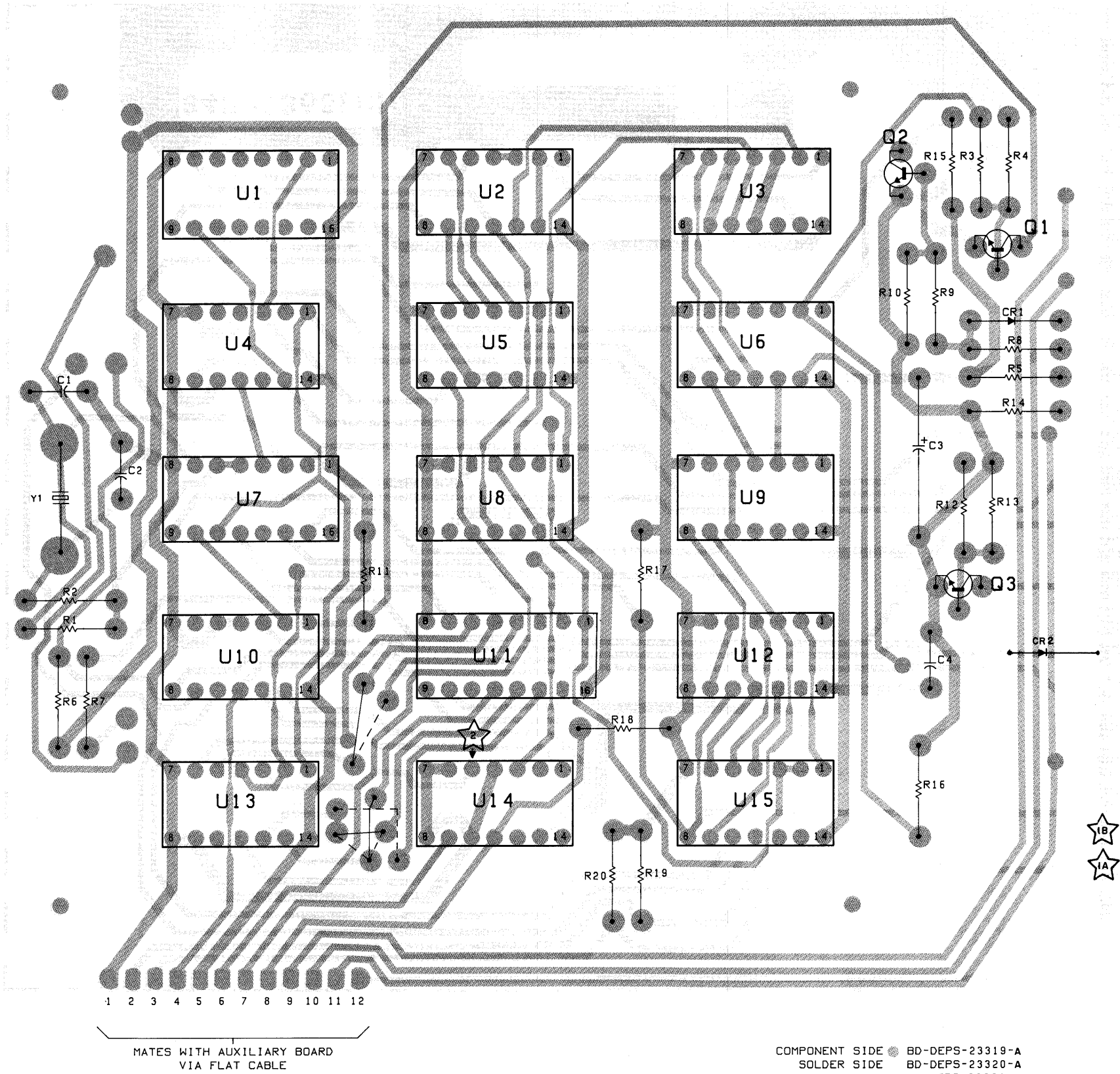
68P81035E62-B

(Sheet 1 of 4)

8/15/82-UP

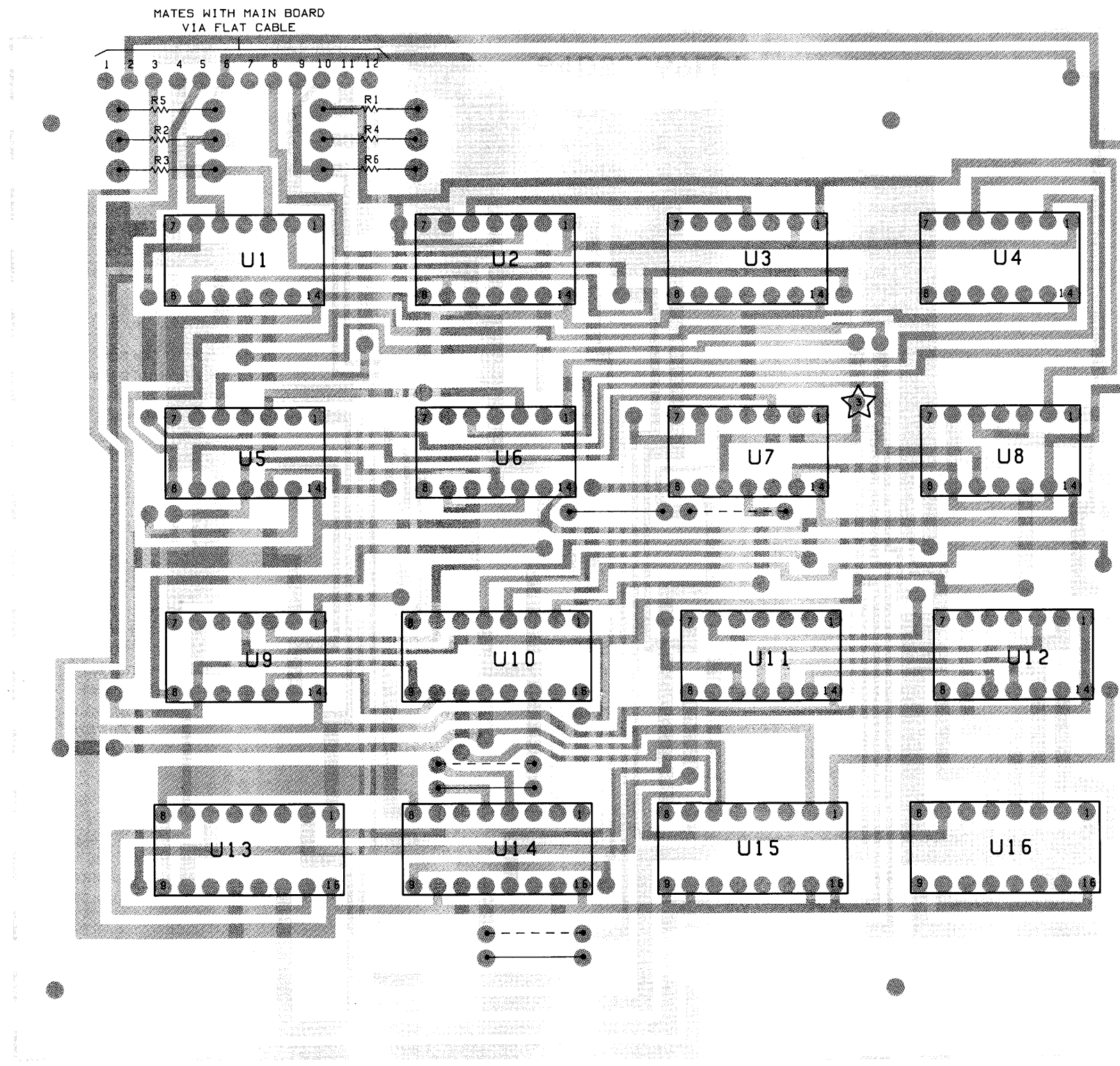
CODE DETECT MODULE

MODEL TLN5974A

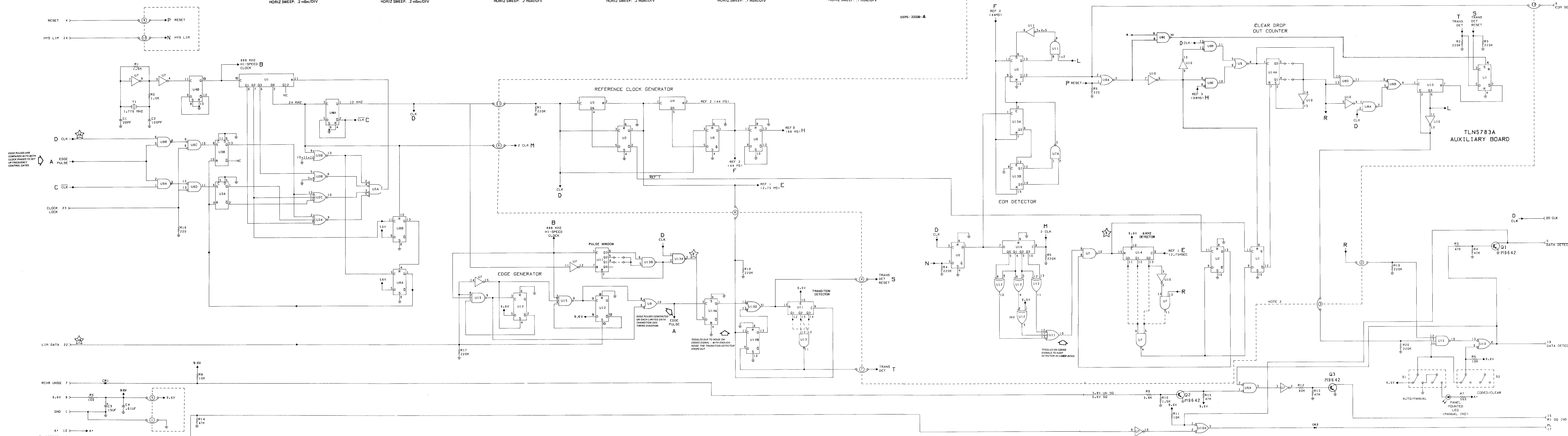
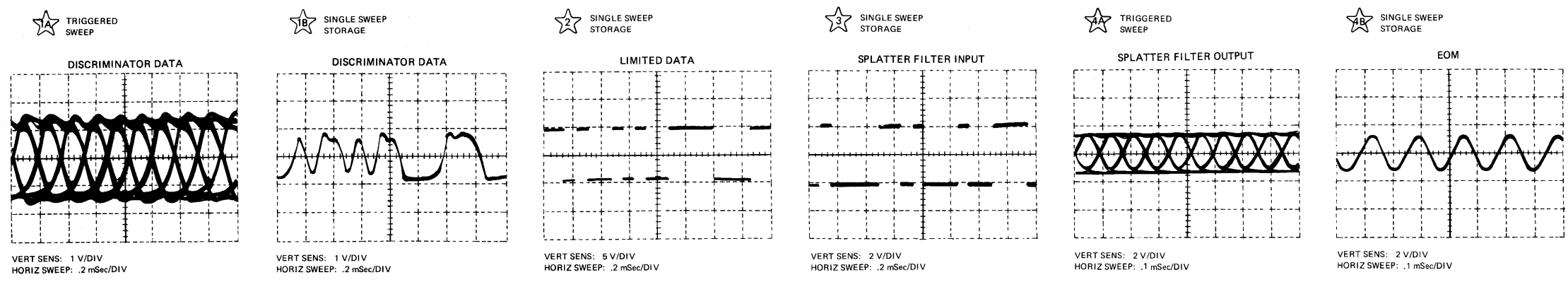


SHOWN FROM COMPONENT SIDE

MODEL TLN5783A



SHOWN FROM COMPONENT SIDE



- NOTES:
- UNLESS SPECIFIED OTHERWISE, ALL RESISTOR VALUES ARE IN OHMS AND CAPACITOR VALUES ARE IN MICROFARADS.
 - THE MODULE CONSISTS OF A TLN5783A MAIN BOARD AND A TLN5783A AUXILIARY BOARD. CIRCUITRY WITHIN THE DASHED LINES IS LOCATED ON THE AUX BOARD.
 - CONNECTORS BETWEEN THE TWO BOARDS ARE MADE ON A 12-CONDUCTOR FLAT CABLE. THESE CONNECTIONS ARE INDICATED AS FOLLOWS: $\text{---} \bigcirc \text{---}$
 - WAVEFORM TEST POINTS ARE INDICATED AS FOLLOWS: $\star$

MAIN BOARD IC DATA

IC REF. SYMBOL	TYPE	DESCRIPTION	SUPPLY VOLTAGE (VDD) PIN NO.	GROUND (VSS) PIN NO.
U1	CD4040	12-BIT BINARY COUNTER	16	8
U2	MC14020	TRIABLE 2-INPUT NOR	14	7
U3	MC14013	DUAL D F-F	14	7
U4	MC14013	DUAL D F-F	14	7
U5	MC14013	DUAL D F-F	14	7
U6	MC14013	DUAL D F-F	14	7
U7	MC14013	DUAL D F-F	14	7
U8	MC14013	DUAL D F-F	14	7
U9	MC14013	DUAL D F-F	14	7
U10	MC14013	DUAL D F-F	14	7
U11	MC14013	DUAL D F-F	14	7
U12	MC14013	DUAL D F-F	14	7
U13	MC14013	DUAL D F-F	14	7
U14	MC14013	DUAL D F-F	14	7
U15	MC14013	DUAL D F-F	14	7
U16	MC14013	DUAL D F-F	14	7

AUXILIARY BOARD IC DATA

IC REF. SYMBOL	TYPE	DESCRIPTION	SUPPLY VOLTAGE (VDD) PIN NO.	GROUND (VSS) PIN NO.
U1	MC14013	DUAL D F-F	14	7
U2	MC14013	DUAL D F-F	14	7
U3	MC14013	DUAL D F-F	14	7
U4	MC14013	DUAL D F-F	14	7
U5	MC14013	DUAL D F-F	14	7
U6	MC14013	DUAL D F-F	14	7
U7	MC14013	DUAL D F-F	14	7
U8	MC14013	DUAL D F-F	14	7
U9	MC14013	DUAL D F-F	14	7
U10	MC14013	DUAL D F-F	14	7
U11	MC14013	DUAL D F-F	14	7
U12	MC14013	DUAL D F-F	14	7
U13	MC14013	DUAL D F-F	14	7
U14	MC14013	DUAL D F-F	14	7
U15	MC14013	DUAL D F-F	14	7
U16	MC14013	DUAL D F-F	14	7

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
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PARTS LIST

TLN5974A Code Detector Module (Main Board) PL-5436-B

C1	21-82610C22	<u>CAPACITORS, fixed:</u> 20 uF ±5%; 200 V
C2	21-82610C44	100 uF ±5%; 100 V
C3	23-82783B24	15 uF ±10%; 25 V
C4	21-82428B12	.01 uF +70-30%; 100 V
CR1, CR2	48-83654H01	<u>DIODE: (SEE NOTE)</u> silicon
DS1	48-88245C08	<u>LIGHT EMITTING DIODE: (SEE NOTE)</u> red
Q1, 2, 3	48-869642	<u>TRANSISTOR: (SEE NOTE)</u> NPN; type M9642
R1	6-124B26	<u>RESISTORS: fixed, ±10%, 1/4W</u> unless otherwise stated
R2	6-124A53	1.5 meg ±5%
R3, 4	6-124C89	47k
R5	6-124C25	100
R6	6-124C73	10k
R7	6-124C43	560
R8	6-124C73	10k
R9	6-124C63	3.9k
R10	6-124C53	1.5k
R11	6-124C73	10k
R12	6-124C95	82k
R13, 14, 15	6-124C89	47k
R16 thru 20	6-124D06	220k
S1, 2	40-83204B01	<u>SWITCH, slide:</u> dpdt
U1	51-83627M14	<u>INTEGRATED CIRCUIT: (SEE NOTE)</u> type CD4040
U2	51-82884L17	type CD4025
U3, 4	51-82884L13	type CD4013
U5	51-82884L22	type 4002
U6	51-82884L04	type CD4001
U7	51-82884L02	type CD4049
U8	51-82884L13	type CD4013
U9	51-82884L05	type CD4011
U10	51-83627M17	type 74C00
U11	51-82884L07	type 14520
U12	51-82884L13	type CD4013
U13	51-82884L05	type CD4011
U14	51-82884L13	type CD4013
U15	51-82884L06	type CD4023
Y1	48-83853F03	<u>CRYSTAL</u> 1.78 MHz
MECHANICAL PARTS		
	3-8022	SCREW, machine; 4-40 x 1/4"; 8 used
	4-7683	WASHER, lock: #4 int.; 8 used
	55-84413E01	HINGE, stand-off
	1-80795B23	PANEL ASSEMBLY includes: ref. items S1, 2
	64-83365L01	PANEL
	1-80795B24	CIRCUIT BOARD ASSEMBLY includes:
	9-83011H01	RECEPTACLE, board mounting; 24 used
	43-84412E01	SPACER, threaded; 2 used
	45-83914G01	GUIDE, card; 2 used
	14-84583B02	INSULATOR

NOTE:

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

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
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TLN5783A Code Detect Module (Auxiliary Board) PL-5434-A

R1 thru 6	6-124D06	<u>RESISTORS, fixed:</u> 220k ±10%; 1/4 W
U1, 2	51-82884L13	<u>INTEGRATED CIRCUITS: (SEE NOTE)</u> type CD4013
U3, 4	51-82884L19	type 4024
U5, 6	51-82884L13	type CD4013
U7, 8	51-82884L05	type CD4011
U9	51-82884L04	type CD4001
U10	51-82884L02	type CD4049
U11	51-82884L06	type CD4023
U12	51-82884L18	type CD4030
U13, 14, 15	51-82884L07	type 14520
U16	51-82884L16	type CD4015
MECHANICAL PARTS		
	30-82906L03	CABLE, flat; 12 conductor

NOTE:

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

68P81035E62-B

(Sheet 4 of 4)

8/15/82-UP

F1 & F1-PL TONE DECODER MODULES

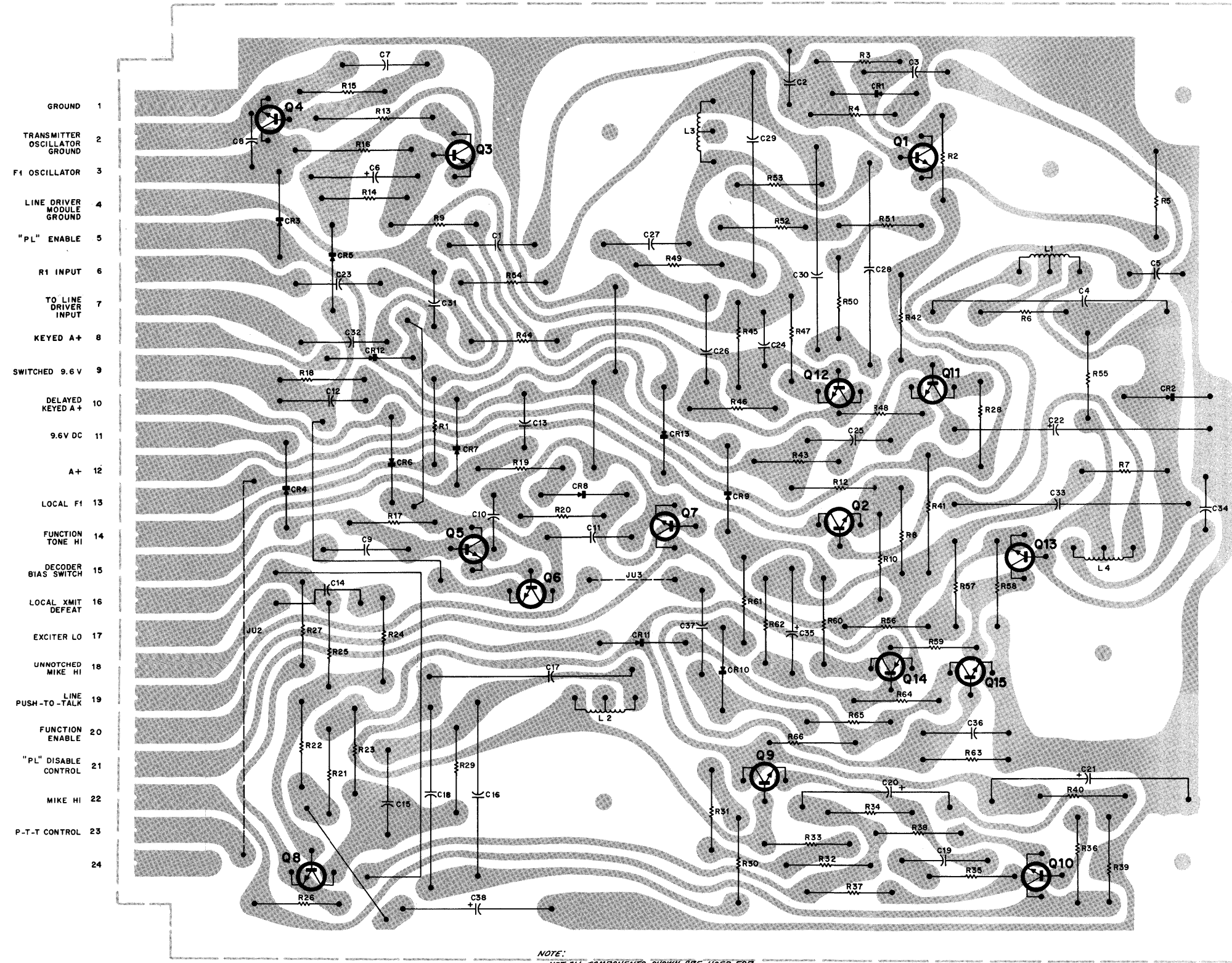
MODELS TLN4638A F1-PL
TLN4658A F1
TLN5293A F1 (4F)
TLN5294A F1-PL (4F)

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).

F1 & F1 "PL" TONE DECODER MODULES

PARTS LIST SHOWN ON BACK OF THIS PAGE
68P81016E19-N
10/5/82 - V & G

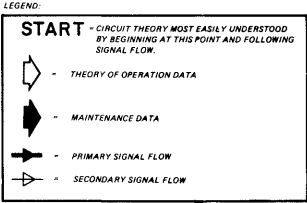
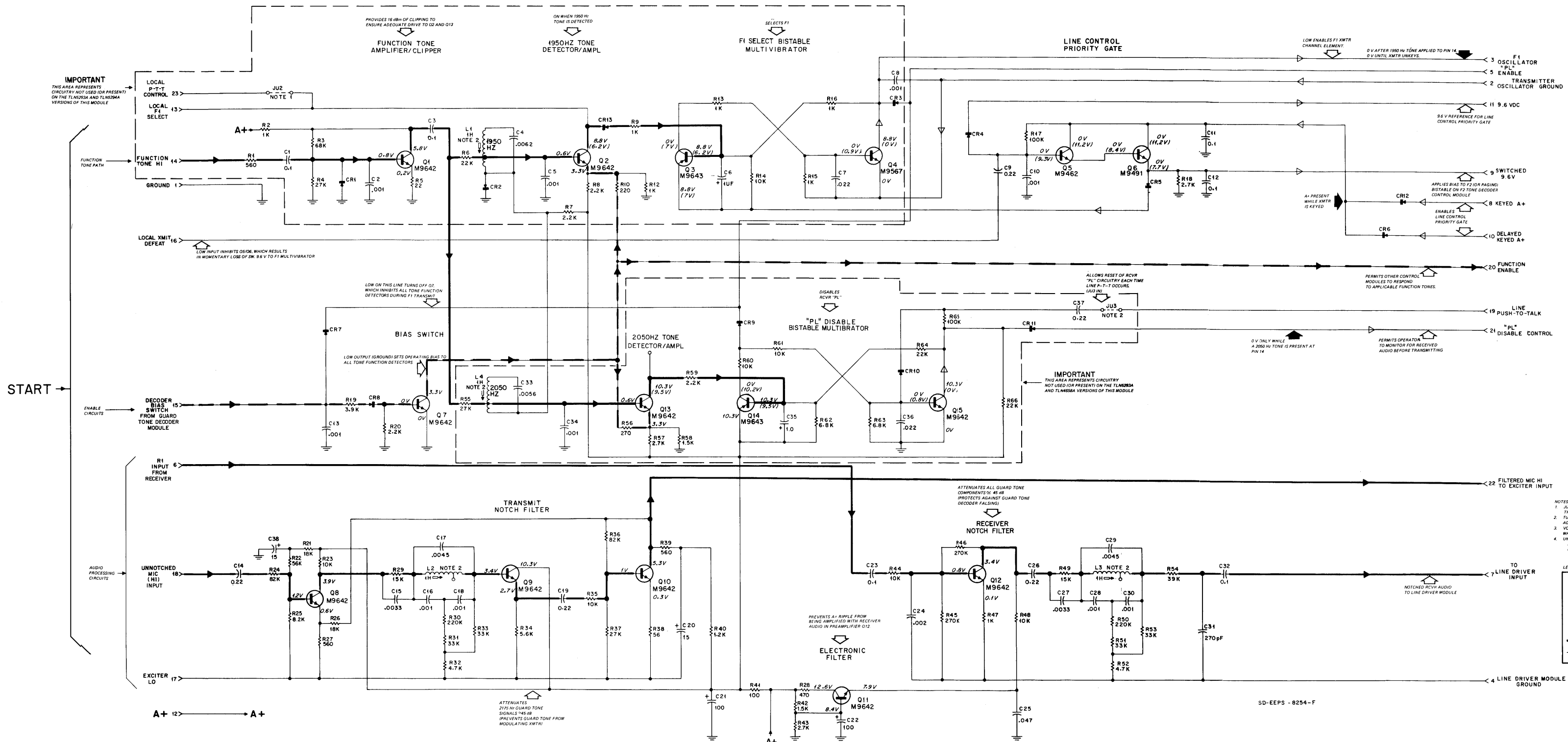


SHOWN FROM SOLDER SIDE

NOTE: NOT ALL COMPONENTS SHOWN ARE USED FOR EACH MODULE. REFER TO SCHEMATIC DIAGRAM FOR COMPONENT-MODULE IDENTIFICATION.

SD-DEPS-8256-0

OL-DEPS-8256-B



parts list

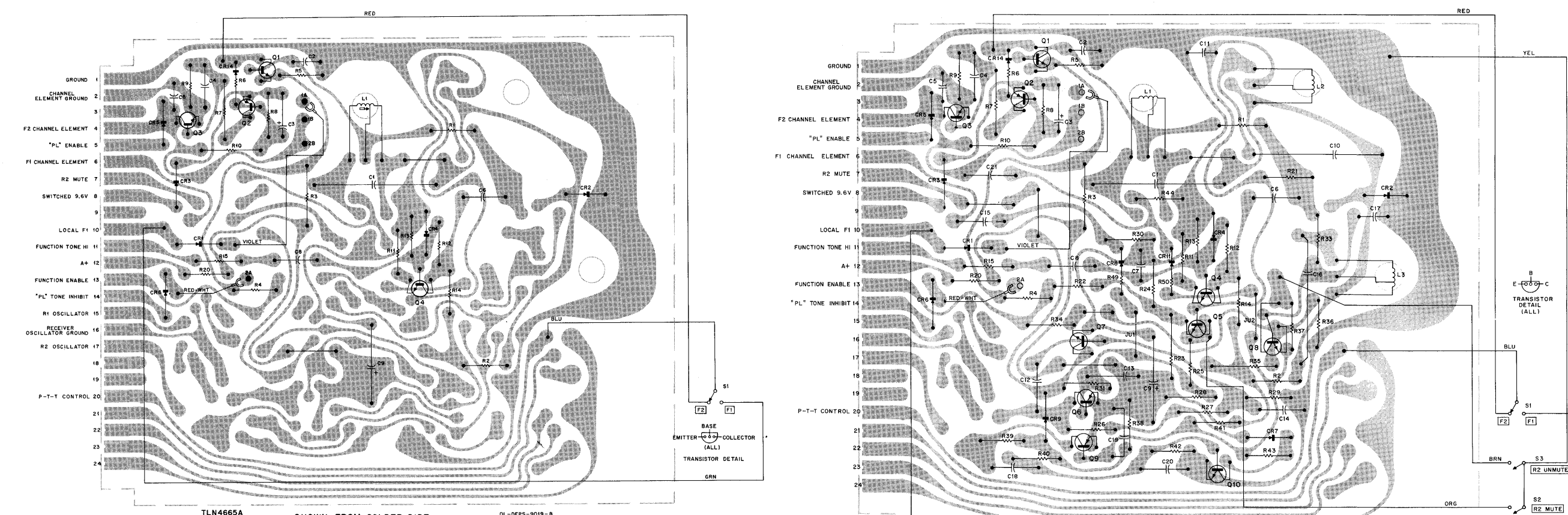
TLN4658A F1 Control Module
 TLN4638A F1 *Private-Line* Control Module
 TLN5293A F1 Control Module
 TLN5294A F1 *Private-Line* Control Module

PL-1798-G

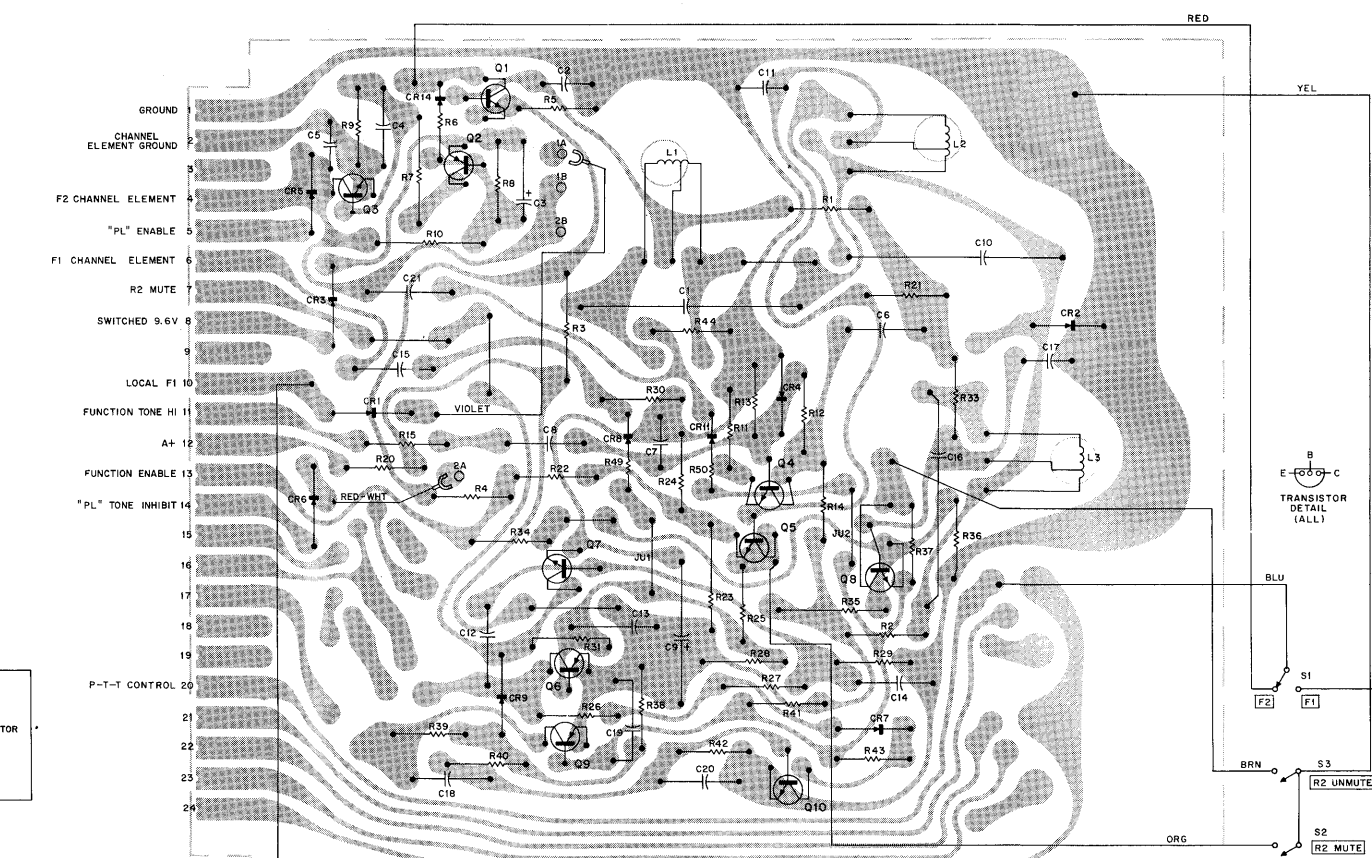
REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		capacitor, fixed: $\mu\text{F} \pm 10\%$; 50 V unless otherwise stated:
C1	8-82905G07	0.1
C2	21-82187B29	.001; 100 V
C3	8-82905G07	0.
C4	8-84326A14	.006 $\pm 2\%$
C5	21-82187B29	.001; 100 V
C6	23-82783B08	1 $\pm 20\%$; 35 V
C7	8-82905G02	.022
C8	21-82187B29	.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 $\pm 1\%$
C18	8-82284C01	.001
C19	8-82905G11	0.22
C20	23-865136	15 $\pm 20\%$; 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 $\pm 1\%$
C30	8-82284C01	.001
C31	21-82187B22	270 pF; 200 V
C32	8-82905G07	0.1
C33	8-84326A13	.0056 $\pm 2\%$
C34	21-82187B29	.001; 100 V
C35	23-82783B08	1 $\pm 20\%$; 35 V
C36	8-82905G02	.022
C37	8-82905G11	0.22
C38	23-865136	15 $\pm 20\%$; 25 V
CR1 thru 13	48-83654H01	semiconductor device, diode (see note) silicon
L1 thru 4	1V80702B11	reactor: (factory-adjusted) res. 40 ohms $\pm 10\%$; includes grounding clip
Q1, 2	48-869642	transistor: (see note) 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
R1	6-11009C43	resistor, fixed; $\pm 5\%$; 1/4 W; unless otherwise stated: 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

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
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 $\pm 5\%$
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

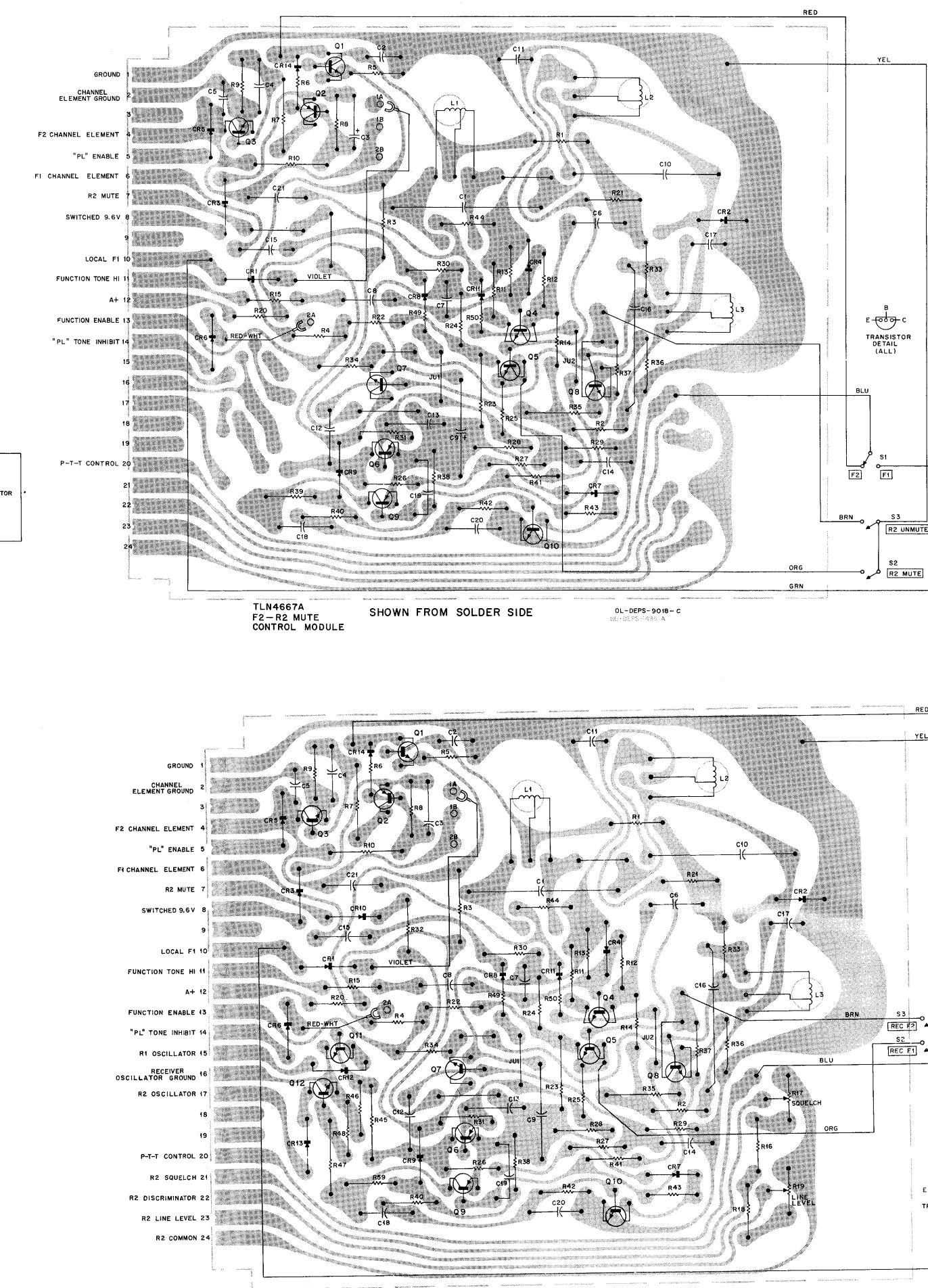
note: Replacement diodes and transistors must be ordered by Motorola part number only for optimum performance.



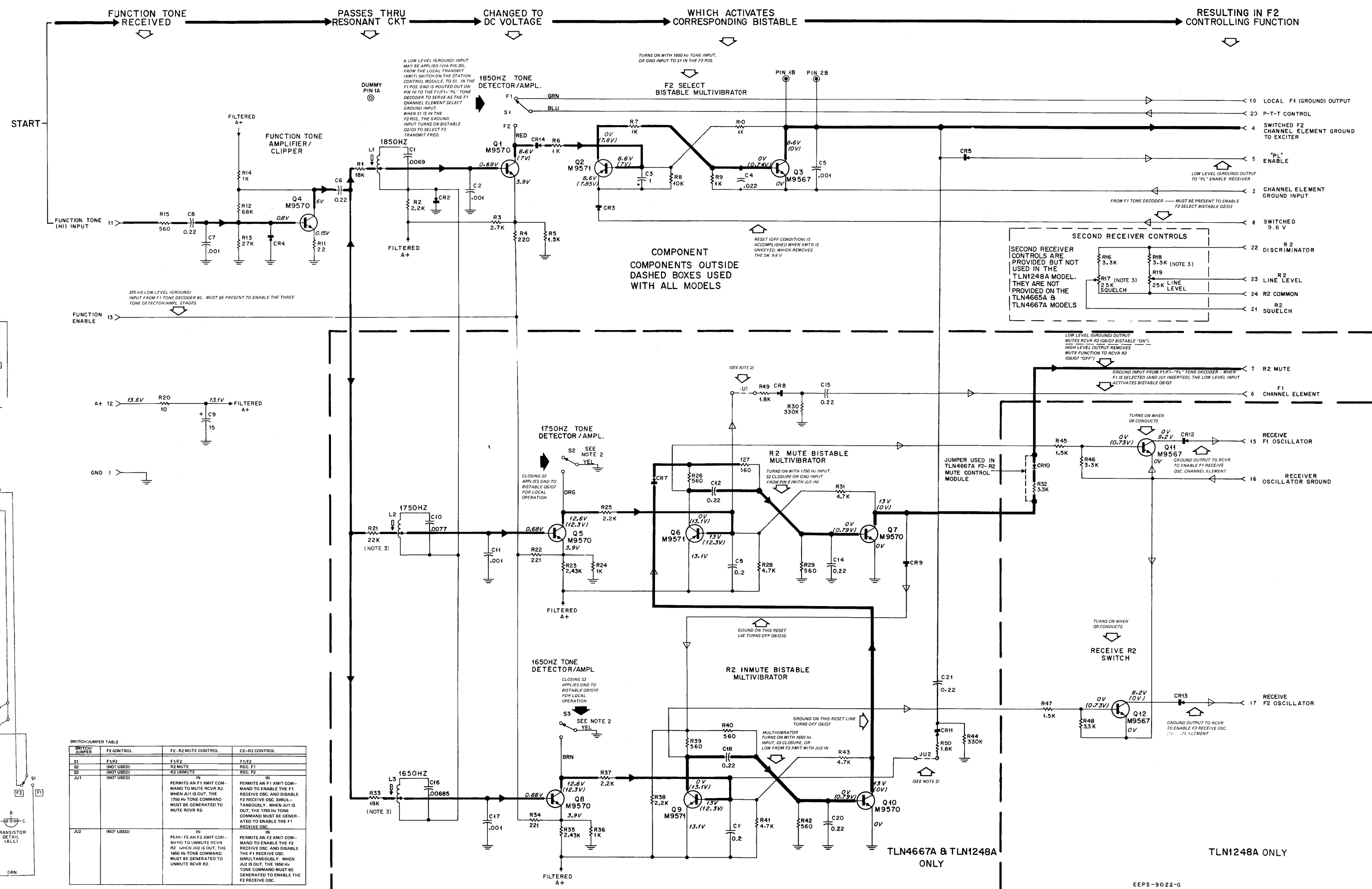
TLN4665A F2 CONTROL MODULE SHOWN FROM SOLDER SIDE OL-DEPS-9018-B (REV. 10/78)



TLN4667A F2-R2 MUTE CONTROL MODULE SHOWN FROM SOLDER SIDE OL-DEPS-9018-B (REV. 10/78)



TLN4248A C2-R2 CONTROL MODULE SHOWN FROM SOLDER SIDE OL-DEPS-1000-E (REV. 10/78)



SWITCH/JUMPER TABLE

Model	F2 CONTROL	F2-R2 MUTE CONTROL	C2-R2 CONTROL
S1	F2 CONTROL	F2-R2 MUTE CONTROL	C2-R2 CONTROL
S2	NOT USED	NOT USED	NOT USED
S3	NOT USED	NOT USED	NOT USED
J1	NOT USED	NOT USED	NOT USED
J2	NOT USED	NOT USED	NOT USED
J3	NOT USED	NOT USED	NOT USED
J4	NOT USED	NOT USED	NOT USED
J5	NOT USED	NOT USED	NOT USED
J6	NOT USED	NOT USED	NOT USED
J7	NOT USED	NOT USED	NOT USED
J8	NOT USED	NOT USED	NOT USED
J9	NOT USED	NOT USED	NOT USED
J10	NOT USED	NOT USED	NOT USED
J11	NOT USED	NOT USED	NOT USED
J12	NOT USED	NOT USED	NOT USED
J13	NOT USED	NOT USED	NOT USED
J14	NOT USED	NOT USED	NOT USED
J15	NOT USED	NOT USED	NOT USED
J16	NOT USED	NOT USED	NOT USED
J17	NOT USED	NOT USED	NOT USED
J18	NOT USED	NOT USED	NOT USED
J19	NOT USED	NOT USED	NOT USED
J20	NOT USED	NOT USED	NOT USED
J21	NOT USED	NOT USED	NOT USED
J22	NOT USED	NOT USED	NOT USED
J23	NOT USED	NOT USED	NOT USED
J24	NOT USED	NOT USED	NOT USED
J25	NOT USED	NOT USED	NOT USED
J26	NOT USED	NOT USED	NOT USED
J27	NOT USED	NOT USED	NOT USED
J28	NOT USED	NOT USED	NOT USED
J29	NOT USED	NOT USED	NOT USED
J30	NOT USED	NOT USED	NOT USED
J31	NOT USED	NOT USED	NOT USED
J32	NOT USED	NOT USED	NOT USED
J33	NOT USED	NOT USED	NOT USED
J34	NOT USED	NOT USED	NOT USED
J35	NOT USED	NOT USED	NOT USED
J36	NOT USED	NOT USED	NOT USED
J37	NOT USED	NOT USED	NOT USED
J38	NOT USED	NOT USED	NOT USED
J39	NOT USED	NOT USED	NOT USED
J40	NOT USED	NOT USED	NOT USED
J41	NOT USED	NOT USED	NOT USED
J42	NOT USED	NOT USED	NOT USED
J43	NOT USED	NOT USED	NOT USED
J44	NOT USED	NOT USED	NOT USED
J45	NOT USED	NOT USED	NOT USED
J46	NOT USED	NOT USED	NOT USED
J47	NOT USED	NOT USED	NOT USED
J48	NOT USED	NOT USED	NOT USED
J49	NOT USED	NOT USED	NOT USED
J50	NOT USED	NOT USED	NOT USED
J51	NOT USED	NOT USED	NOT USED
J52	NOT USED	NOT USED	NOT USED
J53	NOT USED	NOT USED	NOT USED
J54	NOT USED	NOT USED	NOT USED
J55	NOT USED	NOT USED	NOT USED
J56	NOT USED	NOT USED	NOT USED
J57	NOT USED	NOT USED	NOT USED
J58	NOT USED	NOT USED	NOT USED
J59	NOT USED	NOT USED	NOT USED
J60	NOT USED	NOT USED	NOT USED
J61	NOT USED	NOT USED	NOT USED
J62	NOT USED	NOT USED	NOT USED
J63	NOT USED	NOT USED	NOT USED
J64	NOT USED	NOT USED	NOT USED
J65	NOT USED	NOT USED	NOT USED
J66	NOT USED	NOT USED	NOT USED
J67	NOT USED	NOT USED	NOT USED
J68	NOT USED	NOT USED	NOT USED
J69	NOT USED	NOT USED	NOT USED
J70	NOT USED	NOT USED	NOT USED
J71	NOT USED	NOT USED	NOT USED
J72	NOT USED	NOT USED	NOT USED
J73	NOT USED	NOT USED	NOT USED
J74	NOT USED	NOT USED	NOT USED
J75	NOT USED	NOT USED	NOT USED
J76	NOT USED	NOT USED	NOT USED
J77	NOT USED	NOT USED	NOT USED
J78	NOT USED	NOT USED	NOT USED
J79	NOT USED	NOT USED	NOT USED
J80	NOT USED	NOT USED	NOT USED
J81	NOT USED	NOT USED	NOT USED
J82	NOT USED	NOT USED	NOT USED
J83	NOT USED	NOT USED	NOT USED
J84	NOT USED	NOT USED	NOT USED
J85	NOT USED	NOT USED	NOT USED
J86	NOT USED	NOT USED	NOT USED
J87	NOT USED	NOT USED	NOT USED
J88	NOT USED	NOT USED	NOT USED
J89	NOT USED	NOT USED	NOT USED
J90	NOT USED	NOT USED	NOT USED
J91	NOT USED	NOT USED	NOT USED
J92	NOT USED	NOT USED	NOT USED
J93	NOT USED	NOT USED	NOT USED
J94	NOT USED	NOT USED	NOT USED
J95	NOT USED	NOT USED	NOT USED
J96	NOT USED	NOT USED	NOT USED
J97	NOT USED	NOT USED	NOT USED
J98	NOT USED	NOT USED	NOT USED
J99	NOT USED	NOT USED	NOT USED
J100	NOT USED	NOT USED	NOT USED

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

Model	Version	Board	Panel	Version
TLN4665A	F2 Control	TLN4048A	TLN4049A	1
TLN4667A	F2-R2 Mute Control	TLN4044A	TLN4056A	2
TLN1248A	C2-R2 Control	---	---	3
TLN1253A	Paging Control	---	---	---

MODEL COMPLEMENT

Model	Version	Board	Panel	Version
TLN4665A	F2 Control	TLN4048A	TLN4049A	1
TLN4667A	F2-R2 Mute Control	TLN4044A	TLN4056A	2
TLN1248A	C2-R2 Control	---	---	3
TLN1253A	Paging Control	---	---	---

PARTS LIST SHOWN ON BACK

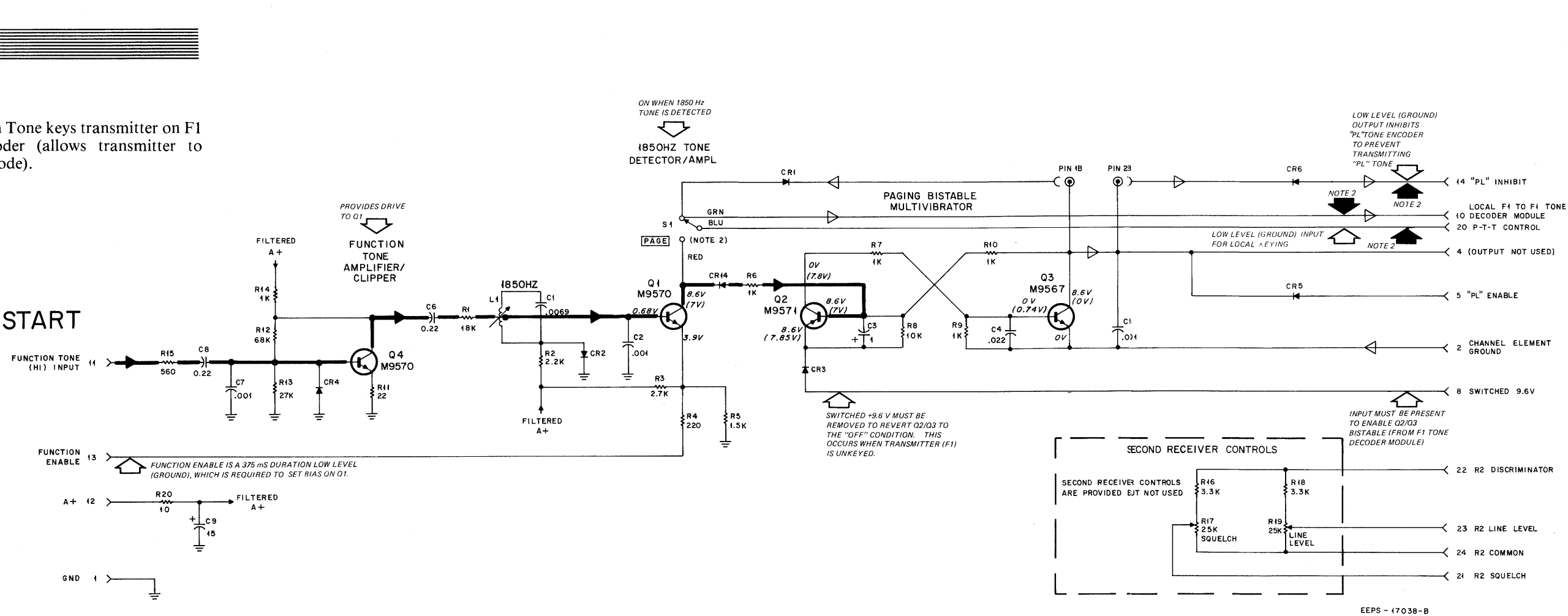
68P81016E39-J
 (Sheet 1 of 2)
 7/15/83-PHI

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).

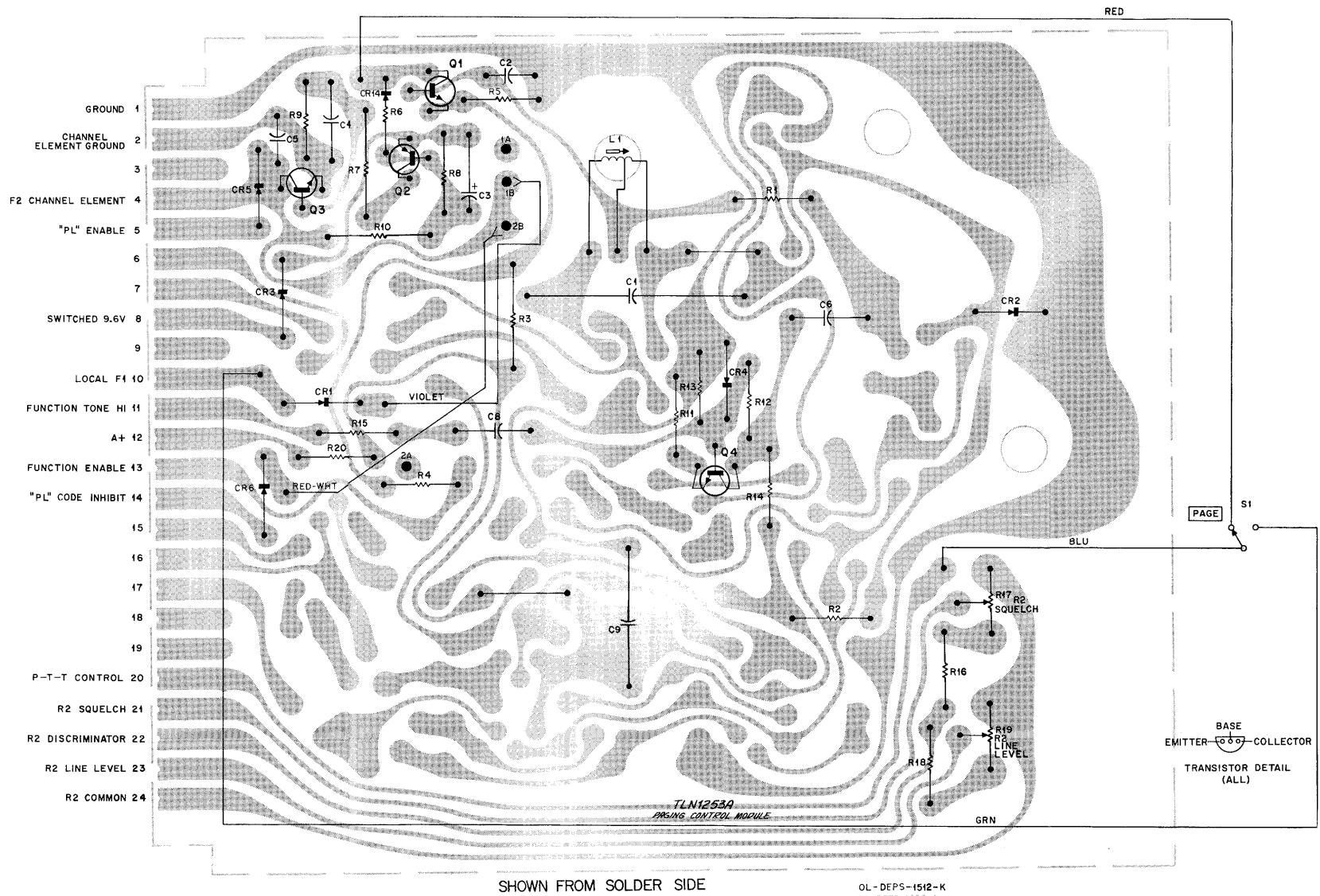


parts list

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
C1	8-84326A15	capacitor, fixed: uF ± 10%; 50 V: unless otherwise stated
C2	21-82187B29	.0069 ± 2%
C3	23-82783B06	.001; 100 V
C4	8-82905G02	1 ± 20%; 35 V
C5	21-82187B29	.022
C6	8-82905G11	.001; 100 V
C7	21-82187B29	.022
C8	8-82905G11	.001; 100 V
C9	23-865136	15 ± 20%; 25 V
C10	8-84326A16	.0077 ± 2%
C11	21-82187B29	.001; 100 V
C12 thru 15	8-82905G11	.022
C16	8-84326A17	.00865 ± 2%
C17	21-82187B29	.001; 100 V
C18 thru 21	8-82905G11	.022
CR1 thru 14	48-82392B03	semiconductor device, diode: (see note) silicon
L1 thru 3	1-80702B11	coil assembly, inductor: 1H; incl. ground clip
Q1	48-869570	transistor: (see note) 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	PNP; type M9571
Q10	48-869570	NPN; type M9570
Q11, 12	48-869567	NPN; type M9567
R1	6-11009C79	resistor, fixed: ± 5%; 1/4 W: unless otherwise stated
R2	6-11009C57	18k
R3	6-5652	2.2k
R4	6-11009C33	220
R5	6-11009C53	2.7k; 1/2 W
R6	6-11009C49	1.5k
R7	6-6229	1k
R8	6-11009C73	1k; 1/2 W
R9	6-11009C49	10k
R10	6-6229	1k
R11	6-11009C09	1k; 1/2 W
R12	6-11009C93	22
R13	6-11009C93	68k
R14	6-11009C83	27k
R15	6-11009C49	1k
R16	6-11009C43	560
R17	6-11009C61	3.3k
R18	18-83083G03	var: 25k
R19	6-11009C61	3.3k
R20	18-83083G03	var: 25k
R21	6-11009C01	10
R22	6-129667	22k
R23	6-84444A07	221 ± 1%
R24	6-84444A09	2.43 ± 1%
R25	6-11009C49	1k
R26, 27	6-11009C57	2.2k
R28	6-11009C43	560
R29	6-11009C65	4.7k
R30	6-11009C43	560
R31	6-11009D10	330k
R32	6-11009C65	4.7k
R33	6-11009C61	3.3k
R34	6-11009C79	18k
R35	6-84444A07	221 ± 1%
R36	6-84444A08	2.21k ± 1%
R37, 38	6-11009C49	1k
R39, 40	6-11009C57	2.2k
R41	6-11009C43	560
R42	6-11009C65	4.7k
R43	6-11009C43	560
R44	6-11009C65	4.7k
R45	6-11009D10	330k
R46	6-6038	1.5k; 1/2 W
R47	6-11009C61	3.3k
R48	6-6038	1.5k; 1/2 W
S1	40-83204B01	switch, slide: spdt
S2, 3	40-83468E01	dpst
non-referenced items		
1-80729B37	PANEL ASSY., incl. ref. parts S1, S2 & S3 (Model TLN4667A)	
1-80728B43	PANEL ASSY., incl. ref. part S1 (Model TLN4665A)	

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
1-80702B25	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	

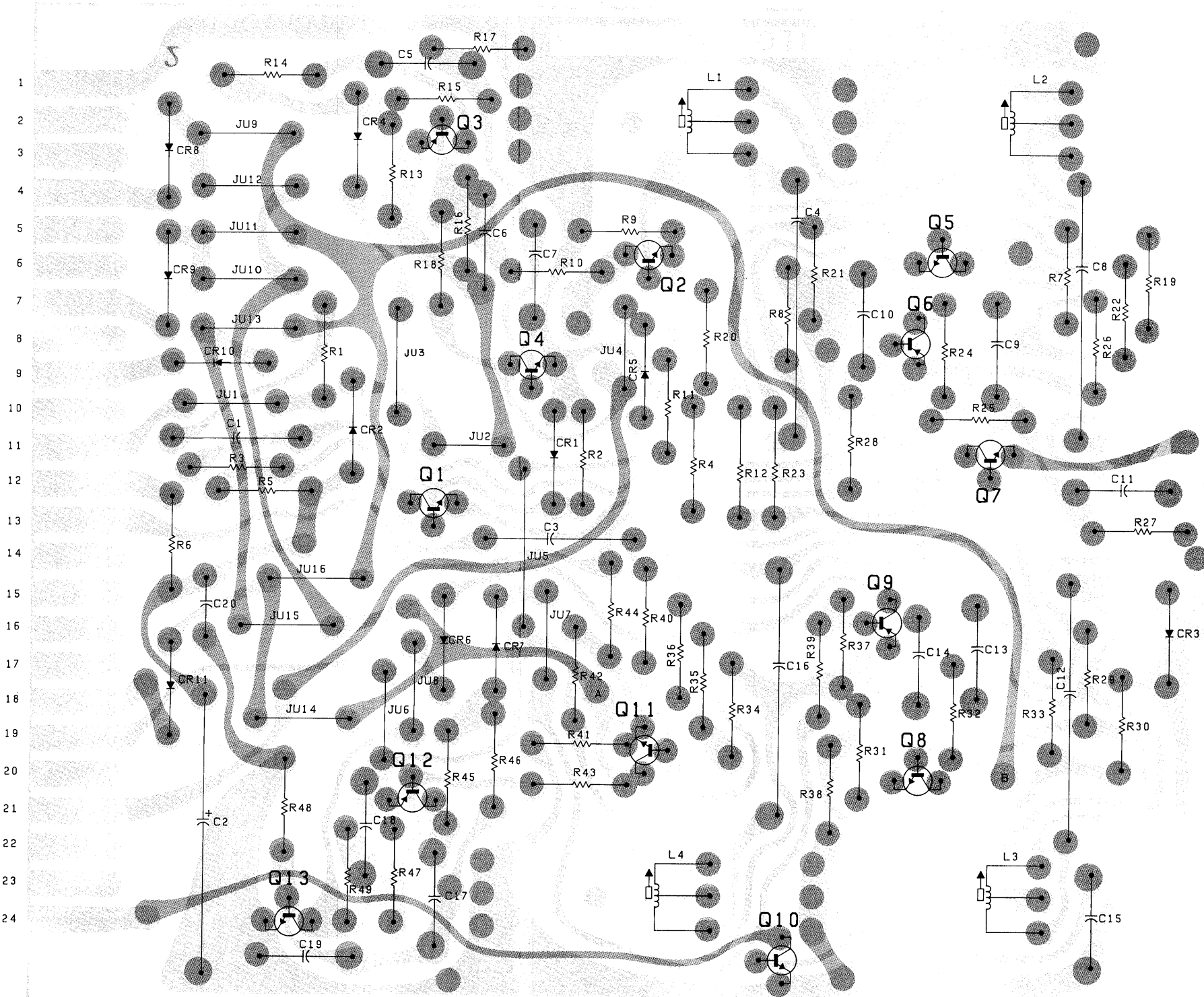
note: For optimum performance, diodes, transistors, and integrated circuits must be ordered by Motorola part numbers.



SHOWN FROM SOLDER SIDE

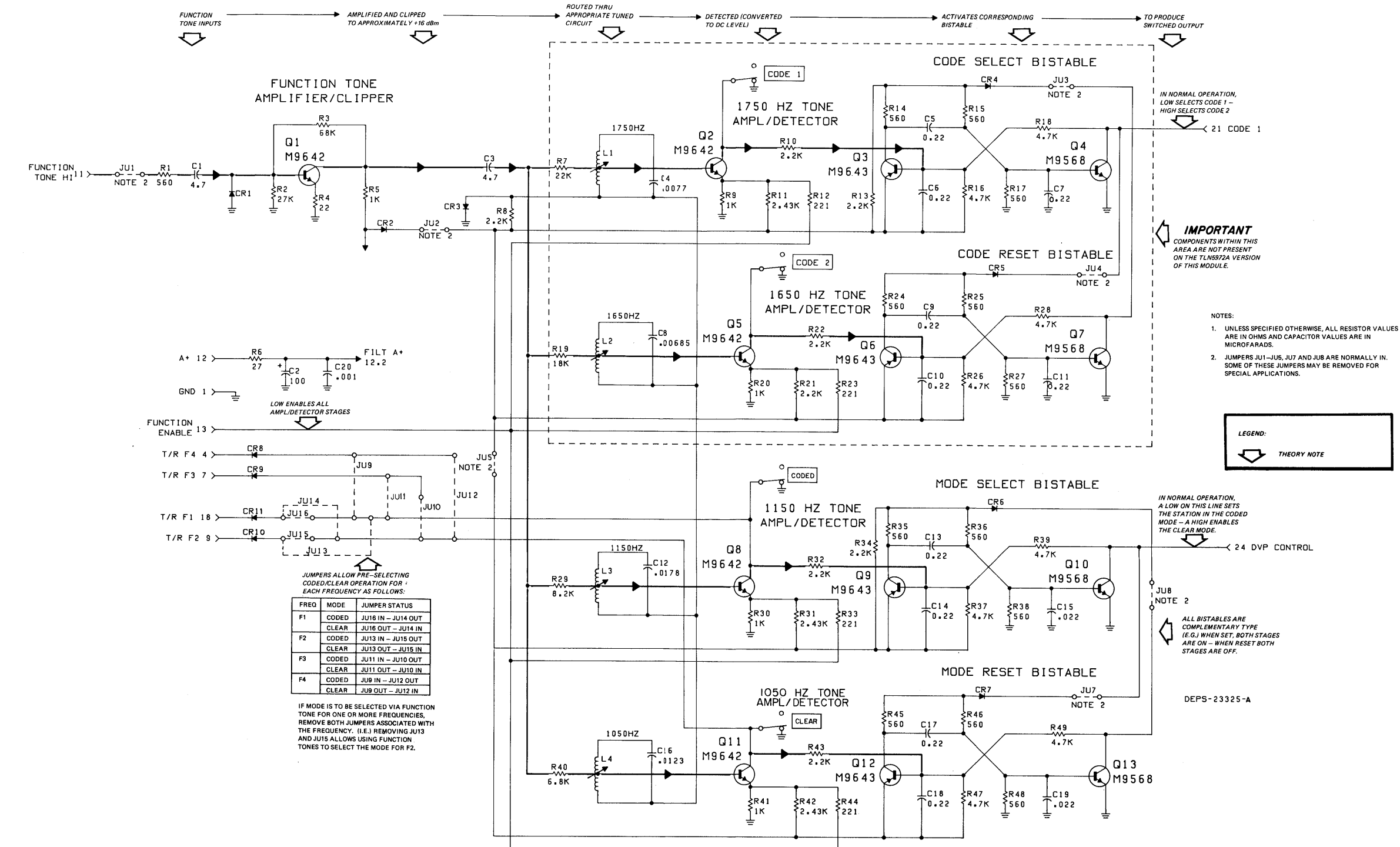
OL-DEPS-1512-K

CU-3000-1000-A



SHOWN FROM SOLDER SIDE

COMPONENT SIDE BD-DEPS-23313-0
SOLDER SIDE BD-DEPS-23314-0
OL-DEPS-23312-A



DVP CONTROL MODULE

MODEL TLN5972A

CODE SELECT MODULE

MODEL TLN5978A

FUNCTION

TLN5972A DVP Control Module -- converts control tones to a switched output used to set the station in the coded or clear mode.

- 1150 Hz selects the coded mode
- 1050 Hz selects the clear mode

TLN5978A Code Select Module -- in addition to the functions provided by the TLN5972A version, this module provides code selection capability as follows:

- 1750 Hz selects code 1
- 1650 Hz selects code 2

PARTS LIST SHOWN ON BACK
68P81035E61-A
2/15/78-UP

DVP CONTROL & CODE SELECT MODULE

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
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PARTS LIST

TLN5972A DVP Control Module
TLN5978A Code Select Module

PL-5439-O

		<u>CAPACITORS, fixed: $\mu F \pm 10\%$;</u> 50 V; unless otherwise stated
C1	23-865137	4.7 $\pm 20\%$; 25 V
C2	23-82601A25	100 $\pm 150-10\%$; 20 V
C3	23-865137	4.7 $\pm 20\%$; 25 V
C4	8-84326A16	.0077 $\pm 2\%$ (TLN5978A only)
C5,6,7	8-82905G11	.22 (TLN5978A only)
C8	8-84326A17	.00865 $\pm 2\%$ (TLN5978A only)
C9,10,11	8-82905G11	.22 (TLN5978A only)
C12	8-84326A22	.0178 $\pm 2\%$
C13,14	8-82905G11	.22
C15	8-82905G02	.022
C16	8-84326H23	.0213 $\pm 2\%$
C17,18	8-82905G11	.22
C19	8-8295G02	.022
C20	21-82187B29	1000; 100 V
		<u>DIODES: (SEE NOTE)</u>
CR1,2,3	48-83654H01	silicon
CR4,5	48-83654H01	silicon (TLN5978A only)
CR6 thru 11	48-83654H01	silicon
		<u>COILS, variable</u>
L1,2	24-84200A01	1.005 μH (TLN5978A only)
L3,4	24-84200A01	1.005 μH
		<u>TRANSISTORS: (SEE NOTE)</u>
Q1	48-869642	NPN; type M9642
Q2	48-869642	NPN; type M9642 (TLN5978A only)
Q3	48-869643	PNP; type M9643 (TLN5978A only)
Q4	48-869568	NPN; type M9568 (TLN5978A only)
Q5	48-869642	NPN; type M9642 (TLN5978A only)
Q6	48-869643	PNP; type M9643 (TLN5978A only)
Q7	48-869568	NPN; type M9568 (TLN5978A only)
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
		<u>RESISTORS: fixed; $\pm 10\%$; 1/4 W</u> unless otherwise stated
R1	6-124C43	560
R2	6-124C83	27k
R3	6-124C93	68k
R4	6-124A09	22 $\pm 5\%$
R5	6-124A49	1k $\pm 5\%$
R6	6-124C11	27
R7	6-124C57	2.2k (TLN5978A only)
R8	6-124C57	2.2k
R9	6-124A49	1k $\pm 5\%$ (TLN5978A only)
R10	6-124C57	2.2k
R11	6-84444A09	2.43k $\pm 1\%$ (TLN5978A only)
R12	6-84444A07	221 $\pm 1\%$ (TLN5978A only)
R13	6-124C57	2.2k (TLN5978A only)
R14,15	6-124C43	560 (TLN5978A only)
R16	6-124C65	4.7k (TLN5978A only)
R17	6-124C43	560 (TLN5978A only)
R18	6-124C65	4.7k (TLN5978A only)
R19	6-124A79	18k $\pm 5\%$ (TLN5978A only)
R20	6-124A49	1k $\pm 5\%$ (TLN5978A only)
R21	6-84444A08	2.21k $\pm 1\%$ (TLN5978A only)
R22	6-124C57	2.2 (TLN5978A only)
R23	6-84444A07	221 $\pm 1\%$ (TLN5978A only)
R24,25	6-124C43	560 (TLN5978A only)
R26	6-124C65	4.7k (TLN5978A only)
R27	6-124C43	560 (TLN5978A only)
R28	6-124C65	4.7k (TLN5978A only)
R29	6-124A71	8.2k $\pm 5\%$
R30	6-124A49	1k $\pm 5\%$
R31	6-84444A09	2.43k $\pm 1\%$
R32	6-124C57	2.2k
R33	6-84444A07	221 $\pm 1\%$

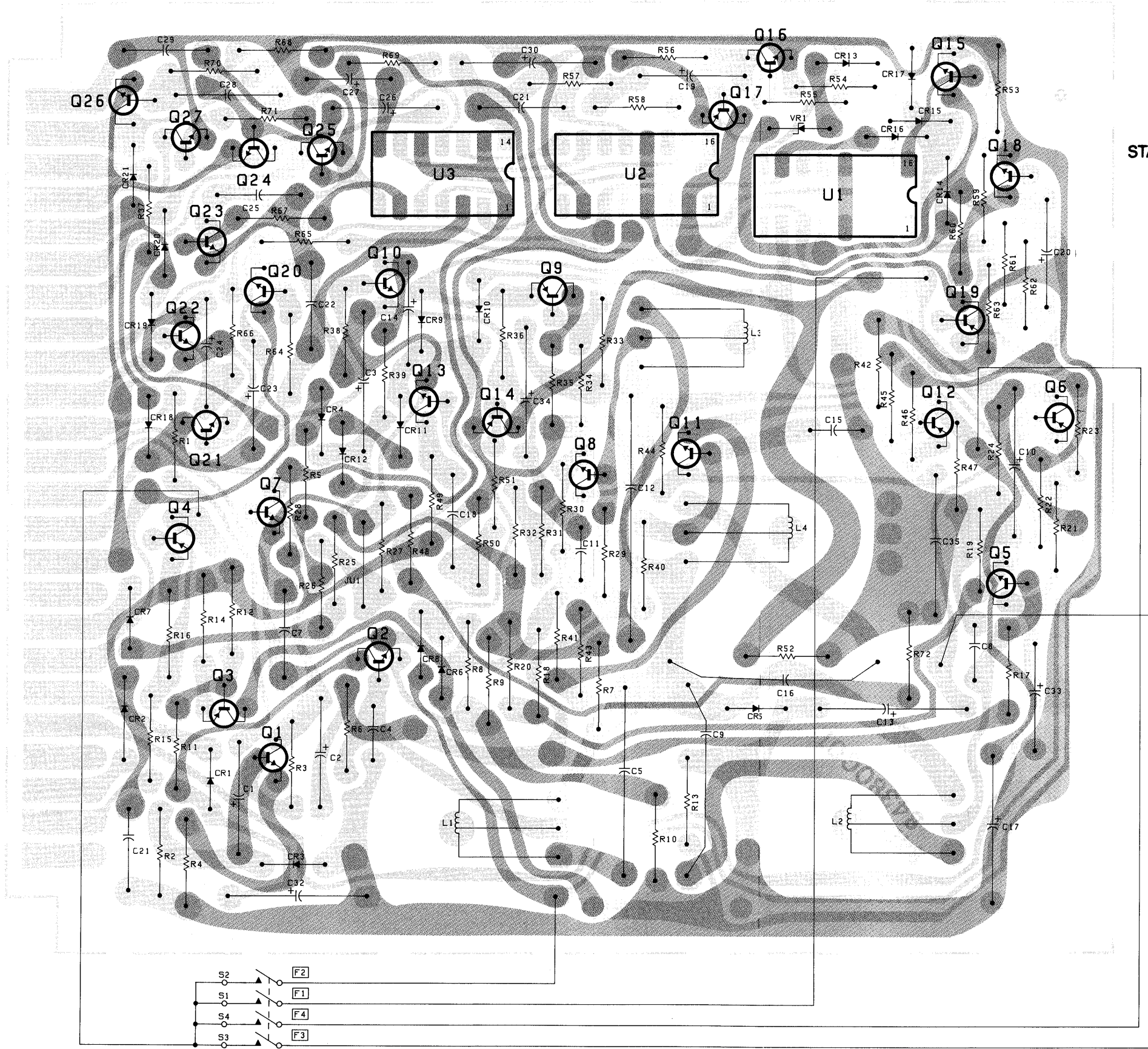
REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
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R34	6-124C57	22k
R35,36	6-124C43	560
R37	6-124C65	4.7k
R38	6-124C43	560
R39	6-124C65	4.7k
R40	6-124A69	6.8k $\pm 5\%$
R41	6-124A49	1k $\pm 5\%$
R42	6-84444A09	2.43k $\pm 1\%$
R43	6-124C57	2.2k
R44	6-84444A07	221 $\pm 1\%$
R45,46	6-124C43	560
R47	6-124C65	4.7k
R48	6-124C43	560
R49	6-124C65	4.7k
		<u>SWITCHES, slide</u>
S1 thru 4	40-83204B01	dpdt
MECHANICAL PARTS		
	1-80702B11	INDUCTOR ASSEMBLY: 2 or 4 used includes: reference items L1-L4
	42-84315A01	CLIP, grounding
	3-8022	SCREW, machine: 4-40 x 1/4"; 2 used
	4-7683	WASHER, lock #4 int.; 2 used
	45-83914G01	GUIDE, card; 2 used
	1-80795B27	CIRCUIT BOARD ASSEMBLY includes:
	9-83011H11	RECEPTACLE, board mounting; 24 used
	43-865080	BUSHING, threaded; 2 used
	1-80795B28	PANEL ASSEMBLY includes: ref. items S1 thru S4

NOTE:

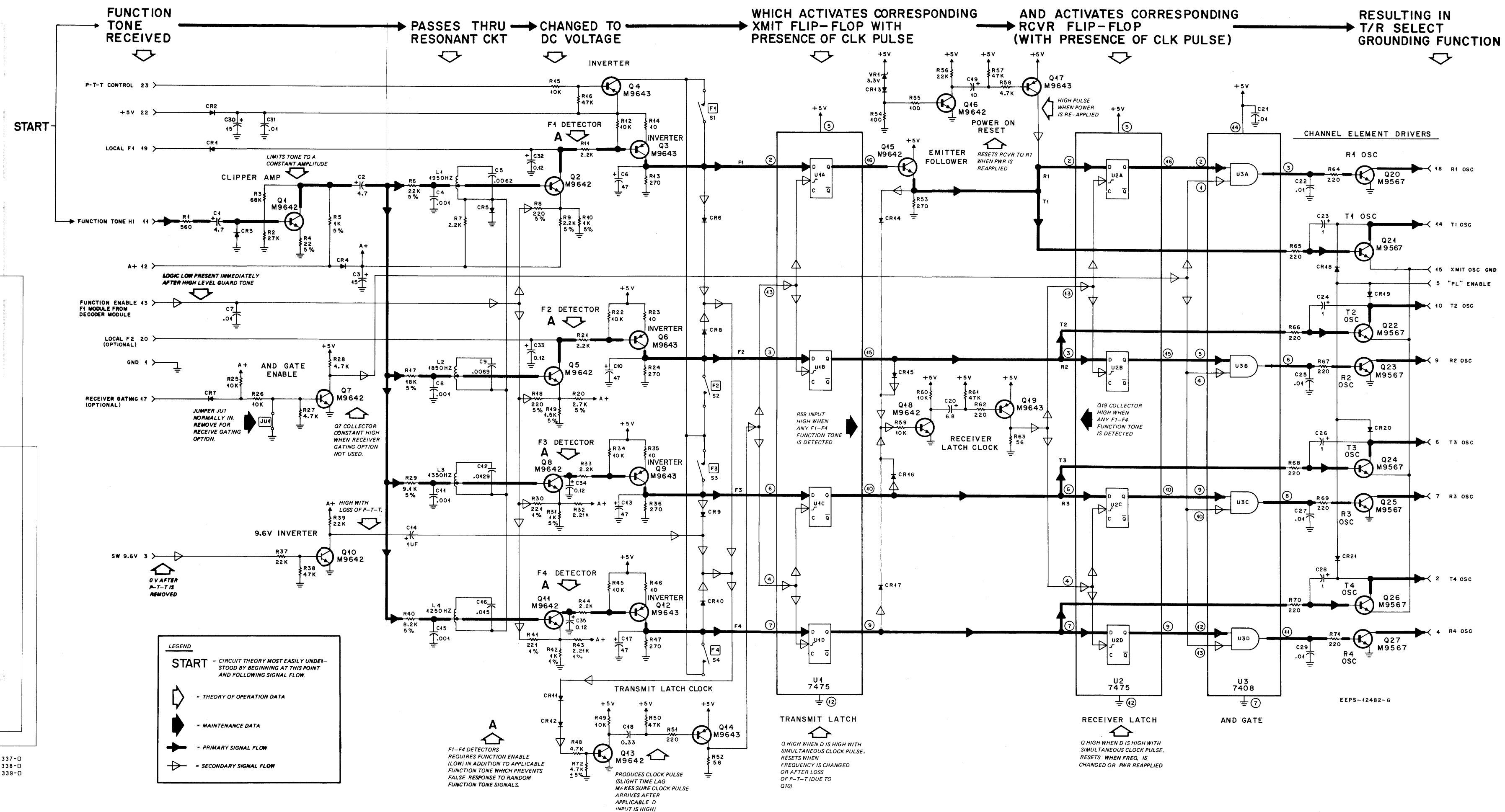
For optimum performance, diodes, transistors, and integrated circuits must be ordered by Motorola part numbers.

GND 1
T4 OSC 2
SW 9.6V 3
R4 OSC 4
"PL" ENABLE 5
T3 OSC 6
R3 OSC 7
8
R2 OSC 9
T2 OSC 10
FUNCTION TONE HI 11
A+ 12
FUNCTION ENABLE 13
T1 OSC 14
TRANSMIT OSC GND 15
16
17
R1 OSC 18
LOCAL F1 19
LOCAL F2 20
21
+5V 22
P-T-T CONTROL 23
24



SHOWN FROM SOLDER SIDE

SOLDER SIDE BD-DEPS-21337-0
COMPONENT SIDE BD-DEPS-21338-0
OL-DEPS-21339-0



FUNCTION

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

FUNCTION TABLE

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.

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 COM-
MAND IS INTERRUPTED.

LOCAL OPERATION

WARNING
ALWAYS LINE DISABLE THIS STATION BEFORE
PERFORMING MAINTENANCE TO PREVENT UN-
EXPECTED KEYING OF THE STATION BY
REMOTE CONTROL. ACTUATION OF THE FRE-
QUENCY SELECT SWITCH MOMENTARILY KEYS
THE STATION EVEN WITHOUT OPERATING
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 DIS-
ABLE SWITCH TO NORMAL POSITION.

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

PARTS LIST SHOWN ON BACK

TLN5292A 4-Frequency Control Module PL-2581-G

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		capacitor, fixed: $\mu\text{F} \pm 20\%$; 50 V: unless otherwise stated
C1, 2	23-865137	4.7; 25 V
C3	23-865136	15; 25 V
C4	21-82187B29	.001 $\pm 10\%$; 100 V
C5	8-84326A14	.0062 $\pm 2\%$
C6	23-868446	47; 6 V
C7	8-82905G01	.01 $\pm 10\%$; 50 V
C8	21-82187B29	.001; 100 V
C9	8-84326A15	.0069 $\pm 2\%$; 50 V
C10	23-868446	47; 6 V
C11	21-82187B29	.001 $\pm 10\%$; 100 V
C12	8-84326A20	.0129 $\pm 2\%$
C13	23-868446	47; 6 V
C14	23-82783B08	1; 35 V
C15	21-82187B29	.001 $\pm 10\%$; 100 V
C16	8-84326A21	.015 $\pm 2\%$
C17	23-868446	47; 6 V
C18	8-82906G42	0.33 $\pm 10\%$
C19	23-84762H03	10; 20 V
C20	23-83214C21	6.8; 20 V
C21, 22	8-82905G01	.01 $\pm 10\%$
C23, 24	23-82783B08	1; 35 V
C25	8-82905G01	.01 $\pm 10\%$
C26	23-82783B08	1; 35 V
C27	8-82905G01	.01 $\pm 10\%$
C28	23-82783B08	1; 35 V
C29	8-82905G01	.01 $\pm 10\%$
C30	23-865136	15; 25 V
C31	8-82905G01	0.1 $\pm 10\%$
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 $\pm 2\%$
		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: $\pm 5\%$; 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 $\pm 1\%$
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 $\pm 1\%$

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
R42	6-10401A49	1k
R43	6-84444A08	2.21k $\pm 1\%$
R44	6-11009C57	2.2k
R45	6-11009C73	10k
R46	6-11009C01	10
R47	6-11009C35	270 $\pm 10\%$
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	spd1
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.

REVISONS				68P8102ZE04- I
CHASSIS SUFFIX	AND 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 6-124 C65, 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

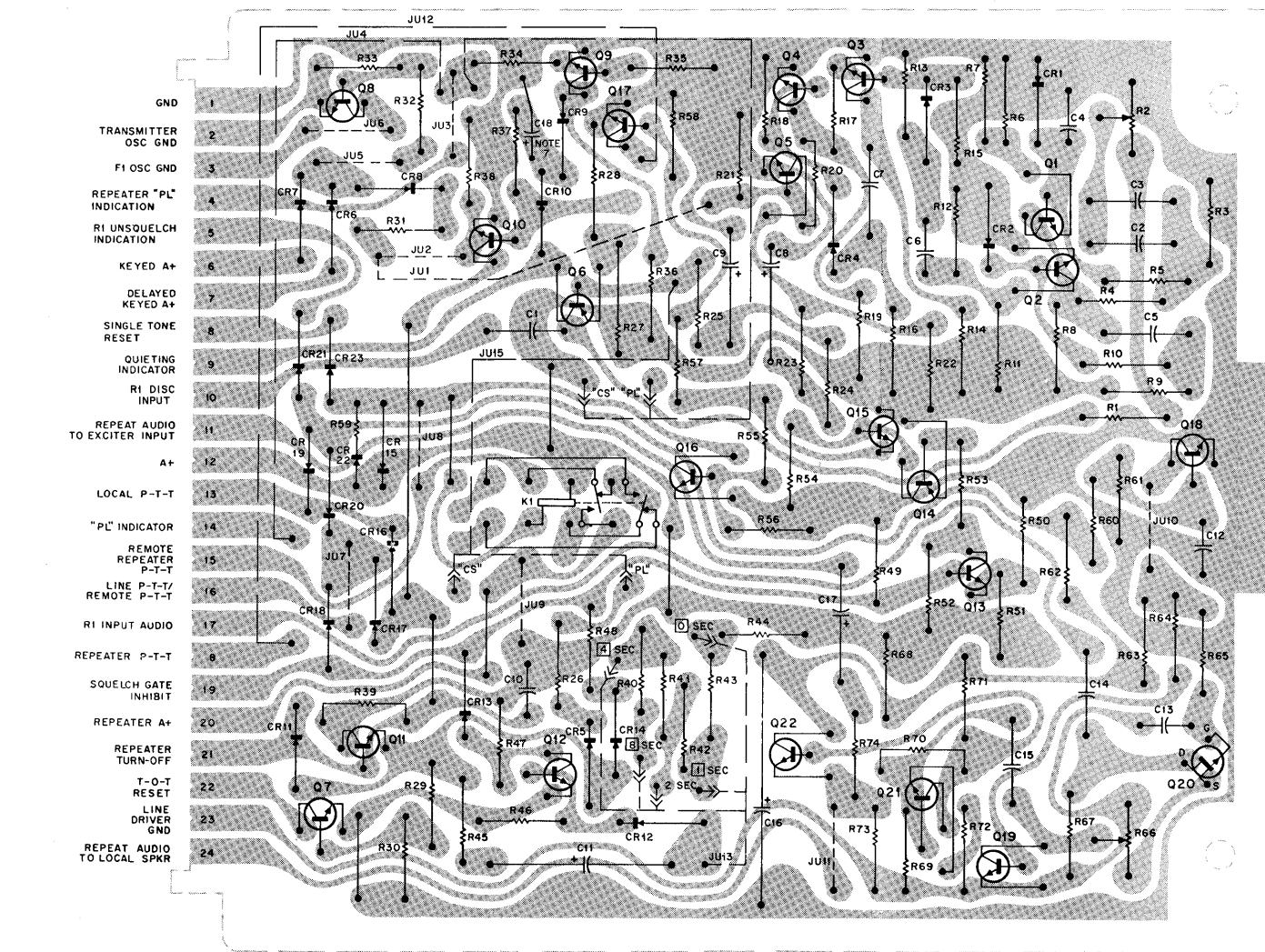
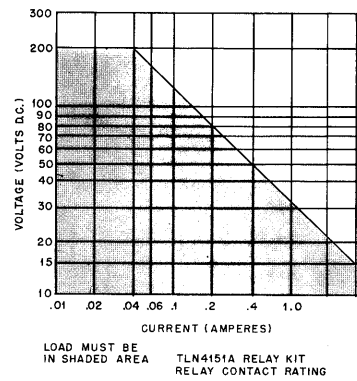
NOTES:

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

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

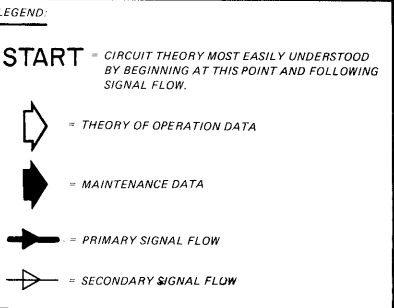
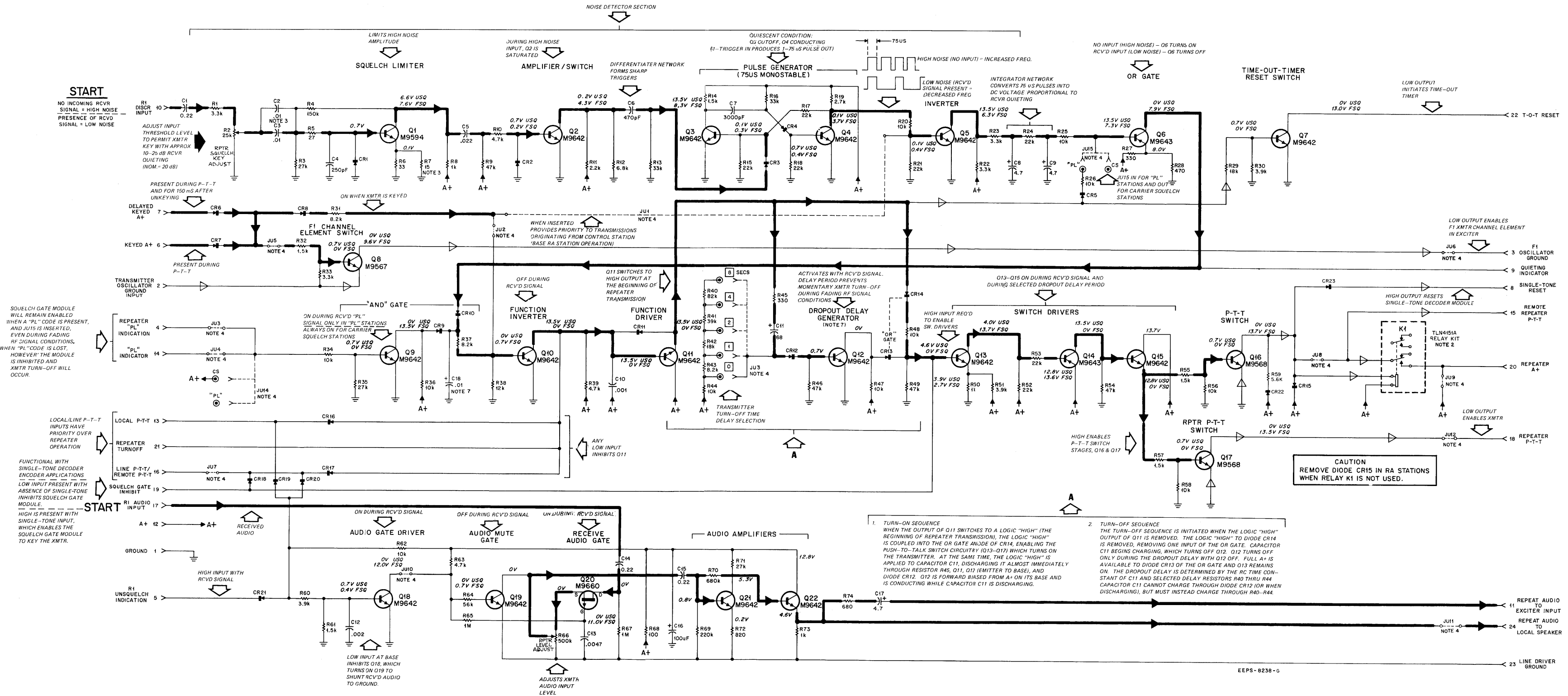
- VOLTAGE READINGS SHOWN ARE FOR TWO CONDITIONS:
USD = UNSQUELCHED
FSO = FULLY SQUELCHED
- JUMPERS JUS & JUB ARE USED IN DC-CONTROLLED "PL" REPEATER STATIONS WHEN SUCH STATIONS CONTAIN AN UNSUPPLIED DC TRANSFER MODULE.
- CAPACITOR C18 IS 0.1 μ F IN STANDARD APPLICATIONS. CAPACITOR C18 IS CHANGED TO 10 μ F WHEN THE C14S TAC ENCODER OPTION IS INSTALLED.

RELAY APPLICATION CHART		
TLN4151A	DIODE	RELAY KIT
CR15	JUB	
NOT USED	OUT	IN
USED	IN	OUT



SHOWN FROM SOLDER SIDE

60-2495-8255-G
OL-DEPS-8240-A



SQUELCH GATE MODULE MODEL TLN4662A

FUNCTION

Measures receive noise levels and controls transmitter keying.

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

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
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
S1 thru 4	40-83468E01	switch, slide: 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
CR11	48-82392B03	diode: silicon
K1	80-84201A01	relay, armature: 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 CIR- CUIT Q9
	C18	ADDED 21-82428B62, .01 uF	

[illegible]

Limits the period of time the transmitter may be keyed.

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

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

68P81044E69-C
7/15/83-PHI

GENERAL

CIRCUIT DESCRIPTION

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.

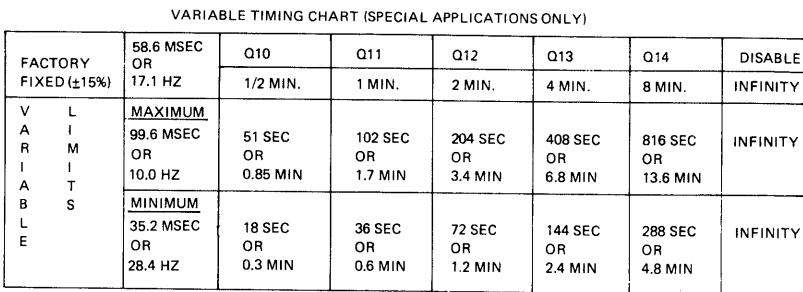
The timing function is started by a low line PTT, a low local PTT, or a low T-O-T reset signal from the squelch gate module. A low on the local PTT or the line PTT input causes the output of U2A to be high. This high is delayed by R4, C2 and is inverted by U4A producing a

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.

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.

JU1	LINE & LOCAL PTT TIME SELECT
JU2	REPEATER TIME SELECT

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.



GENERAL FORMULA: $F = (1/n)(2^{N-1})$; WHERE 1 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 — 012. SECOND, INSERT THE KNOWNS INTO THE GENERAL FORMULA, AND CALCULATE THE REQUIRED FREQUENCY:

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

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

●BEP5-27258

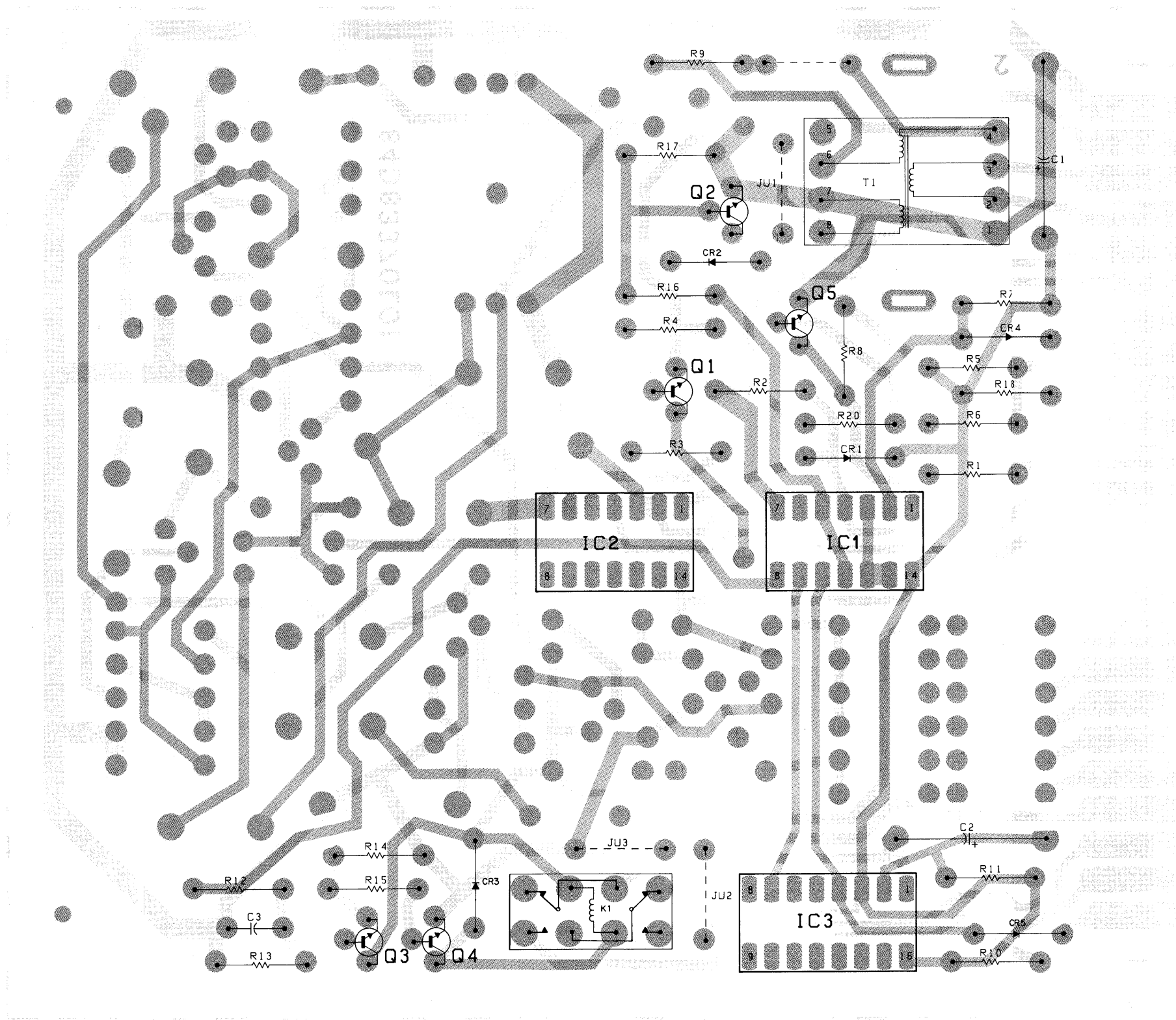
Step 7. Refer to the schematic and timing diagram and note the desired timing cycle for different outputs of the module. Use a stop-watch to compare the desired timing of highs and lows on a VTVM. Timing should be accurate to within $\pm 15\%$.

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.

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

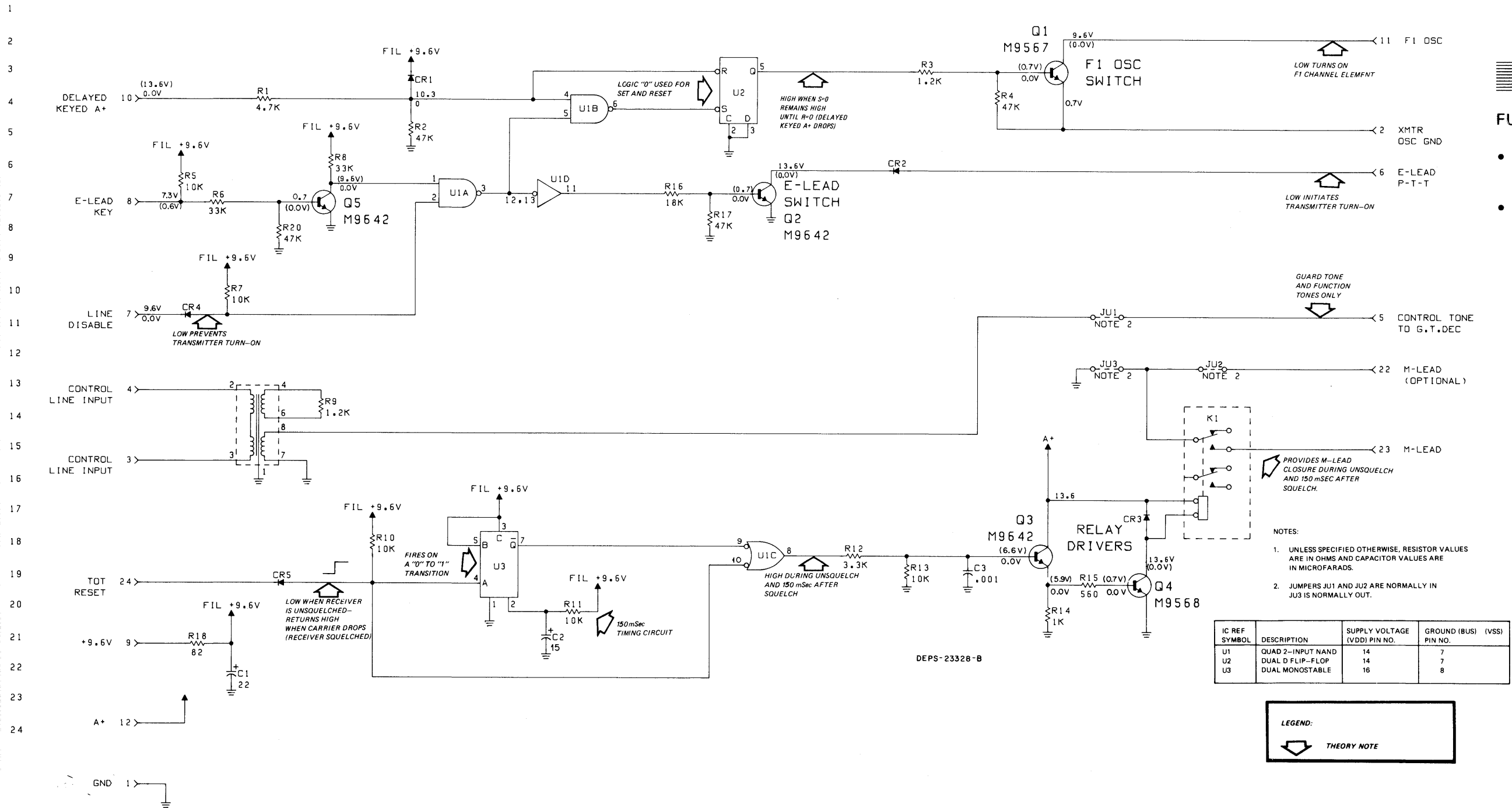
REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
PARTS LIST		
TLN5975A Line Interface Module PL-5438-A		
C1	23-83214C07	CAPACITORS, fixed:
C2	23-84538G04	22 uF ±20%; 15 V
C3	21-83596E01	15 uF ±10%; 20 V
		.001 uF ±10%; 500 V
CR1	48-83654H01	DIODE; (SEE NOTE)
CR4,5,6	48-83654H01	silicon
CR7	48-82466H13	silicon
K1	80-84201A01	RELAY, crystal can
		2 form "C", dpdt; 16 V
Q1	48-869567	TRANSISTOR; (SEE NOTE)
Q2,3	48-869642	NPN; type M9567
Q4	48-869568	NPN; type M9642
Q5	48-869642	NPN; type M9568
		NPN; type M9642
R1	6-124C65	RESISTOR, fixed: ±10%, 1/4 W
R2	6-124C89	unless otherwise stated
R3	6-124C51	4.7k
R4	6-124C89	47k
R5	6-124C73	1.2k
R6	6-124C85	47k
R7	6-124C73	10k
R8	6-124C85	33k
R9	6-124C73	10k
R10	6-124C51	33k; 1/2 W
R11	6-124C73	12k
R12	6-124A73	10k ±5%
R13	6-124C61	3.3k
R14	6-124C73	10k
R15	6-124C43	1k
R16	6-124C79	560
R17	6-124C89	18k
R18	6-124C89	47k
R20	6-124C23	82
	6-124C89	47k
T1	25-84202A02	TRANSFORMER
		pri. resist. 600 ohms
		sec. resist. #1 1200 ohms
		sec. resist. #2 600 ohms
U1	51-83627M17	INTEGRATED CIRCUIT; (SEE
U2	51-83627M18	NOTE)
U3	51-82884L53	type 74C00
		type 74C74
		type 14538
MECHANICAL PARTS		
1-80795B29	43-865080	CIRCUIT BOARD, eyeleted
	9-83011H01	includes:
		BUSHING, threaded; 2 used
		RECEPTACLE, board
		mounting; 24 used
	43-84920H01	SPACER, relay
	45-83914G01	GUIDE, card
	80-83029H01	SPARK GAP
	64-83358L02	PANEL, screened
	64-83113L01	PANEL
	3-8022	SCREW, machine: 4-40 x 1/4"
		2 used
	4-7683	WASHER, lock: #4 int.; 2 used

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



SHOWN FROM COMPONENT SIDE

COMPONENT SIDE ● BD-DEPS-23249-D
SOLDER SIDE ● BD-DEPS-23250-D
DL-DEPS-23251-D



LINE INTERFACE MODULE MODEL TLN5975A

FUNCTION

- Provides additional line termination for control line input.
- Provides MUX interface (E & M lead signaling) capability.

OPTIONS DECODER MODULES

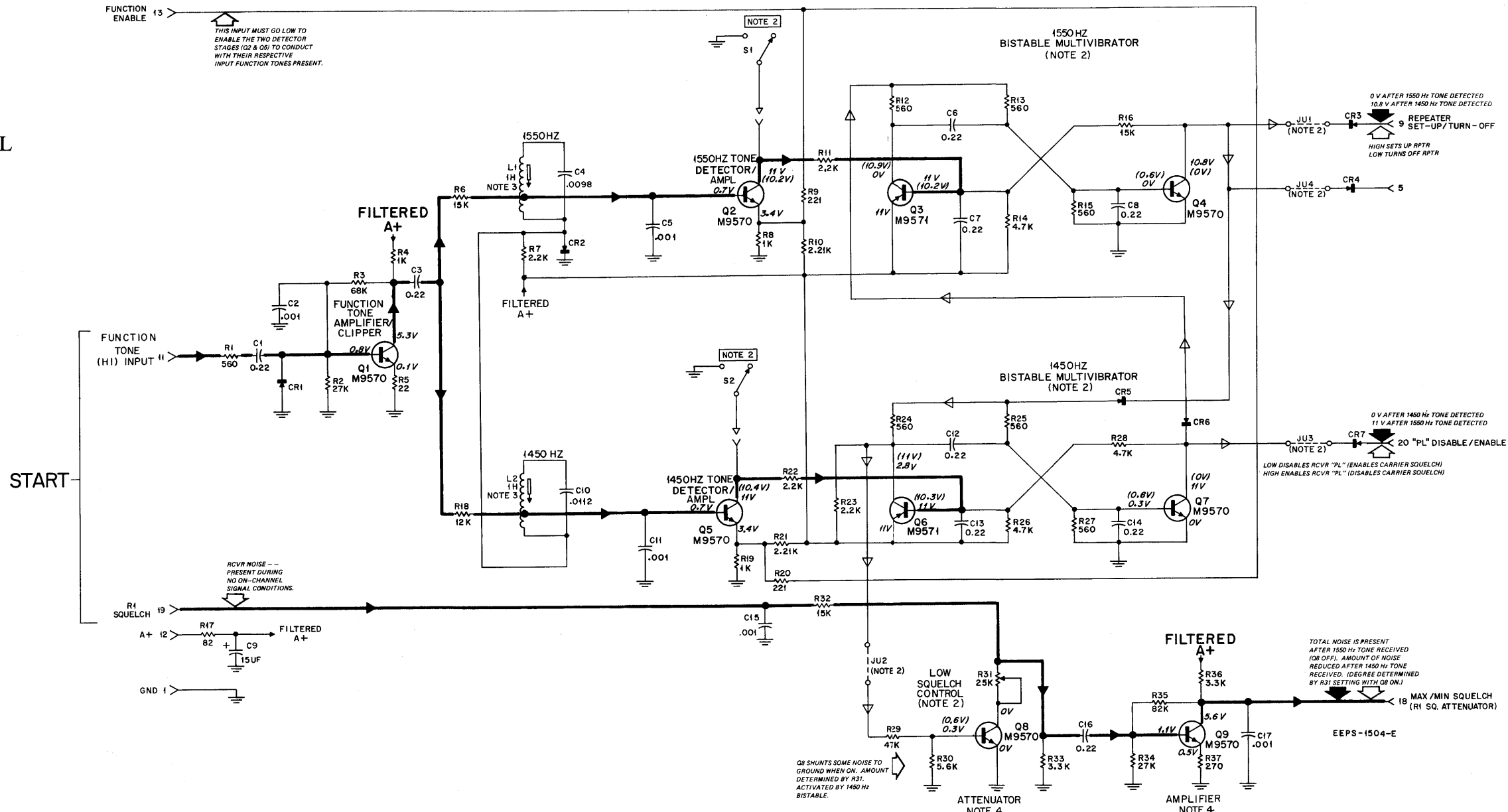
MODEL TLN1249A SQUELCH CONTROL
MODEL TLN1250A REPEATER CONTROL
MODEL TLN1251A "PRIVATE-LINE" CONTROL

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		TLN4050A	-2	TLN4051A
TLN1250A				TLN4052A
TLN1251A				TLN4053A

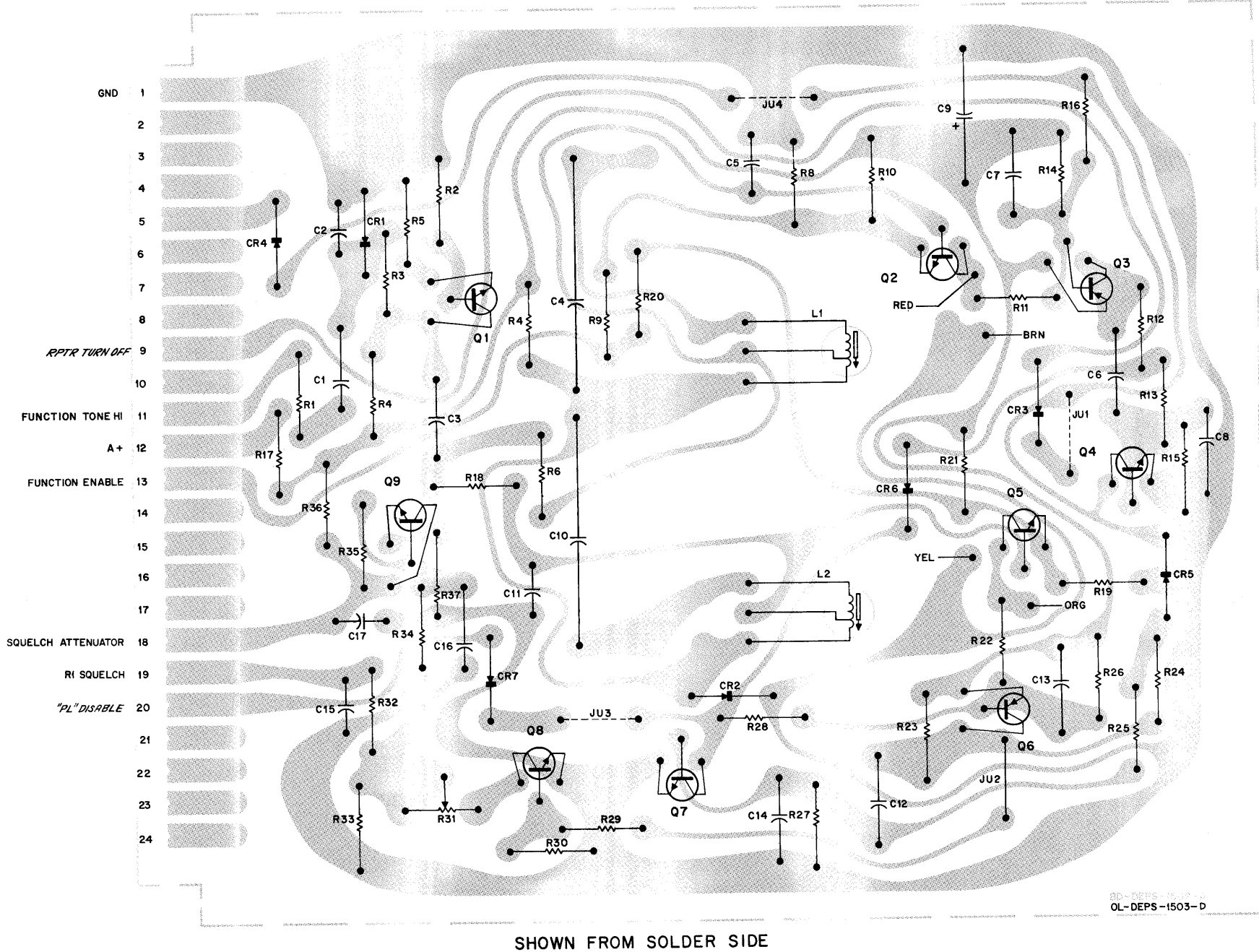


OPTIONS CONTROL MODULES

MODEL / FUNCTION TABLE		
FUNCTION TONE FREQUENCY	TLN1249A SQUELCH CONTROL	TLN1250A REPEATER CONTROL
1550 Hz	MAXIMUM SQUELCH OPERATION	REPEATER TURN OFF SQUELCH OPERATION
1450 Hz	THRESHOLD SQUELCH OPERATION	REPEATER SETUP SQUELCH OPERATION

APPLICATION TABLE		
	SQUELCH CONTROL MODULE	REPEATER CONTROL MODULE
S1	MAX. SQ.	OPERATE "PL"
S2	MIN. SQ.	OPERATE "PL"
Q104	OPERATE MAXIMUM SQUELCH	OPERATE "PL"
Q107	OPERATE THRESHOLD SQUELCH	OPERATE "PL"
R31	LOW SQUELCH CONTROL	INIT USED
J11	OUT	OUT
J12	OUT	OUT
J13	OUT	OUT
J14	OUT	OUT

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



REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
PL-431-E		
C1, 3, 6, 7, 8, 12, 13, 14, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 27	8D82905G11	CAPACITOR, fixed: 0.22 uF ±10%; 50 V.
C2, 5, 11, 15, 17, 18, 19, 20, 21, 22, 23, 24, 25, 27	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: AF 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; unl. 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	6D8444A07	221 ±1%
R10, 21	6D8444A08	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	18C83083G03	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.

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
PL-433-A		
S1, 2	40B83468E01	SWITCH, slide: spdt; spring return
NON-REFERENCED ITEM		
1-80702B21		PANEL ASSEMBLY, includes:
64-84198A03		PANEL
3-8022		SCREW, machine: 4-40 x 1/4"; 2 req'd.
4-7683		WASHER, lock: #4 (internal tooth); 2 req'd.
45B83914G01		GUIDE RAIL (slide-mount for circuit board); 2 req'd.