MOTOROLA

PURC™

Radio Paging Stations

Control and Application

THIS MANUAL HAS BEEN
DISCONTINUED

NOTE: This manual supplements the 900 MHz PURC Station Manual 68P81062E70.

MUST BE USED WITH
Associated Station Manual

Instruction Manual

68P81060E70-B

MOTOROLA INC.
Communications Sector

MODEM DELAY MODULE FOR PURC PAGING STATIONS
Model QRN4612A

1. Attachment

-- 202T Delay Module Connection Diagram 2-SP5860909

2. Description

The QRN4612A Modem Delay Module kit provides delay compensation to the newer 202T modem so that its overall delay approximates that of the older 202T modem.

3. Installation

The modem delay module is added to an existing PURC™ station in the following manner (see the attached drawing):

Step 1 Disconnect the modem cable RS232 connector from the modem.

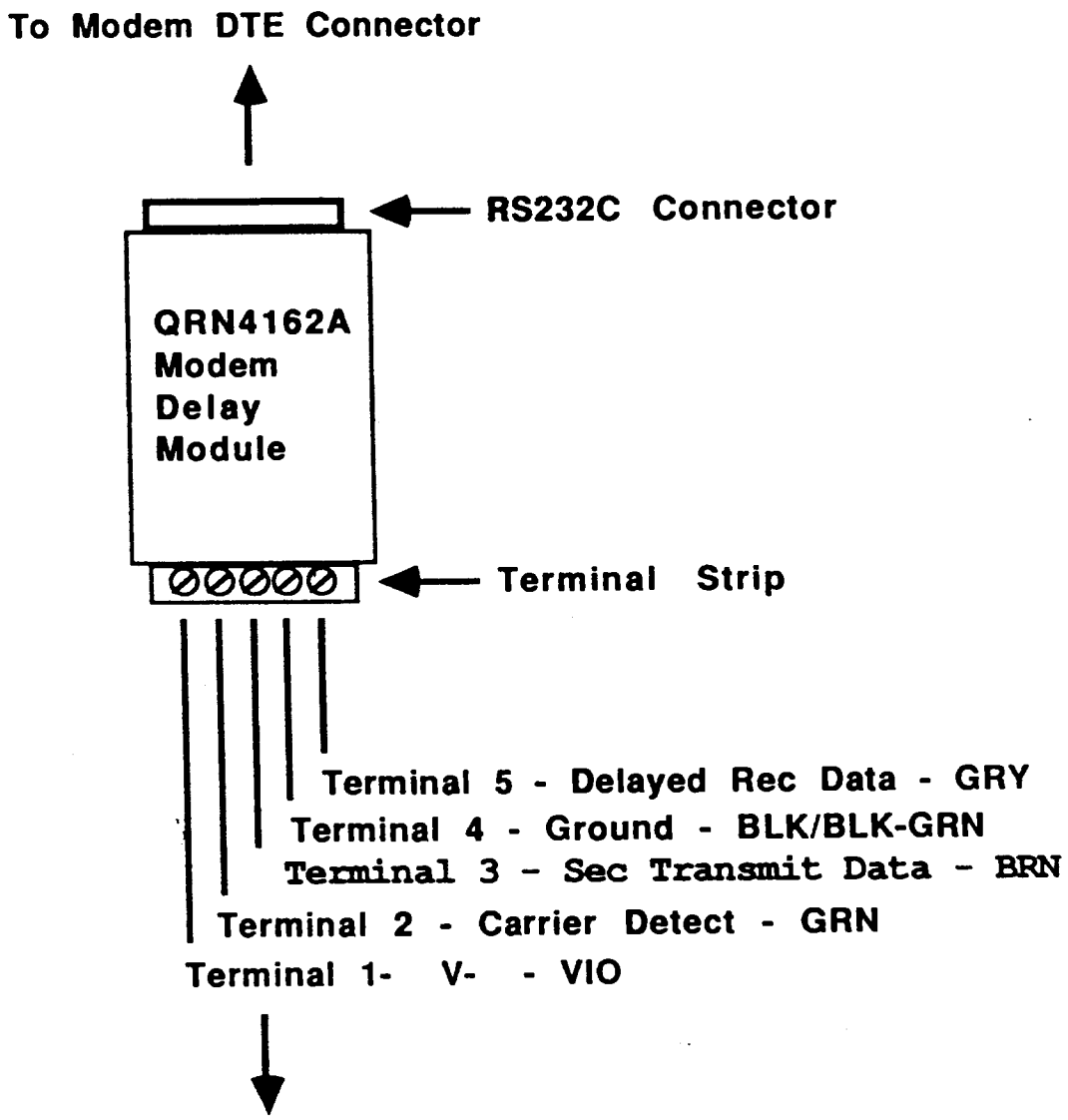
Step 2 Attach the modem delay module to the modem.

Step 3 Cut the RS232 connector from the modem cable, strip the 5 wires, and attach these to the terminal strip on the modem delay module as shown on the attached drawing. The installation is complete.

technical writing services
1301 E. Algonquin Road, Schaumburg, IL 60196

68P06908C10-0
(1S-SP5860909)

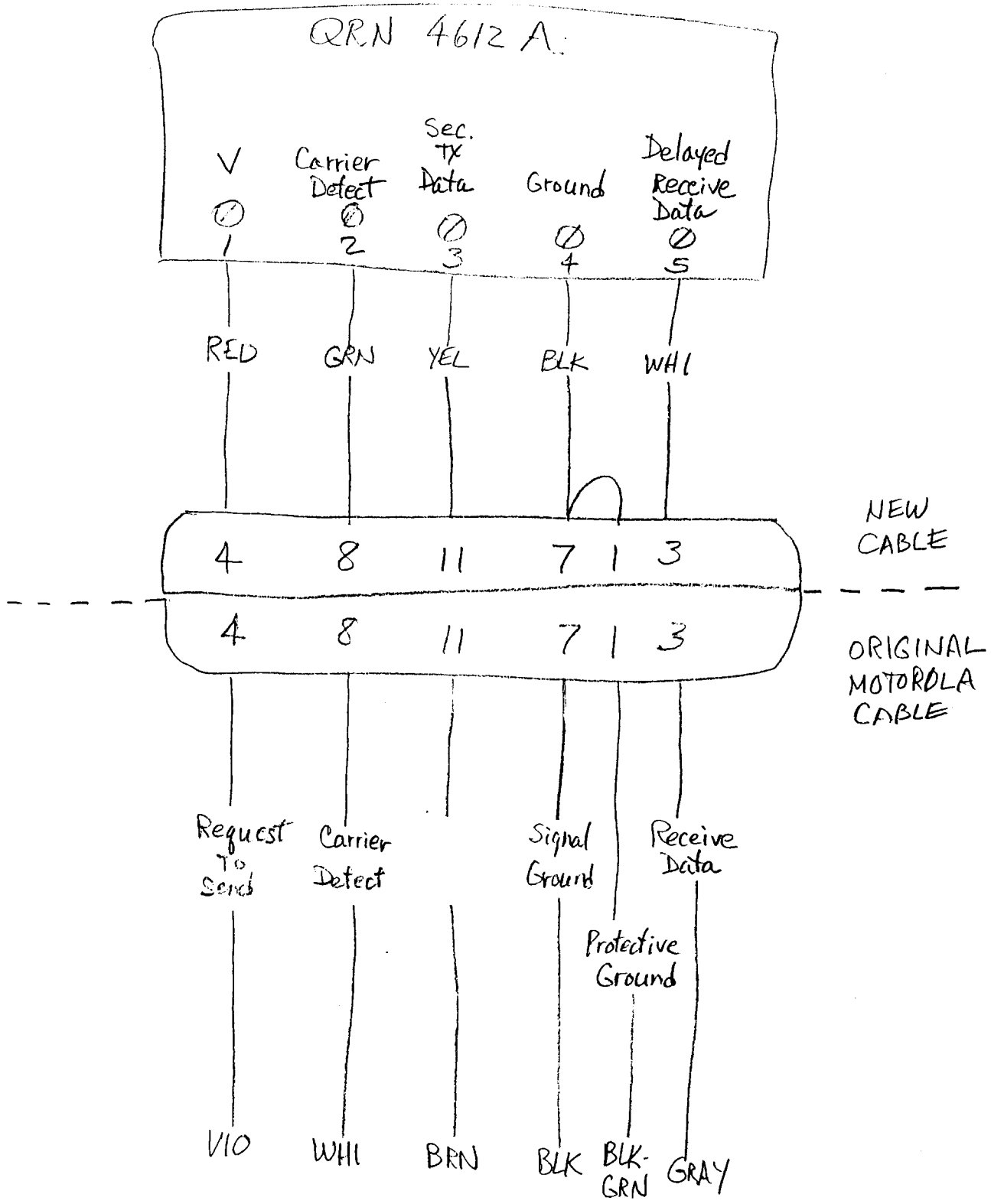
5-20-88



To Install Delay Module:

1) Connect delay module RS232 connector to modem
2) Cut off existing RS232C connector and attach wires as indicated above.

202T Delay Module
Connection Diagram
Motorola No. 2-SP5860909-0
5/20/88


QRN 4612 A.
V
1
Carrier Defect
2
Sec. TX Data
3
Ground
4
Delayed Receive Data
5
RED
GRN
YEL
BLK
WHI
4 8 11 7 1 3
NEW CABLE
4 8 11 7 1 3
ORIGINAL MOTOROLA CABLE
Request To Send
Carrier Detect
Signal Ground
Receive Data
Protective Ground
VIO
WHI
BRN
BLK
BLK-GRN
GRAY

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SECTION *NUMBER*

DESCRIPTION

JUMPERING & ADJUSTMENTS

CONTROL CHASSIS & AUDIO MODULES

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68P81060E70-B
9/27/86-PHI

RF MODULES

OPTIONAL EQUIPMENT

Note: Pages iii and iv are omitted due to irrelevancy

MODEL CHART
FOR
LOWBAND/HIGHBAND
PURC
RADIO PAGING STATIONS

CODE:

● = ONE SUPPLIED

○ = INDICATES A MODEL SERIES

✕ = FREQUENCY SENSITIVE COMPONENT

MODEL	OPERATING FREQUENCY	STATION TYPE	ITEM	DESCRIPTION
B99JZB1106A	136-174MHZ	NON-SYNTHESIZED	KXN1020B	CHANNEL ELEMENT (5 PPM TRANSMIT)
			KXN1018C	CHANNEL ELEMENT (2 PPM TRANSMIT)
B91JZB1106A	30-50MHZ	NON-SYNTHESIZED	TFB6010A	HARMONIC FILTER
			TFB6012A	HARMONIC FILTER (30-36MHZ)
			TFB6013A	HARMONIC FILTER (36-42MHZ)
			TFB6014A	HARMONIC FILTER (42-50MHZ)
B99JZB1101B	136-174MHZ	SYNTHESIZED	TFD6D90A	HARMONIC FILTER (136-174MHZ)
B91JZB1101B	30-50MHZ	SYNTHESIZED	TLB1550A	EXCITER DRIVER
			TLB1552A	EXCITER DRIVER (30-36MHZ)
			TLB1553A	EXCITER DRIVER (36-42MHZ)
			TLB1554A	EXCITER DRIVER (42-50MHZ)
B99JZB1101B	136-174MHZ	SYNTHESIZED	TLD2580A	EXCITER DRIVER
			TLD2581A	EXCITER DRIVER (136-150.8MHZ)
			TLD2582A	EXCITER DRIVER (150.8-162MHZ)
			TLD2583A	EXCITER DRIVER (162-174MHZ)
B91JZB1106A	30-50MHZ	NON-SYNTHESIZED	TLB8140A	POWER AMPLIFIER
			TLB8142A	POWER AMPLIFIER (30-36MHZ)
			TLB8143A	POWER AMPLIFIER (36-42MHZ)
			TLB8144A	POWER AMPLIFIER (42-50MHZ)
B99JZB1101B	136-174MHZ	SYNTHESIZED	TLD5080A	POWER AMPLIFIER
			TLD5081A	POWER AMPLIFIER (136-150.8MHZ)
			TLD5082A	POWER AMPLIFIER (150.8-162MHZ)
			TLD5083A	POWER AMPLIFIER (162-174MHZ)
B99JZB1106A	136-174MHZ	NON-SYNTHESIZED	TKN6733A	TRANSMITTER CABLE
B91JZB1106A	30-50MHZ	NON-SYNTHESIZED	TLN1434A	TRANSMITTER SHIELD
B99JZB1101B	136-174MHZ	SYNTHESIZED	THN6194B	CABINET
B91JZB1101B	30-50MHZ	SYNTHESIZED	TRN8580A	AC JUNCTION BOX
			TLN5697A	METER PANEL
			TKN8284A	DIGITAL MODULATOR CABLE
			TLN1675A	CHASSIS METER & CABLE
			TKN8214A	MODEM CABLE
			TLN4198A	AIR DUCT KIT
			TPN1131A	POWER SUPPLY HIGH VOLTAGE
			TPN1132A	POWER SUPPLY LOW VOLTAGE
B91JZB1106A	30-50MHZ	NON-SYNTHESIZED	TRN5345A	STATION HARDWARE LOW BAND
B99JZB1101B	136-174MHZ	SYNTHESIZED	TRN5343A	STATION HARDWARE HIGH BAND
B91JZB1106A	30-50MHZ	NON-SYNTHESIZED	TLN5703A	TRANSFORMER, KIT (POWER SUPPLY 250 W)
B99JZB1101B	136-174MHZ	SYNTHESIZED	TLN5704A	TRANSFORMER, KIT (POWER SUPPLY 375 W)
B99JZB1106A	136-174MHZ	NON-SYNTHESIZED	TCN1383A	REMOTE CONTROL CHASSIS
			TLN2378A	GUARD TONE DECODER MODULE
			TLN4658A	F1 CONTROL MODULE
			TRN4853A	TRANSMITTER SITE INTERFACE MODULE
			TRN4854A/B	STATION CONTROL MODULE
			TRN4856B	DIGITAL MODULATION MODULE
			TRN4859A	LINE DRIVER MODULE
B99JZB1101B	136-174MHZ	SYNTHESIZED	TPN1195A	POWER SUPPLY, 24 V
			TRN5802A	SYNTHESIZER HARDWARE
			TRN5481A	PROM
			TLD2590A	SERIES SYNTHESIZER
B91JZB1101B	30-50MHZ	SYNTHESIZED	TLB1560A	SERIES SYNTHESIZER
B99JZB1106A	136-174MHZ	NON-SYNTHESIZED	TRN5801A	PURC TUNING TOOLS
B99JZB1101B	136-174MHZ	SYNTHESIZED	KXN1D19B	CHANNEL ELEMENT (5 PPM TRANSMIT)
			KXN1118AA	CHANNEL ELEMENT (20 PPM TRANSMIT)
			TLN2559B	SIMULCAST CONTROL MODULE
			TLN2559B	F1 CONTROL MODULE

EPS-34623-B

EXCITER/DRIVER

MODEL CHART

FOR

PURC RADIO PAGING STATIONS

CODE:

● = ONE SUPPLIED

■ = INDICATES A MODEL SERIES

MODEL	TLB1550A	TLD2580A		
FREQ. RANGE	30-50 MHz	136-174 MHz	**ITEM**	**DESCRIPTION**
		●	TLD1950A	POWER AMPLIFIER & HEAT SINK
		●	TFD6100A	HARMONIC FILTER
		●	TLD5090A	POWER AMPLIFIER
		●	■TLD5320A	EXCITER
		●	TFD6110A	EXCITER FILTER
		●	TKN6569A	TRANSMITTER RF CABLE
		●	TLD5100A	POWER CABLE
		●	TLN5169A	SWITCH & CABLE
		●	TLN5074A	TERMINAL BRACKET
		●	TLN5741A	TRANSMITTER CHASSIS & HEAT SINK
		●	TRN5148A	TRANSMITTER HARDWARE
	●	●	TLN4729B	INTERCONNECT BOARD
	●		TLB1470A	POWER AMPLIFIER & HEAT SINK
	●		TLB8150A	POWER AMPLIFIER
	●		■TLB8170A	EXCITER
	●		TFB6020A	LOW PASS FILTER
	●		TKN6569A	TRANSMITTER RF CABLE
	●		TKN6580A	POWER AMPLIFIER CABLE
	●		TLB6940A	POWER CONTROL BOARD
	●		TLN5170A	TRANSMITTER METER SWITCH & CABLE
	●		TLN5740A	CAP NETWORK
	●		TRN6423A	RF CONNECTOR
	●		TRN6167A	TRANSMITTER CHASSIS & HEAT SINK
	●		TLN5075A	BRACKET
	●		TRN5417A	TRANSMITTER HARDWARE
		●	NOTE 1*	
	●		NOTE 2*	

EPS-34622-O

***NOTES:**

1. KITS PERTAINING TO THE TLD2580A EXCITER CAN BE LOCATED IN THE *MICOR* UPRIGHT BASE & REPEATER (RT) STATIONS INSTRUCTION MANUAL (68P81022E90).

2. KITS PERTAINING TO THE TLB1550A EXCITER CAN BE LOCATED IN THE *MICOR* UPRIGHT BASE & REPEATER (RT) STATIONS INSTRUCTION MANUAL (68P81022E95).

MODEL CHART
FOR
LOWBAND HIGHBAND
PURC RADIO PAGING STATIONS
MODEL CHART

CODE:

● = ONE SUPPLIED

○ = INDICATES A MODEL SERIES

✕ = FREQUENCY SENSITIVE COMPONENT

MODEL	OPERATING FREQUENCY	STATION TYPE					
	30-50 MHZ		30-50 MHZ		132-174 MHZ		132-174 MHZ
	SYNTHESIZED		NON-SYNTHESIZED		SYNTHESIZED		NON-SYNTHESIZED
	C71JZB1101B		C71JZB1108A		C73JZB1101B		C73JZB1108A
ITEM	DESCRIPTION						
KXN1116AA	CHANNEL ELEMENT (20 PPM TRANSMIT)		●				
KXN1018C	CHANNEL ELEMENT (2 PPM TRANSMIT)						●
TCN1381A	REPEATER CONTROL CHASSIS		●	●	●	●	●
THN6318A	CABINET		●	●	●	●	●
TKN6581A	RF CABLE				●	●	
TKN6582A	RF CABLE		●	●			
TKN6883A	REPEATER CABLE		●	●	●	●	●
TKN6918A	CABLE KIT (USED ON TRANSMIT ONLY STATIONS)		●	●	●	●	●
TKN8214A	MODEM CABLE		●	●	●	●	●
TKN8284A	MODULATOR CABLE			●			●
TLB1400A	POWER AMPLIFIER		○	○			
TLB1412C	POWER AMPLIFIER, 100 W (30-36 MHZ)		✕	✕			
TLB1413C	POWER AMPLIFIER, 100 W (36-42 MHZ)		✕	✕			
TLB1414C	POWER AMPLIFIER, 100 W (42-50 MHZ)		✕	✕			
TLD1690D	POWER AMPLIFIER				○	○	
TLD1692D	POWER AMPLIFIER, 100 W (132-150.8 MHZ)				✕	✕	
TLD1693E	POWER AMPLIFIER, 110 W (150.8-162 MHZ)				✕	✕	
TLD1694E	POWER AMPLIFIER, 110 W (162-174 MHZ)				✕	✕	
TLB1560A	SERIES SYNTHESIZER		○				
TLB1562A	SYNTHESIZER (30-36 MHZ)		✕				
TLB1563A	SYNTHESIZER (36-42 MHZ)		✕				
TLB1564A	SYNTHESIZER (42-50 MHZ)		✕				
TLD2061A	EXCITER AND FILTER BOARD (132-150.8 MHZ)				✕	✕	
TLD2062A	EXCITER AND FILTER BOARD (150.8-174 MHZ)				✕	✕	
TLD2590A	SERIES SYNTHESIZER				○		
TLB8270A	EXCITER		○	○			
TLB8273A	EXCITER (30-36 MHZ)		✕	✕			
TLB8274A	EXCITER (36-42 MHZ)		✕	✕			
TLD2593A	EXCITER (42-50 MHZ)		✕	✕			
TLN2375A	GUARD TONE DECODER MODULE		●	●	●	●	
TLN4290B	AUDIO PA MODULE		●	●	●	●	
TLN4658A	F1 CONTROL MODULE			●			●
TLN5902A	TRANSMITTER SHIELD KIT		●	●	●	●	
TLN5903A	RECEIVER SHIELD KIT				●	●	
TLN5914A	RECEIVER SHIELD KIT		●	●			
TPN1110B	POWER SUPPLY		●	●	●	●	
TPN1195A	POWER SUPPLY, 24V		●		●		
TRN4853A	TRANSMITTER SITE INTERFACE MODULE		●	●	●	●	
TRN4854A/B	STATION CONTROL MODULE		●	●	●	●	
TRN4856B	DIGITAL MODULATOR MODULE		●	●	●	●	
TRN4859A	LINE DRIVER MODULE		●	●	●	●	
TRN5342A	STATION HARDWARE, HIGH BAND				●	●	
TRN5344A	STATION HARDWARE, LOW BAND		●	●			
TRN5359A	AC JUNCTION BOX		●	●	●	●	
TRN5802A	SYNTHESIZER HARDWARE		●		●		
TRN5401A	PROM		●		●		
TRN6006A	AUDIO AND SQUELCH BOARD, 10 W				●	●	
TRN6007A	AUDIO AND SQUELCH BOARD, 10 W		●	●			
TRN6423A	RF CONNECTOR		●	●			
TRN5801A	PURC TUNING TOOLS		●	●	●	●	
KXN1019B	CHANNEL ELEMENT (5 PPM TRANSMIT)				●		
KXN1020B	CHANNEL ELEMENT (5 PPM TRANSMIT)			●			
TLN2559B	SIMULCAST CONTROL MODULE		●		●		
TLN5293A	F1 CONTROL MODULE		●		●		

EPS-35256-A

MODEL CHART
FOR
PURC
RADIO PAGING STATIONS

CODE:

● = ONE SUPPLIED

○ = INDICATES A MODEL SERIES

✕ = FREQUENCY SENSITIVE COMPONENT

MODEL					ITEM	DESCRIPTION
OPERATING FREQUENCY	450-512MHZ	450-512MHZ	450-512MHZ	450-512MHZ		
STATION TYPE	SYNTHESIZED	NON-SYNTHESIZED	SYNTHESIZED	NON-SYNTHESIZED		
	B84JZB1101B	B84JZB1108A	C64JZB1101B	C64JZB1108A		
	●	●	●	●	KXN1052A	CHANNEL ELEMENT (TRANSMIT)
	●	●	●	●	TCN1382A	CONTROL CHASSIS
	●	●			THN6373A	HOUSING
			●	●	THN6318A	HOUSING
			●	●	TKN6804A	CABLE, 75 W
	●	●			TKN8007A	CABLE HIGH POWER REPEATER
	●	●			TKN8008A	CABLE, INTERCONNECT
	●	●	●	●	TKN8214A	CABLE, MODEM
		●		●	TKN8284A	CABLE, MODULATOR
	○	○	○	○	TLE1600B	HYBRID AMPLIFIER/TRIPLER
	✕	✕	✕	✕	TLE1603B	HYBRID AMPLIFIER/TRIPLER (450-470MHZ)
	✕	✕	✕	✕	TLE1604B	HYBRID AMPLIFIER/TRIPLER (470-494MHZ)
	✕	✕	✕	✕	TLE1605B	HYBRID AMPLIFIER/TRIPLER (494-512MHZ)
	○	○	○	○	TLE1607B	NETWORK ANTENNA REPEATER
	✕	✕	✕	✕	TLE1673B	NETWORK, ANTENNA REPEATER (450-470MHZ)
	✕	✕	✕	✕	TLE1674B	NETWORK, ANTENNA REPEATER (470-494MHZ)
	✕	✕	✕	✕	TLE1675B	NETWORK, ANTENNA REPEATER (494-512MHZ)
	✕	✕			TLE1693A	POWER AMPLIFIER, 20 W (450-470MHZ)
	✕	✕			TLE1694A	POWER AMPLIFIER, 20 W (470-512MHZ)
			✕	✕	TLE1713A	POWER AMPLIFIER, 75 W (450-470MHZ)
			✕	✕	TLE1714A	POWER AMPLIFIER, 80 W (470-512MHZ)
	○	○	○	○	TLE1720B	EXCITER AND FILTER BOARD
	✕	✕	✕	✕	TLE1723B	EXCITER AND FILTER BOARD (450-470MHZ)
	✕	✕	✕	✕	TLE1724B	EXCITER AND FILTER BOARD (470-494MHZ)
	✕	✕	✕	✕	TLE1725B	EXCITER AND FILTER BOARD (494-512MHZ)
	○	○			TLE1930A	POWER AMPLIFIER
	✕	✕			TLE1933A	POWER AMPLIFIER, (450-470MHZ)
	✕	✕			TLE1934A	POWER AMPLIFIER, (470-494MHZ)
	✕	✕			TLE1935A	POWER AMPLIFIER, (494-512MHZ)
	●		●		TLE2273A	SYNTHESIZER, 450-512MHZ
	●	●			TLE4183A	TRANSMITTER SHIELD KIT
	●	●			TLN1997A	METERING/INTERCOM KIT
	●	●	●	●	TLN2376A	GUARD TONE DECODER MODULE
	●	●	●	●	TLN4290B	AUDIO PA MODULE
		●		●	TLN4658A	F1 CONTROL MODULE
			●	●	TLN4296A	POWER CONTROL MODULE
	●	●			TLN4296AV	POWER CONTROL MODULE
	●	●			TLN5697A	METER PANEL
	●	●			TLN5703A	TRANSFORMER
			●	●	TPN1110B	POWER SUPPLY
	●	●			TPN1167A	POWER SUPPLY, LOW VOLTAGE
	●	●			TPN1168A	POWER SUPPLY, HIGH VOLTAGE
	●		●		TPN1195A	POWER SUPPLY, 24 V
	●	●	●	●	TRN4853A	TRANSMITTER SITE INTERFACE MODULE
	●	●	●	●	TRN4854A/B	STATION CONTROL MODULE
	●	●	●	●	TRN4856A/B	DIGITAL MODULATOR MODULE
	●	●	●	●	TRN4859A	LINE DRIVER MODULE
			●	●	TRN5117A	STATION HARDWARE UHF
	●	●			TRN5118A	STATION HARDWARE UHF HIGH POWER
	●		●		TRN5802A	SYNTHESIZER HARDWARE
	●		●		TRN5401A	PROM
			●	●	TRN5359A	AC JUNCTION BOX
	●	●	●	●	TRN6006A	AUDIO AND SQUELCH BOARD, 10 W
			●	●	TRN6193A	TRANSMITTER SHIELD, 75 W
	●	●	●	●	TRN6194A	RECEIVER SHIELD
	●	●			TRN8580A	AC JUNCTION BOX
	●	●			TRN8584A	BLOWER
	●	●	●	●	TRN5801A	PURC TUNING TOOLS
	●		●		TLN2559B	SIMULCAST CONTROL MODULE
	●		●		TLN5293A	F1 CONTROL MODULE

EPS-35257-A

CONTROL CHASSIS

MODEL CHART

FOR

PURC RADIO PAGING STATIONS

CODE:

● = ONE SUPPLIED

MODEL FREQ. RANGE	TCN1381A 30-50 MHz and 132-174 MHz	TCN1382A 450-512 MHz	ITEM	DESCRIPTION
		●	TLN5645A	TRANSMITTER REPEATER INTERCONNECT BOARD
	●	●	TLN5646A	RECEIVER REPEATER INTERCONNECT BOARD
	●		TLN5894A	TRANSMITTER REPEATER INTERCONNECT BOARD
	●	●	TRN4860A	INTERCONNECT BOARD
	●		TRN5436A	CHASSIS HARDWARE
		●	TRN5437A	CHASSIS HARDWARE

EPS-35258-O

1. INTRODUCTION

1.1 *PURC* (Paging Universal Remote Control) Radio Paging Stations consolidate binary and sequential tone signaling control functions which are required in paging systems. *PURC* Radio Paging Stations accommodate 2-tone and 5/6-tone paging formats (either tone only or tone and voice) as well as binary formats. Binary paging requires FSK-NRZ (frequency shift keying with non-return to zero) signaling.

1.2 There are two modes of operation for *PURC* Radio Paging Stations:

- audio mode - corresponds to commonly used 2-tone or 5/6-tone pager addressing methods (for tone only or tone and voice pagers).
- binary mode - used in display paging and certain types of binary and voice pagers (binary address followed by voice message).

1.3 Control of *PURC* Radio Paging Stations can be accomplished locally (requires multiple paging terminal to base station connections) or remotely (requires one simplex control path). Remote control is required for distances greater than 100 feet. The following discussion refers to remote control operation.

2. STATION CONTROL

Regardless of whether the binary mode or audio mode of operation is selected, the station control sequence is initiated by 120-140 ms (milliseconds) of high

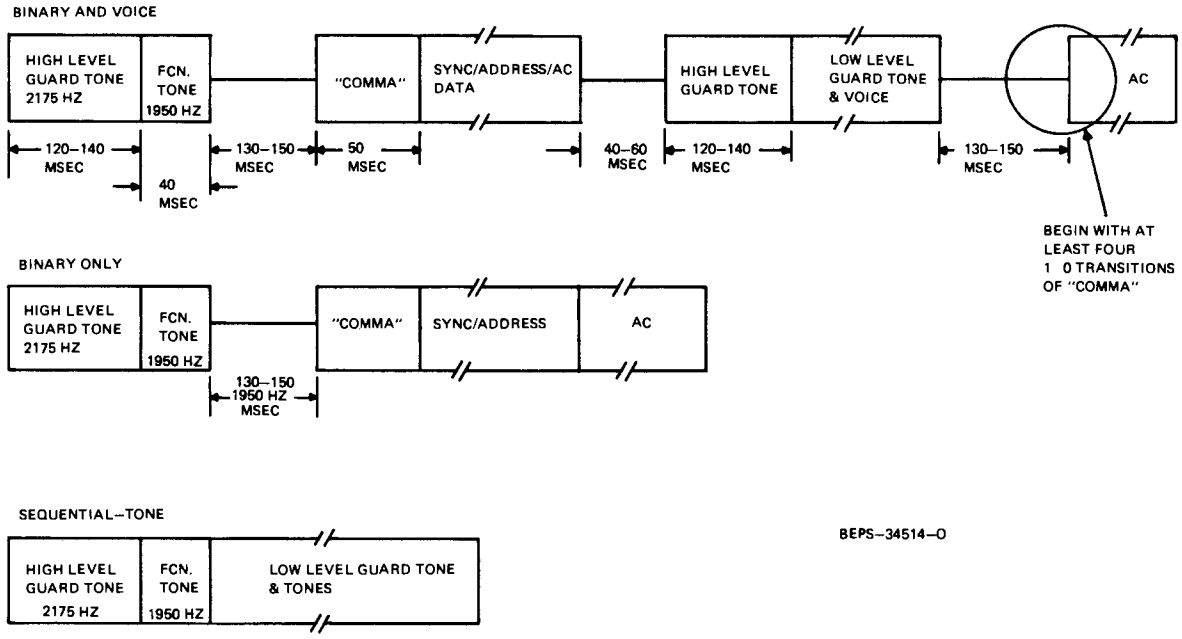

Figure 1. Single Transmitter Sequential Tone Control Format

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level guard tone (2175 Hz) followed by 40 ms of function tone (1950 Hz). This sequence keys the base station through control signals originating in the guard tone decoder, F1 control, and station control modules. The rest of the control sequence depends on the type of information, binary or audio, to be transmitted.

3. BINARY CONTROL

(See Figure 1, Binary Only)

3.1 After the guard tone/function tone sequence, binary control is accomplished by a 130-150 ms pause before sending the binary information. This allows the guard tone decoder to drop out and un- inhibit the modem in the station. During the 130-150 ms pause, the transmitter remains keyed by the delayed keyed A+ voltage from the digital modulator module. After the pause but before the station drops off the air, binary information is send to the station. This information (binary preamble) must begin with 50 ms of an alternating binary 1,0 pattern (comma) received at 600 bps (bits per second). This binary information from the paging terminal is sent to the station via 1200/2200 Hz audio frequency shift signaling (modem tones). A modem in the paging station decodes the modem tones into logic "1" and "0" dc states. These logic states are level shifted in the transmitter site interface and digital modulator modules for application to the modulator stage in the transmitter. Detection of a 1200 Hz tone is defined as a logic 1 and gives a positive shift to the transmitter carrier frequency. Detection of a 2200 Hz tone is defined as a logic "0" and gives a negative frequency shift to the transmitter carrier frequency.

3.2 The detection of the initial 600 bps binary pattern is immediately converted by the modem and TSI (Transmitter Site Interface) module into a modem PTT signal. This results in the station remaining keyed by reverting to the binary mode (FSK-NRZ). When the station has been properly set up in the binary mode, binary data is transmitted. The transmitter unkeys within 350 ms after the modem tones stop. During the time the station is in the binary mode, the modem PTT signal is routed to the guard tone decoder module to inhibit the audio mode. Therefore the binary and audio modes are independent of each other.

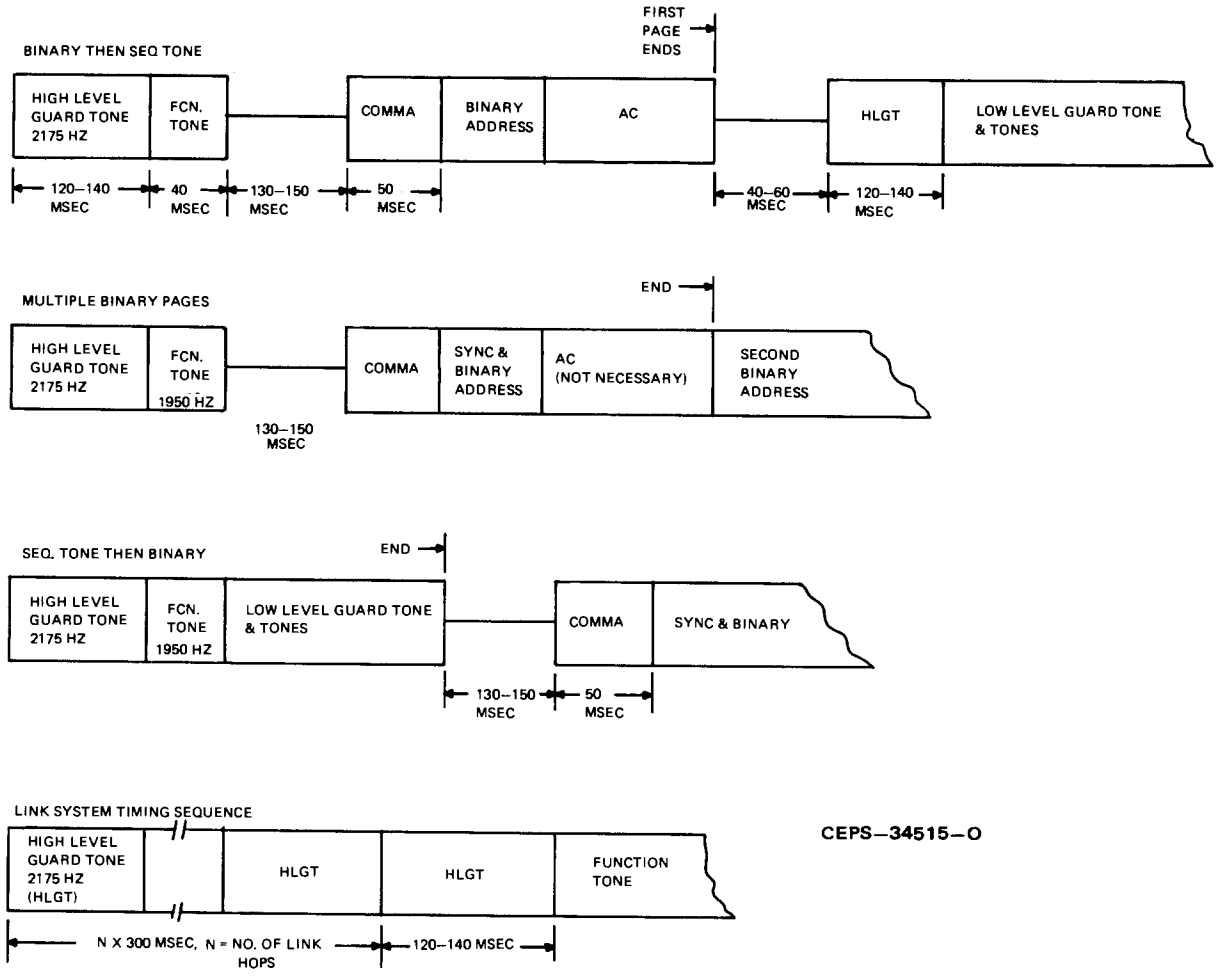


Figure 2. Sequential Tone/Binary Mixed Pager Tone Control Format

4. AUDIO CONTROL

(See Figure 1 Single Transmitter Sequential Tone Control Format)

4.1 After the initial guard tone function tone sequence, audio control is accomplished by sending low level guard tone without any delay after the function tone. The transmitter keys up and the desired paging tones and voice (if required) are then transmitted. Low level guard tone is present during the entire transmission to keep the transmitter keyed. When low level guard tone is removed, the station unkeys within approximately 350 msec. The continuous detection of low level guard tone keeps the modem in the station muted via a relay in the TSI (Transmitter Site Interface) module.

4.2 High level guard tone and function tone are sent at +5 dB and -5 dB respectively, referenced to test tone (test tone is the level of 1000 Hz requires to modulate the transmitter ±3 kHz). Low level guard tone is sent out at a level -25 dB referenced to test tone.

5. COMBINED BINARY AND AUDIO CONTROL

(See Figure 1 and Figure 2)

5.1 A combination of binary and audio control is required for paging in systems with mixed binary and tone signaling, or where tone and voice pagers are used which require a binary address. To initially establish control of the station, high level guard tone and function tone is required as previously described (paragraph 2). Binary or audio control is then established as previously described (paragraphs 3 and 4). If the audio mode is first established and it is desired to switch to the binary mode, a pause of 130-150 ms is sent by the terminal to allow the station to drop out of the audio mode. Binary information is sent out, beginning with 50 ms of comma (alternating 1 and 0 pattern). The remainder of the binary information follows the comma. If multiple binary paging (without voice message) is requried, the binary data must be sent without any pauses to prevent the station from unkeying.

5.2 To switch from the binary mode to the audio mode, a 50 ms pause is sent to allow the station to drop out of the binary mode (loose modem PTT signal). High level guard tone is sent by the paging terminal for 120-140 ms followed immediately by the low level guard tone. The function tone (1950 Hz) is not required. Paging tones or voice is then sent to the station along with continous low level guard tone. To switch back to the audio mode requires a 130-150 ms pause followed by binary information. In the audio mode loss of low level guard tone results in the station unkeying within 350 msec, provided no other information is sent to the station. Similarly, for the binary mode, the station will unkey within 350 msec after modem tones have ended (as sent by the terminal).

6. MULTIPLE PAGE TIMING

Once the station is successfully keyed in either the audio or binary mode, multiple pages of any format may be sent by adhering to the timing required for the audio mode, binary mode, or alternating between audio and binary modes. If paging activity has stopped for more than 160 msec between successive pages to be transmitted, the paging terminal must send a high level guard tone and function tone (1950 Hz) sequence before access to either the audio or binary mode can be determined.

7. LINK STATION TIMING

(See Figure 2 last figure)

When rf control links are used instead of telephone lines, the initial high level guard tone must be extended to insure each transmitter is up to full power and each link receiver is unsquelched. To insure that this condition exists, and additional 300 ms of high level guard tone is sent out for each link (hop).

JUMPER OPTIONS AND TRANSMIT AUDIO LEVEL SETTING

1. JUMPER OPTIONS

The following jumper information is provided to indicate jumper applicability in various *PURC* Radio Paging Stations.

1.1 RECEIVE AUDIO AND SQUELCH BOARD (OPTIONAL)

Jumper	Carrier Squelch	Tone PL Squelch	Digital PL Squelch
JU201	IN	OUT	IN
JU202	IN	OUT	IN
JU203	IN*	IN*	IN*
JU204	IN	IN**	IN**

* IN for 10 W audio
** cut for "and squelch"

1.2 EXCITER

Jumper	Pre-Emphasis	Options	
		Flat Audio	VAR
JU401	OUT	OUT	OUT
JU402	OUT	IN	IN
R401	OUT	OUT	OUT
R402, 3	IN	OUT	OUT
R405	OUT*	OUT*	OUT*

*IN for PL input on Exciter pin 5

1.3 RECEIVER INTERCONNECT BOARD

For full duplex operation on the TLN6196A model board, remove CR957.

1.4 DIGITAL PL SQUELCH DECODER BOARD

Jumper	Normally
JU801	IN
JU802	OUT
JU803	OUT

1.5 FLAT AUDIO BOARD (OPTION)

Jumper No.	JU1	JU2	JU3	JU5	JU6	JU7	JU8	JU9	JU10
Low Band *PURC*	OUT	IN	OUT	IN	OUT	IN	IN	OUT	OUT
Mid Band Link w/DPL	OUT	IN	OUT	IN	IN	IN	IN	OUT	OUT
VHF *PURC*	OUT	IN	OUT	OUT	IN	IN	IN	OUT	OUT
UHF *PURC* and Link w/o DPL	OUT	IN	OUT	IN	OUT	IN	IN	OUT	OUT
UHF Link w/DPL	IN	OUT	OUT	IN	OUT	IN	IN	OUT	OUT
900 MHz *PURC* and Link w/o DPL	OUT	IN	OUT	IN	OUT	IN	IN	OUT	OUT
900 MHz Link w/DPL	OUT	IN	OUT	OUT	IN	IN	IN	OUT	OUT

Note: Resistor 29 is IN for *PURC* and link w/o DPL, OUT for link w/DPL.

1.6 F1 CONTROL MODULE

Part or Jumper	Normal Condition
JU1	NOT USED
JU2	IN
JU3	NOT USED (Always OUT)
C23	IN (out with co-located link receiver)
C32	IN (out with co-located link receiver)

1.7 VOICE ACTUATED RESPONSE (VAR) OPTION

JUMPER		
JU1	OUT	
JU2	IN	Select Normal Trigger Sensitivity
JU3	IN	

		Hang Times		
		1 sec	0.5 sec Nominal	50 ms
JU4		OUT	OUT	OUT
JU5		OUT	OUT	IN
JU6		OUT	OUT	IN
JU7		OUT	IN	IN
JU8	Normally IN	OUT	for C42JZB Link Station	

R56 normally IN for Link Transmitter OUT.

1.8 TRANSMITTER SITE INTERFACE MODULE (MODEL TRN4853A)

Jumper	Normal Condition	Special Applications
JU1	OUT	IN for signal detect key-up
JU2	IN	OUT for inverted data
JU3	OUT	IN for inverted data
JU4	IN	OUT for 387 Hz verification
JU5	IN	OUT when negative voltage module is used
JU6	OUT	IN when modem is removed
JU7	NOT USED	
JU8	IN	OUT when negative voltage module is used

1.9 STATION CONTROL MODULE (MODEL TRN4854B)

Jumper	Normal Condition	Special Applications
JU1	IN	OUT for special applications
JU2	IN	OUT for special applications
JU3	IN	OUT for special applications
JU4	OUT	IN for multi-frequency or JZB1106 stations
JU5	IN	OUT for special applications
JU6	IN	OUT for duplex stations
JU7	OUT	IN for PL squelch
JU8	IN	OUT when simulcast control module used

Note: Remove Q12 when using simulcast control module.

1.10 LINE DRIVER MODULE (MODEL TRN4859A)

Jumper	Normal Condition	Special Applications
JU1	NOT USED	
JU2	NOT USED	
JU3	OUT	IN for 2-wire stations
JU4	OUT	IN for 2-wire stations
JU5	NOT USED	
JU6	NOT USED	
JU7	IN	OUT for special applications
JU8	IN	OUT for special applications
JU9	IN	OUT for special applications
JU10	OUT	IN for rcvr line levels of -10 dBm
R21	IN	OUT for 2-wire stations
R55	OUT	IN for non-binary stations

1.11 UNIFIED REMOTE CONTROL BOARD (MODEL TRN4860A)

Jumper	Normal Condition	Special Applications
JU1	OUT	IN to remove xmit notch
JU2	OUT	IN for guard-tone only or modem keying
JU3	IN	OUT for non-pre-emphasized xmit audio
JU4	OUT	IN for flat xmit audio
JU5	OUT	IN when using var module
JU6	OUT	IN to remove receive notch
JU7	OUT	IN for non-binary paging applications or non-PL link applications

1.12 NON-UNIFIED REMOTE CONTROL BOARD (MODEL TRN5349A)

Jumper	Normal Condition	Special Applications
JU1	OUT	IN to remove xmit notch
JU2	OUT	IN for guard tone only or modem keying
JU3	IN	OUT for non-pre-emphasized xmit audio
JU4	OUT	IN for flat xmit audio
JU5	OUT	IN when using var module
JU6	OUT	IN to remove receive notch
JU7	OUT	IN for non-binary paging or non-PL link applications
JU8	OUT	NOT USED
JU9	OUT	IN when using T.O.T option
JU10	OUT	IN for link xmtrs
JU11	OUT	IN when using T.O.T option
JU12	OUT	IN for link xmtrs
JU13	OUT	IN when using negative voltage module
JU14	OUT	IN For link xmtrs
JU15	IN	OUT when using simulcast control module
JU16	OUT	IN for link xmtrs

1.13 GUARD TONE DECODER (MODEL TRN4892A)

Jumper	Normal Condition	Special Applications
R91	IN	OUT for link receivers with zero dBm link level

1.14. SIMULCAST CONTROL MODULE (MODEL TLN2559B)

Jumper	Normal Condition	Special Applications
JU1	IN	OUT for multi-frequency operation.
JU2	IN	OUT for special products.

2. TRANSMIT AUDIO LEVEL SETTING

NOTE

If station is used without a modem, add jumper JU6 to the TRN4853A Transmitter Site Interface module. JU6 provides a 600 ohm input to the module.

2.1 MAXIMUM DEVIATION CAPABILITY

With 1 volt RMS of 1 kHz audio at the exciter level input on the line driver module, increase transmitter deviation by rotating the exciter IDC control. Transmitter shall be capable of achieving the maximum deviation specified limit without evidence of modulation break up.

2.2 SET MAXIMUM DEVIATION

2.2.1 Without TRN5347A Voice Actuated Response Module (VAR)

Step 1. (Pre-Emphasized Audio Only) Set modulation as in paragraph 2.1, and adjust exciter IDC control for ±5 kHz total deviation.

Step 2. (Flat Audio Only). Set modulation as in paragraph 2.1 and adjust flat audio IDC control fully clockwise. Adjust exciter IDC control for ±5 kHz total deviation.

2.2.2 With (VAR), the following procedure applies:

PURC TRANSMIT AUDIO LEVEL ADJUSTMENT

Step 1. Set VAR DISABLE switch on VAR to DISABLE position.

Step 2. Turn R43 fully clockwise on VAR, for maximum output.

Step 3. Turn R28 fully clockwise on TRN5348A Flat Audio Board to set minimum resistance.

Step 4. Set PRE-EMP/FLAT switch on VAR to FLAT position.

Step 5. Apply a 1 V rms, 1 kHz tone to TRN4859A Line Driver XCTR LEVEL jack.

Step 6. Adjust exciter IDC control for ±5 kHz peak deviation.

Step 7. Adjust input level of 1 kHz tone for ±3 kHz deviation.

Step 8. Set PRE-EMP/FLAT switch on VAR to PRE-EMP position.

Step 9. Adjust R43 on VAR for ±3 kHz deviation.

Step 10. Apply a 1 kHz test tone (from phone line) to TRN4859A Line Driver XMTR LINE input, and adjust R39 on line driver for ±3 kHz deviation.

Step 11. Set VAR DISABLE switch to ENABLED position (opposite DISABLE position).

2.3 EXCITER AUDIO SENSITIVITY

Reduce the input level for 60% of rated deviation. Record the audio voltage at XCTR LEVEL jack on line driver module. (Use Motorola MK871CS Cable Kit).

2.4 TRANSMIT LINE LEVEL

NOTE

If the station has a VAR module, it must be disabled and set to the flat mode.

Step 1a. Apply a 1 KHz test tone into the station on the 600 ohm line terminals and adjust the XCTR LEVEL control on the line driver module for ±3 kHz deviation.

Step 1b. With the VAR option, and the same modulation as in Step 1a, adjust the XCTR LEVEL control on the VAR module for ±3 KHz deviation, with the VAR module disabled and set to the PRE-EMPHASIZED mode.

Step 2. Re-enable VAR module when above adjustments are completed.

3. FREQUENCY SHIFT KEYING (FSK) DEVIATION

Step 1. Line disable the station via switch on station control module.

Step 2. Set the T.S.I. test switch to the TEST position, and place the DEVIATION switch to the +

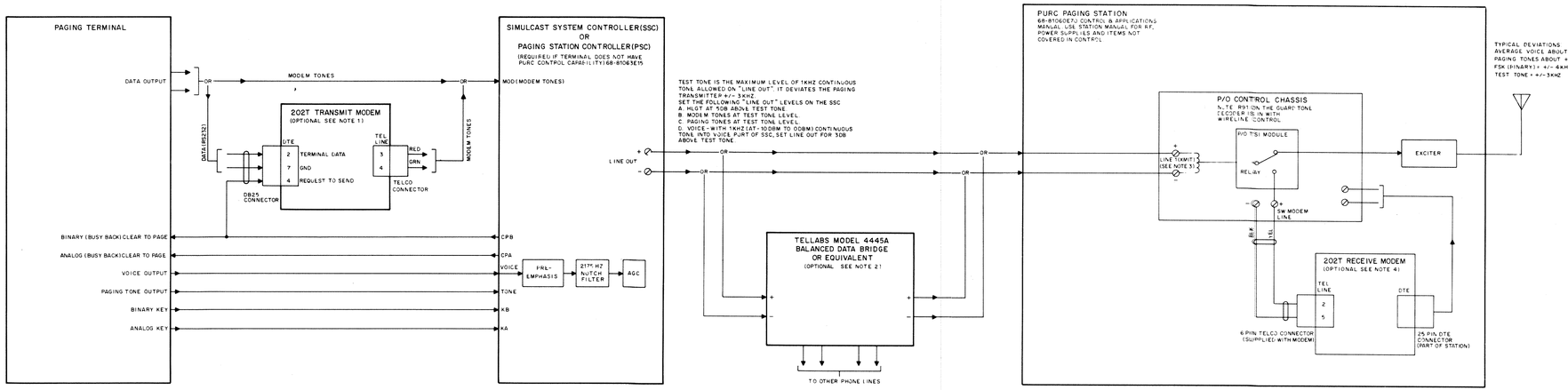
position. The binary deviation can be read as the output frequency (fo) minus the carrier frequency (fc).

Step 3. Adjust the + DEVIATION control on the digital modulator module until fo-fc equals + 4.0 kHz.

Step 4. Place the DEVIATION switch to the - position and adjust the - DEVIATION control for fo-fc equals - 4.0 kHz.

Step 5. Return the TEST switch to its normal position.

PURC PAGING SYSTEM LEVEL ADJUSTMENT PROCEDURE
(WITH WIRELINE CONTROL)



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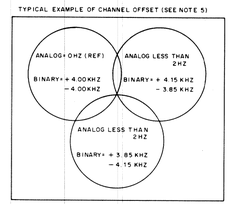
TYPICAL EXAMPLE OF CHANNEL OFFSET (SEE NOTE 5)



NOTES:

CAUTION
Wireline control can be used for binary simulcast but it is NOT recommended for voice simulcast.

1. A transmit modem is required only if the paging terminal does not generate modem tones. The modem converts the paging terminal RS-232 data into modem tones.

   a. Inputs: All inputs to the modem are connected via the DB25 connector labeled DTE on the rear panel. The required inputs are:

      Pin 2 output data from terminal
      -3 to -25 V DC generates a 1200 Hz Mark
      +3 to +25 V DC generates a 2200 Hz Space

      Pin 4 Request to Send
      Pin 7 Signal Ground

   NOTE
   All inputs require RS-232 levels. —3 to -25 V DC OFF (or space). +3 to + 25 V DC ON (or mark).

   However, TTL levels of Mark-0V dc and Space = 5 V dc have been used successfully, but they are not guaranteed.

   b. Outputs: A modular-to-spade lug cable is shipped with each modem. The modem tone output from the UDS202T is a modular connector labeled TEL LINE. With jumpering per the table below, pins 3 and 4 (red and green) provide balanced output. The receive modem accepts modem tone inputs via pins 2 and 5 (yellow and black).

   c. Request to Send (RTS)

   A positive RS-232 level on this line activates the modem carrier signal. It is recommended that modem tones only be present during binary paging activity because of the similarity between the 2200 Hz modem tone and 2175 Hz guard tone. The terminal must control the RTS signal to the modem. If terminal control of RTS is not possible, Motorola's Simulcast System Controller and PURC Station Controller offer a convenient method for controlling RTS. Most terminals can be configured to respond to a logic low (zero volts) "busy" signal and therefore a logic high (5 volts) CPB signal from the SSC. This same CPB signal can be used to control RTS. Note that some RS-232 level shifting is required.

   If "Busy" -5 volts is required, then the CPB signal is not compatible with RTS. Instead, CPA can be used for RTS. The resulting operation turns off modem tones during analog paging activity.

   d. All jumper locations are clearly identified in the UDS202T operating manual.

Jumper Positions for Transmit and Receive Modems

Jumper	Transmit	Receive**
RTS/CTS Delay	8	8*
Transmit Carrier	TC	TC
Local Copy Squelch	IN*	IN*
Call Turnaround Squelch	IN*	IN*
Turnaround Squelch Time	8.3*	8.3*
Soft Carrier Turnoff	0	0
Carrier Detect Level	-30*	-30
Carrier Detect Delay	6*	6
Test Baud Rate	1*	1*
Anti-Streaming	OUT	OUT*
Anti-Streaming Delay	*	*
Chassis Sys GND	IN	IN
2 Wire/4 Wire (2 places)	4W	4W
Transmit Level	0 dBm	*

* Not critical
** For reference

2. For binary simulcast, delay equalizers are required in the PURC paging systems. Individual line level controls of bridge is recommended.

3. Station Audio Adjustments

   IDC. Inject a 1 kHz tone at 1V rms into line driver "XCTR LEVEL" jack. Adjust "IDC" on exciter for ±5.0 kHz deviation. After this adjustment is made no further adjusting of the exciter "IDC" is necessary.

   Measure the test tone level at Line 1 (XMIT). The level is conveniently measure at the BRIDGE XMTR jack on the line driver module. (Jack connections are MK8716S double-banana to mini-phone.) For proper operation, test tone level must be greater than -20 dBm.

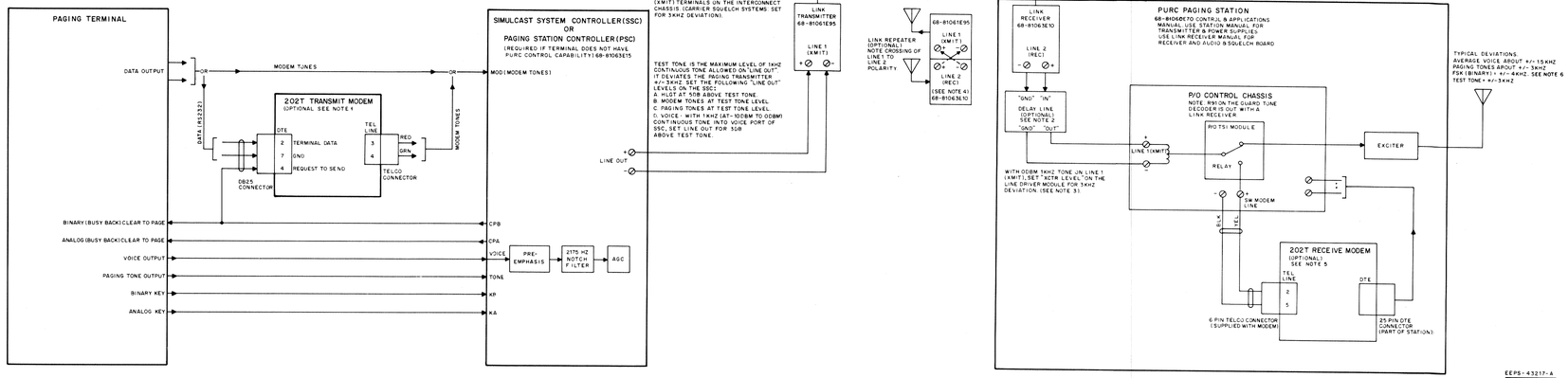
   With test tone on Line 1 (XMIT), adjust the XCTR level control on the line driver module for ± 3 kHz deviation.

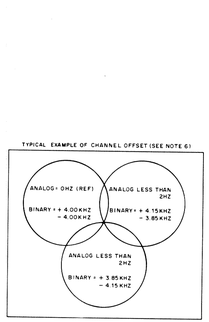
4. A receive modem is required in the PURC transmitter only if a binary format is used. The modem front panel switch must be in the DATA position. Refer to the modem Model UDS202T Operation's Manual and the PURC Control and Applications instruction manual 68P81060E70 for wiring configuration.

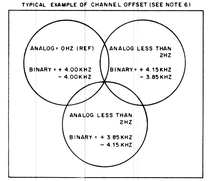
   See note 1d for JUMPERS.

5. For simulcast operation, in systems that have overlapping areas of coverage, the synthesizer reference oscillator is adjusted (after equipment warm-up) for the desired carrier frequency. This is typically less than 2 Hz between overlapping transmitters. For binary signaling (FSK-NRZ), adjust the + and - deviation controls to effect a carrier offset in the binary mode (typically + /- 150 Hz or more) when stations have overlap areas. i.e., for + 150 Hz, adjust + deviation for 4.15 kHz and adjust - deviation for -3.85 kHz deviation. See the inset diagram for typical channel offset.

PURC PAGING SYSTEM
LEVEL ADJUSTMENT PROCEDURE
(WITH RF LINK CONTROL)







NOTES:

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Wireline control can be used for binary simulcast but it is NOT recommended for voice simulcast.

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   NOTE

   All inputs require RS-232 levels. —3 to -25 V DC OFF (or space). +3 to +25 V DC ON (or mark).

   However, TTL levels of Mark-0V dc and Space = 5 V dc have been used successfully, but they are not guaranteed.

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   A positive RS-232 level on this line activates the modem carrier signal. It is recommended that modem tones only be present during binary paging activity because of the similarity between the 2200 Hz modem tone and 2175 Hz guard tone. The terminal must control the RTS signal to the modem. If terminal control of RTS is not possible, Motorola's Simulcast System Controller and PURC Station Controller offer a convenient method for controlling RTS. Most terminals can be configured to respond to a logic low (zero volts) "busy" signal and therefore a logic high (5 volts) CPB signal from the SSC. This same CPB signal can be used to control RTS. Note that some RS-232 level shifting is required.

   If "Busy" -5 volts is required, then the CPB signal is not compatible with RTS. Instead, CPA can be used for RTS. The resulting operation turns off modem tones during analog paging activity.

   d. All jumper locations are clearly identified in the UDS202T operating manual.

2. The delay line "GND" is isolated from the chassis. CAUTION: Observe audio polarity per diagram.

3. Station Audio Adjustments

   IDC. Inject a 1 kHz tone at 1 V rms into line driver "XCTR LEVEL" jack. Adjust "IDC" on exciter for ±5.0 kHz deviation. After this adjustment is made no further adjusting of the exciter "IDC" is necessary.

   Measure the test tone level at Line 1 (XMIT). The level is conveniently measure at the BRIDGE XMTR jack on the line driver module. (Jack connections are MX637GS double-banana to mini-phone.) For proper operation, test tone level must be greater than -20 dBm.

   XCTR LEVEL adjustments on each paging transmitter in a simulcast system should be optimized using the TEST TONE level generated by the Motorola Simulcast System Controller/PURC Station Controller (SSC/PSC) which is sent through the entire linking path. Each transmitter should deviate ±3 kHz with TEST TONE level out of the PSC/SSC.

4. The link repeater is the only part of the system where the audio is crossed + to -. This occurs on the Remote Control chassis between line 1 and line 2.

5. A receive modem is required in the PURC transmitter only if a binary format is used. The modem front panel switch must be in the DATA position. Refer to the modem Module UDS202T Operation's Manual and the PURC Control and Applications instruction manual 68P81063E70 for wiring configuration.

   See note 1d for JUMPERS.

6. For simulcast operation, in systems that have overlapping areas of coverage, the synthesizer reference oscillator is adjusted (after equipment warm-up) for the desired carrier frequency. This is typically less than 2 Hz between overlapping transmitters. For binary signaling (FSK-NRZ), adjust the + and - deviation controls to effect a carrier offset in the binary mode (typically +/- 150 Hz or more) when stations have overlap areas, i.e., for + 150 Hz, adjust + deviation for 4.15 kHz and adjust - deviation for -3.85 kHz deviation. See the inset diagram for typical channel offset.

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Transmit Carrier	TC	TC
Local Copy Squelch	IN*	IN*
Call Turnaround Squelch	IN*	IN*
Turnaround Squelch Time	8.3*	8.3*
Soft Carrier Turnoff	0	0
Carrier Detect Level	-30*	-30
Carrier Detect Delay	6*	6
Test Baud Rate	1*	1*
Anti-Streaming	OUT	OUT*
Anti-Streaming Delay	*	*
Chassis Sys GND	IN	IN
2 Wire/4 Wire (2 places)	4W	4W
Transmit Level	0 dBm	*

* Not critical
** For reference

FUNCTIONAL DESCRIPTION

The station is first keyed up in the audio mode by guard tone††function tone (2175 Hz and 1950 Hz, respectively). The guard tone is coupled from the line by line driver transformer, T1, and routed to the guard tone decoder module. The guard tone decoder module generates a Line PTT upon detection of the 2175 Hz signal. The station control module then opens the function tone window, thus allowing the guard tone decoder module to pass function tones and enabling the tone decoders.

A line PTT produces keyed A+ from the station control module and prevents the station from entering the binary mode by removing the modem via relay K1 in the Transmitter Site Interface (TSI) module.

The F1 Control Module produces an F1 channel element ground and PL enable with the detection of 1950 Hz, these lines are latched until the station un- keys.

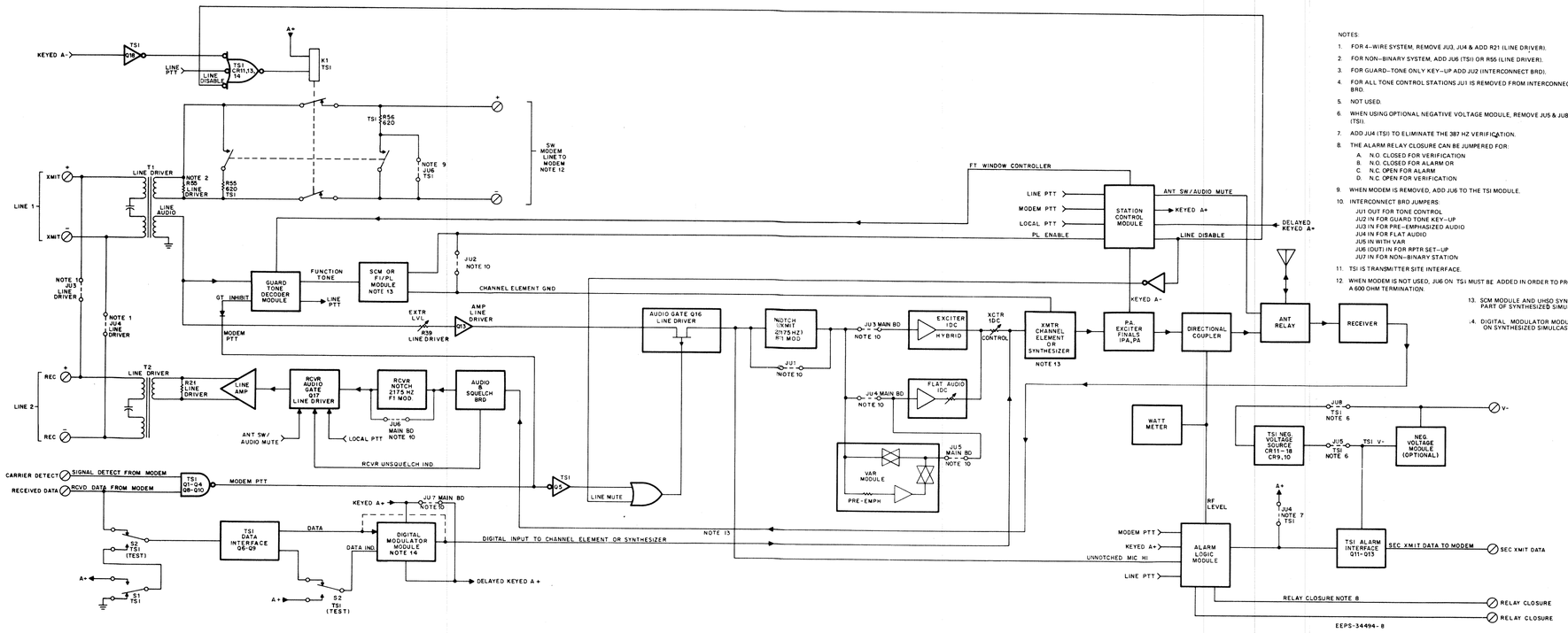
Channel element ground turns on the element and PL enable allows the station control module to generate keyed A-, provided either keyed A+ or delayed keyed A+ is present. Keyed A- closes the function tone window and biases the final rf stages in the transmitter bringing the station up to full power.

After the function tone there is a delay of 130-150 milliseconds, which allows for the loss of line PTT. Keyed A+ is removed by the loss of the PTT signal, but delayed keyed A+ remains for an additional 160-200 milliseconds, preventing the station from un- keying during tone-binary or binary-tone transitions.

If the station is keyed while line PTT or line disable is not present, relay K1 in the TSI module allows the modem tones to be applied to the modem, again via T1 in the line driver module. The modem then generates carrier detect and received data signals. If the TSI module receives active data (active since the modem considers guard tone as static data) and a carrier detect signal, it generates a modem PTT function. The modem PTT function now replaces line PTT in the keying sequence to keep the station transmitter keyed. The modem PTT is used to open the transmit audio path in the line driver so the modem tones do not modulate the carrier. In addition, the guard tone decoder is disabled by modem PTT, therefore inhibiting line PTT while in the binary mode. The TSI module then passes the data to the digital modulator module which level shifts the data and dc couples it to the channel element, thus producing the frequency shift keying-non-return to zero (FSK-NRZ) output.

If a voice message follows the binary information, another delay allows for the loss of modem PTT, then high level guard tone is again used to obtain line PTT. Once keyed in the tone mode the voice (or paging tones in a tone system) is sent with the low level guard tone in order to maintain the line PTT function. The notch filter in the F1 control module removes the low level guard tone. Thus preventing it from being transmitted. The audio is routed from T1 in the line driver, through the notch filter and then to either the pre-emphasized or flat audio path in the exciter before modulating the channel element.

STATION BLOCK DIAGRAM

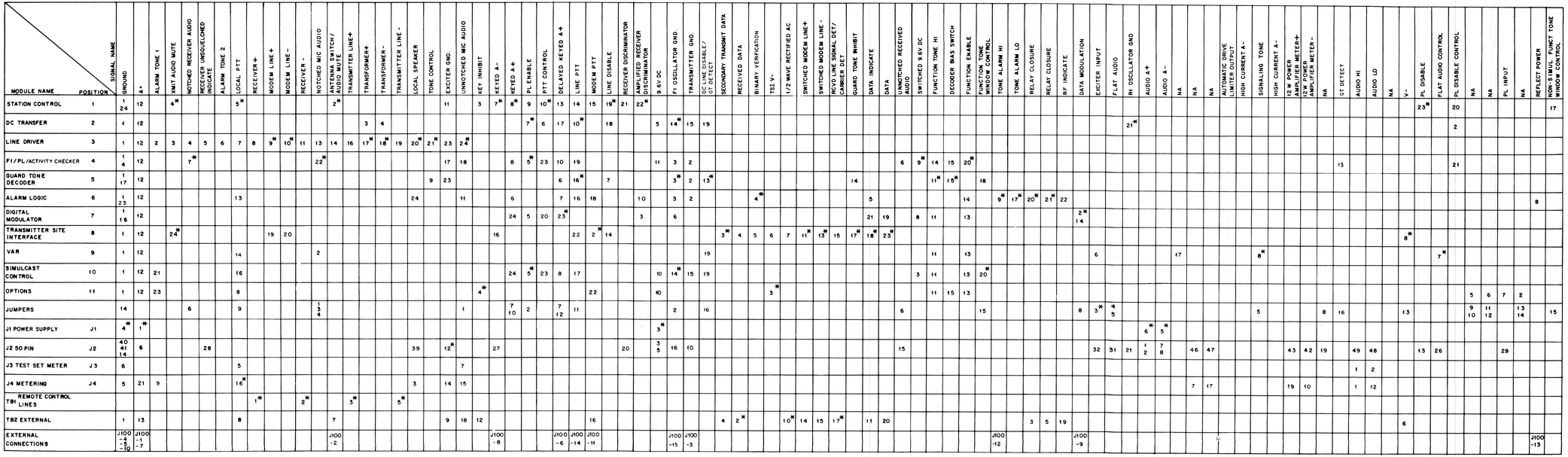


NOTES:

1. FOR 4-WIRE SYSTEM, REMOVE JU3, JU4 & ADD R21 (LINE DRIVER).
2. FOR NON-BINARY SYSTEM, ADD JU6 (TSI) OR R55 (LINE DRIVER).
3. FOR GUARD-TONE ONLY KEY-UP ADD JU2 (INTERCONNECT BRD).
4. FOR ALL TONE CONTROL STATIONS JU1 IS REMOVED FROM INTERCONNECT BRD.
5. NOT USED.
6. WHEN USING OPTIONAL NEGATIVE VOLTAGE MODULE, REMOVE JU5 & JU8 (TSI).
7. ADD JU4 (TSI) TO ELIMINATE THE 387 HZ VERIFICATION.
8. THE ALARM RELAY CLOSURE CAN BE JUMPERED FOR:
   A. N.O. CLOSED FOR VERIFICATION
   B. N.O. CLOSED FOR ALARM OR
   C. N.C. OPEN FOR ALARM
   D. N.C. OPEN FOR VERIFICATION.
9. WHEN MODEM IS REMOVED, ADD JU6 TO THE TSI MODULE.
10. INTERCONNECT BRD JUMPERS:
    JU1 OUT FOR TONE CONTROL
    JU2 IN FOR GUARD TONE KEY-UP
    JU3 IN FOR PRE-EMPHASIZED AUDIO
    JU4 IN FOR FLAT AUDIO
    JU5 IN WITH VAR
    JU6 (OUT) IN FOR RPTR SET-UP
    JU7 IN FOR NON-BINARY STATION
11. TSI IS TRANSMITTER SITE INTERFACE.
12. WHEN MODEM IS NOT USED, JU6 ON TSI MUST BE ADDED IN ORDER TO PROVIDE A 600 OHM TERMINATION.
13. SCM MODULE AND UHSO SYNTHESIZER ARE PART OF SYNTHESIZED SIMULCAST STATIONS ONLY.
14. DIGITAL MODULATOR MODULE DELETED ON SYNTHESIZED SIMULCAST STATIONS.

Motorola No. PEPS-34628-B
7/31/86-PHI

TRN5349A NON-UNIFIED REMOTE CONTROL DIAGRAM



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 (position 1 pin 10) has a function of PTT Control which is interconnected to DC Transfer Module (position 2 pin 6), F1/PL Module (position 4 pin 23), Digital Modulator (position 7 pin 20), and Simulcast Control (position 10 pin 23).

Interconnect Board for Link System
Motorola No. PEPS-35131-B
7/31/86-PH1

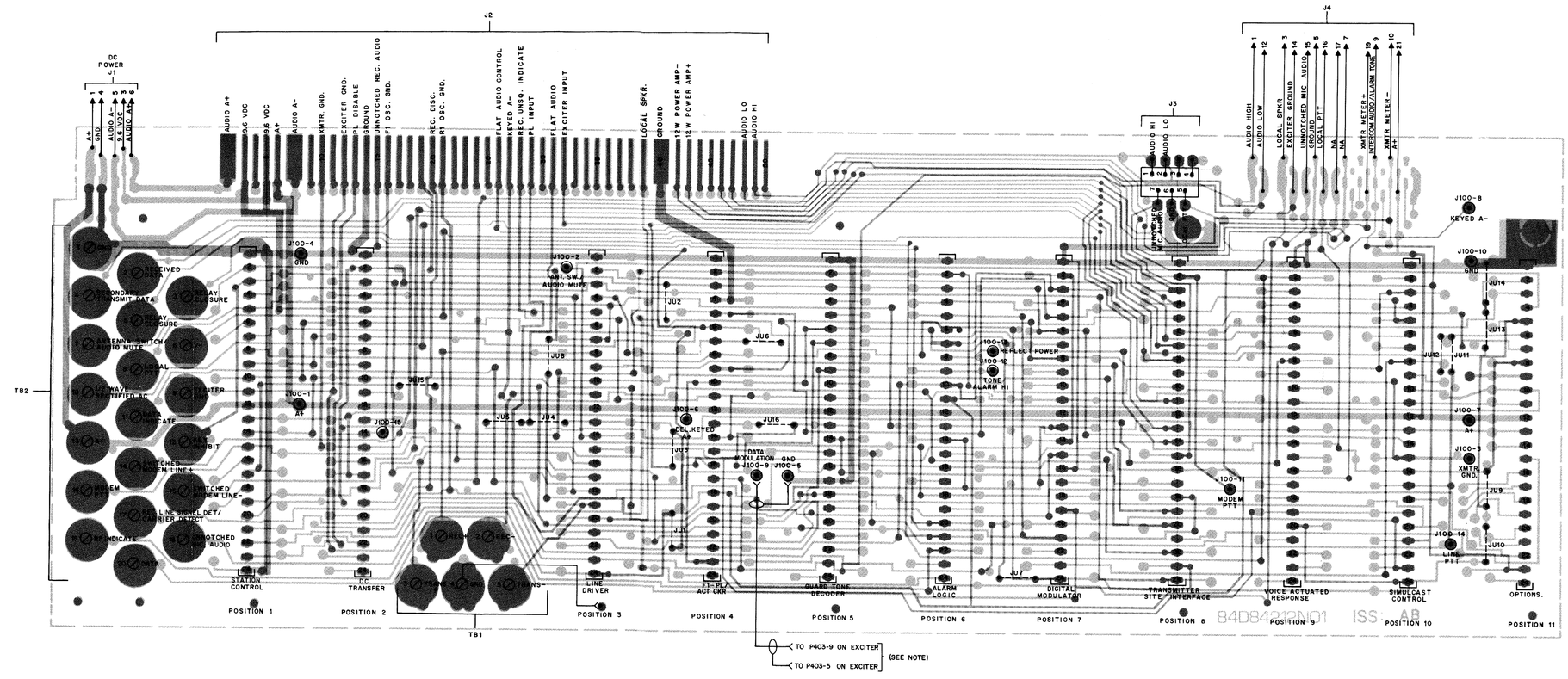
EEPS-35131-B

NON UNIFIED REMOTE CONTROL BOARD
MODEL TRN5349A

parts list

TRN5349A Interconnect Board — PL-7985-O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
E1, 2, 3, 4	80-83029H01	**spark, gap:** 230 V ± 15%
J3	9-84207B01	**connector, receptacle:** female; 7-contact
		mechanical parts
	3-84482M01	SCREW, machine; insulator; 25 used
	29-83362G01	TERMINAL; 25 used
	29-84028H01	TERMINAL; plug; 264 used
	39-10184A10	CONTACT, plug; 13 used
	28-84269C01	TERMINAL, contact; low profile; 13 used
	28-84269C02	TERMINAL, contact; high profile; 10 used



SHOWN FROM SOLDER SIDE
(REAR OF STATION)

NOTE: THESE CONNECTIONS ARE MADE ON NON-SYNTHESIZED STATIONS ONLY.

COMPONENT SIDE = BD-EEPS-34456-A
SOLDER SIDE = BD-EEPS-34457-A
OL-EEPS-34458-A

Circuit Board Detail & Parts List
Motorola No. ***PEPS-34629-B***
7/31/86-PHI

UNIFIED REMOTE CONTROL BOARD INTERCONNECT CHART

MODEL TRN4860A

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.

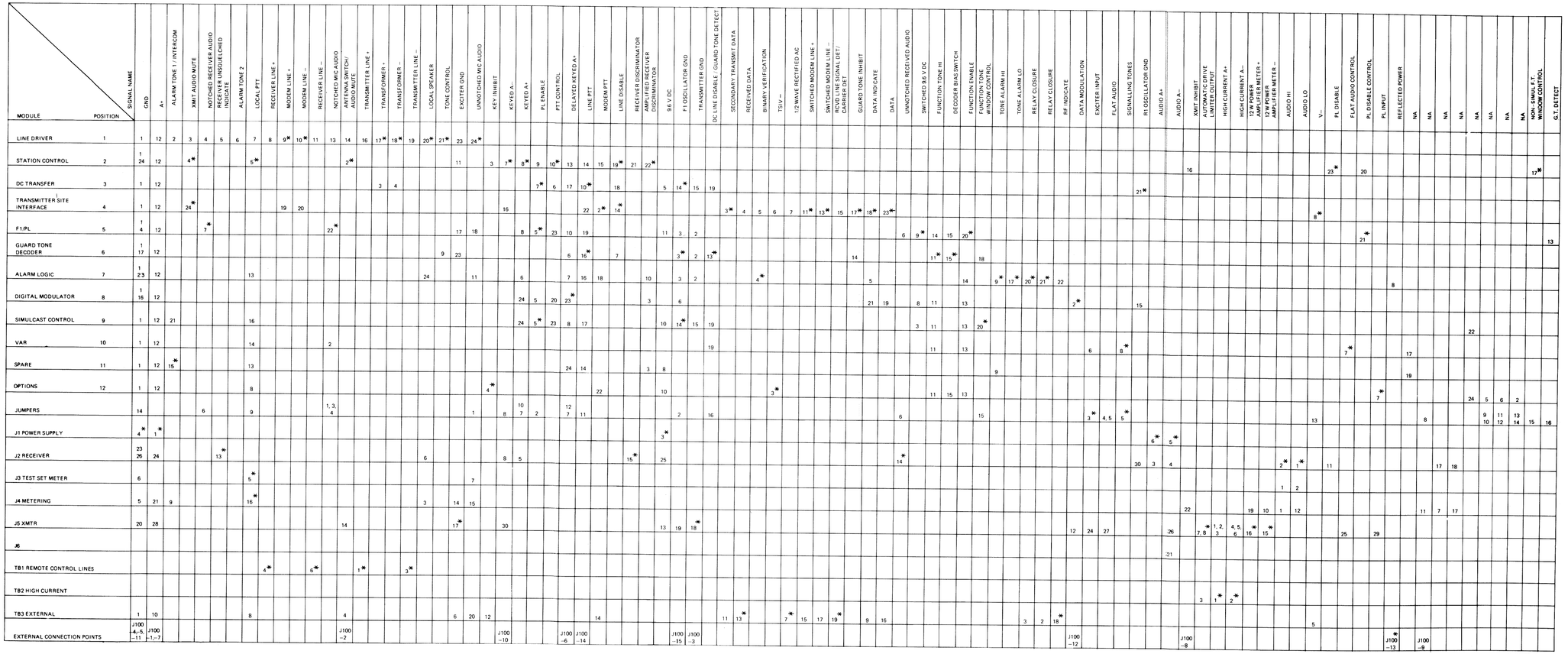
Step 3. Note the function of the desired pin. The function is listed at the top of the column in which the pin number appears. All other pins listed in the same function column are interconnected. For each entry in the function column, trace back to the left hand column to find the module or connector 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 PTT Control, which is interconnected to DC Transfer Module (position 3) pin 6, Module (position 5) pin 23, Digital Modulator (position 8) pin 20, and Simulcast Control Module (position 9) pin 23.



Motorola No. PEPS-34673-C
7/31/86 -PHI

EEPS-34673-C

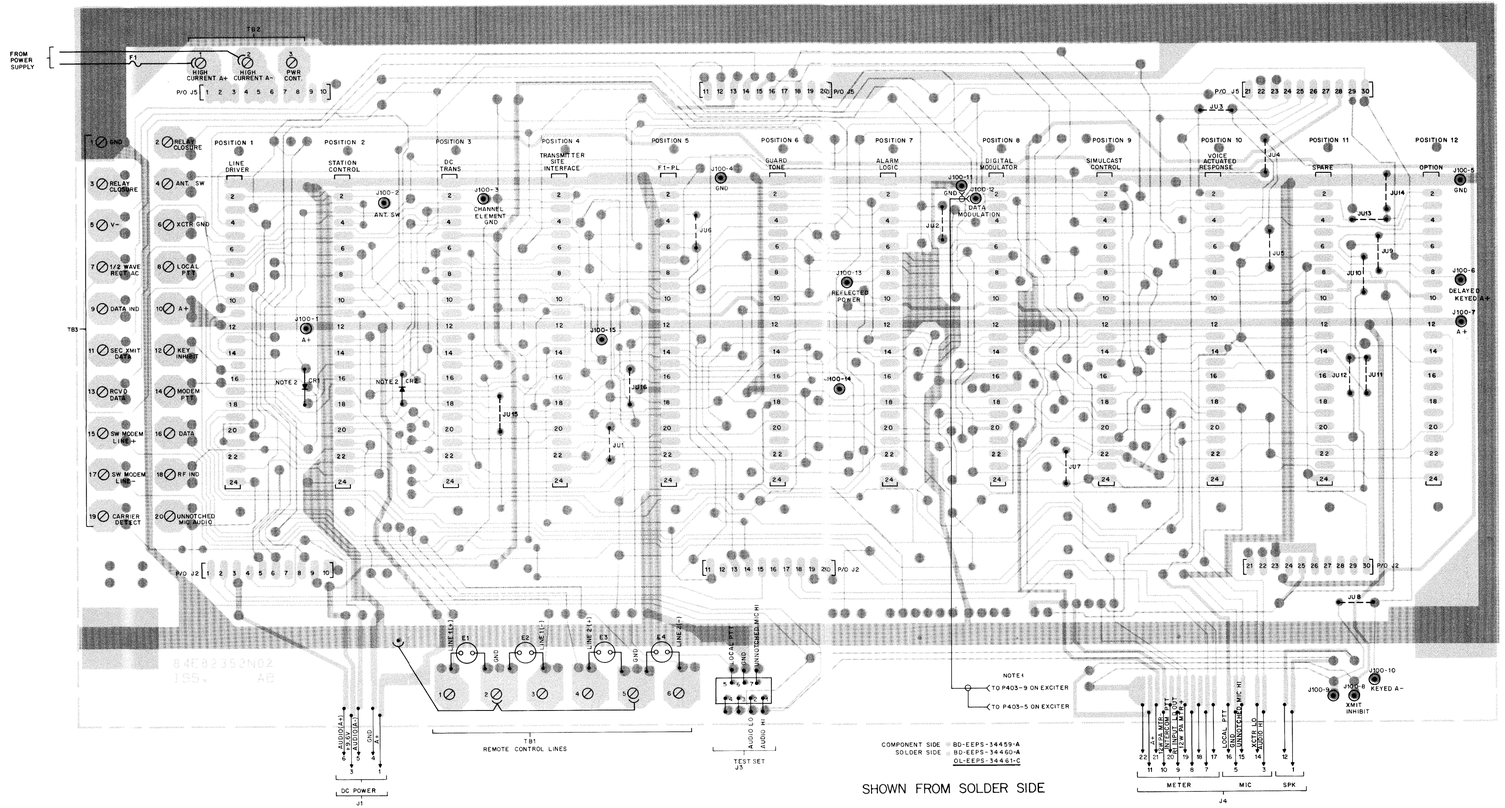
UNIFIED REMOTE CONTROL BOARD
MODEL TRN4860A

parts list

TRN4860A Interconnect Board — PL-7984-A

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		diode: (see note)
CR1, 2	48-83654H01	silicon
		spark, gap:
E1, 2, 3, 4	80-83029H01	250 V ±15%
		connector, receptacle:
J3	9-84207B01	female; 7-contact
		resistor, fixed: ± 10%; 1/4 W: unless otherwise stated
R1	6-125C01	10
		mechanical parts
	3-84482M01	SCREW, machine: insulator; 29 used
	29-83362G01	TERMINAL; 29 used
	29-84028H09	TERMINAL, plug; 348 used
	39-10184A10	CONTACT, plug; 11 used
	28-84269C01	TERMINAL, contact; low profile; 13 used
	28-84269C02	TERMINAL, contact; high profile; 10 used

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



NOTES:

1. These connections are made on non-synthesized stations only.
2. CR1 and CR2 used with B84, and C75 station models only.

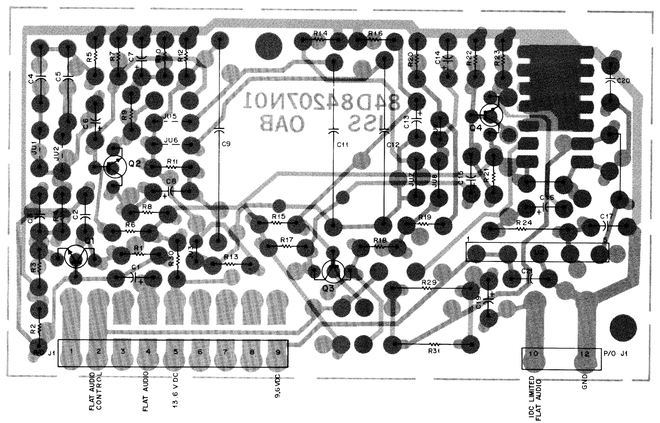
Jumper Chart

Jumper	Normal	Description
JU1	OUT	IN To Remove Xmit Notch
JU2	OUT	IN For Guard Tone only or Modem Key-Up
JU3	IN	OUT For Non-Preemphasized Xmit Audio
JU4	OUT	IN For Flat Audio
JU5	OUT	IN When Using VAR Module
JU	OUT	IN To Remove Rcvr Notch
JU7	OUT	In For Non-Binary Paging Applications and Non-PL Link Applications
JU8	IN	Always In
JU9	OUT	IN When using T.O.T. Option
JU10	OUT	IN When Used in Link Stations with DPL
JU11	OUT	IN When Using T.O.T. Option
JU12	OUT	IN When Used in Link Stations with DPL
JU13	OUT	IN For Special
JU14	OUT	IN When Used in Link Stations
JU15	IN	OUT When Using Simulcast Control Module or Link Transmitter
JU16	OUT	IN When Used in Link Transmitter

Circuit Board Detail & Parts List
Motorola No. PEPS-34630-C
7/31/86-PHI

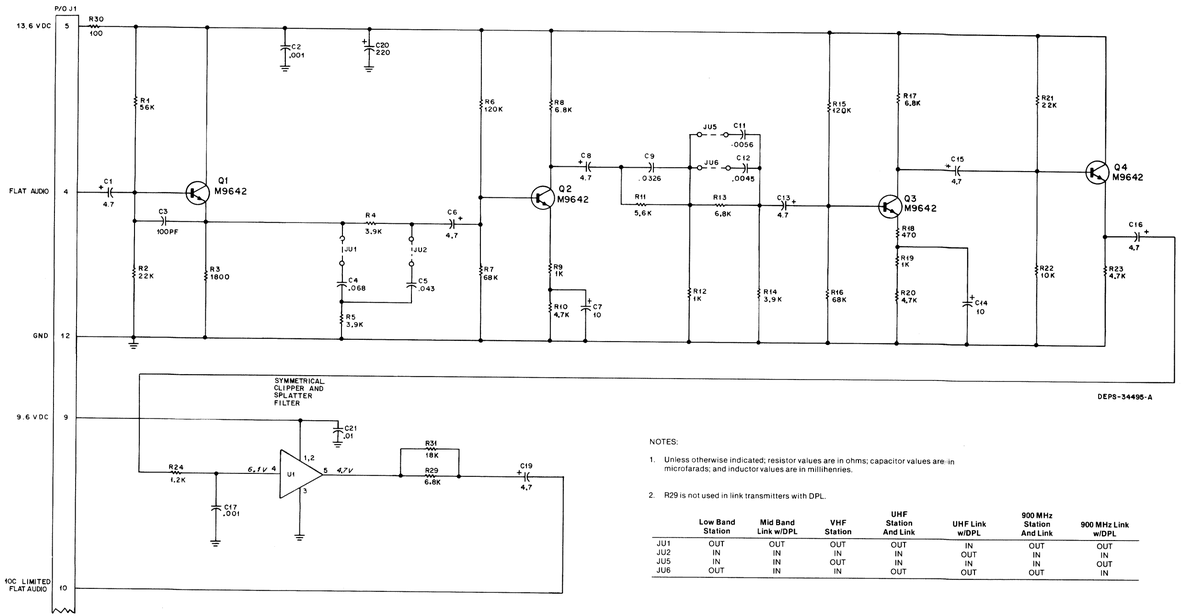
TRANSMITTER FLAT AUDIO BOARD

MODEL TRN5348B



SHOWN FROM COMPONENT SIDE

COMPONENT SIDE ● BD CEPS-34496-A
SOLDER SIDE ● BD CEPS-34497-A
OL CEPS-34498-B



NOTES:

1. Unless otherwise indicated; resistor values are in ohms; capacitor values are in microfarads; and inductor values are in millihenries.
2. R29 is not used in link transmitters with DPL.

	Low Band Station	Mid Band Link w/DPL	VHF Station	UHF Station And Link	UHF Link w/DPL	900 MHz Station And Link	900 MHz Link w/DPL
JU1	OUT	OUT	OUT	OUT	IN	OUT	OUT
JU2	IN	IN	IN	IN	OUT	IN	IN
JU5	IN	IN	OUT	IN	IN	IN	OUT
JU6	OUT	IN	IN	OUT	OUT	OUT	IN

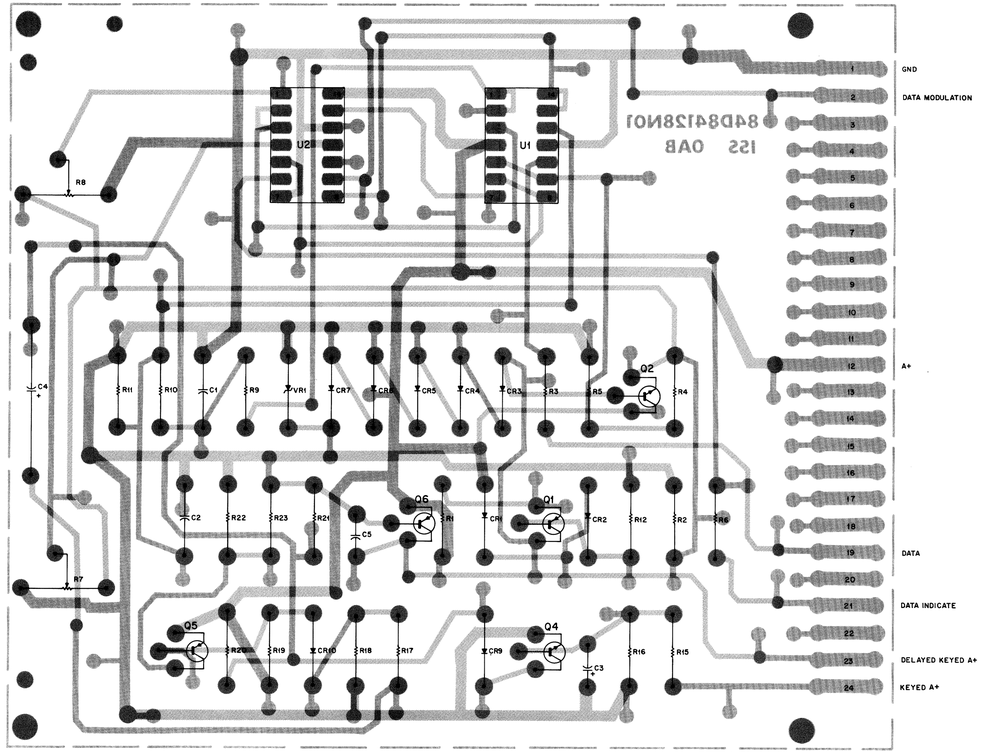
parts list

TRN5348A Transmitter Flat Audio Board — PL-7975-A

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		capacitor, fixed: uF ±20%; 20 V; unless otherwise stated
C1	23-84538G02	4.7
C2	21-11015B13	.001 ± 10%; 100 V
C3	21-11014H49	100 pF
C4	8-84637L48	.068 ± 5%; 100 V
C5	8-83813H14	.043 ± 5%; 50 V
C6	23-84538G02	4.7
C7	23-11013C07	10 ± 10%; 15 V
C8	23-84538G02	4.7
C9	8-84326A25	.0326 ± 2%; 50 V
C11	8-84326A13	.0056 ± 2%; 50 V
C12	8-84326A30	.0045 ± 1%; 50 V
C13	23-84538G02	4.7
C14	23-11013C07	10 ± 10%; 15 V
C15, 16	23-84538G02	4.7
C17	21-11015B13	.001 ± 10%; 100 V
C19	23-84538G02	4.7
C20	23-84665F36	220
C21	8-11017B08	.01
		transistor: (see note)
Q1, 2, 3, 4	48-869642	NPN; type M9642
		resistor, fixed: ±5%; 1/4 W; unless otherwise stated
R1	6-11009E91	56k
R2	6-11009E81	22k
R3	6-11009E55	1.8k
R4, 5	6-11009E63	3.9k
R6	6-11009E99	120k
R7	6-11009E93	68k
R8	6-11009E69	6.8k
R9	6-11009E49	1k
R10	6-11009E65	4.7k
R11	6-11009E67	5.6k
R12	6-11009E49	1k
R13	6-11009E69	6.8k
R14	6-11009E63	3.9k
R15	6-11009E99	120k
R16	6-11009E93	68k
R17	6-11009E69	6.8k
R18	6-11009E41	470
R19	6-11009E49	1k
R20	6-11009E65	4.7k
R21	6-11009E81	22k
R22	6-11009E73	10k
R23	6-11009E65	4.7k
R24	6-11009C51	1.2k
R29	6-11009C69	6.8k
R30	6-11009E25	100
R31	6-11009C79	18k
		integrated circuit: (see note)
U1	1-80755D60	IDC hybrid
		non-referenced parts
	9-83697M01	RECEPTACLE, circuit board mount; 11 used
	9-84728L01	JUMPER, plug-in; 2 used
	28-84729L01	RECEPTACLE

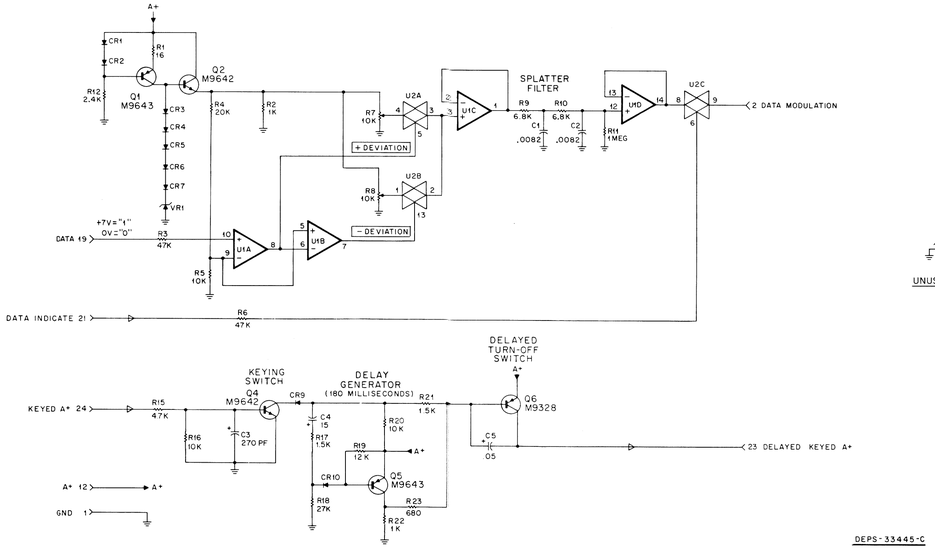
note: For optimum performance, diodes, transistors, and integrated circuits must be ordered by Motorola part numbers.

Circuit Board Detail, Schematic Diagram & Parts List
Motorola No. ***PEPS-34631-B***
7/31/86-PHI



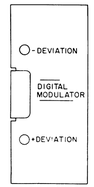
SHOWN FROM COMPONENT SIDE

COMPONENT SIDE ■ BD-DEPS-35226-O
SOLDER SIDE ■ BD-DEPS-35227-O
OL-DEPS-35228-O



DEPS-33445-C

UNUSED CIRCUIT



FRONT PANEL
DETAIL

DIGITAL MODULATOR MODULE

MODEL TRN4856B

FUNCTION

This module accepts binary data from the Transmitter Site Interface (TSI) module and dc level shifts it to the proper voltages to deviate the transmitter carrier frequency ±4 kHz corresponding to binary "1"'s and "0"'s.

The splatter filter attenuates high frequency energy from the binary data stream prior to application to the modulator. This limits the bandwidth of the transmitted signal per FCC regulations.

This module also provides gating of the binary data to the modulator stage in the transmitter, via the "Data Indicate" signal originating in the TSI module. The delayed keyed A+ from this module prevents the transmitter from un-keying during transitions between the normal mode and the binary mode of operation.

NOTES:

1. Unless otherwise indicated: resistor values are in ohms; capacitor values are in microfarads.
2. Integrated circuits on this board are CMOS devices.
3. IC types and connections for this board are as follows:

Reference Designation	Type	VCC	Gnd	Mfgr's Description
U1	29M08	4	11	Quad Op Amp
U2	84L14	14	7	Quad Analog Gate

Circuit Board Detail, Schematic Diagram & Parts List
Motorola No. PEPS-34632-B
7/31/86-PHI

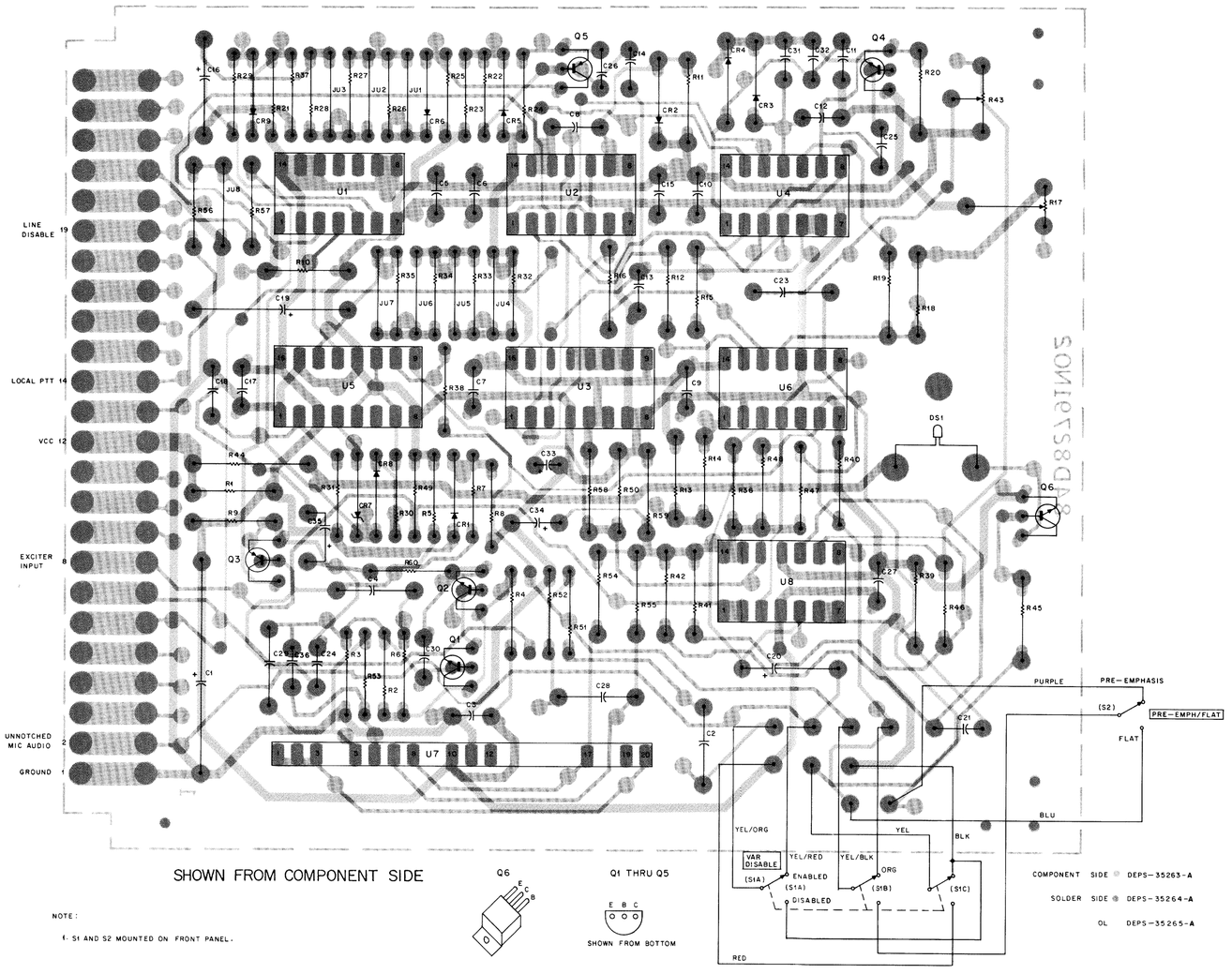
parts list

TRN4856B Digital Modulator Module PL-7983-B

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		capacitor, fixed: uF: unless otherwise stated
C1, 2	8-83813H30	.0082 ±10%; 100 V
C3	21-82187B22	270 pF ±10%; 200 V
C4	23-82783B24	15 ±15%; 25 V
C5	21-82372C04	.05 +80-20%; 25 V
		diode: (see note)
CR1 thru 10	48-83654H01	silicon
		transistor: (see note)
Q1	48-869643	PNP; type M9643
Q2	48-869642	NPN; type M9642
Q4	48-869642	NPN; type M9642
Q5	48-869643	PNP; type M9643
Q6	48-869328	NPN; type M9328
		resistor, fixed: ±5%; 1/4 W: unless otherwise stated
R1	6-11009C06	16
R2	6-11009C49	1k
R3, 6	6-11009C89	47k
R4	6-11009C80	20k
R5	6-11009C73	10k
R7, 8	18-84143N01	variable; 10k
R9, 10	6-11009C69	6.8k
R11	6-11009D22	1 meg.
R12	6-11009C58	2.4k
R15	6-11009C65	4.7k
R16	6-11009C73	10k
R17	6-11009C53	1.5k
R18	6-11009C83	27k
R19	6-11009C75	12k
R20	6-11009C73	10k
R21	6-11009C53	1.5k
R22	6-11009C49	1k
R23	6-11009C45	680
		integrated circuit: (see note)
U1	51-83629M08	quad operational amplifier
U2	51-82884L14	quad analog gate
		voltage regulator:
VR1	48-82256C44	Zener type; 7.5 V
		mechanical parts
	3-125790	SCREW, machine: 4-40 x 5/16"; 2 used
	45-83914G01	CARD, guide; 2 used
	46-84703E01	GUIDE, circuit board
	64-83163L13	PANEL, screened
	9-83697M01	RECEPTACLE, female; 24 used
	43-865080	BUSHING; 2 used

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

VOICE ACTUATED RESPONSE MODULE
MODEL TRN5347A



SHOWN FROM COMPONENT SIDE

Q6

Q1 THRU Q5

SHOWN FROM BOTTOM

COMPONENT SIDE DEPS-35263-A

SOLDER SIDE DEPS-35264-A

OL DEPS-35265-A

NOTE:

1. S1 AND S2 MOUNTED ON FRONT PANEL.

68P81048E69-A
(Sheet 1 of 2)
7/31/86-PHI

parts list

TRN5347A Voice Actuated Response Module — PL-8209-A

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		capacitor, fixed: uF ± 10%; 50 V; unless otherwise stated
C1	23-84669A19	100 uF + 150-10%; 20 V
C2	8-82905G11	0.22
C3	8-11017B08	.01
C4	8-82905G11	0.22
C5, 6, 7	8-11017B08	.01
C8	21-82187B20	.001 uF +—10%; 100 V
C9, 10	8-11017B08	.01
C11, 12	8-11017A08	.01 uF +—5%; 50 V
C13	8-11017A17	0.1 uF +—5%; 50 V
C14, 15	8-11017B08	.01
C16	23-82783B08	1.0 uF +—20%; 35 V
C17	8-11017B08	.01
C18	21-82187B20	.001 uF +—10%; 100 V
C19	23-83214C15	4.7 uF +—20%; 25 V
C20	23-84762H08	3.9 uF +—20%; 15 V
C21	21-82537B38	.001 uF +—3%; 100 V
C22		NOT USED
C23	8-82905G11	0.22
C24, 25, 26	21-11014H49	100 pF +—5%; 100 V
C27	8-11017B08	.01
C28, 29	8-82905G11	0.22
C30, 31, 32	21-11014H49	100 pF +—5%; 100 V
C33	23-84538G01	1.0 uF +—20%; 35
C34	23-84538G04	15 uF +—20%; 20 V
C35	23-84538G06	47 uF +—20%; 20 V
C36	21-11014H49	100 pF +—5%; 100 V
CR1	48-83654H02	**diode: (see note)** silicon
CR2, 3, 4	48-83654H01	silicon
CR5	48-83654H02	silicon
CR6, 8, 9	48-83654H01	silicon
DS1	65-83554G01	**lamp, incandesent:** 12 V
Q1, 2	48-869642	**transistor: (see note)** NPN; type M9642
Q3	48-869649	PNP; type M9649
Q4	48-869706	NPN; type M9706
Q5	48-869649	PNP; type M9649
Q6	48-869640	NPN; type M9640
		resistor, fixed: ± 5%; 1/4 W; unless otherwise stated
R1	6-11009C01	10
R2	6-11009D18	680k
R3	6-11009D14	470k
R4	6-11009C59	2.7k
R5	6-11009C35	270
R6	6-11009C61	3.3k
R7	6-11009C75	12k
R8	6-11009C79	18k
R9	6-11009C45	680
R10	6-11009C83	27k
R11	6-11009C97	100k
R12	6-11009C49	1k
R13	6-11009C65	4.7k
R14	6-11009C93	68k
R15, 16	6-11009C49	1k
R17	18-84944C03	variable; 10k
R18	6-11009C93	68k
R19	6-11009C49	1k
R20	6-11009C51	1.2k
R21	6-11009D04	180k
R22	6-11009C75	12k
R23	6-11009C79	18k
R24	6-11009C47	820
R25	6-11009C75	12k
R26	6-11009C71	8.2k
R27	6-11009C59	2.7k
R28	6-11009C63	3.9k
R29	6-11009D14	470k
R30	6-11009C25	100
R31	6-11009C97	100k
R32	6-11009C73	10k
R33	6-11009C85	33k
R34	6-11009C91	56k
R35, 36, 37	6-11009C97	100k
R38	6-11009C73	10k
R39	6-11009C49	1k
R40	6-11009C97	100k
R41	6-11009C67	5.6k
R42	6-11009C73	10k
R43	18-83083G16	variable; 25k
R44	6-125A01	10; 1/2 W
R45	6-11009C61	3.3k
R46, 47, 48	6-11009C97	100k
R49	6-11009C49	1k
R50	6-11009C97	100k
R51, 52	6-11009C75	12k
R53	6-11009C99	120k
R54 thru 58	6-11009C97	100k
R59	6-11009C49	1k
R60	6-11009C15	39

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		switch:
S1	40-83204B03	dpdt
S2	40-83204B01	dpdt
		integrated circuit: (see note)
U1	51-82884L66	quad 2-input nand Schmitt
U2	51-82884L05	quad 2-input nand gate
U3	51-82884L10	dual j-k flip-flop
U4	51-82884L14	quad analog switch
U5	51-82884L53	dual precision monostable
U6	51-82884L14	quad analog switch
U7	1-80717D13	hybrid notch filter
U8	51-82609M05	quad op-amplifier
		voltage regulator: (see note)
VR1	48-82256C12	Zener type
		mechanical parts
	3-125790	SCREW, machine; 4-40 x 5/16"; 2 used
	45-83914G01	GUIDE CARD; 2 used
	46-84703E01	GUIDE CARD; circuit board
	61-855798	JEWEL, GRN
	9-84285C01	SOCKET, wedge base
	29-8167C01	TERMINAL, strain relief; 9 used
	9-83697M01	RECEPTACLE, female; 24 used
	43-865080	BUSHING; 2 used
	28-83916F01	CONNECTOR; 13 used
	64-83163L17	PANEL

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

VOICE ACTUATED RESPONSE MODULE

MODEL TRN5347A

FUNCTION

The Voice Actuated Response Module (VAR) monitors the type of audio that is present at the Unnotched Mic Audio (pin 2). If tones are present, the VAR routes this audio to the buffer which has a constant gain throughout the audio frequency range. If voice is present, the VAR provides EIA 6 db per octave pre-emphasized audio response.

NOTES:

1. Unless otherwise indicated: resistor values are in ohms; capacitor values are in microfarads; and inductor values are in millihenries.
2. Unless otherwise indicated: all waveforms have an amplitude of 13.5 V. All waveforms are taken with a 1 kHz sine wave (340 mV p-p) applied to pin 2 of module.
3. Adjust R17 until the waveform shown on this diagram appears on the positive side of C13.
4. Switch S1 shown in enabled position. Switch S2 shown in pre-emphasis position.
5. Normal jumper settings are shown below:

Voice Latched Timer Jumpers

Time	JU4	JU5	JU6	JU7
1 sec	OUT	OUT	OUT	OUT
950 ms	IN	OUT	OUT	OUT
850 ms	OUT	IN	OUT	OUT
800 ms	IN	IN	OUT	OUT
750 ms	OUT	OUT	IN	OUT
700 ms	IN	OUT	IN	OUT
600 ms	OUT	IN	IN	OUT
500 ms	IN	IN	IN	OUT
500 ms	OUT	OUT	OUT	IN
450 ms	IN	OUT	OUT	IN
350 ms	OUT	IN	OUT	IN
300 ms	IN	IN	OUT	IN
200 ms	OUT	OUT	IN	IN
150 ms	IN	OUT	IN	IN
50 ms	OUT	IN	IN	IN

Jumper JU8 is usually IN, it is OUT for link transmitters.

Jumpers JU1-JU3 are usually inserted or removed at the factory to provide the proper sensitivity and noise immunity. Normally JU1 is OUT and JU2, JU3 are IN.

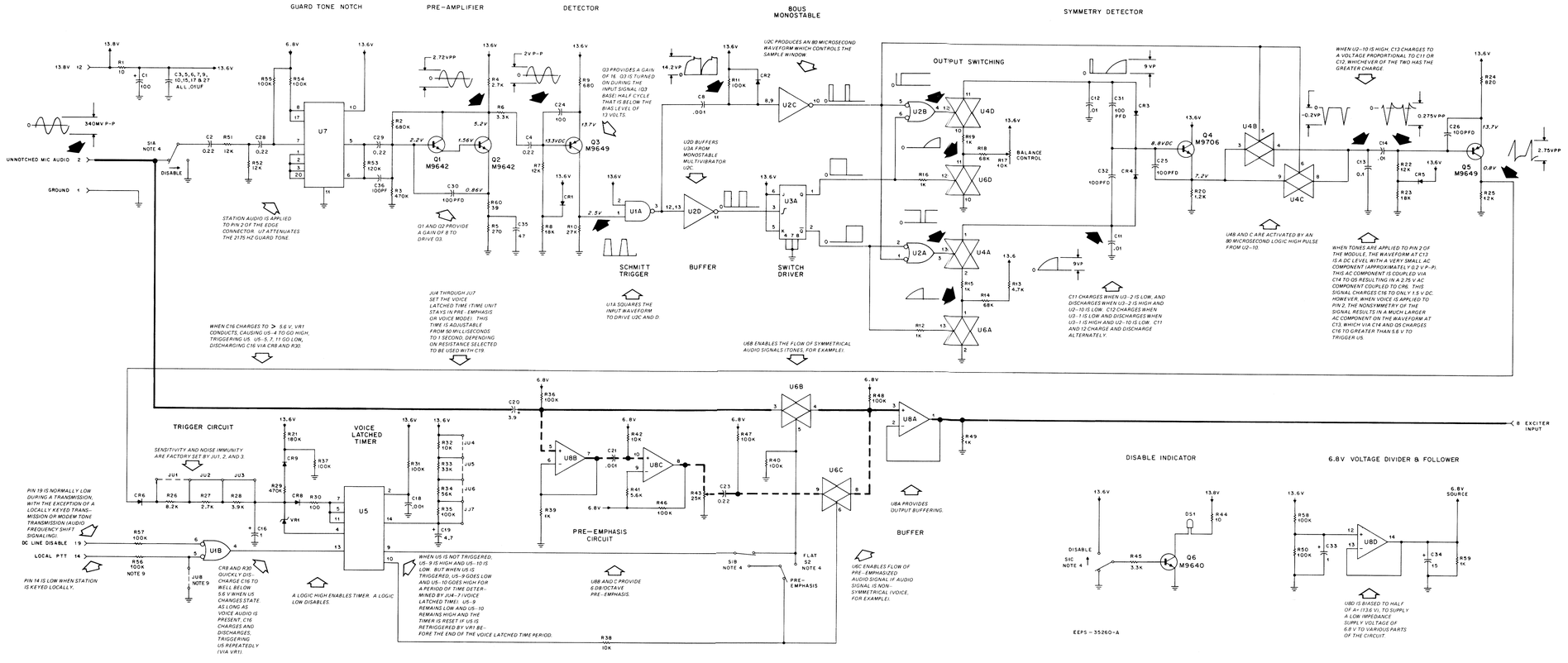
6. This diagram shows positive logic:

   Logic "1" greater than 11 V DC
   Logic "0" less than 4 V DC

7. Integrated circuits on this board are CMOS devices.
8. IC types and connections for this board are as follows:

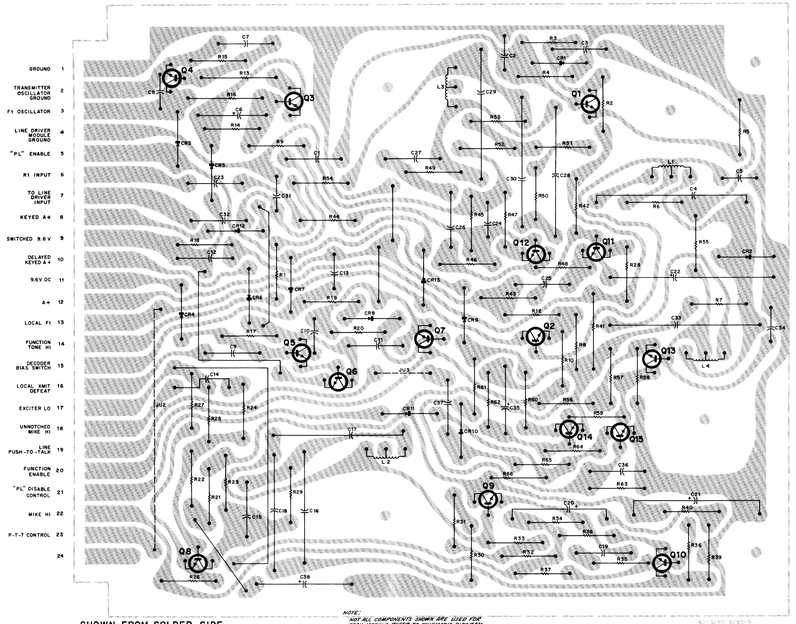
Reference Designation	Type	VCC	Gnd	Description
U1	84L66	14	7	Quad 2-Input NAND Schmitt Trigger
U2	84L05	14	7	Quad 2-Input NAND Gate
U3	84L10	16	8	Dual J-K Flip-Flop
U4, U6	84L14	14	7	Quad Analog Switch/Quad Multiplexer
U5	84L53	16	8	Retriggerable/Resettable Monostable Multivibrator
U7	17D13	10	11	Hybrid Notch Filter (Attenuates 2175 Hz)
U8	09M05	4	11	Quad Operational Amplifier

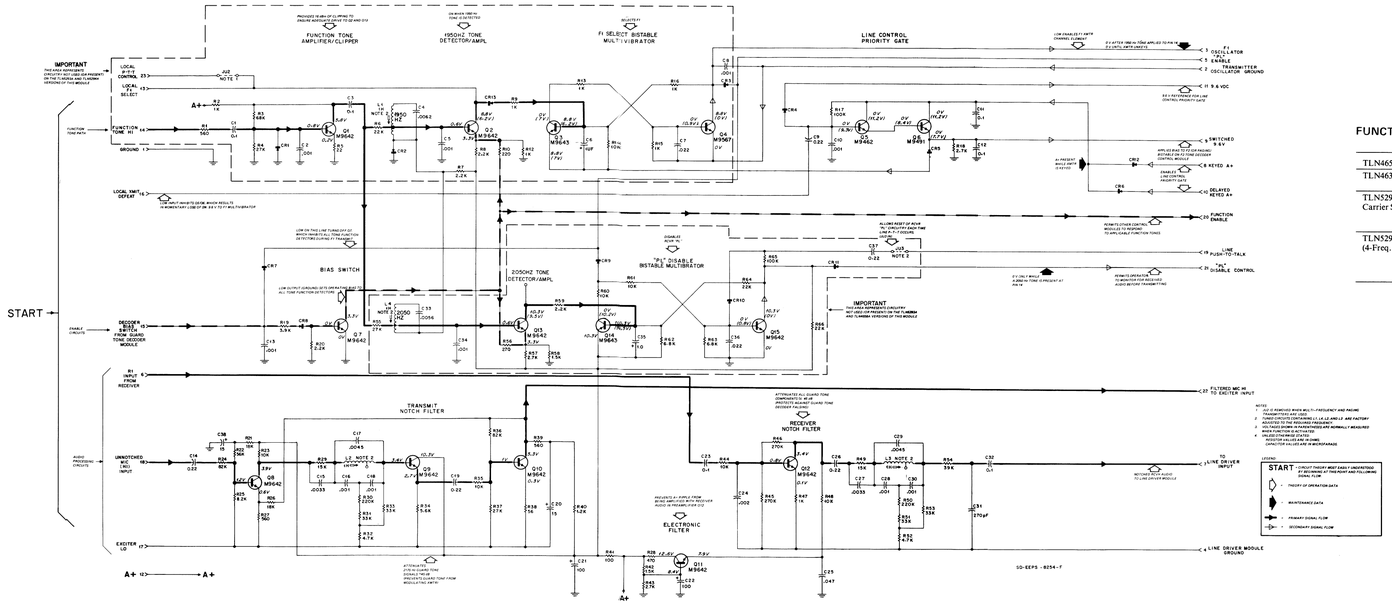
9. For paging base station applications, jumper JU8 must be in and resistor R56 (100k) must be cut out. For link transmitter applications, jumper JU8 must be cut out and resistor R56 must be left in.



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

10/5/82 PHI

parts list

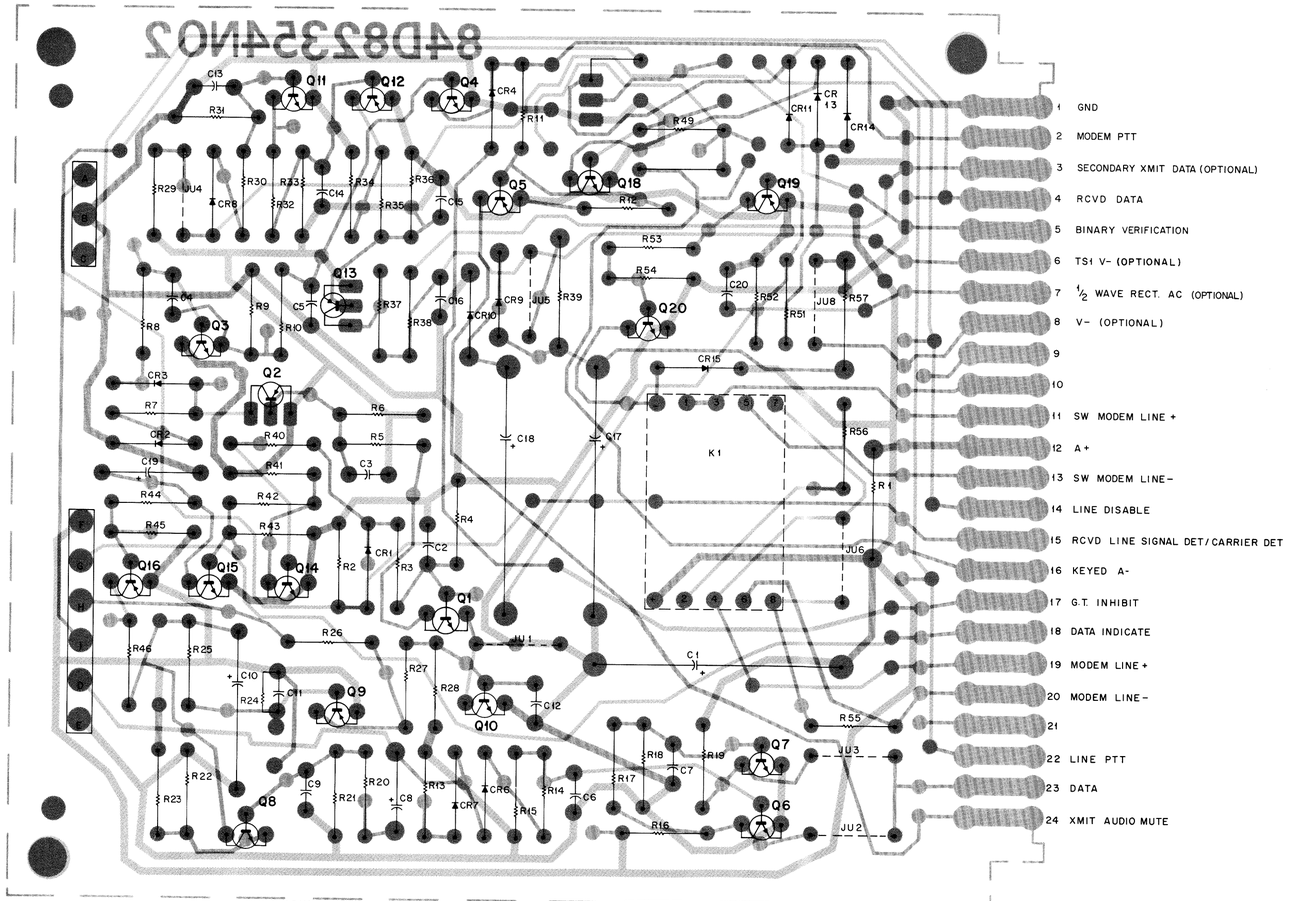
TLN4658A F1 Control Module
TLN4638A F1 *Private-Line* Control Module
TLN5293A F1 Control Module
TLN5294A F1 *Private-Line* Control Module PL-1798-G

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.

TRANSMITTER SITE INTERFACE MODULE (TSI)

MODEL TRN4853A



SHOWN FROM COMPONENT SIDE

SOLDER SIDE ● BD DEPS 33439- A
COMPONENT SIDE ● BD DEPS 33438- A
OL DEPS 33437- B

Circuit Board Detail, Schematic Diagram & Parts List
Motorola No. ***PEPS-34633-B***
(Sheet 1 of 2)
*7/31/86-***PHI**

parts list

TRN4853A Transmitter Site Interface Module — PL-7685-B

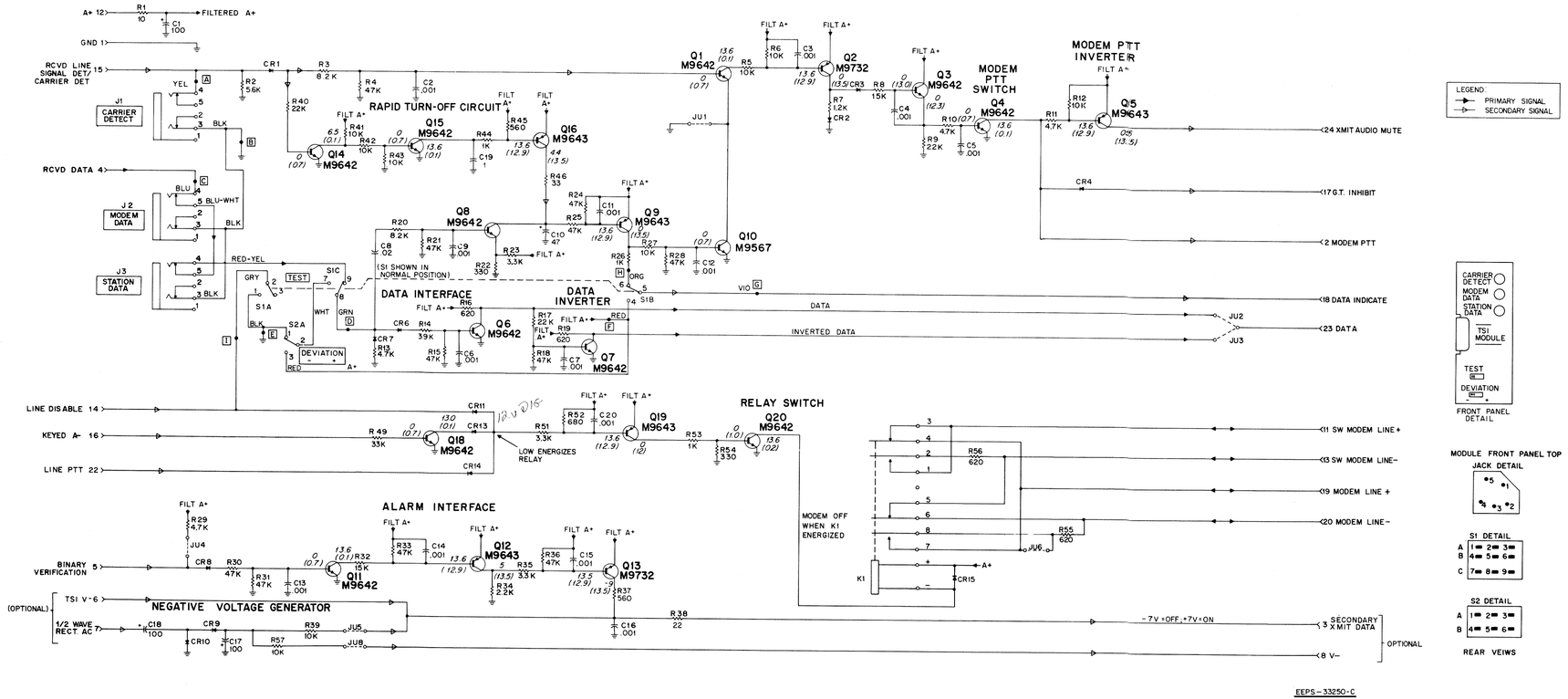
REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		capacitor, fixed: uF ± 10%; 100 V: unless otherwise stated
C1	23-82601A25	100 +150-10%; 20 V
C2 thru 5	21-11015D13	.001
C6, 7	21-11015B13	.001
C8	8-82905Q23	.02
C9	21-11015B13	.001
C10	23-82783B37	47 ± 20%; 25 V
C11 thru 16	21-11015B13	.001
C17, 18	23-82077C01	100 + 150-10%; 35 V
C19	23-84762H06	1.0 ± 20%; 35 V
C20	21-11015B13	.001
		diode: (see note)
CR1 thru 4	48-83654H01	silicon
CR5 thru 8	48-83654H01	silicon
CR9, 10	48-82466H13	silicon
CR11	48-83654H01	silicon
CR13, 14, 15	48-83654H01	silicon
		connector, receptacle:
J1, 2, 3	9-83073L02	jack, phone
		relay, reed:
K1	80-82617M06	13.4 V; coil res. 240 ohms ± 10%
		transistor: (see note)
Q1	48-869642	NPN; type M9642
Q2	48-869732	PNP; type M9732
Q3, 4	48869642	NPN; type M9642
Q5	48-869643	PNP; type M9643
Q6, 7, 8	48-869642	NPN; type M9642
Q9	48-869643	PNP; type M9643
Q10	48-869567	NPN; type M9567
Q11	48-869642	NPN; type M9642
Q12	48-869643	PNP; type M9643
Q13	48-869732	PNP; type M9632
Q14, 15	48-869642	NPN; type M9642
Q16	48-869643	PNP; type M9643
Q17		NOT USED
Q18	48-869642	NPN; type M9642
Q19	48-869643	PNP; type M9643
Q20	48-869642	NPN; type M9642
		resistor, fixed: ± 5%; 1/4 W: unless otherwise stated
R1	6-125C01	10 ± 10%; 1/2 W
R2	6-11009C67	5.6k
R3	6-11009C71	8.2k
R4	6-11009C89	47k
R5, 6	6-11009C73	10k
R7	6-11009C51	1.2k
R8	6-11009C77	15k
R9	6-11009C81	22k
R10, 11	6-11009C65	4.7k
R12	6-11009C73	10k
R13	6-11009C65	4.7k
R14	6-11009C63	3.9k
R15	6-11009C89	47k
R16	6-11009C44	620
R17	6-11009C81	22k
R18	6-11009C89	47k
R19	6-11009C44	620
R20	6-11009C71	8.2k
R21	6-11009C89	47k
R22	6-11009C37	330
R23	6-11009C61	3.3k
R24	6-11009E89	47k
R25	6-11009C89	47k
R26	6-11009C49	1k
R27	6-11009C73	10k
R28	6-11009C89	47k
R29	6-11009C65	4.7k
R30, 31	6-11009C89	47k
R32	6-11009C77	15k
R33	6-11009C89	47k
R34	6-11009C57	2.2k
R35	6-11009C61	3.3k
R36	6-11009C89	47k
R37	6-11009C43	560
R38	6-11009C09	22
R39	6-125A73	10k; 1/2 W
R40	6-11009C81	22k
R41 thru 43	6-11009C73	10k
R44	6-11009C49	1k
R45	6-11009C43	560
R46	6-11009C13	33
R47		NOT USED
R48	NOT USED	
R49	6-11009C85	33k
R51	6-11009C61	3.3k
R52	6-11009C45	680
R53	6-11009C49	1k
R54	6-11009C37	330
R55, 56	6-11009C44	620
R57	6-125A73	10k; 1/2 W

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		switch, slide:
S1	40-83204B03	3 pdt
S2	40-83204B01	dpdt
		mechanical parts
	3-125790	SCREW, machine: 4-40 x 5/16"; 2 used
	45-83914G01	GUIDE, card; 2 used
	46-84703E01	GUIDE, circuit board
	1-80761D46	PANEL, riveted (includes ref. item S1, S2)
	9-83697M01	RECEPTACLE, board mounting; 24 used
	43-865080	BUSHING, threaded; 2 used

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

TRANSMITTER SITE INTERFACE MODULE (TSI)

MODEL TRN4853A



LEGEND:
PRIMARY SIGNAL
SECONDARY SIGNAL

MODULE FRONT PANEL TOP

NOTES:

1. Unless specified otherwise, resistor values are in ohms and capacitor values are in microfarads.
2. Jumper configurations are given in the following chart.

Jumper	Normal Usage
JU1	Out (In for signal detect key-up)
JU2	In (Out for inverted data)
JU3	Out (In for inverted data)
JU4	Always In
JU5	In (Out when negative voltage module is used)
JU6	Out (In when modem is removed)
JU7	NOT USED
JU8	In (Out when negative voltage module is used)

FUNCTION

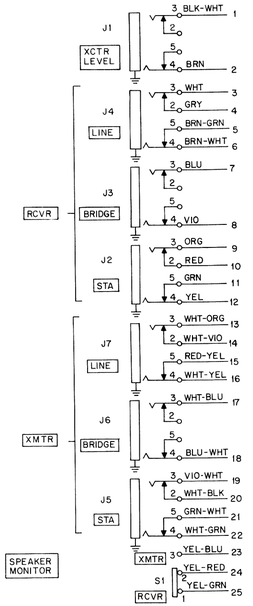
This module accepts binary data from the modem and dc level shifts it to the proper logic levels required by the digital modulator module for binary paging. The T.S.I. module provides a modem PTT function in conjunction with the carrier detect signal and the binary output data from the modem. The modem PTT function is used to key the station in the binary mode of operation. The modem PTT signal is also used to inhibit the guard tone decoder allowing the station to go into the FSK-NRZ (frequency shift keying - non return to zero) mode required for binary signaling.

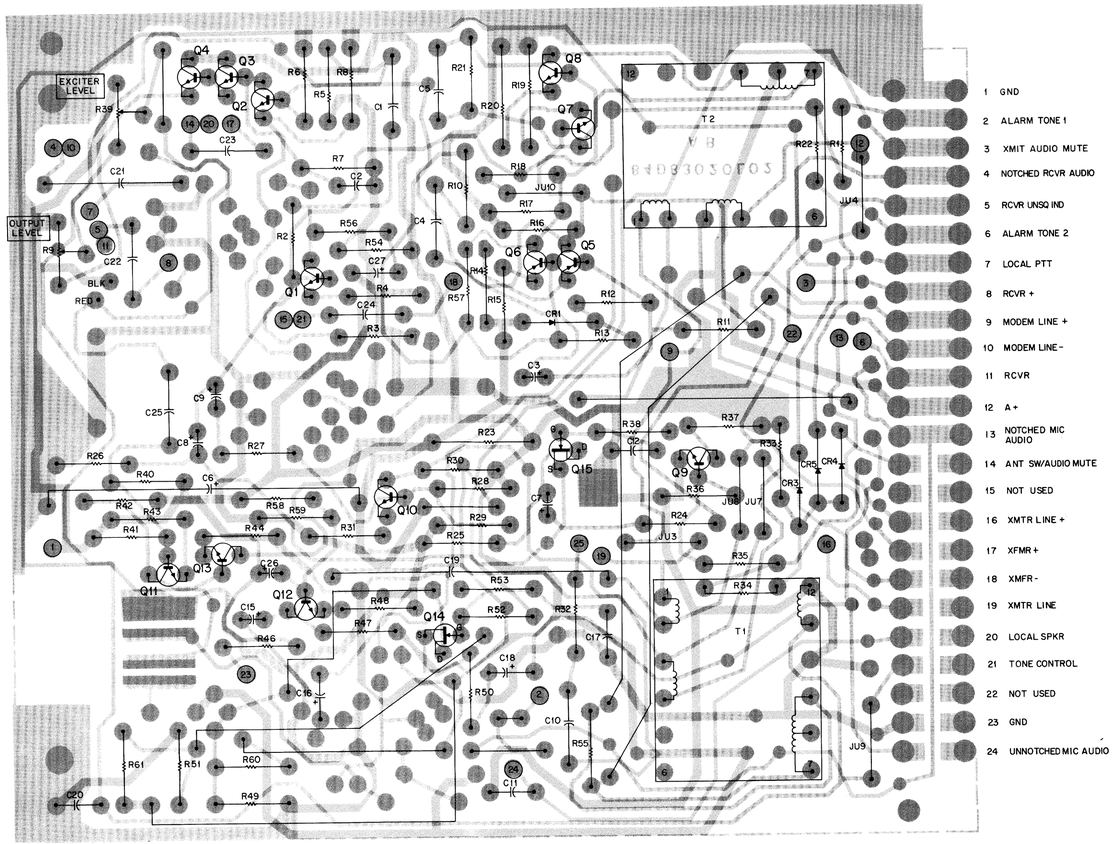
A relay and associated driver control circuitry are contained in this module to switch the modem off line until the station has received the proper tone remote signaling commands. This prevents modem falsing and subsequent transmitter key up falsing due to telephone line or radio link noise. It also prevents the modem from being on the line during line PTT.

EEPS-33250-C

Circuit Board Detail, Schematic Diagram & Parts List
Motorola No. ***PEPS-34633-B***
(Sheet 2 of 2)
7/31/86-PHI

LINE DRIVER MODULE
MODEL TRN4859A





SHOWN FROM COMPONENT SIDE

COMPONENT SIDE = BD DEPS-34478-O
SOLDER SIDE = BD DEPS-34477-O
OL DEPS-33112-A

Circuit Board Detail, Schematic Diagram & Parts List
Motorola No. PEPS-34634-C
(Sheet 1 of 2)
7/31/86-PH1

parts list

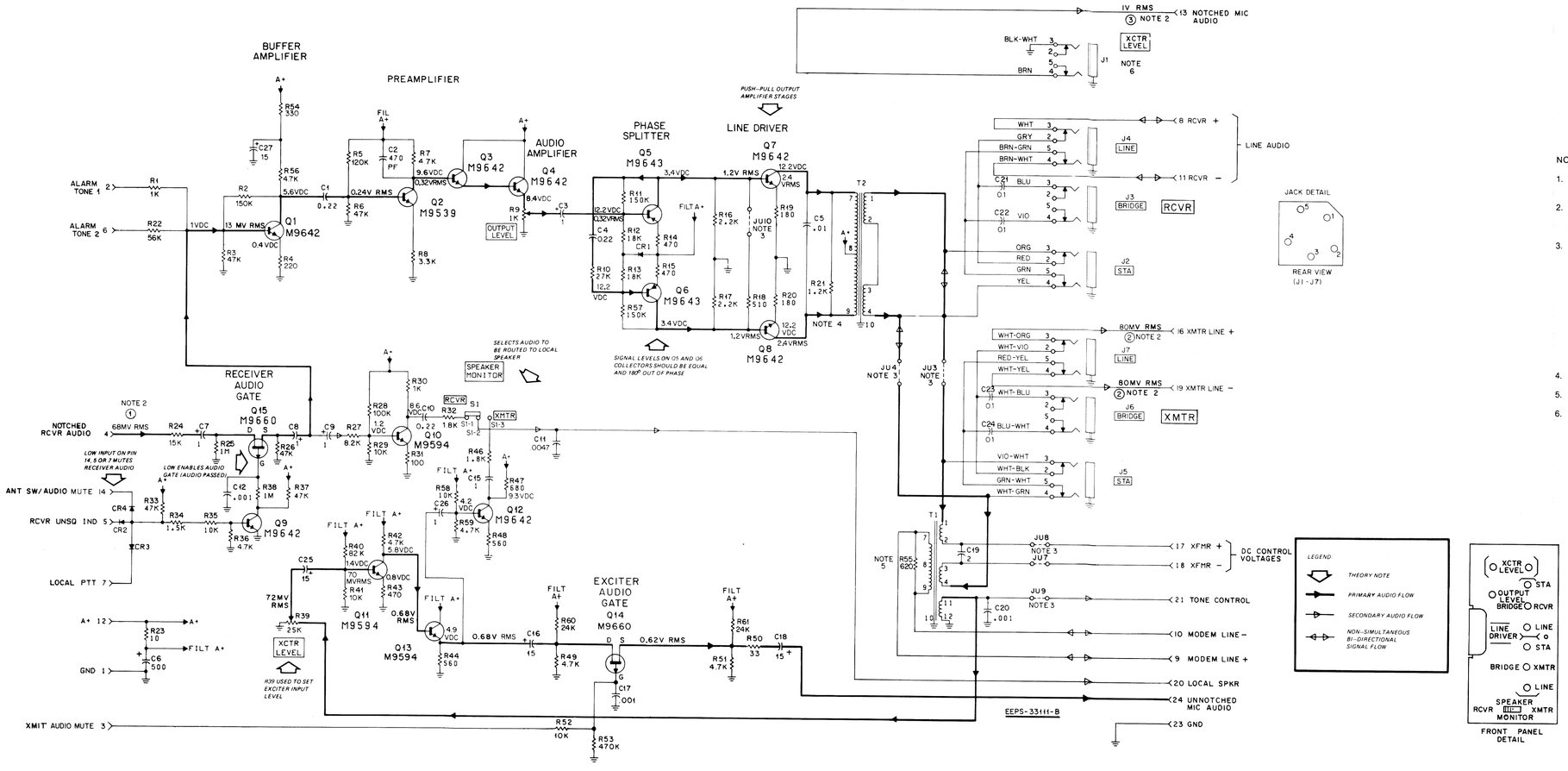
RN4859A Line Driver Board — PL-7640-B

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		capacitor, fixed: uF ± 10%; 50 V; unless otherwise stated
C1	8-82905G11	0.22
C2	21-82187B07	470 pF; 500 V
C3	23-84538G01	1.0 ± 20%; 35V
C4	8-82905G11	0.22
C5	8-82905G01	.01
C6	23-83210A19	500; 20 V
C7, 8, 9	23-84538G01	1.0 ± 20%; 35 V
C10	8-82905G11	0.22
C11	21-82428B27	.0047; 100 V
C12	21-82187B20	.001; 100 V
C13, 14		NOT USED
C15	23-84538G01	1.0 ± 20%; 35 V
C16	23-84538G04	15 ± 20%; 20 V
C17	21-82187B20	.001; 100 V
C18	23-84538G04	15 ± 20%; 20 V
C19	8-863305	2.0; 200 V
C20	21-82187B20	.001; 100 V
C21	8-82317B01	0.1; 100 V
C22, 23, 24	21-82372C01	0.1
C25	23-84538G04	15 ,16 ,17 ,15 ,20%; 20 V
C26	23-84538G01	1.0 ± ;35 V
C27	23-84538G04	15 ± 20%; 20 V
CR1 thru 4	48-83654H01	**diode: (see note)** silicon
J1 thru 7	9-83073L02	**connector, receptacle:** phono
		transistor: (see note)
Q1	48-869642	NPN; type M9642
Q2	48-869539	NPN; type M9539
Q3, 4	48-869642	NPN; type M9642
Q5, 6	48-869643	PNP; type M9643
Q7, 8, 9	48-869642	NPN; type M9642
Q10, 11	48-869594	NPN; type M9594
Q12	48-869642	NPN; type M9642
Q13	48-869694	NPN; type M9594
Q14, 15	48-869660	FET; type M9660
		resistor, fixed: ± 5%; 1/4 W unless otherwise stated
R1	6-11009C49	1k
R2	6-11009D02	150k
R3	6-11009C89	47k
R4	6-11009C33	220
R5	6-11009C99	120k
R6	6-11009C89	47k
R7	6-11009C65	4.7k
R8	6-11009C61	3.3k
R9	18-83083G09	var. 1k
R10	6-11009C83	27k
R11	6-11009D02	150k
R12, 13	6-11009C79	18k
R14, 15	6-11009C41	470
R16, 17	6-11009C57	2.2k
R18	6-11009C42	510
R19, 20	6-125A31	180; 1/2 W
R21	6-11009C51	1.2k
R22	6-11009C91	56k
R23	6-125A01	10; 1/2 W
R24	6-11009C77	15k
R25	6-11009D22	1.0 meg
R26	6-11009C89	47k
R27	6-11009C71	8.2k
R28	6-11009C97	100k
R29	6-11009C73	10k
R30	6-11009C49	1k
R31	6-11009C25	100
R32	6-11009C55	1.8k
R33	6-11009C81	47k
R34	6-11009C53	1.5k
R35	6-11009C73	10k
R36	6-11009C65	4.7k
R37	6-11009C81	47k
R38	6-11009D22	1.0 meg
R39	18-83083G16	var. 25k
R40	6-11009C95	82k
R41	6-11009C73	10k
R42	6-11009C65	4.7k
R43	6-11009C41	470
R44	6-11009C43	560
R45		NOT USED
R46	6-11009C55	1.8k
R47	6-11009C45	680
R48	6-11009C43	560
R49	6-11009C65	4.7k
R50	6-11009C13	33
R51	6-11009C65	4.7k
R52	6-11009C73	10k
R53	6-11009D14	470k
R54	6-11009C37	330
R55	6-11009C44	620
R56	6-11009C65	4.7k
R57	6-11009D02	150k
R58	6-11009C73	10k
R59	6-11009C65	4.7k
R60, 61	6-11009C82	24k
		switch, slide:
S1	40-83204B01	dpdt
		transformer, line driver:
T1	25-83036L02	pins #7 and 9 dc resist. = 110 ohms pins #1 and 2 dc resist. = 25 ohms pins #3 and 4 dc resist. = 25 ohms pins #11 and 12 dc resist. = 250 ohms
T2	25-83036L01	pins #7 and 9 dc resist. = 250 ohms pins #1 and 2 dc resist. = 25 ohms pins #3 and 4 dc resist. = 25 ohms pins #11 and 12 dc resist. = 250 ohms
		non-referenced items
	1-80761D42	CIRCUIT BOARD
	9-83697M01	includes: RECEPTACLE, board mounting; 24 used
	43-865080	BUSHING, threaded; 2 used
	1-80761D40	PANEL, riveted includes: ref. items S1
	64-83163L09	PANEL
	4-82418B97	WASHER, insulated
	3-134184	SCREW, tapping; 4-40 x 5/16"; 2 used
	3-125790	SCREW, tapping; 4-40 x 5/16"; 2 used
	7-83164L01	BRACKET, panel
	29-83167C01	STRAIN RELIEF, 7 used
	42-10217A02	STRAP, tie; 3 used
	45-83914G01	CARD, guide; 2 used
	46-84703E01	GUIDE, circuit board

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

LINE DRIVER MODULE

MODEL TRN4859A



NOTES:

1. Unless specified otherwise, resistor values are in ohms and capacitor values are in microfarads.
2. Circled numbers (① , ②) indicate signal input levels for ac voltage (V rms) measurements. In all cases, the signal generator is set to the level indicated at 1000 Hz.
3. Jumper configurations are given in the following chart:

Jumper	Usage
JU1, 2	Always out
JU3, 4	In for 2-wire control; out for 4-wire control.
JU5, 6	Always out
JU7	Normally in, out for special applications.
JU8	Normally in, out for special applications.
JU9	Normally in, out for special applications.
JU10	Normally out, in for RCVR line levels less than −10 dBm.

4. R21 deleted for 2-wire control.
5. R55 deleted when module is used in binary stations.
6. This circuit is used to bypass guard tone filters when injecting a 1 V rms signal into exciter for deviation adjustment.

FUNCTION

This module amplifies and gates incoming 600-ohm line audio to the transmitter. It also routes incoming modem tones for binary paging applications to the modem via a relay in the transmitter site interface module (TSI). The line driver also receives audio from an optional monitor or link receiver, gates and amplifies it so it is capable of driving a 600-ohm telephone line.

When the station has local speaker monitoring capability, a front panel mounted switch on the line driver selects either received or transmit audio which is routed to the local speaker. An amplifier circuit is located in both receive and transmit audio paths to drive the local speaker final amplifier circuits.

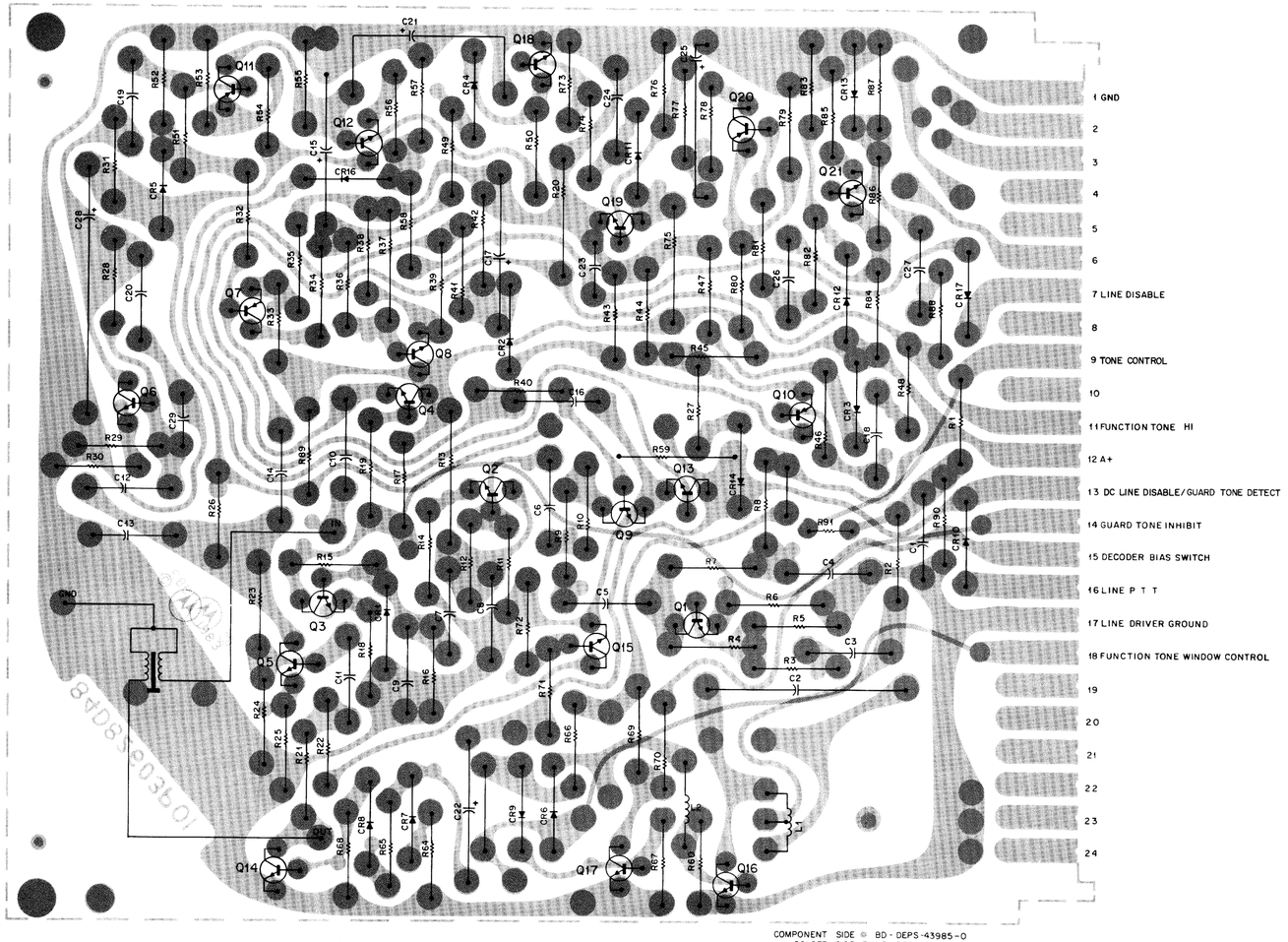
The test jacks located on the front panel facilitate level settings. Three jacks are for receiver line audio measurements and an additional set of three jacks are for transmit line audio measurements. One bridging and two terminating jacks are provided in each set of three jacks mentioned above. An additional test jack labeled XCTR LEVEL is provided for injecting a test tone directly into the exciter audio circuitry for Instantaneous Deviation Control (IDC) setting.

Jumpers in the module provide for either a 4-wire configuration (receive audio on a separate phone line from transmit audio) or a 2-wire configuration (receive and transmit audio combined on the same telephone line).

Circuit Board Detail, Schematic Diagram & Parts List
Motorola No. PEPS-34634-C
(Sheet 2 of 2)
7/31/86-PHI

GUARD TONE DECODER MODULE

MODEL TLN2376A



SHOWN FROM COMPONENT SIDE

COMPONENT SIDE ✲ BD - DEPS-43985-O
SOLDER SIDE ✲ BD - DEPS-43986-O
OL-DEPS-34431- B

Circuit Board Detail
Schematic Diagram & Parts List
Motorola No. ***PEPS-34635-B***
(Sheet 1 of 2)
7/31/86 -PHI

parts list

TRN4892A Guard Tone Decoder Module — PL-7638-B

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, 6, 7	8-82905G02	.022
C8	8-82905G25	.0033
C9	8-82905G01	.01
C10	8-82905G11	0.22
C11 thru 14	8-82905G04	.068
C15	23-82783B37	47 ± 20%; 25 V
C16	8-82905G03	.047
C17	23-865136	15 ± 20%; 25 V
C18, 19, 20	8-82905G04	.068
C21	23-865137	4.7 ± 20%; 25 V
C22	23-82783B08	1.0 ± 20%; 35 V
C23	21-82187B20	.001; 100 V
C24	8-82905G11	0.22
C25	23-82783B12	4.7
C26	8-82905G07	0.1
C27	8-82905G11	0.22
C28	23-82601A25	100 + 150-10%; 20 V
C29	21-82187B20	.001; 100 V
		semiconductor device, diode: (see note)
CR1 thru 4	48-83654H01	silicon
CR10	48-83654H01	silicon
CR17	48-83654H01	silicon
		coil, assembly, inductor:
L1	1-80702B11	1 H; incl. ground clip
L2	24-82723H01	choke; 1.2 uH
		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	48-869642	NPN; type M9642
Q17 thru 19	48-869570	NPN; type M9570
Q20	48-869571	PNP; type M9571
Q21	48-869570	NPN; type M9570
		resistor, fixed: ± 5%; 1/4 W: unless otherwise stated
R1	6-11009C96	91k
R2	6-11009C69	6.8k
R3	6-11009C81	22k
R4	6-11009D06	220k
R5	6-11009C97	100k
R6	6-11009C49	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	6-124A73	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	6-125A37	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, 27	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	6-125A97	100k; 1/2 W
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	6-125A49	1k; 1/2 W
R60	6-11009C89	47k
R61		NOT USED
R62		NOT USED
R63		NOT USED
R64	6-11009C75	12k
R65	6-11009C61	3.3k
R66	6-11009C85	33k
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	6-125A49	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	6-11009C57	2.2k
R91	6-11009C74	11k
		mechanical parts
	45-83914G01	GUIDE, card
	9-83697M01	RECEPTACLE, female; 15 used
	5-84220B01	BUSHING, 2 used
	3-84256M01	SCREW, machine; 4-40 x 5/16"; 2 used
	46-84703E01	GUIDE, circuit bd.
	64-83128L01	PANEL

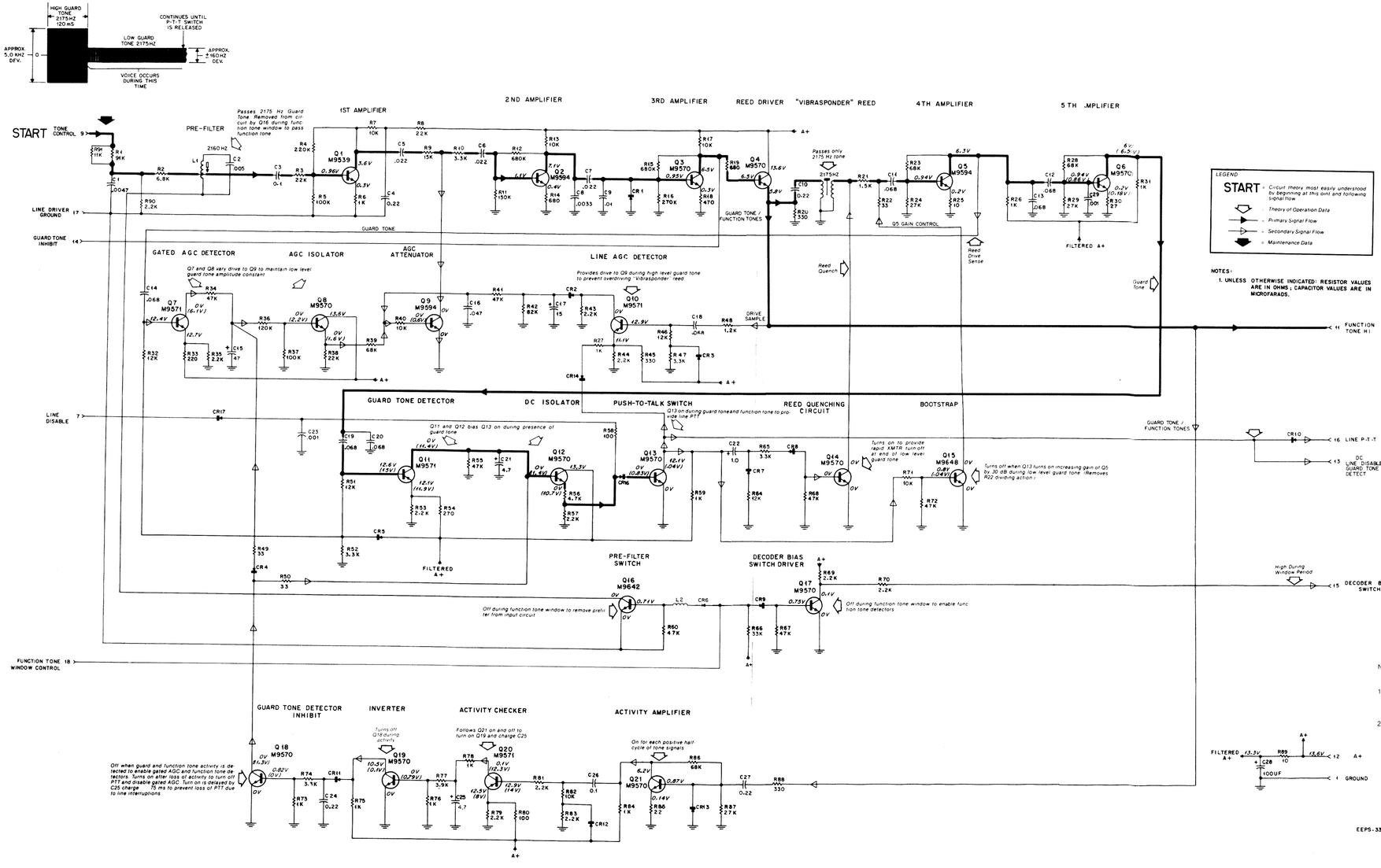
Vibrasponder Resonant Reed — PL-7639-O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
K	LN6209A	2175 Hz

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

GUARD TONE DECODER MODULE

MODEL TLN2376A



NOTES:

1. Unless otherwise indicated: resistor values are in ohms; capacitor values are in microfarads.
2. R91 located on solder side of circuit board.

FUNCTION

This module detects 2175 Hz guard tone and converts it into line PTT signal which is required for remote key up of the transmitter. It also amplifies received function tones and distributes them to other function tone decoders in the station (for example the 1950 Hz tone detector in the F1 Control Module).

The automatic gain control circuitry in this module adjusts guard tone and function tone levels for proper operation of tone decoding circuitry independent of input levels to the remote control chassis of the station.

The activity detector stages sense the loss of low level guard tone. The fast turn off circuitry quickly turns off the line PTT signal so the station can rapidly enter the binary mode of operation or un-key the transmitter depending on the commands sent to the station.

This module also has a switchable bandpass filter to allow only the guard tone frequency to enter the module to provide falsing protection. After detection of guard tone, this filter is switched out during the time function commands are sent to the station and during this period, the tone decoders are enabled. This allows function tones of various frequencies to be amplified in the guard tone decoder prior to being sent to the respective function tone decoders. The switching of the filter is controlled by circuitry in the TRN4854A Station Control Module.

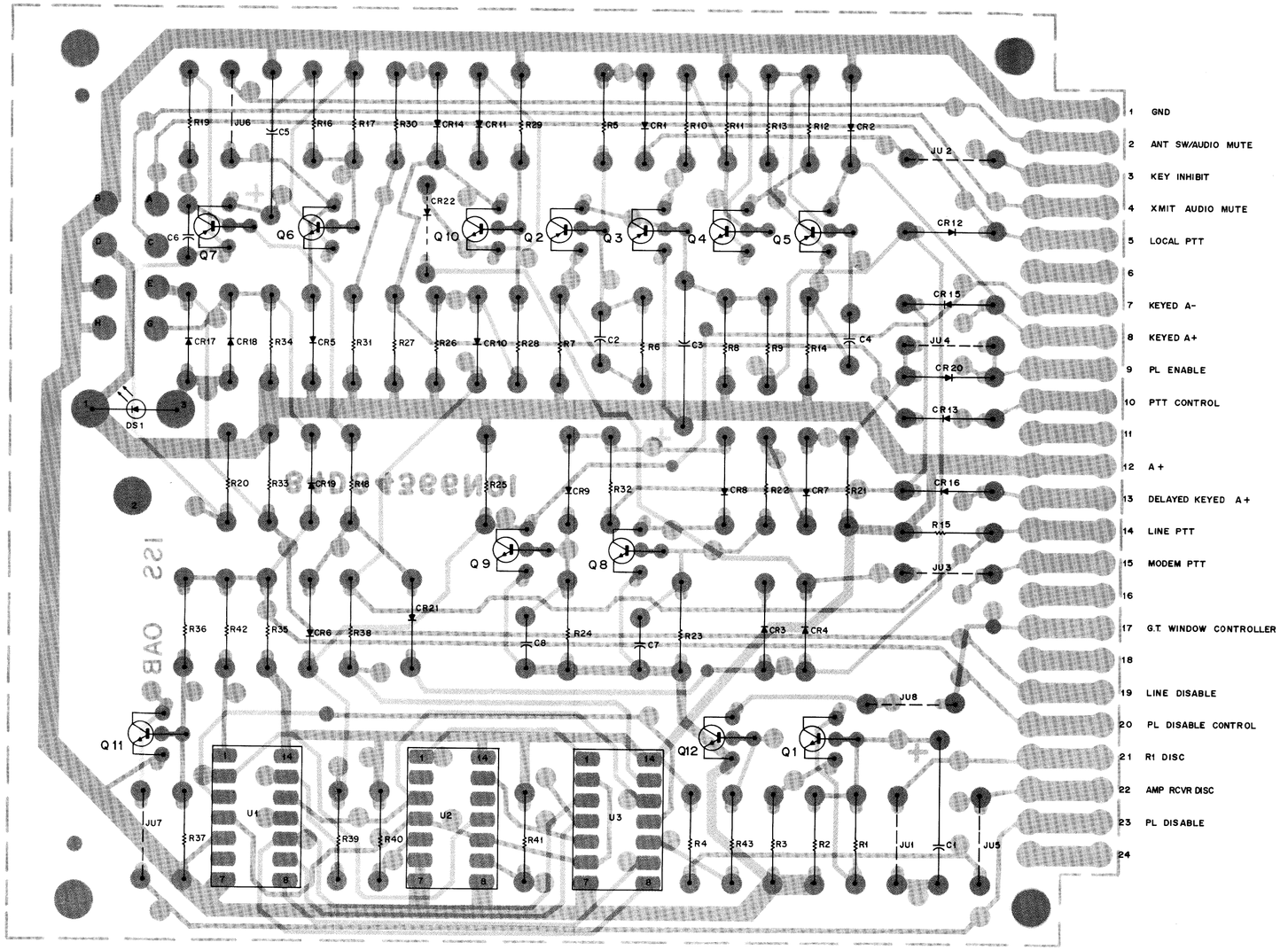
Model Complement

Model	Module	Reed
TLN2376A	TRN4892A	(2175 Hz) KLN6209A

Circuit Board Detail
Schematic Diagram & Parts List
*Motorola No. **PEPS-34635-B***
(Sheet 2 of 2)
7/31/86-PHI

STATION CONTROL MODULE

MODEL TRN4854B



SHOWN FROM COMPONENT SIDE

SOLDER SIDE ▯ IBD-DEPS-35215-O
COMPONENT SIDE ▯ D-DEPS-35216-O
▯ L-DEPS-35217-O

Circuit Board Detail, Schematic Diagram & Parts List
Motorola No. PEPS-35213-A
(Sheet 1 of 2)
7/31/86-PHI

parts list

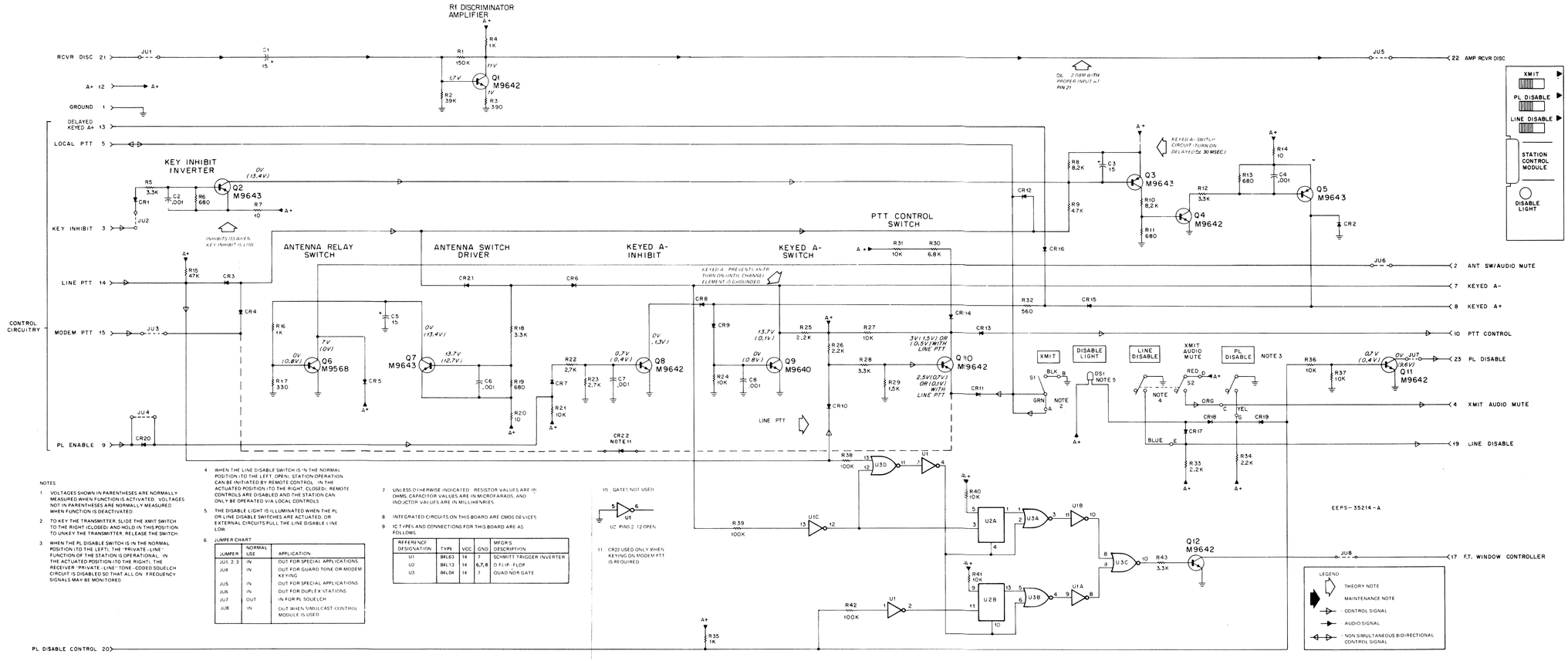
TRN4854B Station Control Module — PL-8156-A

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		capacitor, fixed: uF
C1	23-865136	15 ±20%; 20 V
C2	21-82187B20	.001 ±10%; 100 V
C3	23-865136	15 ±20%; 20 V
C4	21-82187B20	.001 ±10%; 100 V
C5	21-865136	15 ±20%; 20 V
C6, 7, 8	21-82187B20	.001 ±10%; 100 V
		diode: (see note)
CR1 thru 4	48-83654H01	silicon
CR5	48-82466H13	silicon
CR6 thru 22	48-83654H01	silicon (CR22 optional)
		lamp, incandescent:
DS1	65-83554G01	12 volts; 0.19 amp
		transistor: (see note)
Q1	48-869642	NPN; type M9642
Q2, 3	48-869643	PNP; type M9643
Q4	48-869642	NPN; type M9642
Q5	48-869643	PNP; type M9643
Q6	48-869568	NPN; type M9568
Q7	48-869643	PNP; type M9643
Q8	48-869642	NPN; type M9642
Q9	48-869640	NPN; type M9640
Q10, 11, 12	48-869642	NPN; type M9642
		resistor, fixed: ±5%; 1/4 W: unless otherwise stated
R1	6-11009D02	150k
R2	6-11009C87	39k
R3	6-11009C39	390
R4	6-11009C49	1k
R5	6-11009C61	3.3k
R6	6-11009C45	680
R7	6-11009C01	10
R8	6-11009C71	8.2k
R9	6-11009C89	47k
R10	6-11009C71	8.2k
R11	6-11009C45	680
R12	6-11009C61	3.3k
R13	6-11009C45	680
R14	6-11009C01	10
R15	6-11009C89	47k
R16	6-11009C49	1k
R17	6-11009C37	330
R18	6-11009C61	3.3k
R19	6-11009C45	680
R20	6-11009C01	10
R21	6-11009C73	10k
R22, 23	6-11009C59	2.7k
R24	6-11009C73	10k
R25, R26	6-11009C57	2.2k
R27	6-11009C73	10k
R28	6-11009C61	3.3k
R29	6-11009C53	1.5k
R30	6-11009C69	6.8k
R31	6-11009C73	10k
R32	6-11009C43	560
R33, 34	6-11009C57	2.2k
R35	6-11009C49	1k
R36, 37	6-11009C73	10k
R38, 39	6-11009C97	100k
R40, 41	6-11009C73	10k
R42	6-11009C97	100k
R43	6-11009C61	3.3k
		switch:
S1	40-83468E01	slide; spdt
S2, 3	40-83204B01	slide; dpdt
		integrated circuit: (see note)
U1	51-82884L63	Schmitt trigger inverter
U2	51-82884L13	D flip-flop
U3	51-82884L04	quad NOR gate
		mechanical parts
	1-80761D38	PANEL, screened; includes: S1, 2, 3
	9-84285C01	LAMPHOLDER, single contact
	61-855798	JEWEL, lamp GRN
	46-84603E01	GUIDE, circuit board
	45-83914G01	GUIDE, card; 2 used
	3-125790	SCREW, machine; 4-40 x 5/16"; 2 used

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

STATION CONTROL MODULE

MODEL TRN4854B



NOTES

1. VOLTAGES SHOWN IN PARENTHESES ARE NORMALLY MEASURED WHEN FUNCTION IS ACTIVATED. VOLTAGES NOT IN PARENTHESES ARE NORMALLY MEASURED WHEN FUNCTION IS DEACTIVATED.
2. TO KEY THE TRANSMITTER, SLIDE THE XMIT SWITCH TO THE RIGHT (CLOSED) AND HOLD IN THIS POSITION. TO UNKEY THE TRANSMITTER, RELEASE THE SWITCH.
3. 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.
4. 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.
5. THE DISABLE LIGHT IS ILLUMINATED WHEN THE PL OR LINE DISABLE SWITCHES ARE ACTUATED, OR EXTERNAL CIRCUITS PULL THE LINE DISABLE LINE LOW.
6. JUMPER CHART

JUMPER	NORMAL USE	APPLICATION
JU1, 2, 3	IN	OUT FOR SPECIAL APPLICATIONS
JU4	IN	OUT FOR GUARD TONE OR MODEM KEYING
JU5	IN	OUT FOR SPECIAL APPLICATIONS
JU6	IN	OUT FOR DUPLEX STATIONS
JU7	OUT	IN FOR PL SQUELCH
JU8	IN	OUT WHEN SIMULCAST CONTROL MODULE IS USED

7. UNLESS OTHERWISE INDICATED: RESISTOR VALUES ARE IN OHMS, CAPACITOR VALUES ARE IN MICROFARADS, AND INDUCTOR VALUES ARE IN MILLIHENRIES.
8. INTEGRATED CIRCUITS ON THIS BOARD ARE CMOS DEVICES.
9. IC TYPES AND CONNECTIONS FOR THIS BOARD ARE AS FOLLOWS:

REFERENCE DESIGNATION	TYPE	VCC	GND	MFGR'S DESCRIPTION
U1	84L63	14	7	SCHMITT TRIGGER INVERTER
U2	84L13	14	6,7,8	D FLIP-FLOP
U3	84L04	14	7	QUAD NOR GATE

10. GATES NOT USED

11. CR22 USED ONLY WHEN KEYING ON MODEM PTT IS REQUIRED.

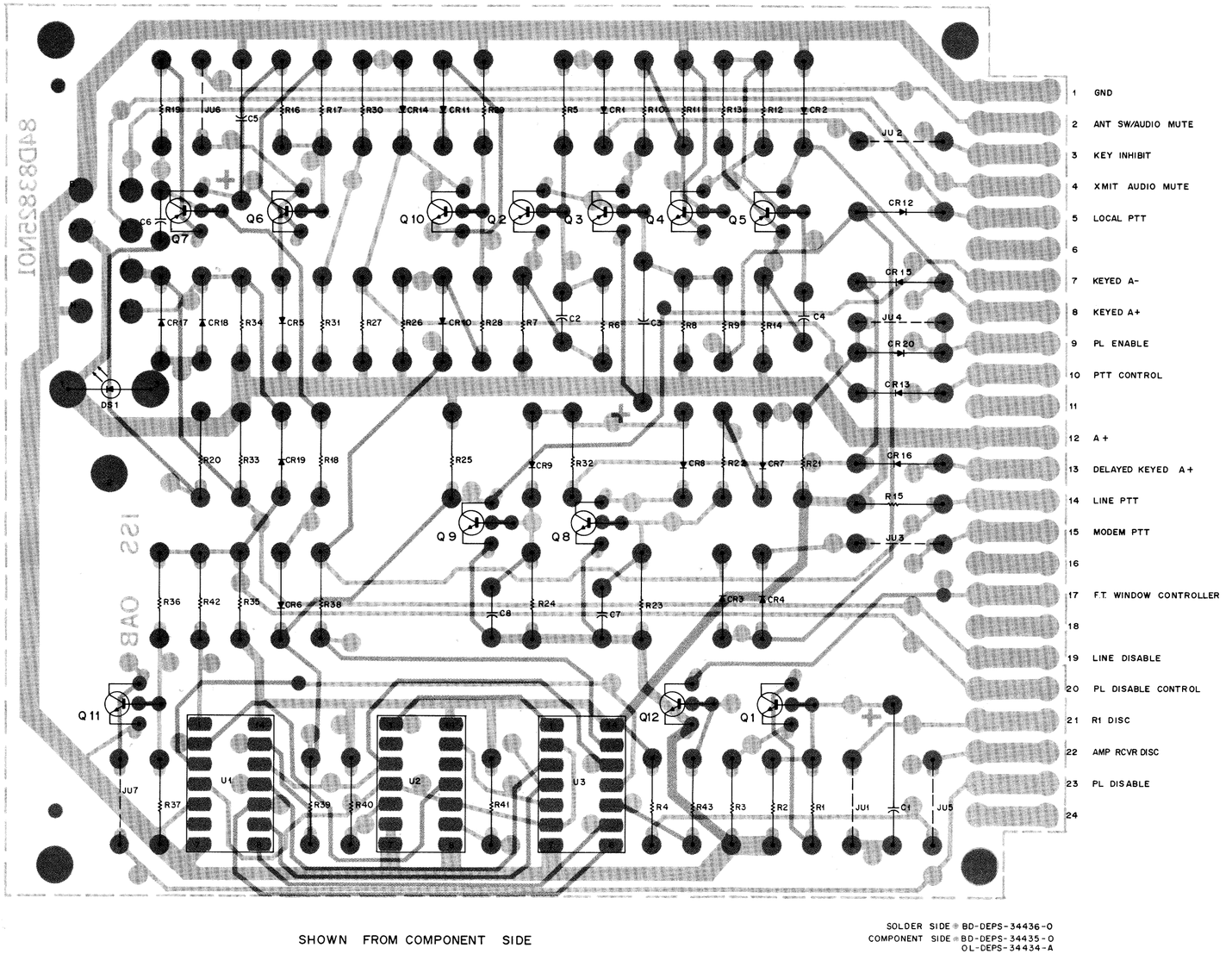
FUNCTION

This module integrates control functions from other modules in the station to key the transmitter. Keyed A+ and a A− voltages are generated in this module to provide transmitter turn on. Local transmitter keying is accomplished via a panel mounted "XMIT" switch. The LINE DISABLE and PL DISABLE switch also on the front panel, are used to disable remote keying for maintenance purposes, and the PL DISABLE switch is used for local channel monitoring in those cases where a monitor or link receiver is used.

Other circuitry in the model provides for control of the prefilter on the guard tone decoder module. This allows for function tones to pass through the guard tone decoder at the proper time in route to function tone decoder modules such as the F1 control module.

Circuit Board Detail, Schematic Diagram & Parts List
Motorola No. PEPS-35213-A
(Sheet 2 of 2)
7/31/86 -PHI

STATION CONTROL MODULE
MODEL TRN4854A



SHOWN FROM COMPONENT SIDE

SOLDER SIDE = BD-DEPS-34436-O
COMPONENT SIDE = BD-DEPS-34435-O
OL-DEPS-34434-A

Circuit Board Detail, Schematic Diagram & Parts List
Motorola No. ***PEPS-34636-A***
(Sheet 1 of 2)
7/31/86-PHI

parts list

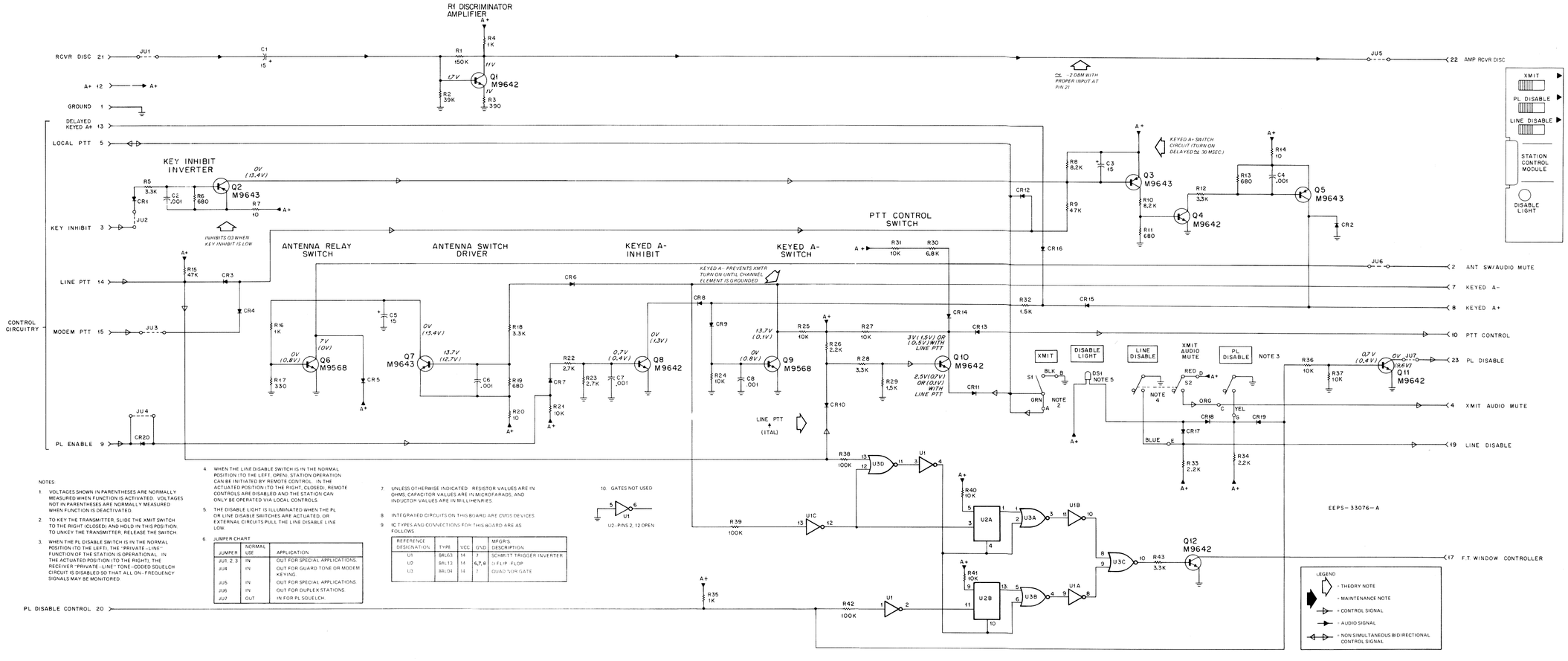
TRN4854A Station Control Module — PL-7645-A

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		capacitor, fixed: uF
C1	23-865136	15 ±20%; 20 V
C2	21-82187B20	001 ±10%; 100 V
C3	23-865136	15 ±20%; 20 V
C4	21-82187B20	.001 ±10%; 100 V
C5	21-865136	15 ±20%; 20 V
C6, 7, 8	21-82187B20	.001 ±10%; 100 V
		diode: (see note)
CR1 thru 4	48-83654H01	silicon
CR5	48-82466H13	silicon
CR6 thru 20	48-83654H01	silicon
		lamp, incandescent:
DS1	65-83554G01	12 volts; 0.19 amp
		transistor: (see note)
Q1	48-869642	NPN; type M9642
Q2, 3	48-869643	PNP; type M9643
Q4	48-869642	NPN; type M9642
Q5	48-869643	PNP; type M9643
Q6	48-869568	NPN; type M9568
Q7	48-869643	PNP; type M9643
Q8	48-869642	NPN; type M9642
Q9	48-869568	NPN; type M9568
Q10, 11, 12	48-869642	NPN; type M9642
		resistor, fixed: ±5%; 1/4 W: unless otherwise stated
R1	6-11009D02	150k
R2	6-11009C87	39k
R3	6-11009C39	390
R4	6-11009C49	1k
R5	6-11009C61	3.3k
R6	6-11009C45	680
R7	6-11009C01	10
R8	6-11009C71	8.2k
R9	6-11009C89	47k
R10	6-11009C71	8.2k
R11	6-11009C45	680
R12	6-11009C61	3.3k
R13	6-11009C45	680
R14	6-11009C01	10
R15	6-11009C89	47k
R16	6-11009C49	1k
R17	6-11009C37	330
R18	6-11009C61	3.3k
R19	6-11009C45	680
R20	6-11009C01	10
R21	6-11009C73	10k
R22, 23	6-11009C59	2.7k
R24	6-11009C73	10k
R25, R26	6-11009C57	2.2k
R27	6-11009C73	10k
R28	6-11009C61	3.3k
R29	6-11009C53	1.5k
R30	6-11009C69	6.8k
R31	6-11009C73	10k
R32	6-11009C53	1.5k
R33, 34	6-11009C57	2.2k
R35	6-11009C49	1k
R36, 37	6-11009C73	10k
R38, 39	6-11009C97	100k
R40, 41	6-11009C73	10k
R42	6-11009C97	100k
R43	6-11009C61	3.3k
		switch:
S1	40-83468E01	slide; spdt
S2, 3	40-83204B01	slide; dpdt
		integrated circuit: (see note)
U1	51-82884L63	Schmitt trigger inverter
U2	51-82884L13	D flip-flop
U3	51-82884L04	quad NOR gate
		mechanical parts
	1-80761D38	PANEL, screened; includes: S1, 2, 3
	9-84285C01	LAMPHOLDER, single contact
	61-855798	JEWEL, lamp GRN
	46-84603E01	GUIDE, circuit board
	45-83914G01	GUIDE, card; 2 used
	3-125790	SCREW, machine; 4-40 x 5/16"; 2 used

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

STATION CONTROL MODULE

MODEL TRN4854A



NOTES:

1. VOLTAGES SHOWN IN PARENTHESES ARE NORMALLY MEASURED WHEN FUNCTION IS ACTIVATED. VOLTAGES NOT IN PARENTHESES ARE NORMALLY MEASURED WHEN FUNCTION IS DEACTIVATED.
2. TO KEY THE TRANSMITTER, SLIDE THE XMIT SWITCH TO THE RIGHT (CLOSED) AND HOLD IN THIS POSITION. TO UNKEY THE TRANSMITTER, RELEASE THE SWITCH.
3. 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.
4. 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.
5. THE DISABLE LIGHT IS ILLUMINATED WHEN THE PL OR LINE DISABLE SWITCHES ARE ACTUATED, OR EXTERNAL CIRCUITS PULL THE LINE DISABLE LINE LOW.
6. JUMPER CHART

JUMPER	NORMAL USE	APPLICATION
JU1, 2, 3	IN	OUT FOR SPECIAL APPLICATIONS.
JU4	IN	OUT FOR GUARD TONE OR MODEM KEYING.
JU5	IN	OUT FOR SPECIAL APPLICATIONS.
JU6	IN	OUT FOR DUPLEX STATIONS.
JU7	OUT	IN FOR PL SQUELCH.

7. UNLESS OTHERWISE INDICATED: RESISTOR VALUES ARE IN OHMS, CAPACITOR VALUES ARE IN MICROFARADS, AND INDUCTOR VALUES ARE IN MILLIHENRIES.
8. INTEGRATED CIRCUITS ON THIS BOARD ARE CMOS DEVICES.
9. IC TYPES AND CONNECTIONS FOR THIS BOARD ARE AS FOLLOWS:

REFERENCE DESIGNATION	TYPE	VCC	GND	MFGR'S DESCRIPTION
U1	84L63	14	7	SCHMITT TRIGGER INVERTER
U2	84L13	14	6,7,8	D FLIP-FLOP
U3	84L04	14	7	QUAD NOR GATE

10. GATES NOT USED

U2-PINS 2, 12 OPEN

FUNCTION

This module integrates control functions from other modules in the station to key the transmitter. Keyed A+ and A- voltages are generated in this module to provide transmitter turn on. Local transmitter keying is accomplished via a panel mounted "XMIT" switch. The LINE DISABLE and PL DISABLE switches also on the front panel, are used to disable remote keying for maintenance purposes, and the PL DISABLE switch is used for local channel monitoring in thoses cases where a monitor or link receiver is used.

Other circuitry in the module provides for control of the prefilter on the guard tone decoder module. This allows for function tones to pass through the guard tone decoder at the proper time in route to function tone decoder modules such as the F1 control module.

Circuit Board Detail, Schematic Diagram & Parts List
Motorola No. PEPS-34636-A
(Sheet 2 of 2)
7/31/86-PHI

MOTOROLA INC.
Communications
Sector

ALARM LOGIC MODULE
MODEL TRN4857A

1. GENERAL

The alarm logic module is used in a Motorola radio paging station. It provides an alarm output for any of three alarm conditions: audio alarm, rf alarm, or system alarm. The alarm output is provided by the contacts of relay K1, located on the circuit board. The relay contacts are rated at 500 mA maximum, 100 V dc maximum, and 15 watts maximum.

2. INSTALLATION

2.1 The alarm logic module is supplied with two card guides that allow the module to be installed in either a unified or non-unified remote control chassis in the station.

2.2 On stations using a unified remote control chassis, the alarm logic module is installed in position 7. The relay contact output is available at TB3-2 and TB3-3 on the interconnect board. On stations using a non-unified remote control chassis, the alarm logic module is installed in position 6. The relay contact output is available at TB2-3 and TB2-5 on the interconnect board.

3. POWER THRESHOLD ADJUSTMENTS

Step 1. Remove module from remote control chassis and place on extender card.

Step 2. Preset the following controls as viewed from the module front panel. (Refer to circuit board detail for location of controls.)

- RF Forward (R18) fully counterclockwise
- Audio (R9) fully counterclockwise
- RF Reverse (R23) fully clockwise
- Set switch S1 through S8 as follows:
  S1, 2, 3, 4, 5, and S8 - ON
  S6 and S 7 - OFF

Step 3. Install module and card extender into remote control chassis. If test control potentiometer is not available, proceed to Step 13.

Equipment Needed:

(1) 25k test control potentiometer with (2) leads and alligator clips attached. CCW rotation increases resistance between the 2 leads.

Step 4. Put switch on rf meter to "FWD HIGH" position. Key transmitter, **NOTE power meter reading.** Power meter is FACTORY calibrated, does not require calibration.

Step 5. Preset the test control pot (25k) fully CCW.

Step 6 Connect red lead of test control to white wire at terminal on detector module or to TB3-18 (unified chassis) or TB2-19 (non-unified chassis) and connect yellow lead to chassis GND.

Step 7. With transmitter keyed, adjust test control until power meter reads 50% of reading noted in Step 4.

NOTE
Do not keep transmitter keyed constantly.

Step 8. Adjust upper threshold control (rf forward) until alarm indicator (both on ALM) just lights with transmitter keyed.

Step 9. Disconnect yellow lead of test control from ground and connect it to J100-13 or red wire at terminal of detector module. Preset test control CCW. Put meter switch to "REV. HIGH".

Step 10. Key transmitter, adjust test control until meter reads 15 to 20% of reading noted in Step 4.

Step 11. Adjust lower threshold control (rf reflected) until alarm indicator just lights, with transmitter keyed.

Step 12. Disconnect test control, put meter switch in "FWD HIGH", key transmitter, alarm indicator should remain OFF. Perform Section 4 Audio Level Adjustment.

(Alternate Power Threshold Set Procedure)

Step 13. Connect a jumper from J100-13 on the remote control interconnect board to the forward power terminal (white) on the wattmeter. Make sure the red (reverse power) wire is not connected to J100-13.

Step 14. Set wattmeter to Fwd - High. Keying into a 50 ohm load, set output power to 18% of rated power power of the station.

Step 15. Rotate the rf reverse control (R23) on the alarm logic module, until the alarm LED just lights.

Step 16. Disconnect the jumper stated in Step 13, and connect the red (reverse power) wire from the wattmeter to J100-13.

Step 17. Tune transmitter to 50% of rated power power.

Step 18. Rotate the rf forward control (R18) on the alarm logic module, until the alarm LED just lights.

Step 19. Tune the station to rated power output.

4. AUDIO LEVEL ADJUSTMENT

4.1 The alarm logic module modulation check requires that the initial burst of high level guard tone be used to verify proper audio level. Any control configuration which does not begin the keying sequence with high level guard tone, requires the modulation check to be disabled on the alarm logic module. To disable the modulation check, turn R9 on the alarm logic module fully counterclockwise.

4.2 If the modulation check is to be used to verify proper audio level, the audio trip point must be set by R9, to a point 6 dB below the normal level of high level guard tone. Follow the procedure outlined in Steps 1 and 2.

NOTE

The station must be in normal operating condition before the audio trip point on the alarm logic module is set (phone line and exciter level adjustments must be set at normal levels). Any change in exciter level adjustment requires readjustment of the audio trip point on the alarm logic module.

Step 1. Apply a 2175 Hz sine wave at a level 6 dB below normal high level guard tone to the phone line.

Step 2. Monitor the voltage at pin 7 of U1 on the alarm logic module and adjust audio control R9 until this voltage just drops to near ground.

Step 3. Remote extender card, put S4 to OFF, install ALM, recheck transmitter.

Step 4. Turn meter switch to OFF.

5. SYSTEM TIMER PROGRAMMING

5.1 Dip Switch S1 (actually S1-S8) is used to program the system timer. Positions 1, 2 and 3 are not used (always in "ON" position). Position 4 is used to disable the timer. If S4 is "on" the timer is disabled. If S4 is "off" the timer causes a system alarm at a programmable time after loss of push-to-talk. Positions 5, 6, 7 and 8 are used to program the timer. The following table gives approximate times for each combination of switch positions.

Table 1. System Timer Programmable Times

S8	S7	S6	S5	Time
0	0	0	0	10 seconds
0	0	0	1	21 seconds
0	0	1	0	42 seconds
0	0	1	1	1.5 min.
0	1	0	0	2.8 min.
0	1	0	1	5.7 min.
0	1	1	0	11.3 min.
0	1	1	1	23 min.
1	0	0	0	45 min.
1	0	0	1	1.5 hr.
1	0	1	0	3 hr.
1	0	1	1	6 hr.
1	1	0	0	12 hr.
1	1	0	1	1 day
1	1	1	0	2 days
1	1	1	1	4 days

0 = ON
1 = OFF

5.2 An example is shown in Figure 1, on how dip switch S1 is set to program the system timer to produce an alarm 45 minutes after loss of push-to-talk. Refer to Figure 1.

6. ALARM LOGIC MODULE JUMPERING INFORMATION

The relay contacts may be jumpered to either open or close on an alarm or on verification. The alarm logic module is shipped with jumpers set to close the contacts on an alarm. See jumper table on the schematic diagram for other possible jumper configurations.

7. THEORY OF OPERATION

7.1 AUDIO ALARM

Integrated circuit U1C amplifies the unnotched microphone audio and applies it to level detector CR1 and C5. It is then applied to U1B-5, which compares the audio level with a reference level set by R9 at U1B-6. The reference level is set for an audio level of 6 dB below normal high level guard tone. During high level guard tone,

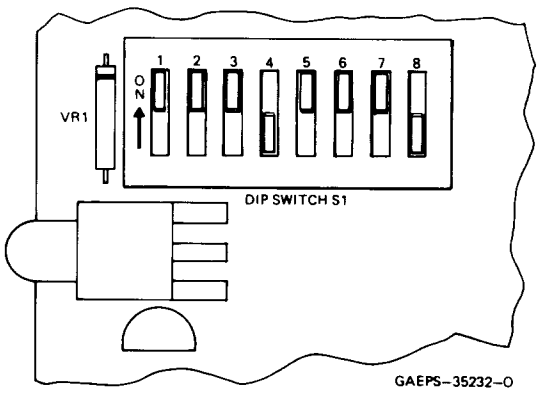


Figure 1. Timer Set to Alarm 45 Minutes After Loss of Push-To-Talk

delayed keyed A+ is inverted by U2A-2, and applied to latch U3B and U3C. If high level guard tone is of sufficient level, a logic low ("0") is latched at U3C-10. This indicates there is no audio alarm. If high level guard tone is degraded by more than 6 dB, a logic high "1" appears at U3C-10, indicating an audio alarm at pin 17.

7.2 RF ALARM

7.2.1 Operational amplifier U1D samples the forward power (pin 22) as detected by the wattmeter. the forward power is compared to a reference level set by R18. The reference level is set to one-half of the rated power, a logic high ("1") appears at U3A-3, indicating an rf failure. In a similar manner U1A samples the reflected power (pin 8) and compares it to a reference level set by R23 (18§ of station power). If the reflected power exceeds the pre-set limit, a logic high ("1") appears at U3A-3, indicating an rf alarm.

7.2.2 Transistor Q9 is a constant current source for Zener diode VR1. VR1 is a precision temperature compensated voltage reference, that is used by the audio and rf comparators.

7.3 SYSTEM ALARM

Integrated circuit U6 is a programmable timer. C10 and R35 form an RC time constant for an oscillator that is divided by 24 flip- flop stages; the last 16 stages are selectable by a four-bit binary code programmed by switches S5, 6, 7, and 8. Switch S4 can be closed to disable the timer completely. The timer is reset by Q7 via CR2, CR3, or CR4, whenever there is a push-to-talk function. C13 causes the timer to reset on initial power up. If a push-to-talk function does not occur within a predetermined time limit, a system alarm occurs via Q3.

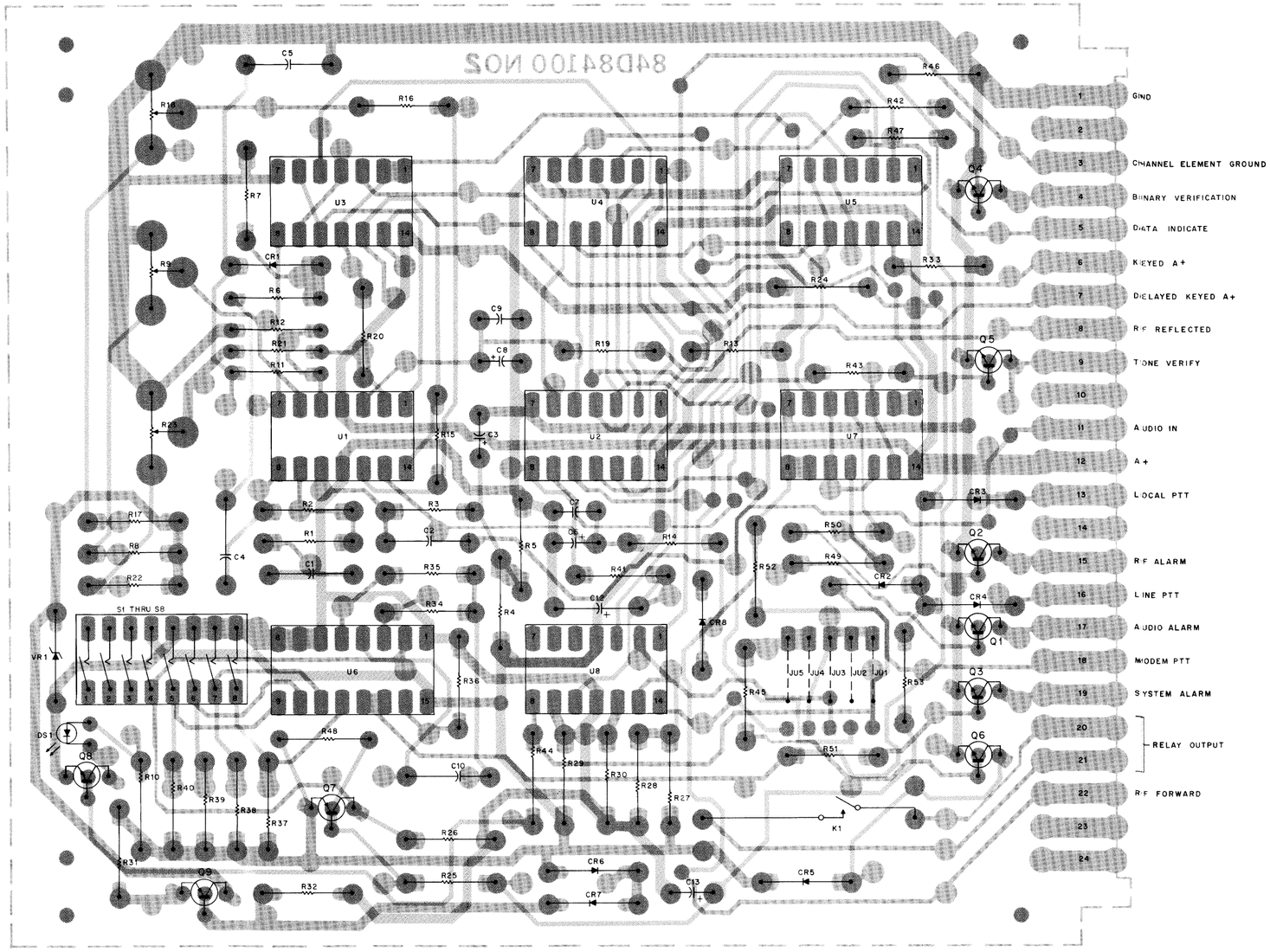
7.4 VERIFICATION LOGIC CIRCUITRY

The verification logic circuit consists of U4 and U2B, C, and F. When a channel element ground appears at pin 3 and an audio signal appears at pin 11 with rated rf power at pin 22, a logic high appears at the output of U4B-4. If JU2 is in, relay K1 is activated to provide verification. Transistors Q4 and Q5 supply open collector outputs to indicate the station is keyed up in the binary mode (Q4) or the tone mode (Q5).

7.5 ALARM LOGIC CIRCUITRY

The alarm logic circuitry consists of U5, U2D, E, and U8C. U5 detects any of the alarm conditions (audio, rf, or system). Upon detection of an alarm, U5A-3 goes low, causing U2D-8 to go high. The output of U2D is applied to R41, C12, and U8C, to form a time delay that blocks transient alarm conditions that occur during the key-up sequence. The output of U8C is at a logic high ("1") when an alarm condition exists. The output of U8C-8 is routed to JU1, which can be connected to operate K1 relay. The alarm signal also lights the front panel alarm LED (DS1) via Q8. During an alarm condition U7 decodes the type of alarm. Transistors Q1, Q2, and Q3 provide open collector outputs to indicate an audio alarm (Q1), and rf alarm (Q2), or a system alarm (Q3).

ALARM LOGIC MODULE
MODEL TRN4857A



SHOWN FROM COMPONENT SIDE

COMPONENT SIDE ⓒ BD-DEPS-34915-A
SOLDER SIDE ⓢ BD-DEPS-34916-A
OL-DEPS-34917-B

Schematic Diagram, Circuit Board Detail & Parts List
Motorola No. ***PEPS-34991-A***
(Sheet 1 of 2)
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parts list

TRN4857A Alarm Logic Module — PL-8099-O

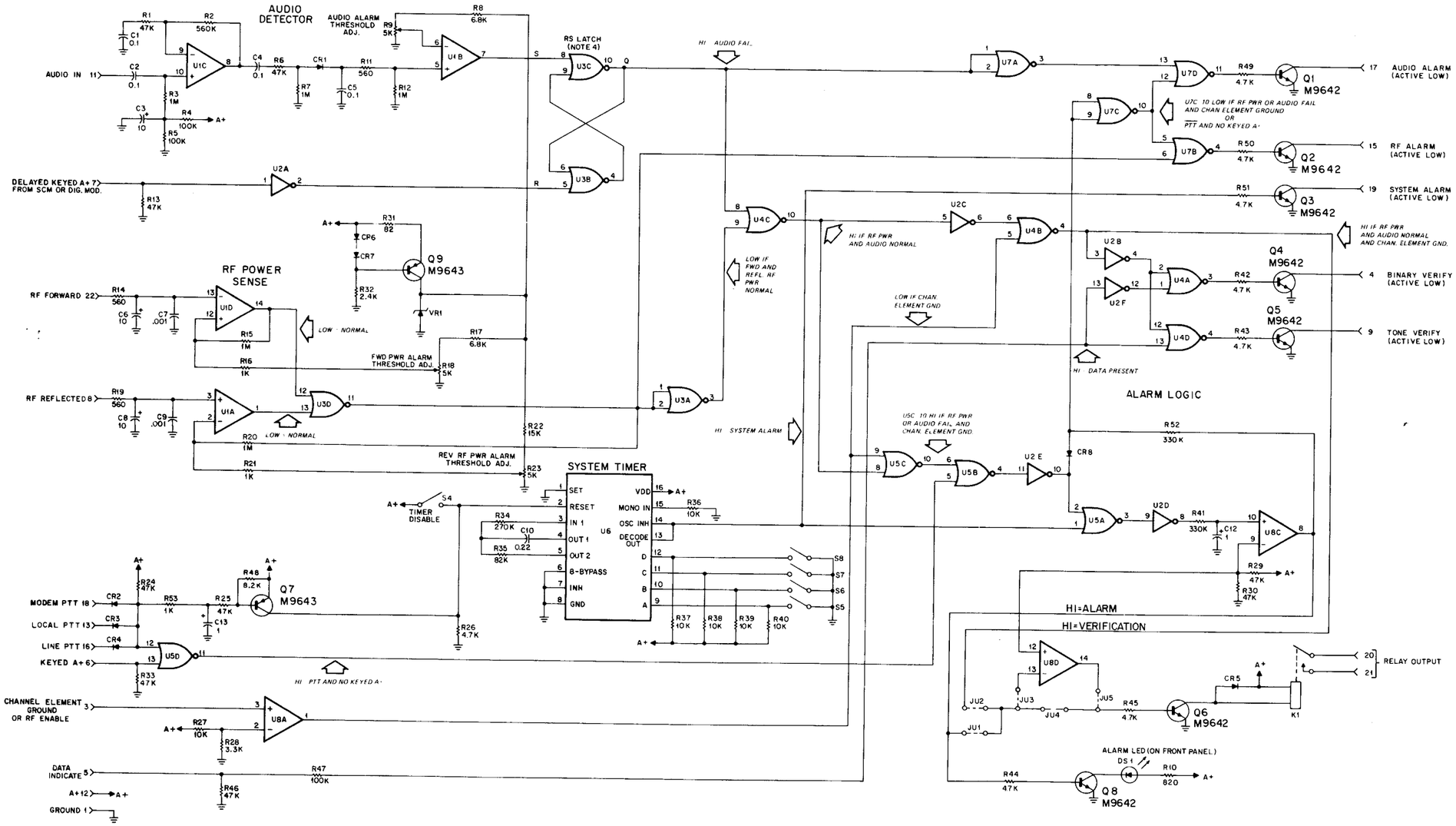
REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		capacitor, fixed: ± 10%; 100 V; unless otherwise stated
C1, 2	8-84637L14	0.1 uF
C3	23-11013C54	10 uF ± 20%; 15 V
C4, 5	8-84637L14	0.1 uF
C6	23-11013C54	10 uF ± 20%; 15 V
C7	21-11015B13	.001 uF
C8	23-11013C54	10 uF ± 20%; 15 V
C9	21-11015B13	.001 uF
C10	8-84637L44	0.22 uF ± 5%
C11		NOT USED
C12	23-84538G14	1 uF; 35 V
C13	23-11013D01	1 uF; 20 V
		diode: (see note)
CR1, 2, 3, 4	48-83654H01	silicon
CR5	48-82466H13	silicon
CR6, 7, 8	48-83654H01	silicon
		light emitting diode:
DS1	48-88245C28	red
		relay:
K1	80-82617M01	1 form A; coil res. 820
		transistor: (see note)
Q1 thru 6	48-869642	NPN; type M9642
Q7	48-869643	PNP; type M9643
Q8	48-869642	NPN; type M9642
Q9	48-869643	PNP; type M9643
		resistor, fixed: ± 5%; 1/4 W unless otherwise stated
R1	6-11009C89	47k
R2	6-11009D16	560k
R3	6-11009D22	1 meg
R4, 5	6-11009C97	100k
R6	6-11009C89	47k
R7	6-11009D22	1 meg
R8	6-11009C69	6.8k
R9	18-83083G07	variable; 5k
R10	6-11009C47	820
R11	6-11009C43	560
R12	6-11009D22	1 meg
R13	6-11009C89	47k
R14	6-11009C43	560
R15	6-11009D22	1 meg
R16	6-11009C49	1k
R17	6-11009C69	6.8k
R18	18-83083G07	variable; 5k
R19	6-11009C43	560
R20	6-11009D22	1 meg
R21	6-11009C49	1k
R22	6-11009C77	15k
R23	18-83083G07	variable; 5k
R24, 25	6-11009C89	47k
R26	6-11009C65	4.7k
R27	6-11009C73	10k
R28	6-11009C61	3.3k
R29, 30	6-11009C89	47k
R31	6-11009C23	82
R32	6-11009C58	2.4k
R33	6-11009C89	47k
R34	6-11009D08	270k
R35	6-11009C95	82k
R36 thru 40	6-11009C75	10k
R41	6-11009D10	330k
R42 thru 45	6-11009C65	4.7k
R46	6-11009C89	47k
R47	6-11009C97	100k
R48	6-11009C71	8.2k
R49, 50, 51	6-11009C65	4.7k
R52	6-11009D10	330k
R53	6-11009C49	1k
		switch:
S1	40-83022M03	8-position: (spst)
		integrated circuit: (see note)
U1	51-83629M08	quad op-amplifier
U2	51-82884L03	hex inverter
U3, 4, 5	51-82884L04	quad 2-input NOR gate
U6	51-82884L62	programmable timer
U7	51-82884L04	quad 2-input NOR gate
U8	51-83629M08	quad op-amplifier
		voltage regulator:
VR1	48-82372L04	Zener type; 6.25 V

mechanical parts

3-125790	SCREW, machine; 4-40 x 5/16"; 2 used
45-83914G01	GUIDE, card; 2 used
46-84703E01	GUIDE, circuit board
64-83163L19	PANEL, screened
9-83697M01	RECEPTACLE, board mounting; 24 used
43-865080	BUSHING

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

ALARM LOGIC MODULE
MODEL TRN4857A



EEPS-34914-8

NOTES:

1. Unless otherwise indicated: resistor values are in ohms; capacitor values are in microfarads.
2. Integrated circuits on this board are (TTL) CMOS devices.
3. IC types and connections for this board are as follows:

Reference Designation	Type	VCC	Gnd	Mfgr's Description
U1	29M08	4	11	Quad Op-Amp
U2	84L03	14	7	Hex Inverter
U3, 4, 5, 7	84L04	14	7	Quad 2-Input NOR Gate
U6	84L62	16	8	Programmable Timer
L8	29M08	4	11	Quad Op-Amp

Jumpers Used

Contact Closure On Alarm	JU1, JU4
Contact Closure On Verification	JU2, JU4
Contact Open On Alarm	JU1, JU3, JU5
Contact Open On Verification	JU2, JU3, JU5

4. **U3B, C RS Latch Truth Table**

HLGT(S)	DEL KA+ (R)	Q	Indication
0	0	1	Station Inactive or Audio Fail
0	1	X	Latch Failed
1	0	0	Normal
1	1	0	Normal

X = No Change

Schematic Diagram, Circuit Board Detail & Parts List
Motorola No. PEPS-34991-A
(Sheet 2 of 2)
7/31/86-PHI

TLN2559B
PURC SIMULCAST CONTROL MODULE

1. GENERAL DESCRIPTION

1.1 The TLN2559B Simulcast Control Module (SCM) is a plug-in unit for the remote control chassis of a *PURC* paging station. The SCM consists of two circuit boards, TRN5379B Control Board and TRN5603B Logic Board, fixed together to form the module. The SCM replaces the function tone decoder in the *PURC* station, providing the keying function to the paging transmitter in response to input signals Push-To-Talk (PTT) Control or Line PTT. Key-up output signals are provided on the Channel Element Ground, PL Enable, F1 Ground, and F2 Ground lines.

1.2 The TRN5379B Control Board has the interface circuitry required to connect the microcomputer on the TRN5603B Logic Board to the base station and an on-board power supply to run the logic board.

1.3 The TRN5603B Logic Board contains the MC6803 microcomputer, program ROM, code selector switches, and the support devices for the microcomputer.

2. OPERATION

2.1 The basic function of the SCM is to decode function tone (FT) inputs and key or disable the transmitter in response to correct codes. The key-up request lines on the SCM have different levels of priority. PTT Control is an immediate-response input with lower priority than Line PTT. Line PTT initiates the microcomputer examination of the FT input line. The FT input goes through waveshaping circuitry and is then applied to the microcomputer. The microcomputer compares the FT input sequence to the code set in the selector switches to determine if the transmitter should be keyed up or not. The group and function tone selection is done according to Table 1 and Table 2.

2.2 The SCM provides the Delayed Keyed A+ signal to the *PURC* station in response to a Keyed A+ input signal. The Delayed Keyed A+ stays active for about 300 milliseconds after the Keyed A+ signal drops out. This delay allows the station to have an active A+ signal during temporary losses of Keyed A+ that can occur during mode changeover sequencing. Delayed Keyed A+ also keeps the SCM active during these short periods.

Table 1. Group Selection

Group	G2	G3	Stations
See note	ON	ON	All
I	OFF	OFF	1-10
II	ON	OFF	11-20
III	OFF	ON	21-30

Note: Station cannot be disabled when both G2 and G3 are on.

2.3 A Line PTT input signal causes the SCM to generate DC Line Disable and FT Window Control signals. DC Line Disable causes the Guard Tone Module to hold Line PTT active. If the function tone sequence stops before the SCM detects KT1, the FT Window Control times out and DC Line Disable also becomes inactive about 60 milliseconds after tone input stops. If the microcomputer detects too many function tones, the DC Line Disable is dropped. In either case the latest tones are wiped from memory and the SCM returns to input line scanning. In normal operation the FT Window Control closes and DC Line Disable drops after the SCM detects KT1.

Table 2. Function Tone Selection

Tone Switch	Tone Frequency (Hz)
T10	750
T9	950
T8	1050
T7	1150
T6	1250
T5	1350
T4	1450
T3	1550
T2	1650
T1	1750

1950 Hz = F1 select
850 Hz = F2 select
2350 Hz = F3 select

2.4 The Channel Element Grounds and PL Enable outputs become active after all conditions have been met. Since the Channel Element Grounds are the final transmitter key-up control, any condition that inhibits the transmitter causes these signals to become inactive.

3. CIRCUIT DESCRIPTION

3.1 INPUT CIRCUITS

3.1.1 PTT Key-Up Lines

The PTT inputs are normally high and go low when active. The 12 volt input is converted to a logic-compatible 5 volts by input buffer U14. The buffer outputs then go directly to the input port of microcomputer U1.

3.1.2 Keyed A+

The Keyed A+ signal is applied to transistor Q8. Q8 charges C13 and causes Q9 to saturate. Q10 is normally on at this time, but has no effect. When the Keyed A+ signal goes low, Q8 shuts off and C13 begins to discharge through the network of R19-R20-R21-R22-R25, keeping Q10 shut off. After the discharge time period set by C13 and the resistor network, Q10 conducts, shutting off Q9. Delayed Keyed A+ then goes low.

3.1.3 Function Tone Input

Sine wave tones from the audio line are applied to lower and upper peak detectors U10A and U10B, respectively. The peak levels are applied to opposite ends of divider network R26-R27-R28. Transmission gate U11 shifts the reference of comparator U10D to either the high-level or low-level reference point of the divider string. Since the circuit is wired in a hysteresis configuration, U11 selects the high-level reference if the input signal is below the reference point, and vice-versa. The output of U10D is a clean square wave signal which is passed through Q11, and then to the microcomputer.

3.2 OUTPUT CIRCUITS

DC Line Disable, FT Window Control, and the Channel Element Grounds are all transistor outputs driven directly from U1. PL Enable is driven by F1 Oscillator Ground through CR4, which allows PL Enable to be pulled low by another signal in the station without affecting F1 Oscillator Ground.

3.3 MICROCOMPUTER LOGIC

The central logic unit of the SCM is composed of microcomputer U1, octal latch U2, hex buffers U4 and U5 (with associated switch set S1), and address decoders U6 and U7. Timers U8 and U9 perform a watchdog function, keeping track of the microcomputer "tickle pulses".

3.3.1 Microprocessor

U1 contains the master clock and timing generator, microprocessor, and 128 8-bit bytes of RAM. The processor communicates with the other circuitry of the SCM via four ports. Port 1 (pins 6-10) accepts the conditioned signals from the FT line and services the watchdog circuitry. Diodes CR9 and CR10 set the pro cessor mode as "Extended Multiplexed." Port 2 (pins 13-19) handles all the input/output control signals. Port 3 (pins 22-29) provides the upper eight bits of the address bus. Port 4 (pins 30-37) provides the lower eight bits of address (through octal latch U2) and carries data from the data bus.

3.3.2 ROM

U3 contains the program information the processor needs to detect and process function tones. Address selection is done on pins 1-8, 19, 22, and 23. Data is brought out on pins 9-11 and 13-17.

3.3.3 FT Code Programming Circuit

FT codes are determined in switch set S1. The processor requests code information on address lines A14 and A15. The address decoder composed of U6 and U7 then allows the appropriate buffer to output switch code information to the data bus. The device to output data to the data bus is selected according to Table 3.

Table 3. Device Selection Address

Device	A14	A15
ROM	1	1
U4	1	0
U5	0	1
Not Used	0	0

3.3.4 Watchdog Circuit

In normal operation, U1 generates a "tickle pulse" on the P22 line (pin 10) every 66 milliseconds. A time window is established by monostables U8A and U9 during which the "tickle pulse" must occur. The incoming "tickle pulse" triggers both monostables. U9 times out before the next "tickle pulse" while U8A is continuously triggered. If the "tickle pulses" are too far apart, U8A times out. The Q output of U8A then triggers U8B, the reset pulse generator. If the "tickle pulses" occur too close together, U9 is still active when the next "tickle pulse" occurs and gate U6B clears U8A, again triggering the reset pulse generator. When U8B is triggered, the reset signal passes through Q13 and is sent to the reset pin of U1. The Q12-R44-C27 network allows the processor to generate a "tickle pulse" within about 6 milliseconds after the falling edge of the reset pulse. If U1 does not generate a "tickle pulse" in this period, U8B sends another reset pulse. If the "tickle pulse" occurs normally, U8A is triggered and U8B is shut off.

4. TROUBLESHOOTING

4.1 EQUIPMENT REQUIRED

- DC, 15 MHz Dual-Trace Oscilloscope
- Audio Oscillator

- 15 MHz Frequency Counter
- Voltmeter
- TLN8799A Servicing Board Kit

4.2 FUNCTIONAL TESTS

To service the SCM it is necessary to first unplug the module, plug in the TLN8799A extension, and then plug the SCM into the extender board. The steel cover can be removed from the TRN5603B Logic Board to gain access to the microcomputer logic assembly.

4.2.1 Power Supply

Measure the voltage on control board pin 12 (A+), pin 10 (9.6 V), and U13 pin 3 (5 V). Correct any problems.

4.2.2 Delayed Keyed A+

Connect one oscilloscope channel to the Keyed A+ line at pin 24 of the control board. Connect the other channel to the Delayed Keyed A+ line at pin 8. Set the oscilloscope to trigger on a low-going transition occurring on Keyed A+. Apply 12 V to Keyed A+ by using the local PTT switch or a test switch. Release the PTT switch and observe the oscilloscope second channel trace. The trace should show a high-level signal which drops to ground after about 300 milliseconds. If the trace drops immediately, check the timing network for Q10 to determine if there is a component failure. If the trace stays high, check Q9 and Q10.

4.2.3 Input Buffer

The input buffer is a non-inverting level shifter. 12 V input signals should result in 5 V level output signals. Check all inputs and their corresponding outputs for correct levels. Replace U14 to correct any pro blems.

4.2.4 Function Tone Conditioning Circuit

Connect the audio oscillator to pin 11 (FT HI) of the control board through a .01 uF capacitor. Set the frequency to 1 kHz and the amplitude to 6 V p-p. Probe the collector of Q11 (line P20) with the oscilloscope to see a 0-5 V 1 kHz square wave signal. Reduce the generator output to 0.6 V p-p. The P20 signal remains the same. Measure the dc level of FT HI with no audio signal applied. Apply signal and observe U11 pin 14 (the comparator reference point) with the oscilloscope. The dc level at this point is the same as that of FT HI, but with a square wave of about 10% of the audio signal level applied to FT HI. Vary the audio signal amplitude and observe the square wave signal amplitude change. If the comparator reference does not show this hysteresis effect, check peak detectors U10A and U10B and their associated components, and transmission gate U11.

4.2.5 Control Outputs

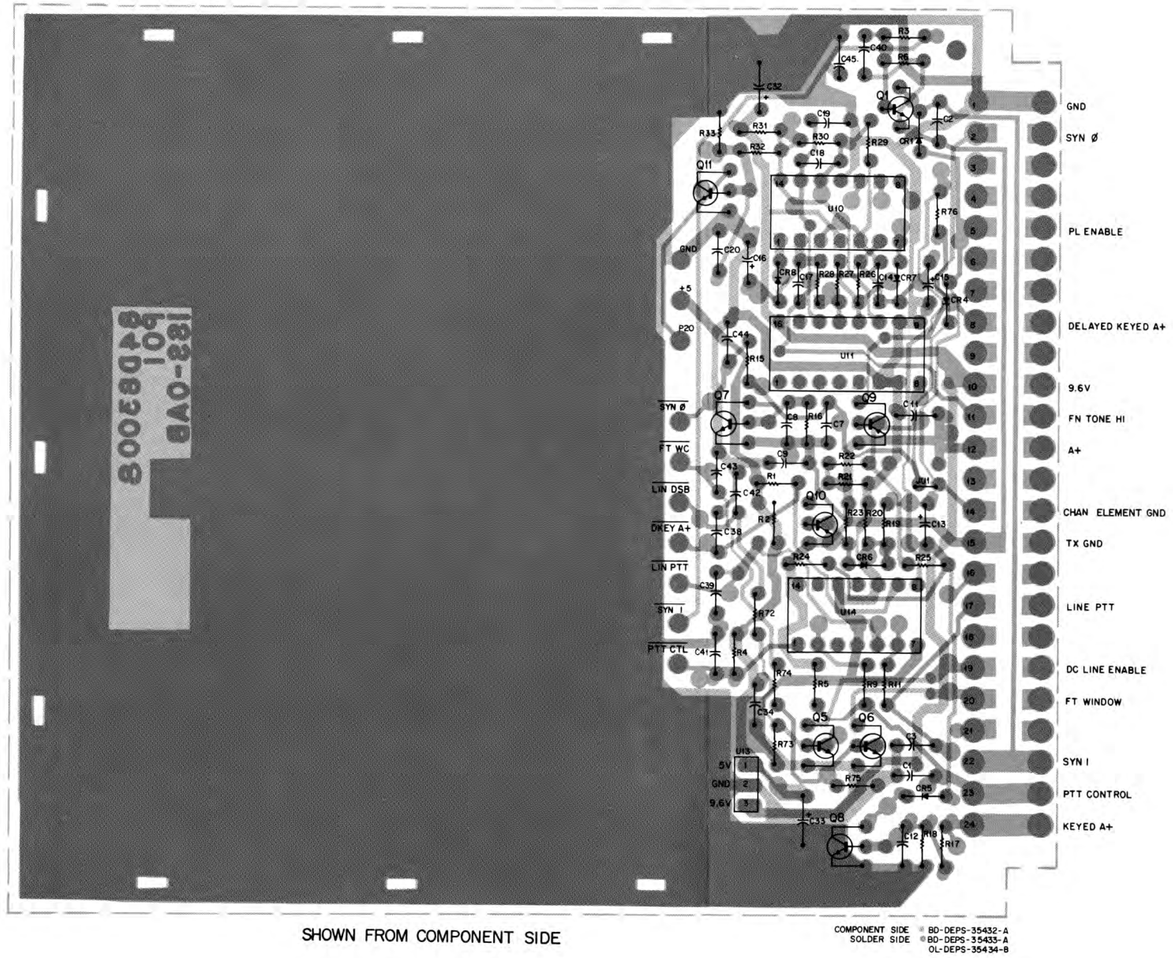
The SCM output circuits are simple transistor drivers. Note that PL Enable and F1 Oscillator Ground are returned to a connection in the paging station, not to the SCM ground return. Make all measurements of these leads referenced to the TX Ground, pin 11.

Table 4. SCM/Station Jumper Selection
(Refer to Station Module Jumper Charts)

Affected Board	Conditions	Action
Non-unified Main Board TRN5349A (Low Band and VHF 330 Watt Stations)	w/board part no. 84-84212N01	— remove JU15
	w/board part no. 84-83601N01	— remove JU15 — connect option slot pin 10 to SCM pin 10 — connect guard tone decoder pin 13 to SCM pin 19
Unified Main Board TRN4860A (Low Band through 960 MHz Low Power and UHF High Power)		— connect option slot pin 10 to SCM pin 10 — connect guard tone decoder pin 13 to SCM pin 19
TSI Module TRN4853A		— remove CR13 — remove R24 — add 47k resistor across C11
Station Control Module TRN4854A	Unified Chassis Stations	— remove Q12
Station Control Module TRN4854B		— remove JU8
Digital Modulator Module TRN4856A		— remove module
F1 Module TLN5293A w/ Optional Link Receiver		— remove C23 and C32
Guard Tone Decoder Module TLN2376A	systems with more than one rf link (more than 120 ms of HLGT)	— change C15 to 47 uF; 20%, 25 V tantalum (Motorola Part No. 23-82783B37) in the link transmitters and the paging station)

SIMULCAST CONTROL MODULE

CIRCUIT BOARD DETAIL
TRN5379B CONTROL BOARD



SHOWN FROM COMPONENT SIDE

COMPONENT SIDE - BD-DEPS-35432-A
SOLDER SIDE - BD-DEPS-35433-A
OL-DEPS-35434-B

parts list

TRN5379B Control Board — PL-8320-C

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		capacitor, fixed:
C1, 3	21-11015B13	.001 uF ± 10%; 100 V
C7, 8, 9	21-11015A05	.0047 uF +80-20%; 100 V
C11	21-11015A07	.01 uF +80-20%; 100 V
C12	21-82187B04	270 pF ±10%; 500 V
C13	23-84538G04	15 uF ±10%; 25 V
C14	21-82610C58	100 pF ±10%; 100 V
C15,16	23-11019A09	1.0 uF ±20%; 50 V
C17, 18	21-82610C58	100 pF ±10%; 100 V
C19	21-11015B13	.001 uF ±10%; 100 V
C20	21-82187B04	270 pF ±10%; 500 V
C32, 33	23-84538G06	47 uF ±20%; 20 V
C34	21-11015A07	.01 uF +80-20%; 100 V
C38, 39	21-11015B13	.001 uF ±10%; 100 V
C40	21-11015A05	.0047 uF +80-20%; 100 V
C41	21-11015B13	.001 uF ±10%; 100 V
C42 thru 45	21-83406D81	20 pF ±5%; 500 V
C46	21-11015A05	.0047 uF +80-20%; 100 V
		diode: (see note)
CR4, 5, 6	48-11034D01	silicon
CR7, 8	48-84616A01	Hot carrier
CR9	48-11034D01	silicon
		transistor: (see note)
Q5, 6	48-869642	NPN; type M9642
Q7	48-869567	NPN; type M9567
Q8	48-869642	NPN; type M9642
Q9	48-869328	PNP; type M9328
Q10	48-869643	PNP; type M9643
Q11	48-869642	NPN; type M9642
Q14	48-869567	NPN; type M9567
		resistor, fixed: ±5%: 1/4 W: unless otherwise stated
R1, 2	6-11009E65	4.7k
R3	6-11009E79	18k
R4	6-11009E65	4.7k
R5, 6	6-11009E73	10k
R9, 11	6-11009E97	100k
R15	6-11009E61	3.3k
R16	6-11009E79	18k
R17	6-11009E65	4.7k
R18	6-11009E73	10k
R19	6-11009E53	1.5k
R20	6-11009E83	27k
R21	6-11009E49	1k
R22	6-11009E45	680
R23	6-11009E75	12k
R24	6-11009E73	10k
R25	6-11009E53	1.5k
R26	6-11009E63	3.9k
R27	6-11009E47	820
R28	6-11009E63	3.9k
R29	6-11009E57	2.2k
R30	6-11009F22	1 meg.
R31, 32	6-11009E87	39k
R33	6-11009E93	68k
R72	6-11009E61	3.3k
R73	6-11009E79	18k
R74	6-11009E61	3.3k
R75	6-11009E79	18k
R76	6-11009E97	100k
R77	6-11009E61	3.3k
		integrated circuit: (see note)
U10	51-83629M09	Quad Low Power Operational Amplifier
U11	51-84887K60	Analog Multiplexer
U13	51-84561L76	Voltage Regulator (1.5A)
U14	51-82764K29	Hex Buffer
		mechanical parts
	2-132616	NUT, 6-32 × 1/4 × 3/32 × 1/8"
	3-136194	SCREW, machine: 6-32 × 3/8"
	7-84560N01	BRACKET, heat sink mounting
	26-84434N01	SHIELD

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

SIMULCAST CONTROL MODULE

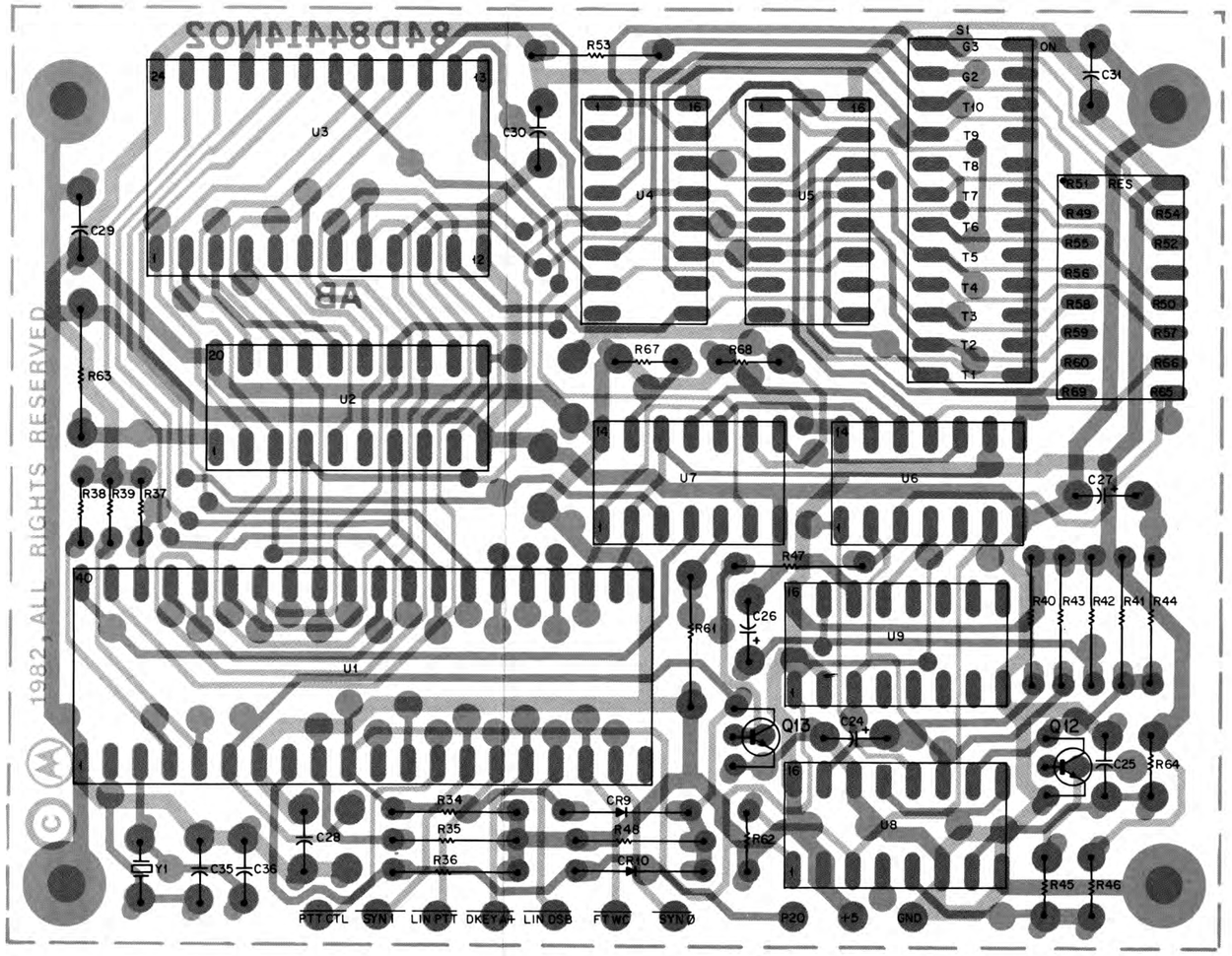
CIRCUIT BOARD DETAIL
TRN5603B LOGIC BOARD

parts list

TRN5603B Logic Board — PL-8321-C

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		capacitor, fixed:
C24	23-11013D09	4.7 uF ±10%; 20 V
C25	8-11017A15	.056 uF ±5%; 50 V
C26	23-11013D09	4.7 uF ±10%; 20 V
C27	23-11013C56	22 uF ±20%; 15 V
C28 thru 31	21-11015A07	.01 uF +80-20%; 15 V
C35, 36	21-11014H35	27 pF ±5%; 100 V
		diode: (see note)
CR8, 9	48-82392B03	silicon
		transistor: (see note)
Q12, 13	48-869642	NPN; type M9642
		resistor, fixed; ±5%: 1/4 W: unless otherwise stated
R34, 35, 36	6-11009C65	4.7k
R37	6-11009E65	4.7k
R38, 39	6-11009E25	100
R40	6-11009C97	100k
R41	6-11009C77	15k
R42	6-11009C73	10k
R43	6-11009C65	4.7k
R44	6-11009C10	24
R45	6-11009E19	56
R46	6-11009C51	1.2k
R47	6-11009C47	820
R48	6-11009C23	82
R49 thru 60	p/o 51-84333G23	3.3k resistor network
R61	6-11009C51	1.2k
R62	6-11009E73	10k
R63	6-11009E65	4.7k
R64	6-11009F04	180k
R65A, 66, 69	p†to 51-84333G23	3.3k resistor network
R67, 68	6-11009E65	4.7k
		switch:
S1	40-83022M04	12 position; spst
		integrated circuit: (see note)
U1	51-83625M06	Microprocessor
U2	51-83627M03	Octal Transparent Latch
U3	51-83625N84	ROM
U4, 5	51-84561L77	Hex Buffer, 4-bit and 2-bit (3-state)
U6	51-84371K83	Quad 2-input NAND gate
U7	51-84561L04	Quad 2-input NAND gate
U8, 9	51-84561L11	Monostable Multivibrator
		crystal: (see note)
Y1	48-82611M03	3.9672 MHz
		mechanical parts
	9-84924E01	SOCKET, 24-contact
	9-84181L01	JUMPER
	14-84602K02	INSULATOR
	28-84729L02	RECEPTACLE
	29-82713M01	TERMINAL, lug; 20 used

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

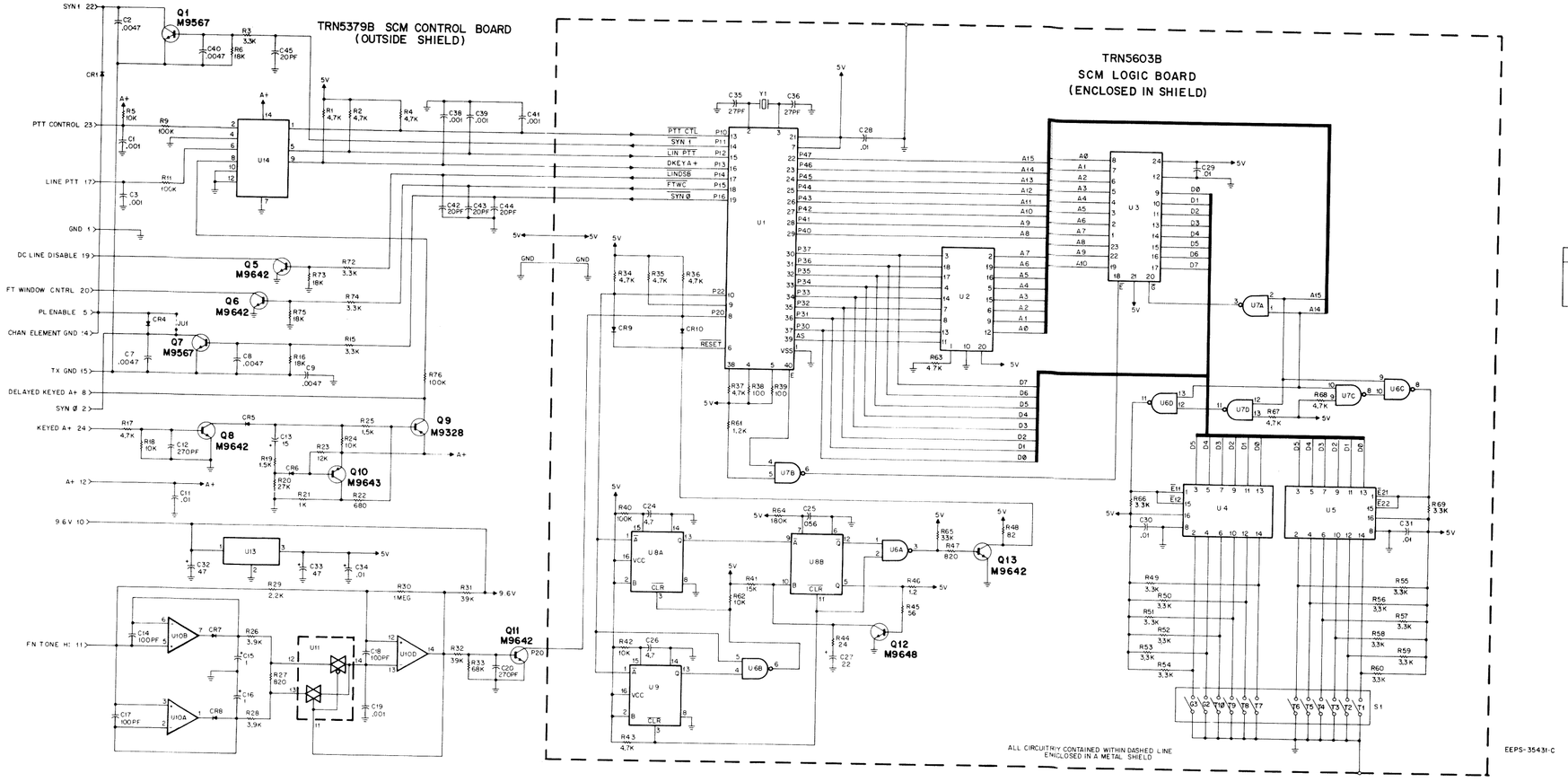


SHOWN FROM COMPONENT SIDE

COMPONENT SIDE ● BD-DEPS-35435-B
SOLDER SIDE ● BD-DEPS-35436-B
OL-DEPS-35437-B

SIMULCAST CONTROL MODULE

MODEL TLN2559B



INTEGRATED CIRCUIT POWER CONNECTIONS

DEVICE	5 VOLTS	9.6 VOLTS	GROUND
U6	14	—	7
U7	14	—	7
U10	—	4	11
U11	—	16	6,7,8

FUNCTION

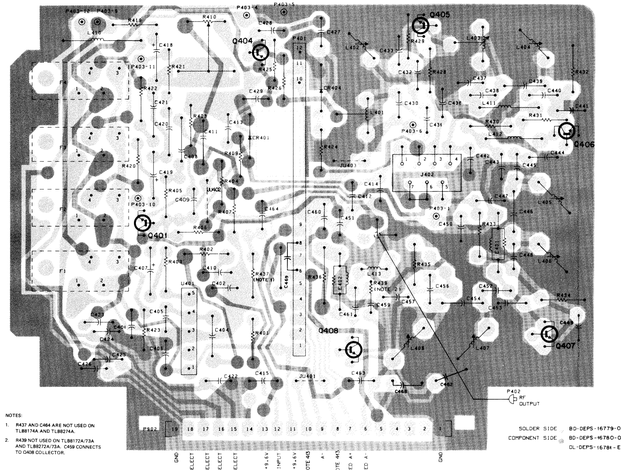
Decodes Function Tone signals and keys the transmitter in response to correct code sequences.

parts list

TRN5625A Control Module Hardware Kit — PL-8319-O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
	3-125790	SCREW, machine: 4-40 × 5/16"; 6 used
	45-83914G01	GUIDE, card; 2 used
	46-84703E01	GUIDE, circuit board
	64-83163L16	PANEL

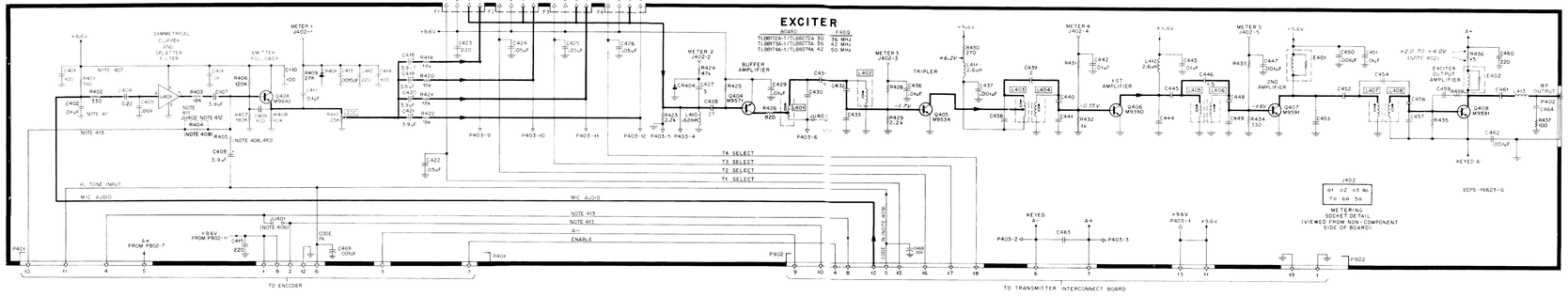
SHOWN FROM SOLDER SIDE



NOTES:

1. R437 AND C464 ARE NOT USED ON TLB8174A AND TLB8274A.
2. R439 NOT USED ON TLB8172A/72A AND TLB8272A/73A. CR68 CONNECTS TO Q408 COLLECTOR.

SOLDER SIDE 80-DEPS-16779-D
COMPONENT SIDE 80-DEPS-16780-D
CL-DEPS-16784-E



COMPONENT VALUE TABLE			
COMPONENT AFFECTED	FREQUENCY RANGE (MHz)		
	30–36	36–42	42–50
C430	180	130	91
C432	390	250	175
C433	300	190	160
C439	56	39	24
C440	75	47	36
C441	220	180	60
C444	190	100	80
C445	80	56	47
C448	80	47	27
C449	150	150	130
C452	56	34	30
C453	220	220	120
C454	3.9	2.7	2.2
C456	49	34	30
C457	91	62	47
C459	24	24	82
C411	100	100	80
C463	.001	NOT USED	NOT USED
C464	15	30	NOT USED
E401	SEE FOOT NOTE		
E402			
E407			
E408			
L413			
R425	1.2k	1.2k	3.9k
R428	39k	47k	39K
R431	33k	33k	22k
R432	56k	47k	47k
R437	100	100	NOT USED
R439	NOT USED IN THESE TWO RANGES		560

PARTS NOT IDENTIFIED BY VALUE, BUT EACH FREQUENCY RANGE HAS A DIFFERENT CHARACTERISTIC.

NOTES:

401. Transmitter Frequency Calculation:

$fc = 3fo \qquad fo = \frac{fc}{3}$

Where:
fo = Channel Element Frequency
fc = Carrier Frequency

402. Voltage measured across R436.

403. High impedance transistorized voltmeters (11 megohm) not recommended.

404. Unless otherwise stated, voltages measured in respect to chassis ground.

405. Unless otherwise stated, capacitor values are in picofarads.

406. JU401 removed in *Private-Line* and *PURC* paging radios.

407. R401 removed in remote control stations.

408. R404 and R405 are factory selected so that *Private-Line* deviation falls between 500 Hz and 1000 Hz limits. See parts list for values.

409. In *Private-Line* radios, P9002-5 is not connected to the transmitter interconnect board.

410. Remove R405 unless code inputs are applied via P401-6 or P902-5.

411. R402 and R403 removed only in flat audio stations.

412. JU402 is added when flat audio board is used.

413.

With PL Squelch Signal Name	With Flat Audio Option Signal Name
P401-19 Code Input	IDC Limited Flat Audio
P401-4, 902-8 Delayed Keyed A +	Flat Audio
P401-2, 902-10 Keyed A +	Flat Audio Control

PARTS LIST SHOWN ON BACK OF THIS DIAGRAM
TLB8170A & TLB8270A Series Exciter Schematic Diagram & Circuit Board Detail
Motorola No. PEPS-16956-G
10/5/82 - PHI

TLB8170A & TLB8270A SERIES EXCITER

PARTS LIST

LEGEND
L = 30 - 36 MHz
M = 36 - 42 MHz
H = 42 - 50 MHz

TLB8172A/TLB8272A Exciter (30-36 MHz)
TLB8173A/TLB8273A Exciter (36-42 MHz)
TLB8174A/TLB8274A Exciter (42-50 MHz)

PL-5088-B

This parts list covers several models of the low band Exciter Board. Where differences exist a letter suffix L, M, or H is added to the reference symbol or model number given in the Description column to show the applicable unit.

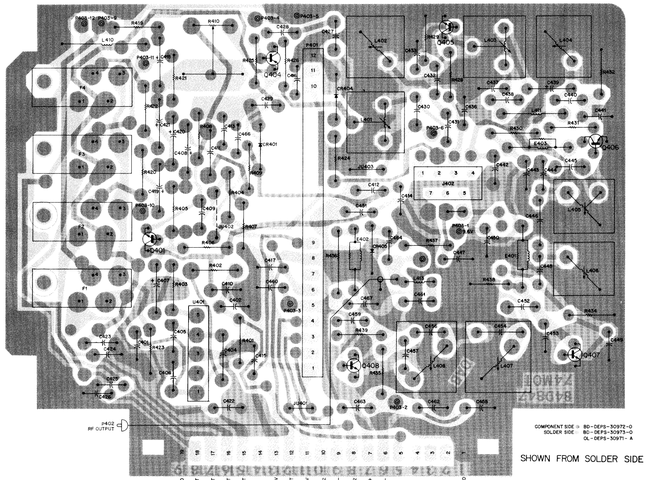
REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		CAPACITOR, fixed: pF ±5%; 500 V unless otherwise stated
C401	21-831125	100 ±10%; 300 V
C402	21-82428B59	.01 uF +80-20%; 200 V
C403		NOT USED
C404	8-82905G11	.22uF ±10%; 50 V
C405	21-83596E13	.001 uF ±10%; 100 V
C406	21-82428B59	.01 uF +80-20%; 200 V
C407, 408	23-84762H08	3.9 uF ±20%; 15 V
C409, 410	21-831125	100 ±10%; 300 V
C411	21-82372C03	0.1 uF +80-20%; 25 V
C412	21-83596E10	220 ±20%
C413	21-82187B31	.0015 uF ±10%; 100 V
C414	21-831125	100 ±10%; 300 V
C415	21-83596E10	220 ±20%
C416, 417		NOT USED
C418 thru 421	23-84762H08	3.9 uF ±20%; 15 V
C422	21-82372C04	.05 uF +80-20%; 25 V
C423	21-83596E10	220 ±20%
C424, 425, 426	21-82372C04	.05 uF +80-20%; 25 V
C427	21-83406D51	3 ±0.25 pF
C428	21-82133G06	27
C429	21-82428B59	.01 uF +80-20%; 200 V
C430L	21-84494B46	180 ±3%
C430M	21-84494B26	130
C430H	21-84494B52	91
C431	21-83406D54	4 ±0.25
C432L	21-84494B18	390
C432M	21-859943	250
C432H	21-84494B09	175
C433L	21-84494B15	300
C433M	21-84494B10	190
C433H	21-84494B51	160
C434, 435		NOT USED
C436	21-82428B59	.01 uF +80-20%; 200 V
C437	21-83596E13	.001 uF ±10%; 100 V
C438L	21-84494B45	56
C438M	21-84494B24	39
C438H	21-84494B41	24
C439	21-82450B18	2
C440L	21-84494B31	75
C440M	21-84494B44	47
C440H	21-84494B43	36
C441L	21-84494B12	220
C441M	21-84494B46	180 ±3%
C441H	21-84494B35	60
C442, 443	21-82428B59	.01 uF +80-20%; 200 V
C444L	21-84494B10	190
C444M	21-84494B04	100
C444H	21-84494B03	80
C445L	21-84494B03	80
C445M	21-84494B45	56
C445H	21-84494B44	47
C446	21-82450B13	1.5
C447	21-83596E13	.001 uF ±10%; 100 V
C448L	21-84494B03	80
C448M	21-84494B44	47
C448H	21-84494B42	27
C449L, M	21-84494B07	150
C449H	21-84494B26	130
C450	21-83596E13	.001 uF ±10%; 100 V
C451	21-82428B59	.01 uF +80-20; 200 V
C452L	21-84494B45	56
C452M	21-84494B52	34
C452H	21-84494B33	30
C453L, M	21-84494B12	220
C453H	21-84494B06	120
C454L	21-82450B03	3.9 ±10%
C454M	21-82450B32	2.7
C454H	21-82450B17	2.2
C455		NOT USED
C456L	21-84494B25	49
C456M	21-84494B30	34
C456H	21-84494B33	30
C457L	21-84494B52	91
C457M	21-84494B02	62
C457H	21-84494B44	47
C458		NOT USED
C459L, 459M	21-84494B41	24
C459H	21-82610C20	82
C460	21-83596E10	220 ±20% (TLB8172A/TLB8173A/TLB8174A)
C460	21-83596E13	.001 uF ±10% (TLB8272A/TLB8273A/TLB8274A)
C461L, 461M	21-84494B04	100
C461H	21-84494B03	80
C462	21-83596E13	.001 uF ±10%; 100 V
C463L	21-83596E13	.001 uF ±10%; 100 V
C464L	21-840846	15
C464M	21-849335	30
C468, 469	21-83596E13	.001 uF ±10% (TLB8272A/TLB8273A/TLB8274A)
		DIODE: (SEE NOTE)
CR401	48-863030	germanium
CR402, 403		NOT USED
CR404	48-82139G01	germanium
		COIL, rf:
E401L, M	24-84392B12	40 turns on 330 ohm resistor
E401H	24-84392B08	18 turns on 220 ohm resistor
E402L, M	24-84392B11	40 turns on 820 ohm resistor
E402H	24-84392B12	40 turns on 330 ohm resistor
		CONNECTOR, receptacle:
J401		NOT USED
J402	9-84207B01	7 contacts
		COIL, rf:
L401	24-84389B02	18-2/3 turns; coded BLACK
L402	24-84389B01	18-1/2 turns; coded YELLOW
L403	24-84389B06	8-2/3 turns; coded GREEN
L404, 405, 406	24-84389B05	8-1/2 turns; coded RED
L407L, M	24-84389B07	10-1/2 turns; coded YELLOW
L407H	24-84389B05	8-1/2 turns; coded RED
L408L, M	24-84389B07	10-1/2 turns; coded RED
L408H	24-84389B05	8-1/2 turns; coded RED
L409		NOT USED
L410	24-80900A61	0.62 mH
L411, 412	24-82835G08	2.6 uH; coded RED-BLUE-GOLD
L413L, M	24-84389B10	12-1/3 turns; coded RED
L413H	24-84389B08	10-1/3 turns; coded BLACK
		CONNECTOR, plug:
P401		part of printed circuit board
P402	28-84282D01	phono
P403, 902		part of printed circuit board
		TRANSISTOR: (SEE NOTE)
Q401	48-869642	NPN; type M9642
Q402, 403		NOT USED
Q404	48-869571	PNP; type M9571
Q405	48-869534	NPN; type M9534
Q406	48-869390	NPN; type M9390
Q407, 408	48-869591	NPN; type M9591
		RESISTOR, fixed: ±10%; 1/4 W unless otherwise stated
R401	6-124C43	560
R402	6-124A37	330 ±5%
R403	6-124A79	18k ±5%
R404	6-124A87	39k] Factory Selected
	or6-124A89	47k] For DPL Models
R405	6-124A85	33k] Factory Selected
	or6-124A89	47k] For Tone PL Models
R406	6-124A99	120k ±5%
R407	6-124B04	180k ±5%
R408	6-124C73	10k
R409	6-124C83	27k
R410	18-83083G24	variable: 25k ±30%
R411 thru 418		NOT USED
R419 thru 422	6-124A79	18k ±5%
R423	6-124C57	2.2k
R424	6-124C89	47k
R425L	6-124C51	1.2K
R425M	6-124C51	1.2k
R425H	6-124C63	3.9k
R426	6-124C47	820
R427		NOT USED
R428L, H	6-124C87	39k
R428M	6-124C89	47k
R429	6-124C57	2.2k
R430	6-124C35	270
R431L, M	6-124C85	33k
R431H	6-124C81	22k
R432	6-124C49	1k
R433L	6-124C91	56k
R433M, H	6-124C89	47k
R434	6-124C37	330
R435	6-124C05	15 ±10%
R436	1-80766B23	
R437L, M	6-124C25	100 ±5%
R438		NOT USED
R439H	6-124C43	560
		SYMMETRICAL CLIPPER AND SPLATTER FILTER:
U401	1-80763B05	potted unit
		NON-REFERENCED ITEMS
	14-861196	INSULATOR, transistor; 2 used (used with Q407 & Q408)
	26-83379H01	HEAT SINK: 2 used
	26-84598A02	SHIELD, coil; 8 used
	42-84284B01	RETAINER; screw, 4 used
	3-138162	SCREW, tapping: 4-40 x 3/8"; 4 used (used for mounting retainers)
	55-84300B01	HANDLE
	1-80767B48	CIRCUIT BOARD ASSEMBLY includes:
	29-855943	PIN, terminal: .385" lg: 16 used
	29-84028H01	PIN, terminal: .800" lg.; 19 used
	29-84028H02	PIN, terminal: .595" lg.; 12 used
	39-10184A10	CONTACT, male: .058 x .355"; 10 used
	1-80793B69	CABLE ASSEMBLY includes:
	30-83794C01	CABLE, coaxial: 8" lg. CONNECTOR P402

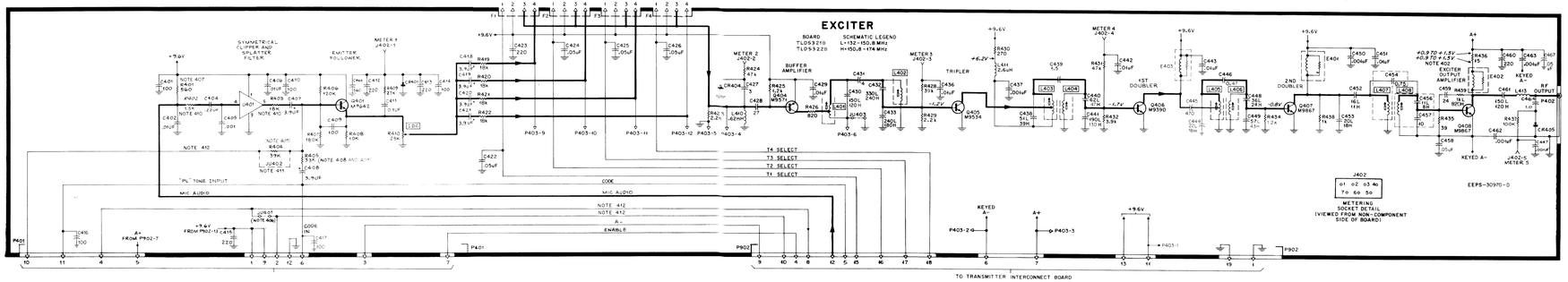
NOTE:
For optimum performance, replacement diodes and transistors must be ordered by Motorola part numbers.

REVISIONS

PEPS-16956-E

CHASSIS AND SUFFIX NO.	REF. SYMBOL	CHANGE	LOCATION
TLB8172A-1 TLB8173A-1 TLB8174A-1	R425	WAS 6-124C51, 1.2K	PARTS LIST
TLB8272A TLB8273A TLB8274A		NEW MODELS ADDED	
TLB8174A-3 TLB8274A-1	C440H	FROM 21-84494B33, 30 pF TO 21-84494B43, 36 pF	
	C441H	FROM 21-84494B27, 140 pF TO 21-84494B35, 60 pF	





NOTES:

401. Transmitter Frequency Calculation.

$$fo = \frac{fc}{12} \qquad fc = fo\ 12$$

Where:
fo = Channel Element Frequency
fc = Carrier Frequency

402. Voltage measured across R436.

403. High impedance transistorized voltmeters (11 megohm) not recommended.

404. Unless otherwise stated, voltages measured in respect to chassis ground.

405. Unless otherwise stated, capacitor values are in picofarads.

406. JU401 removed in *Private-Line* and PURC paging radios.

407. R401 removed in remote control stations.

408. R405 is removed unless code inputs are applied via P401-6 or P902-5.

409. R404 and R405 are factory selected so that *Private-Line* deviation falls between 500 Hz and 1000 Hz limits.

410. R402 and R403 removed only in flat audio stations.

411. JU402 is added when flat audio board is used.

412.

With PL Squelch Signal Name	With Flat Audio Option Signal Name
P401-10 Code Input P401-4, 902-8 Delayed Keyed A + P401-2, 902-10 Keyed A +	DC Limited Flat Audio Flat Audio Flat Audio Control

PREVIOUS REVISIONS AND PARTS LIST SHOWN ON BACK OF THIS DIAGRAM
TLD5321B and TLD5322B Exciters
Schematic Diagram and Circuit Board Detail
Motorola No. PEPS-30974-C
7/31/86-PHI

parts list

TLD5321B Exciter (132-150.8 MHz) = L
TLD5322B Exciter (150.8-174 MHz) = H

PL-7116-B

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
This parts list covers two models of the high band Exciter Board. Where differences exist a letter suffix L or H is added to the reference symbol to show the applicable unit.		
		capacitor, fixed: pF ±5%; 500 V unless otherwise stated
C401	21-831125	100 ±10%; 300 V
C402	21-83596E21	.01 uF +80-20%; 200 V
C403		NOT USED
C404	8-82905G11	.22 uF ±10%; 50 V
C405	21-83596E13	.001 uF ±10%; 100 V
C406	21-83596E21	.01 uF +80-20%; 200 V
C407, 408	23-84762H08	3.9 uF ±20%; 15 V
C409, 410	21-831125	100 ±10%; 300 V
C411	21-82372C03	0.1 uF +80-20%; 25 V
C412, 413, 415	21-83596E10	220 ±20%
C414, 416, 417	21-831125	100 ±10%; 300 V
C418 thru 421	23-84762H08	3.9 uF ±20%; 15 V
C422	21-82372C10	.05 uF +80-20%; 25 V
C423	21-83596E10	220 ±10%
C424, 425, 426	21-82872C10	.05 uF +80-20%; 25 V
C427	21-83406D51	3 ±0.25 pF
C428	21-83406D68	27; 500 V
C429	21-83596E21	.01 uF +80-20%; 200 V
C430L	21-84494B07	150
C430H	21-84494B06	120
C431	21-83406D54	4 ±0.25 pF
C432L	21-84494B16	330
C432H	21-84494B13	240
C433L	21-84494B13	240
C433H	21-84494B46	180 ±3%
C434, 435		NOT USED
C436	21-83596E21	.01 uF +80-20%; 200 V
C437	21-83596E13	.001 uF ±10%; 100 V
C438L	21-84494B01	51
C438H	21-84494B24	39
C439	21-861453	1.5 ±10%
C440L	21-852322	62
C440H	21-868681	47
C441L	21-84494B10	190
C441H	21-861601	130
C442, 443	21-83596E21	.01 uF +80-20%; 200 V
C444L	21-84493B26	22
C444H	21-83406D55	18
C445	21-82187B45	470 ±10%
C446	21-82450B37	0.47
C447	21-83596E13	.001 uF ±10%; 100 V
C448L	21-83406D92	36
C448H	21-83406D56	24
C449L	21-84493B31	57; 200 V
C449H	21-84494B28	43
C450	21-83596E13	.001 uF ±10%; 100 V
C451	21-83596E21	.01 uF +80-20%; 200 V
C452L	21-83406D93	16
C452H	21-83406D90	11
C453L	21-83406D81	20
C453H	21-83406D55	18
C454	21-82450B06	0.75 ±10%
C455		NOT USED
C456L	21-83406D90	11
C456H	21-83406D70	8 ±0.5 pF
C457	21-83406D89	10 ±0.5 pF
C458	21-82372C10	.05 ±20%; 25 V
C459	21-840365	24; NP0
C460	21-83596E10	220 ±20%
C461L	21-84494B07	150
C461H	21-84494B06	120
C462, 463	21-83596E13	.001 uF ±10%; 100 V
C464	21-82355B62	1.0
C465		NOT USED
C466	21-82187B06	560
C467	21-82372C10	.05 ±20%; 25 V
		diode: (see note)
CR401	48-863030	germanium
CR402, 403		NOT USED
CR404, 405	48-82139G01	germanium
		coil, rf:
E401	24-84392B06	40 turns on 820 ohm resistor
E402L	24-84392B13	15 turns on 560 ohm resistor
E402H	24-84392B05	9 turns on 560 ohm resistor
E403L	24-84392G18	40 turns on 10k ohm resistor
E403H	24-82835G08	2.7 uH coded RED-BLU-GLD
		connector, receptacle:
J401		NOT USED
J402	9-84207B01	7 contacts
		coil, rf:
L401	24-84389B02	18-2/3 turns; coded BLK
L402	24-84389B01	18-1/2 turns; coded YEL
L403	24-84389B06	8-2/3 turns; coded GRN
L404	24-84389B05	8-1/2 turns; coded RED
L405	24-84972A33	6-1/2 turns; coded RED
L406	24-84972A09	6-1/2 turns; coded YEL
L407, 408	24-84972A11	3-1/2 turns; coded GRN
L409		NOT USED
L410	24-80900A61	0.62 mH
L411	24-82835G08	2.6 uH; coded RED-BLU-GLD
L412		NOT USED
L413H	24-84923C01	1-1/2 turns
L413L	24-84923C04	2-1/2 turns
		connector, plug:
P401		part of printed circuit board
P402	28-84282D01	phono
P403, 902		part of printed circuit board
		transistor: (see note)
Q401	48-869642	NPN; type M9642
Q402, 403		NOT USED
Q404	48-869571	PNP; type M9571
Q405	48-869534	NPN; type M9534
Q406	48-869390	NPN; type M9390
Q407, 408	48-869867	NPN; type M9867
		resistor, fixed: ±5%; 1/4 W unless otherwise stated
R401	6-124A43	560
R402	6-124A53	1.5k
R403	6-124A79	18k
R404	6-124A87 or	39k
	6-124A89	47k (factory selected for DPL models only)
R405	6-124A85 or	33k
	6-124A89	47k (factory selected for PL models only)
R406	6-124A99	120k
R407	6-124B04	180k
R408	6-124A73	10k
R409	6-124A83	27k
R410	18-83083G24	variable: 25k ±30%
R411 thru 418		NOT USED
R419	6-124A79	18k%
R423	6-124A57	2.2k
R424	6-124A89	47k
R425	6-124A51	1.2k
R426	6-124A47	820
R427		NOT USED
R428	6-124A87	39k
R429	6-124A57	2.2k
R430	6-124A35	270
R431	6-124A89	47k
R432	6-124A63	3.9k
R433		NOT USED
R434	6-124A51	1.2k
R435	6-124A15	39
R436	6-125C05	15 ±10%; 1/2 W
R437	6-124A97	100k
R438	6-124A49	1k
R439L	6-124A49	1k
R439H	6-124A47	820
		symmetrical clipper and splatter filter:
U401	1-80726D74	potted unit
		non-referenced items
	14-861196	INSULATOR, transistor; 2 req'd. (used with Q407 & Q408)
	26-83379H01	HEAT SINK (used with Q408)
	26-84598A01	SHIELD, coil; 2 req'd. (used with L405, L406)
	26-84598A02	SHIELD, coil; 4 req'd. (used with L401 thru L404)
	26-84250B14	SHIELD, coil; 2 re'd. (used with L407, L408)
	42-84284B01	RETAINER: 4 req'd.
	3-138162	HEX LOCK; 4-40 x 3/8"; 4 req'd. (used for mounting Retainers)
	55-84300B01	HANDLE
	30-83794C01	CABLE, coaxial; 6" req'd. (used with P402)
	29-84028H01	TERMINAL, pin; 19 req'd.
	29-84028H02	TERMINAL, pin; 12 req'd.
	29-855943	TERMINAL, pin; 16 req'd.
	39-10184A10	CONTACT, terminal; 10 req'd.

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

EXCITER/1ST BANDPASS FILTER

MODEL TLE1720B SERIES

TRIPLER/LOW LEVEL AMPLIFIER

MODEL TLE1600B SERIES

Motorola No. PEPS-18716-H
(Sheet 1 of 2)
10/5/82 -PHI

PARTS LIST

LEGEND

L = 132-150.8 MHz
H = 150.8-174 MHz

TLD5491A,AV Exciter (132-150.8 MHz)
TLD5492A,AV Exciter (150.8-174 MHz) PL-4122-F

This parts list covers two models of the high band Exciter Board. Where differences exist a letter suffix L or H is added to the reference symbol to show the applicable unit.

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		CAPACITOR, fixed: pF ±5%; 500 V: unless otherwise stated
C401	21-831125	100 ±10%; 300 V
C402	21-82428B59	.01 uF +80-20%; 200 V
C403		NOT USED
C404	8-82905G11	.22 uF ±10%; 50 V
C405	21-83596E13	.001 uF ±10%; 100 V
C406	21-82428B62	.01 uF +80-20%; 200 V
C407, 408	23-84762H08	3.9 uF ±20%; 15 V
C409, 410	21-831125	100 ±10%; 300 V
C411	21-82372C03	0.1 uF +80-20%; 25 V
C412, 413	21-83596E10	220 ±20%
C414	21-831125	100 ±10%; 300 V
C415	21-83596E10	220 ±20%
C416, 717		NOT USED
C418 thru 421	23-84762H08	3.9 uF ±20%; 15 V
C422	21-82372C04	.05 uF +80-20%; 25 V
C423	21-83596E10	220 ±20%
C424, 425, 426	21-82372C04	.05 uF +80-20%; 25 V
C427	21-83406D51	3 ±0.25 pF
C428	21-82133G06	27; 500 V
C429	21-82428B62	.01 uF +80-20%; 200 V
C430L	21-84494B07	150
C430H	21-84494B06	120
C431	21-83406D54	4 ±0.25 pF
C432L	21-84494B16	330
C432H	21-84494B13	240
C433L	21-84494B13	240
C433H	21-84494B46	180 ±3%
C434, 435		NOT USED
C436	21-82428B62	.01 uF +80-20%; 200 V
C437	21-83596E13	.001 uF ±10%; 100 V
C438L	21-84494D01	51
C438H	21-84494B24	39
C439L	21-861453	1.5 ±10%
C439H	21-864518	1 ±10%
C440L	21-852322	62
C440H	21-868681	47
C441L	21-84494B10	190
C441H	21-861601	130 ±3%
C442, 443	21-82428B59	.01 uF +80-20%; 200 V
C444L	21-84493B27	51; 200 V
C444H	21-84484B24	39
C445L	21-83406D91	40
C445H	21-84494B30	34
C446	21-82450B06	0.75 ±10%
C447	21-83596E13	.001 uF ±10%; 100 V
C448L	21-83406D92	36
C448H	21-83406D56	24
C449L	21-84493B31	57; 200 V
C449H	21-84494B28	43
C450	21-83596E13	.001 uF ±10%; 100 V
C451	21-82428B62	.01 uF +80-20%; 200 V
C452L	21-83406D93	16
C452H	21-83406D90	11
C453L	21-83406D81	20
C453H	21-83406D55	18
C454	21-82450B06	0.75 ±10%
C455	21-83596E13	.001 uF ±10%; 100 V
C456L	21-83406D90	11
C456H	21-83406D70	8 ±0.5 pF
C457	21-83406D89	10 ±0.5 pF
C458	21-83596E13	.001 uF ±10%; 100 V
C459	21-840365	24; NP0
C460	21-83596E10	220 ±20%
C461L	21-84494B07	150
C461H	21-84494B06	120
C462, 463	21-83596E13	.001 uF ±10%; 100 V
C464	21-82355B62	1.0
C465	21-82428B59	.01 uF +80-20%; 200 V
C466	21-82610C23	6.8 ±.5%; 200 V
C467	21-82187B07	470 ±10%
C468	21-82428B28	.002 uF ±10%; 200 V
C469	21-82187B06	560
		DIODE: (SEE NOTE)
CR401	48-863030	germanium
CR402, 403		NOT USED
CR404, 405	48-82139G01	germanium
		COIL, rf:
E401	24-84392B06	40 turns on 820 ohm resistor
E402L	24-84392B13	15 turns on 560 ohm resistor
E402H	24-84392B05	9 turns on 560 ohm resistor
		CONNECTOR, receptacle:
J401		NOT USED
J402	9-84207B01	7 contacts
		COIL, rf:
L401	24-84389B02	18-2/3 turns; coded Black
L402	24-84389B01	18-1/2 turns; coded Yellow
L403	24-84389B06	8-2/3 turns; coded Green
L404	24-84389B05	8-1/2 turns; coded Red
L405, 406	24-84972A09	6-1/2 turns; coded Yellow
L407, 408	24-84972A11	3-1/2 turns; coded Green
L409		NOT USED
L410	24-80900A61	0.62 mH
L411, 412	24-82835G08	2.6 uH; coded Red-Blue-Gold
L413	24-84923C01	1-1/2 turns
		CONNECTOR, plug:
P401		part of printed circuit board
P402	28-84282D01	phono
P403, 902		part of printed circuit board
		TRANSISTOR: (SEE NOTE)
Q401	48-869642	NPN; type M9642
Q402, 403		NOT USED
Q404	48-869571	PNP; type M9571
Q405	48-869534	NPN; type M9534
Q406	48-869390	NPN; type M9390
Q407, 408	48-869867	NPN; type M9867
		RESISTOR, fixed: ± 5%; 1/4 W unless otherwise stated
R401	6-124A43	560 ohms
R402	6-124A53	1.5k
R403	6-124A79	18k
R404	6-124A87 or 6-124A89	39k 47k
R405	6-124A85 or 6-124A89	33k 47k
R406	6-124A99	120k
R407	6-124B04	180k
R408	6-124A73	10k
R409	6-124A81	22k
R410	18-83083G24	variable: 25k ±30%
R411 thru 418		NOT USED
R419 thru 422	6-124A79	18k
R423	6-124A57	2.2k
R424	6-124A85	33k
R425	6-124A51	1.2k
R426	6-124A47	820 ohms
R427		NOT USED
R428	6-124A87	39k
R429	6-124A57	2.2k
R430	6-124A35	270 ohms
R431	6-124A89	47k
R432	6-124A63	3.9k
R433		NOT USED
R434	6-124A39	390 ohms
R435L	6-124A09	22 ohms
R435H	6-124A15	39 ohms
R436	6-125A05	15; 1/2 W
R437	6-124A94	82k
R438	6-124A49	1k
R439L	6-124A49	1k
R439H	6-124A41	470 ohms
		SYMMETRICAL CLIPPER AND SPLATTER FILTER:
U401	1-80726D74	potted unit

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
NON-REFERENCED ITEMS		
	14-861196	INSULATOR, transistor: 2 req'd. (used with Q407 & Q408)
	26-83379H01	HEAT SINK (used with Q408)
	26-84598A01	SHIELD, coil; 4 req'd. (used with L405 thru L408)
	26-84598A02	SHIELD, coil; 4 req'd. (used with L401 thru L404)
	42-84284B01	RETAINER; 4 req'd.
	3-139506	SCREW, tapping; Phillips round hd., 4-40 x 5/16" 4 req'd. (used for mounting Retainers)
	55-84300B01	HANDLE
	30-83794C01	CABLE, coaxial; 6" req'd. (used with P402)
	29-84028H01	TERMINAL, pin; 19 req'd.
	29-84028H02	TERMINAL, pin; 12 req'd.
	29-855943	TERMINAL, pin; 16 req'd.
	39-10184A10	CONTACT, terminal; 10 req'd.

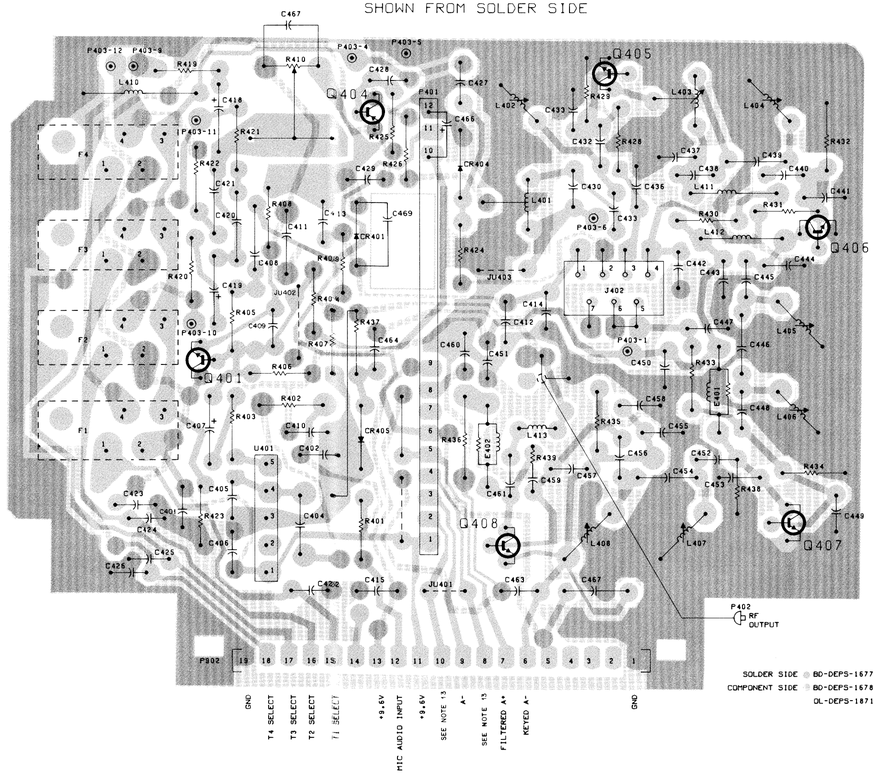
NOTE: For optimum performance, replacement diodes and transistors must be ordered by Motorola part numbers.

REVISIONS

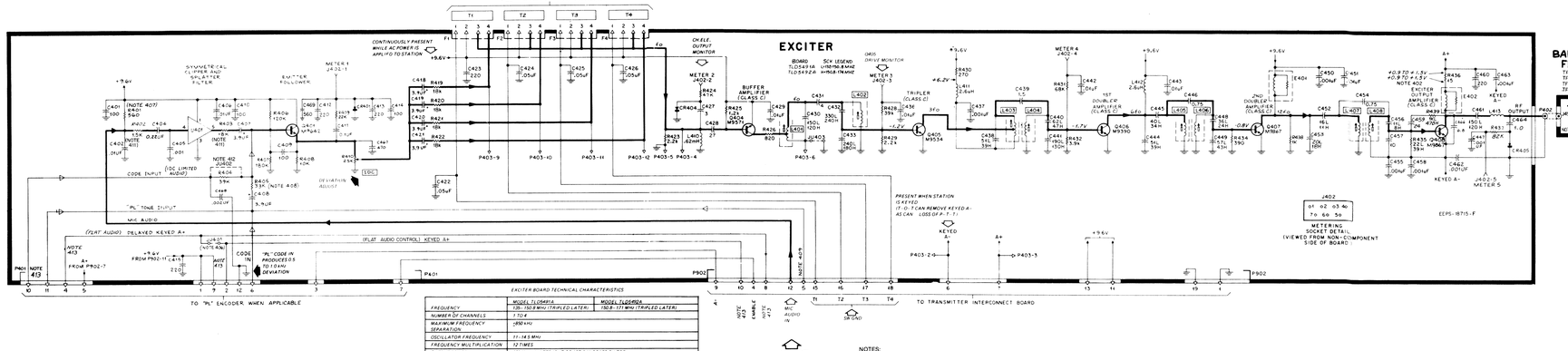
PEPS-18716-D

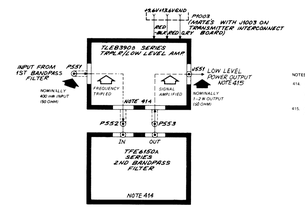
CHASSIS AND SUFFIX NO.	REF. SYMBOL	CHANGE	LOCATION
TLD5491A TLD5492A	R428	FROM 6-124C85: 33k TO 6-124C87: 39k	PARTS LIST
	R437	FROM 6-124C97: 100k TO 6-124C94: 82k	
	C466	FROM 21-82428B28: .002 uF; ±10%; 500 V TO 21-82610C23: 6.8 pF; ±.5%; 200 V	
	R404, R405	ALTERNATE 6-124A89 47k ±5%; 1/4 W ADDED	PARTS LIST
	R409	From 6-124C88, 27k To 6-124C81, 22k	Meter 1 7402-1

SHOWN FROM SOLDER SIDE



EXCITER/1ST BANDPASS FILTER
MODEL TLE1720B SERIES
TRIPLER/LOW LEVEL AMPLIFIER
MODEL TLE1600B SERIES





EXCITER BOARD TECHNICAL CHARACTERISTICS

	MODEL TLD5491A (136–162 MHz TRIPLED LATER)	MODEL TLD5492A (162.8–171 MHz TRIPLED LATER)
FREQUENCY		
NUMBER OF CHANNELS	1 TO 4	
MAXIMUM FREQUENCY SEPARATION	3850 kHz	
OSCILLATOR FREQUENCY	11–14.5 MHz	
FREQUENCY MULTIPLICATION	12 TIMES	
OUTPUT POWER	400 MILLIWATTS (OUT OF 1ST BANDPASS FILTER)	
OUTPUT IMPEDANCE	50 OHMS	
MODULATION TYPE	DIRECT FM CHANNEL ELEMENTS	
DEVIATION	±5 kHz, ADJUSTABLE INSTANTANEOUS DEVIATION LIMITING	
AUDIO RESPONSE	6 dB/OCTAVE PRE-EMPHASIS 300 TO 3000 Hz	
AUDIO SENSITIVITY	700 MILLIVOLTS RMS FOR ±2.0 kHz DEVIATION	
AUDIO DISTORTION	LESS THAN 2% AT ±2 kHz DEVIATION FROM 300 TO 3000 Hz	
POWER REQUIREMENTS	REGULATED +9.6 VOLTS DC @ 150 mA +13.6 VOLTS DC @ 100 mA	
METERING	FIVE TEST POINTS CRITICAL TO OPERATION AND ALIGNMENT ARE ACCESSIBLE AT A METERING RECEPTACLE WHICH PERMITS TESTING WITH AN OPTIONAL BUILT-IN STATION METER, MOTOROLA PORTABLE TEST SET, OR A 0–50 µA MICROAMMETER WITH 2,000 OHMS INTERNAL RESISTANCE (SEE THE BUILT-IN STATION METERING ON THE SM/GR MODEL SERIES STATIONS)	
FREQUENCY CALCULATION	$f_o = 12 f_x$ $f_x = 36 f_c$ $f_x = f_c$ or $\frac{f_o}{36} = \frac{f_o}{12}$ f_o = CARRIER FREQUENCY f_x = OSCILLATOR CRYSTAL FREQUENCY f_c = EXCITER OUTPUT FREQUENCY	

NOTES:

401. Frequency calculations given in accompanying technical characteristics table. Note that output of exciter is $12 f_x$ and not final carrier frequency. A following tripler stage multiplies exciter output to the carrier frequency.
402. Voltage measured across R436.
403. High impedance transistorized voltmeters (11 megohm) not recommended.
404. Unless otherwise stated, voltages measured in respect to chassis ground.
405. Unless otherwise stated, capacitor values are in picofarads.
406. JU401 removed in *Private-Line* and *PURC* paging radios.
407. R401 removed in remote control stations.
408. Remove R405 unless code inputs are applied via P401-6 or P902-5.
409. In *Private-Line* radios, P902-5 is not connected to the transmitter interconnect board.
410. The tripler/low level amplifier "box" is not repairable. If defective, it must be replaced. This also applies to the 1st and 2nd bandpass filters.
411. R402 and R403 removed when flat audio board is used.
412. JU402 added when flat audio board is used.
413. When PL squelch is used, signal name of P401-10 is Code Input; P401-4 and P902-8 is Delayed Keyed A +; P401-2 and P902-10 is Keyed A +.

    When flat audio board option is used, signal name of P401-10 is IDC Limited Audio; P401-4 and P902-8 is Flat Audio; P401-2 and P902-10 is Flat Audio Control.

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

Model Complemen:

Assembly	Consists of					
	1st Bandpass Filter: Note 410				Exciter Board	
Exciter/1st Bandpass Filter	TFD4371A	TFD4372A	TFD4374A	TFD4375A	TLD5491A	TLD5492A
TLE1721B (406–420 MHZ)	X				X	
TLE1723B (450–470 MHZ)		X				X
TLE1724B (470–494 MHZ)			X			X
TLE1725B (494–512 MHZ)				X		X

Model Complement

Assembly	Consists of									
	Chassis and Hardware Kit	Tripler/Low Level Amplifier Note 410					2nd Bandpass Filter Note 410			
Tripler/Low Level Amplifier	TLN5650B	TRN8728A	TLE8391A	TLE8393B	TLE8394B	TLE8395B	TFE4151A	TFE4153A	TFE4154A	TFE4155A
TLE1601B (406–420 MHZ)		X	X			X				
TLE1603B (450–470 MHZ)		X		X				X		
TLE1604B (470–494 MHZ)		X			X				X	
TLE1605B (494–512 MHZ)		X				X				X

FUNCTION

Exciter — Produces modulated RF signal in 135-171 MHz range.

1st Bandpass Filter — Attenuates signals outside the bandpass range.

Tripler/Low Level Amp. — Triples exciter output frequency and amplifies that signal to drive the following PA.

Motorola No. PEPS-18716-H (Sheet 2 of 2)
10/5/82 - PHI

MOTOROLA INC.
Communications Sector

PAGING SYNTHESIZER

MODELS: TLB1572A, TLB1562A, TLB1582A 30-36 MHz
MODELS:TLB1573A, TLB1563A, TLB1583A 36-42 MHz
MODELS:TLB1574A, TLB1564A, TLB1584A 42-50 MHz
MODELS:TLD2592A, TLD2632A 132-150 MHz
MODELS:TLD2593A, TLD2633A 150-174 MHz
MODELS:TLE2271A, TLE2421A 406-420 MHz
MODELS:TLE2273A, TLE2423A 450-512 MHz
MODELS:TLF1352A,TLF1342A 928-960 MHz

PERFORMANCE SPECIFICATIONS

Frequency Stability With UHSO (Ultra High Stability Oscillator) With HSO (High Stability Osc) Without HSO or UHSO	 Same as UHSO (±.002 ppm) Same as HSO (±.025 ppm) ±2 ppm -30 to -60°C
Supply Voltage Requirements	+13.8 V dc ±20%
Supply Current Drain	With HSO 2000 mA, max. Without HSO 800 mA, max.
Spurious and Harmonic Emissions	More than 85 dB below carrier (or station spec)
FM Noise With EIA Pre-emphasis With Flat Audio	 55 dB 40 dB
Audio Response	±0.5 dB; 300 Hz to 3 kHz
Audio Harmonic Distortion	Less than 1% at ±3 kHz
Audio Sensitivity Low Band Other Bands	 3 V to 4 V p-p for ±5 kHz at 1 kHz 2 V to 3 V p-p for ±5 kHz at 1 kHz
DC Deviation Range at Fc	±3 kHz to ±5 kHz
Data Deviation Range at Fc	±3 kHz to ±5 kHz
Data/Voice Mode Transient	Less than 100 Hz peak
Data Rise Fall Time	Less than 160 usec
RF Output	0.3 V rms to 1 V rms
Frequency Ranges: Low Band 30-50 MHz High Band 132-174 MHz UHF 406-420 MHz UHF 450-512 MHz 900 MHz 928-960 MHz	 10.0 to 16.666 MHz 11.0 to 14.5 MHz 11.277 to 11.666 12.5 to 114.222 MHz 12.888 to 13.333 MHz

PAGING SYNTHESIZER INTERFACE REQUIREMENTS

UHSO Supply Voltage	24 V dc ±10%
HSO Power Consumption	13.5 watts max.
UHSO Power Consumption	11 watts, max.
Synthesizer Supply Voltage	13.8 V dc ±20%
Synthesizer Current Drain	With HSO 2000 mA max. Without HSO 800 mA max.
UHSO/HSO RF Level	More than 1.0 V rms @50 ohms
Synthesizer RF Output Level	More than 0.3 V rms into cable terminated by exciter
Audio Input Level Data Levels Data Enable Levels	More than 4 V peak to peak @1 kHz "1" — More than 4 V "0" — Less than 0.7 V Enable — More than 7 V Disable — Less than 0.7 V
RF Enable Input	Enable — Less than 0.7 V (I_{Source} = 4 mA Disable — More than 9 V
Out of Lock Indicate	I_{sink} less than 4 mA dc
Synthesizer Metering	TEK-5 or equivalent

Paging Synthesizer Option Chart

Option	Added	Delete	Description
C306AA	TLB1582A (30-36 MHz) TLB1583A (36-42 MHz) TLB1584A (42-50 MHz) TRN9757A	TLB1562A LB1563A TLB1564 TPN1195 TRN5802A	High Stability Reference Oscillator
C306AB	TLB1582A (30-36 MHz) TLB1583A (36-42 MHz) TLB1584A (42-50 MHz) TRN5940A	TLB1562A TLB1563A TLB1564A TPN1195A TRN5480A	High Stability Reference Oscillator
C306AC	TLD2632A (132-150 MHz) TLN2633A (150-174 MHz) TRN9757A	TLD2592A TLD2593A TPN1195A TRN5802A	High Stability Reference Oscillator
C306AD	TLD2632A (132-150 MHz) TLD2633A (150-174 Mhz) TRN5940A	TLD2592A TLD2593A TPN1195A TRN5480A	High Stability Reference Oscillator
C306AE	TLE2421A (406-420 MHz) TLE2423A (450-512 MHz) TRN9757A	TLE2271A TLE2273A TPN1195A TRN5802A	High Stability Reference Oscillator
C306AF	TLE2421A (406-420 MHz) TLE2423A (450-512 MHz) TRN9759A	TLE2271A TLE2273A TPN1195A TRN5198A	High Stability Reference Oscillator
C574AD	TLB1572A (30-36 MHz) TLB1573A (36-42 MHz) TLB1574A (42-50 MHz) TRN5940A	TLB1562A TLB1563A TLB1564A TPN1195A TRN5480A	Omit Ultra High Stability Oscillator

OPTIONS

Options C306AA-AF modify the paging synthesizers from ultra high stability (±0.002 ppm) to high stability (±0.025 ppm) operation.

Option C574AD modifies the paging synthesizers to non-ultra high stability operation. Frequency stability is now determined by the 2.5 ppm KXN1096A Channel Element.

PAGING SYNTHESIZER MODEL CHART

MODEL NO.	DESCRIPTION
TLB1562A	30-36MHZ UHSO
TLB1563A	36-42MHZ UHSO
TLB1564A	42-50MHZ UHSO
TLB1572A	30-36MHZ (DELETE UHSO)
TLB1573A	36-42MHZ (DELETE UHSO)
TLB1574A	42-50MHZ (DELETE UHSO)
TLB1582A	30-36MHZ HSO
TLB1583A	36-42MHZ HSO
TLB1584A	42-50MHZ HSO
TLD2592A	132-150MHZ UHSO
TLD2593A	150.8-174MHZ HSO
TLD2632A	132-150MHZ HSO
TLD2633A	150-174MHZ HSO
TLE2271A	406-420MHZ UHSO
TLE2273A	450-512MHZ UHSO
TLE2421A	406-420MHZ HSO
TLE2423A	450-512MHZ HSO
TLF1342A	926-960MHZ UHSO
TLF1352A	926-960MHZ (MULTIFREQUENCY) UHSO

CODE:
● = ONE ITEM SUPPLIED

MODEL NO.	DESCRIPTION
TRN5058A	REGULATOR BOARD
TKN8968A	SYNTHESIZER CABLE
TKN8967A	HSO CABLE
TKN8966A	REFERENCE CABLE
TRN5447A	SYNTHESIZER HARDWARE
TLB8502A	SYNTHESIZER BOARD 30-36MHZ
TLB8503A	SYNTHESIZER BOARD 36-42MHZ
TLB8504A	SYNTHESIZER BOARD 42-50MHZ
TLD9333A	SYNTHESIZER BOARD 150.8-174MHZ
TLE5493A	SYNTHESIZER BOARD 450-512MHZ
TLE5491A	SYNTHESIZER BOARD 406-420MHZ
TLF6582A	SYNTHESIZER BOARD 928-960MHZ
TLD9332A	SYNTHESIZER BOARD 132-150MHZ
TRN5672A	SYNTHESIZER HARDWARE
TRN5960A	SYNTHESIZER HARDWARE (DELETE HSO)
TRN9035A	SYNTHESIZER HARDWARE (MULTIFREQUENCY)
TRN9756A	SYNTHESIZER HARDWARE

NOTE: COMPLETE SYNTHESIZER REQUIRES CHANNEL ELEMENT AND TRN5814A FREQUENCY PROM FOR OPERATION. CEPS-34980-D

1. GENERAL DESCRIPTION

The paging synthesizer is a standard 19" rack mounted unit designed for use in Motorola *Micor* Paging Base Stations. The paging synthesizer provides a modulated rf signal to drive the exciter. Modulation can be either analog (voice and tones) or digital (binary paging codes or equivalent). Digital modulation including dc is made possible by the technique of dual-port modulation, where dc and low frequency data components are controlled by the digital modulation circuit. The higher frequency components of modulation (greater than 1 Hz) are accommodated by direct frequency modulation (fm) of the synthesizer voltage controlled crystal oscillator (VCXO or channel element). The paging synthesizer also provides high frequency stability by optional phase-locking to 100 kHz, 1 MHz, 5 MHz (standard) or 10 MHz high stability reference oscillators. Refer to the voltage regulator board and paging synthesizer schematic and block diagrams for the following descriptions. Figures 1 and 2 show component location and the solder side shield location.

2. FUNCTIONAL BLOCK DESCRIPTIONS

2.1 9.6 V AND 5 V REGULATORS
(Refer to PEPS-34965 for details)

2.1.1 The 9.6 V regulator consists of a series pass transistor (Q400) which is driven by the regulator integrated circuit (U400). The regulated 9.6 V dc is provided to all analog and rf circuits, and is derived from the station 12 V dc supply (typically 13.6 V dc).

2.1.2 The 5 V regulator is supplied from the regulated 9.6 V dc supply, and provides regulated 5 V dc to all logic circuits requiring 5 V dc. The 5 V regulator consists of a 3-terminal integrated circuit (U401).

2.2 REFERENCE AMPLIFIER AND SWITCH (Q24, Q23)
(Refer to Paging Synthesizer diagrams PEPS-34989 for details)

The reference amplifier and switch amplify the high stability oscillator signal to the proper logic levels and shape, for application to integrated circuits U14 and U16.

2.3 REFERENCE DIVIDER (U14, U15, U16)

The reference divider divides the (Ultra) High Stability Oscillator (HSO/UHSO) frequency down to 100 kHz for use in phase locking U18, the 14.4 MHz oscillator. HSO/UHSO frequencies of 100 kHz, 1 MHz, 5 MHz, or 10 MHz can be programmed by jumpers JU20 and JU21.

2.4 REFERENCE PHASE DETECTOR (U17)

One section of U17, (quad exclusive-OR gate) is used as a reference phase detector. The output consists of pulses at 200 kHz, (twice the input frequency) having a width dependent on the phase error between the two input signals to U17.

2.5 REFERENCE LOOP FILTER (Q22 with associated circuitry)

Q22 amplifies the output pulses of U17 to approximately 8 volts peak-to-peak. R61, C62, R60, and C61 form an integrator circuit which recovers the dc value of Q22 output pulses, for use in controlling the frequency of U18 (14.4 MHz voltage controlled crystal oscillator, VCXO).

2.6 14.4 MHz VOLTAGE CONTROLLED CRYSTAL OSCILLATOR (U18)

U18 is a 14.4 MHz voltage controlled crystal oscillator which is phase-locked to the HSO/UHSO. The output of U18 is used to provide one of the phase detector (U17) inputs, and also provide an input to the digital modulator circuitry (U11).

2.7 REFERENCE LOOP AMPLIFIER (Q21, Q20, Q19)

The reference loop amplifier amplifies U18 output signal to the proper logic levels and shape for application to U19 (reference loop divider) and U11 (digital modulator).

2.8 REFERENCE LOOP DIVIDER (U19, U20)

Reference loop dividers U19 and U20 divide the output frequency of Q19 by 144. This is the 100 kHz feedback signal to the phase detector (U17), which is compared in phase to the 100 kHz signal derived from the HSO/UHSO.

2.9 DIGITAL MODULATOR (U9, U10, U11, U12, U13)

2.9.1 This circuit frequency modulates the output signal of Q19 to the "one" and "zero" frequencies upon command of the pulse insertion oscillator dividers U3 through U8.

2.9.2 Pulse insertion results in positive deviation by inserting extra pulses into the 14.4 MHz pulse train at the appropriate rate. This takes place in integrated circuit U12 (exclusive-OR gate with the input on pins 4 and 5; output on pin 6).

2.9.3 Pulse blanking, similarly, creates negative deviation by blanking pulses from the 14.4 MHz pulse train at the appropriate rate. This occurs in integrated circuit U11 (input pins 12 and 13, output pin 11).

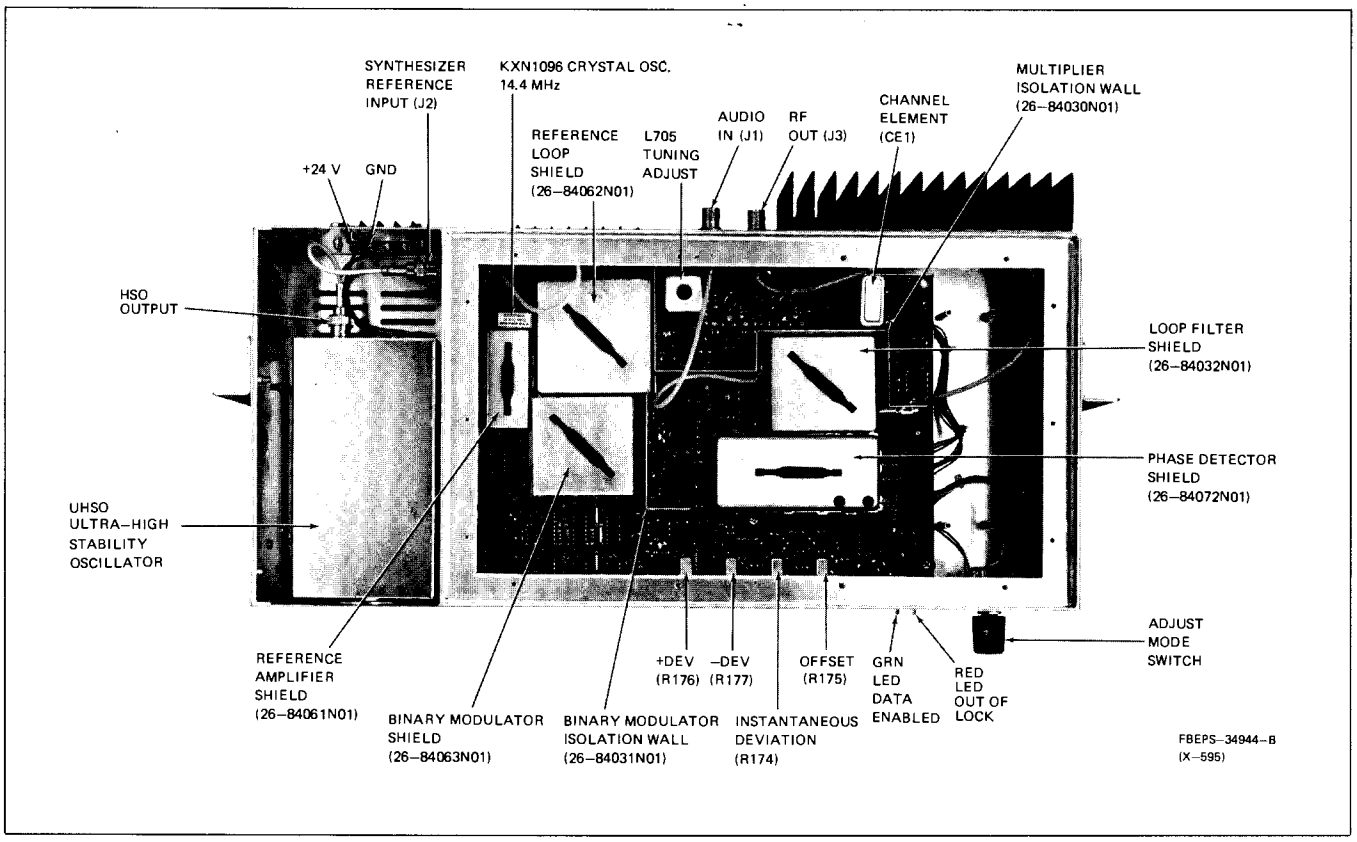


Figure 1. Paging Synthesizer Component Location (Shown with UHSO Installed)

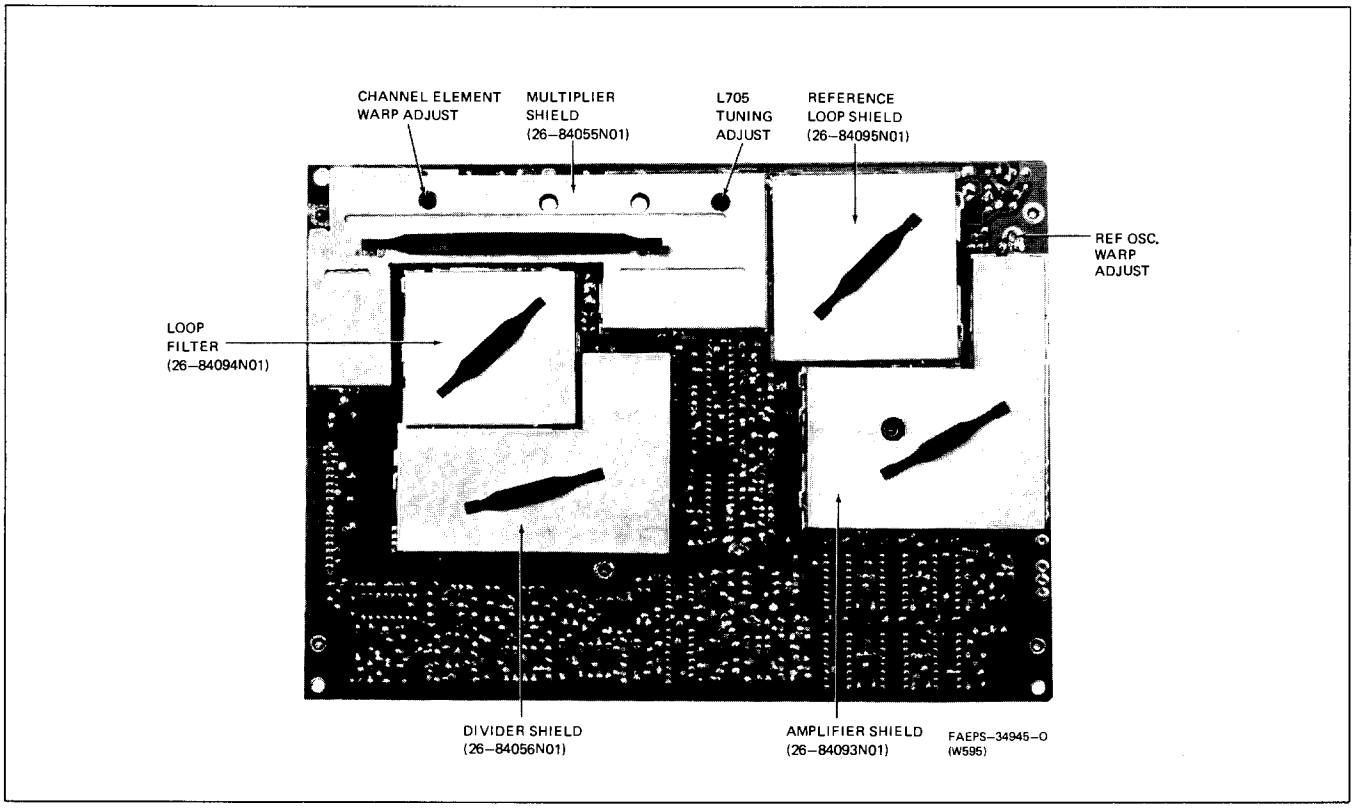


Figure 2. Synthesizer Board Solder Side Shield Location

2.9.4 Pulse insertion is selected upon command by a data enable and a data "one". Pulse blanking is selected upon command by a data enable and a data "zero". The appropriate rate of insertion pulses or blanking pulses is determined by the following formula:

$$R = \frac{Deviation \times 14.4\ MHz}{Carrier\ Frequency\ (MHz)}$$

The frequency modulated 14.4 MHz is divided by two to 7.2 MHz, by U13 (input pin 11, output pin 9) and serves as the reference input for the main synthesizer loop phase detector U602.

2.10 PULSE INSERTION OSCILLATORS AND DIVIDERS (U1 and U3-U8)

U1 is a dual timer which serves as two independent RC oscillators. The outputs are frequency divided by U3 through U8 to obtain the pulse insertion and blanking rates mentioned in paragraph 2.9. These are necessary for (+) and (-) data deviation of the 14.4 MHz signal. R176 and R177 are precision potentiometers for setting the "one" and "zero" (or + and -) deviations respectively. In order to obtain the proper deviations, jumpers JU1 through JU18 which set the divider ratios, must be properly installed.

2.11 MAIN LOOP DIVIDER (U602), ROM (U604)

2.11.1 U602 is an integrated circuit which is used to divide the 7.2 MHz reference input (pin 2) to either 2.0833 kHz or 2.500 kHz output (pin 5) depending on the frequency band (900 MHz, UHF, or HB, LB respectively). The internal ÷ 63/÷ 64 prescaler is driven by U601 and in turn drives the A and B dividers internally. The choice of 2.0833 kHz, or 2.500 kHz, and the numbers programmed into the A and B dividers are stored in U604 and called out on "D" lines (U604-12,11,10,9) by U602 addressing the "A" lines (U604-5,6,7).

2.11.2 The A and B dividers provide the loop output at 2.0833 kHz or 2.500 kHz (U602-9). This frequency is derived from the channel element (CE1). U602 pin 9 is also used to signal the ÷ 3/÷ 4 prescaler (U601) when to divide by 4 rather than 3. The $\overline{C0}$ and $\overline{C1}$ lines (pins 15 and 16) signal to U601 how many times to divide by 4 rather than 3. This information is stored in U604 ROM and (like A and B divider programs) differs from channel to channel.

2.12 SAMPLE AND HOLD PHASE DETECTOR (U603)

Integrated circuit U603 is used to compare the two divider IC output phases (2.0833 kHz or 2.500 kHz depending on the frequency band). It ultimately generates an output signal on pin 15, which after further filtering and amplification, is used to control the frequency of the channel element (CE1).

2.13 LOOP DC AMPLIFIERS (U609, U21) LOOP FILTERS, AND LOOP SUMMERS (U21)

2.13.1 DC amplifier U609 amplifies the output signal of U603 and applies this signal to the loop filter.

2.13.2 The loop filter is composed of R122, R123, C23, C24, and C28. It is a standard lead-lag filter and results in a loop bandwidth of about 1/2 Hz, with a damping factor of approximately 0.65. These parameters determine that the cross-over frequency between pulse insertion/blanking modulation, and the modulation summed in this loop is approximately 1 Hz.

2.13.3 The first loop summer (U21-8,9,10) adds binary modulation to the loop dc control voltage and amplifies the data amplitude by a factor of 2. Following the first loop summer is a 3 kHz passive RC low pass filter (R79, R78, R77, C74, C75, and C76), which has no effect on the dc control voltage, but shapes the data modulation to prevent excessive modulation sideband splatter. This filter is buffered by unity gain amplifier Q25, Q26.

2.13.4 U21 pins 2 and 3 is the second loop summer which is used to sum voice or tone modulation with the loop dc control voltage. For modulation, it has a voltage gain of unity; for the loop signals, it has a voltage gain of two. The output (pin 1) is applied directly to the channel element (CE1) modulation port (pin 4). This controls the channel element frequency so that it is phase locked to the 7.2 MHz output of the digital modulator circuit, and also directly frequency modulates it with voice or tones, or splatter filtered data.

2.14 CHANNEL ELEMENT (CE1)

The channel element serves as the voltage controlled crystal oscillator (VCXO) in the main synthesizer loop, and provides an output signal between 10 and 16-2/3 MHz. The output signal is amplified and drives the exciter in the transmitter portion of the base station.

2.15 EXCITER AMPLIFIER/BUFFER SWITCH (Q701, Q36, Q37, CR1, CR2)

Q701 (not used on 900 MHz model) amplifies the output of channel element (CE1) to the proper level to drive a base station exciter. Q36 and Q37 buffer the output of Q701 to prevent loading by the coaxial cable used to connect it to the base station exciter. CR1 and CR2 PIN diodes used in a series-shunt rf switch greatly attenuate the signal delivered to the base station exciter, if rf enable is a high level dc signal. The output of the synthesizer (Q36 and Q37 emitters) is frequency multiplied in the base station, just as a normal channel element signal would be: × 3 for low band, × 12 for high band, × 36 for UHF, and × 72 for 900 MHz.

2.16 FREQUENCY MULTIPLIERS (Q706, Q702, Q703, Q704) AND BUFFER (Q40)

2.16.1 For low band models, Q702 and Q703 are not used. Q706 is a unity gain amplifier, and Q704 and associated components form a frequency tripler. The output of Q704 is limited in amplitude by CR6 and CR7, buffered by Q40 before being applied to U601 pin 1 (divide by 3/divide by 4 prescaler).

2.16.2 For all other models, Q706 is a unity gain buffer, Q702 is a frequency tripler, and Q703 and Q704 are both frequency doubling stages. The overall frequency multiplication is a factor of 12. CR6, CR7, and Q40 are as described before. Low band and the other frequency bands differ so that the phase detector input frequencies may remain reasonably high and still achieve the desired channel spacings.

2.17 ÷3/÷4 PRESCALER (U601)

2.17.1 U601 is normally used to allow synthesizer operation from a 400 MHz or higher voltage controlled oscillator. In this synthesizer the highest frequency from Q40 is 174 MHz. U601 used in this application with frequency multipliers, allows all of the desired channel spacings to be achieved without resorting to excessively low phase detector (U603) input frequencies.

2.17.2 $\overline{C0}$ and $\overline{C1}$ (U601 pins 7 and 6) receive instructions from U604 via U602 as to how many cycles of its operation U601 should be in the divide by 4 mode during a loop pulse period (loop pulse is signaled from U602 pin 9 to U601 pin 5). In this manner an assortment of non-integer divisors are achieved. The total frequency divisor from CE1 pin 3 to U602 pin 9 is:

$$\text{Low Band: } Nr = \frac{3(64A + 63B) + C}{3}$$

$$\text{Other Bands: } Nr = \frac{3(64A + 63B) + C}{12}$$

(where A and B are U603 divider programs, and C is the U601 program).

2.18 LOSS OF LOCK DETECTOR (U606, U607)

The loss of lock detector consists of two voltage comparators (both within U606); a reference loop detector and a main loop detector. The outputs of these are combined in U607, a quad OR-gate. The output of U607 is dc amplified by Q39, stored in delay capacitor C93, and used to inhibit transmitter keying by Q33 in the event of loss of lock. The delay time constant components C93, and R164, are used to prevent false transmission during acquisition of lock or other transient or oscillatory conditions. Q32 drives DS1 which provides a visual indication for out of lock condition.

2.19 DATA MODULATOR (Q3-5, Q9-14, Q31, Q42, Q43, U22)

2.19.1 The data modulator performs two functions: First, it translates data levels to precisely the peak-to-peak voltage level necessary for modulation of the main synthesizer loop via U21 pin 10. This is adjustable with R174. Secondly, it provides a dc level which is superimposed on the data applied to U21 pin 10. This level is adjustable (in the data enable mode) by R175. This dc level is necessary for the following conditions:

- To change the data levels, so they are symmetrical about the main loop dc control voltage for equal plus and minus frequency deviations.
- To change the data levels so they are not symmetrical about the main loop dc control voltage for unequal plus and minus frequency deviations, if desired.

Q3,4,9,13, and 14 perform the first function by switching R174 to either a fixed high level voltage (data "1") or a fixed low level voltage (data "0"). R174 is switched by either Q13 or Q14, but not both simultaneously. The resistance setting of R174 along with fixed resistors R137 and R134 determine the voltage amplification of op. amp. U22 for the data levels.

2.19.2 The circuit composed of Q5, Q31, Q42, and Q43 connects R175 into the circuit in the data enable mode. Switching transistors Q42 and Q43 are both on at the same time thus connecting R175 between regulated 9.6 V dc and ground. The voltage setting of R175 provides the adjustable dc level function mentioned above in the data enable mode. This voltage is summed with the data in op. amp. U22, via R133 and along with R134, provides unity gain for this level. DS2 provides a visual indication of the Data Enable mode.

2.20 DATA SIMULATOR (U23)

2.20.1 This circuit provides a simulated 300 bps data stream which, when selected by the rotary switch S1 (INSTANTANEOUS DEVIATION ADJUST position) on the synthesizer panel allows the peak-to-peak data deviation to be set using R174.

2.20.2 In the OFFSET ADJUST mode of rotary switch S1, a simulated data stream and a pulsating data enable are available. This allows for convenient setting of the data bias control R175, by adjusting for minimum frequency transient upon change of data enable states (voice/tone to data, and vice versa). Final adjustment of R174 and R175 cannot be made until the + DEV (R176) and - DEV (R177) controls are set. The rotary switch must always be returned to the normal (OPERATE) position after servicing the station. An ADJUST MODE LED (DS3) is provided to indicate if the switch is not in the OPERATE mode.

2.20.3 U23 is a self contained RC oscillator and frequency divider. Oscillation of U23 is controlled by R139, R140, and C81. The frequency of oscillation determines the rate of the simulated data stream. Q34 buffers the simulated data for application to the binary modulator through the rotary switch when selected. U23 further frequency divides the oscillation frequency to provide a simulated pulsating data enable signal of approximately 1.5 Hz. This circuit is included as an aid to servicing and alignment, and is not normally activated during system operation.

3. SUMMARY

The paging synthesizer allows analog or digital (binary) modulation of paging base stations including low band, high band, and UHF. It not only provides dc modulation capability, but high stability transmitter frequency at the same time; this is necessary for simulcast system applications.

4. ALIGNMENT PROCEDURE

4.1 GENERAL

4.1.1 Monitor the transmitter output frequency with an adequate frequency counter (typically accurate to †71 Hz). The transmitter modulation should be monitored with a Motorola Service Monitor (R1200) with a deviation meter or equivalent.

4.1.2 On later model synthesizers:

- TP1 can be measured at TB1 "test points" when S1 is in INSTANTANEOUS position.
- TP2 can be measured at TB1 "test points" when S1 is in OPERATE position.

4.2 MULTIPLIER

(Use a Motorola TEK-5 or equivalent metering panel.)

Step 1. Low Band — Peak L705 on Meter 3.

Step 1A. Other Bands —

- Peak L703 on Meter 1
- Peak L704 on Meter 2
- Peak L705 on Meter 3

Step 2. Repeat Step 1A.

4.3 14.4 MHz VOLTAGE CONTROLLED CRYSTAL OSCILLATOR (VCXO)

Adjust U18 warp coil (located through small hole on top of chassis, (see Figure 3) for 1.5 V ±0.1 V dc at test point 1 (junction of C82 and R150). A high resistance voltmeter (11 megohm, R1002 or equivalent) must be used.

4.4 CHANNEL ELEMENT (CE1)

Step 1. Set the adjust mode switch on the synthesizer to the OPERATE mode. **DO NOT** apply any modulating signals.

Step 2. Set CE1 warp capacitor for 4.7 V ±0.3 V dc at test point 2 (junction of R151 and C83). Use a high resistance voltmeter as before. Refer to Figure 3 for location of tuning hole.

4.5 (ULTRA) HIGH STABILITY OSCILLATOR (HSO/UHSO)

IMPORTANT

The USO/UHSO frequency is factory preset within FCC limits and should not be adjusted except for simulcast netting applications.

Allow at least 45 minutes warm-up at 25°C (90 minutes at 0°C) before measuring frequency.

For simulcast systems, the HSO/UHSO should be allowed to stabilize for 24 hours before netting. Use the alignment tool provided with the station or damage to the oscillator may result. AVOID EXCESSIVE TORQUE.

Step 3. Repeat paragraphs 4.3 and 4.4.

4.6 DIGITAL MODULATOR (+ DEV and - DEV)

(Refer to paragraph 4.10 before performing this procedure.)

Step 1. Set the panel switch on the synthesizer to the OPERATE position.

Step 2. Set the switch on the TSI module to the TEST position. The TSI module is located in the station control chassis.

Step 3. Pulse Insertion: Select the + DEVIATION position of the switch on the TSI module. Set R176 (+ DEV) on the synthesizer panel for the transmitter output frequency of Fr + 4.000 kHz.

Step 4. Pulse Blanking: Select the - DEVIATION position of the switch on the TSI module. Set R177 (- DEV) on the synthesizer panel for transmitter output frequency of Fr - 4.000 kHz.

Step 5. Return the TEST switch on the TSI module to the normal position.

4.7 INSTANTANEOUS DEVIATION ADJUST (R174)

Step I. Set the panel switch on the synthesizer to the INSTANTANEOUS DEVIATION ADJUST mode. The adjust mode and data enable lamps should light. The transmitter is now modulated with simulated data.

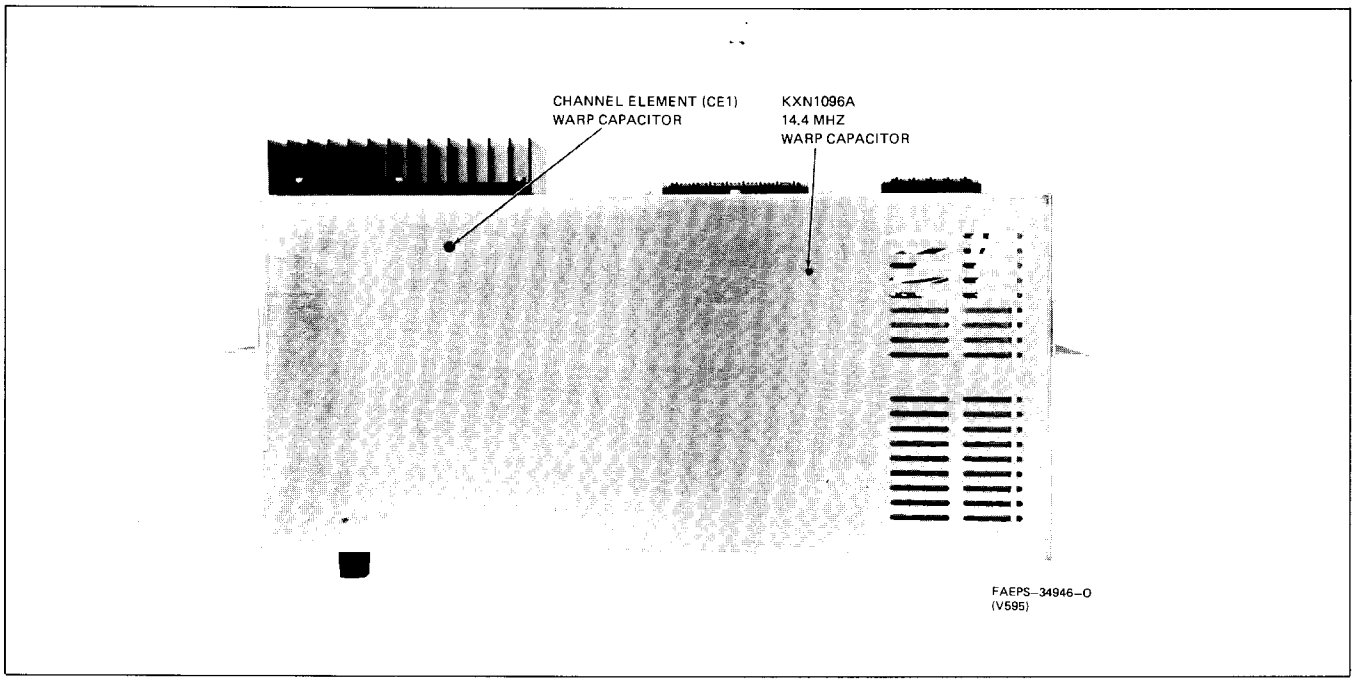


Figure 3. Synthesizer Tuning Adjustment Location

Step 2. Set R174 on the synthesizer panel for ±4.0 kHz deviation.

4.8 OFFSET (R175)

Step 1. Disconnect the out-of-lock (transmitter inhibit) line to the station.

Step 2. Set the panel switch on the synthesizer to the OFFSET ADJUST position. The adjust mode lamp should be lit, and the data enable lamp should be pulsating slowly.

Step 3. Set R175 on the synthesizer for minimum transient or bounce on the transitions from no modulation to data modulation or vice-versa.

Step 4. Reconnect the out-of-lock line to the station. The station should remain keyed. The out-of-lock lamp should not be lit.

Step 5. Return the panel switch to the OPERATE position. The adjust mode lamp should not be lit, and the data enable lamp should be lit only if the modem is detecting data.

4.9 (ULTRA) HIGH STABILITY OSCILLATOR

Readjust the HSO/UHSO if necessary and place the station back in service.

4.10 ALIGNMENT PROCEDURE FOR BINARY MODE FREQUENCY OFFSET

4.10.1 If a frequency offset in the binary mode is desired, the entire alignment procedure is the same as previously described except for replacing paragraph 4.6 with the following procedure:

4.10.2 Digital Modulator (+ DEV and - DEV)

Step 1. Set the panel switch on the synthesizer to the OPERATE position.

Step 2. Set the switch on the TSI module to the TEST position.

Step 3. Pulse Insertion: Select the + DEVIATION position of the switch on the TSI module. Set R176 (+ DEV) on the synthesizer panel for the transmitter output frequency of Fr + 4.000 kHz + offset.

Step 4. Pulse Blanking: Select the - DEVIATION position of the switch on the TSI module. Set R177 (- DEV) on the synthesizer panel for transmitter output frequency of Fr - 4.000 kHz + offset.

Example: Desired OFFSET = + 100 Hz,
using + DEV: F = Fr + 4.1 kHz;
using - DEV: F = Fr - 3.9 kHz.

Step 5. Return the TEST switch on the TSI module to the normal position.

5. OPERATIONAL TESTS

5.1 REGULATORS

Check both the 9.6 V dc ±0.5 V and 5 V dc ±0.1 V regulators for proper operation.

5.2 REFERENCE LOOP

Jumpers JU20 and JU21 determine which External Reference frequency is applied to the synthesizer and are "in" or "out" accordingly (see note 4 on synthesizer schematic diagram). With the proper input signal applied, check for the following:

- 100 kHz signal at U17-1,2 (Phase Detector)
- 14.4 MHz signal at collector of Q19
- U18 Steering Line (TP1) set for 1.5 V dc

5.3 MAIN LOOP

In order to test the Main Loop, the Reference Loop must be functioning normally, U604 (ROM), and the channel element must be installed, and jumpers JU22-JU25 removed accordingly. With these conditions met, perform the following tests:

- Check for 7.2 MHz signal at U602-2.
- Check that Multiplier metering positions 1, 2 and 3 are normal when L703, L704, and L705 are tuned.
- Check for a VHF signal of approximately 1 V P/P (350 mV rms) at U601-1.
- Check for a VHF signal of approximately 225 mV rms at U602-25.
- Check for a 2.083 kHz (for UHF and 900 MHz units) or a 2.5 kHz (for LB and HB units) square wave signal of approximately 4 V P/P at U603-2.
- Check for 2.083 kHz or 2.5 kHz signal pulses of approximately 2.8 V P/P at U603-23.
- Check for 2.083 kHz or 2.5 kHz Truncated ramp signal greater than or equal to 1.4 V P/P at U603-24.
- Check that the voltage at U603-15 is at least 3 V dc but not more than 8 V dc (no ac voltage present).
- Check that the voltage at TP2 is at least 3 V dc but not more than 6 V dc (no ac voltage present).
- The RF output should be approximately 1.0 V rms when the RF ENABLE line is low (less than 0.7 V). When the RF ENABLE line is high, the RF output should be approximately 10 mV rms.

5.4 PULSE STUFFING CIRCUIT (DATA ENABLE = 1, and JU1-JU8 removed accordingly)

- Check for a signal of approximately 12 kHz at 4 V P/P at U5-14 (Data = 0).
- Check for a signal of approximately 12 kHz at 4 V P/P at U6-14 (Data = 1).
- Check that F_{RFOUT} = Fx - approx. 4 kHz ÷ M when Data = 0.
- Check that F_{RFOUT} = Fx + approx. 4 kHz ÷ M when Data = 1.

NOTE

Where M = station multiplier; LB = 3, HB = 12, UHF = 36, and 900 MHz = 72.

5.5 DATA MODULATOR

Step 1. Set the panel switch on the synthesizer to the INSTANTANEOUS DEVIATION ADJUST position. The switch remains in this position for Steps 2, 3, and 4.

Step 2. Check for 2 V P/P at the junction of R174 and R19.

Step 3. Check for a 150 Hz square wave of approximately 4 V P/P at CE1-4. Adjust INSTANTANEOUS DEVIATION control R174 if necessary.

Step 4. Check that the voltage at U22-7 is at least 4 V dc but not more than 5 V dc, and is variable with the OFFSET control R175. Set this voltage to 4.8 V dc.

Step 5. Set the panel switch on the synthesizer to the OFFSET ADJUST position.

Step 6. Check for a square wave at U22-7. This waveform can be varied with the OFFSET control R175 above and below 4.8 V dc. Adjust R175 for minimum dc voltage shift between data and voice modulation (not critical).

5.6 VOICE MODULATION (Data Enable = 0)

Step 1. Apply a 1 kHz tone @ 1.4 V rms to the VOICE INPUT connector J1.

Step 2. Measure this 1 kHz tone at TP2. Level should be 3 V P/P.

NOTE

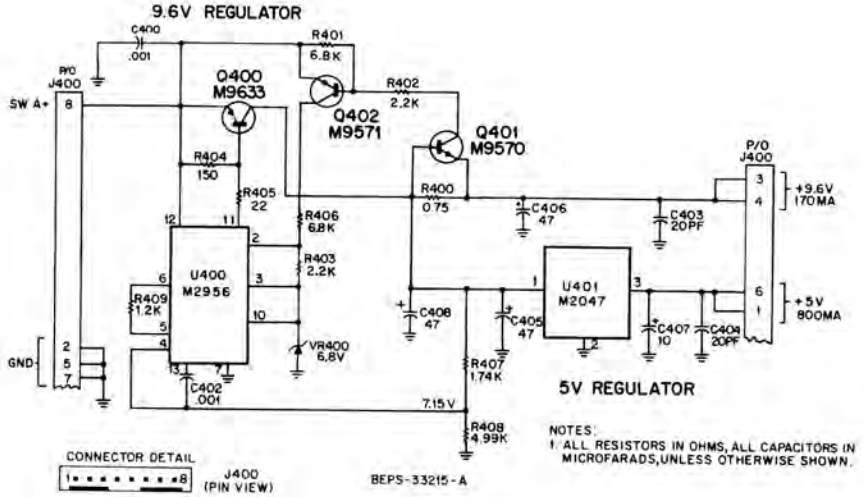
If any of the previously described operational tests fail to perform as noted refer to the Synthesizer Troubleshooting Guide for further information.

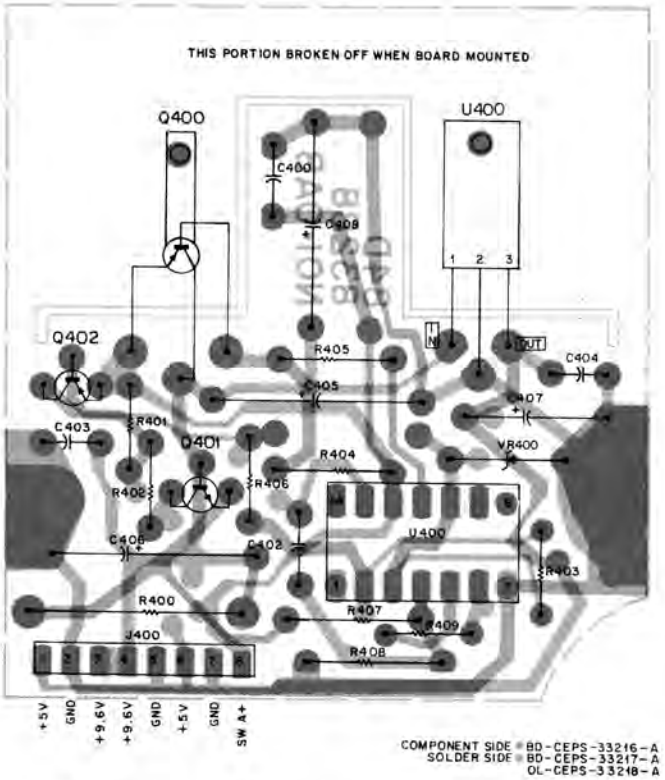
6. TROUBLESHOOTING GUIDE AND PROCEDURE

Table 1. Paging Synthesizer Troubleshooting Guide

Symptom	Possible Causes
No RF output	RF Enable is not low. Q36, Q37, or Q701 is bad. CR1 is open or CR2 is shorted.
Out-of-Lock (preliminary)	Remove yellow "Lock Indicate" wire from TB1 on synthesizer. If red Out of Lock Indicate LED (DS1) remains lit, proceed with synthesizer troubleshooting. If indicator goes off, synthesizer is operating properly. Check transmit inhibit circuitry in low voltage power supply and fan air vane switch operation. Identify which loop is causing out-of-lock operation as follows: U606, pin 1 or 14 high: Main loop out-of-lock. U606, pin 2 high or pulsing: Reference loop out-of-lock.
Out-of-Lock (Main Loop)	OFFSET ADJUST improperly set. JU22, 23, 24, 25 improperly installed. Multiplier not tuned or defective. ROM U604 defective. Defective Loss-of-Lock Detector circuit. R120 wrong value.
Out-of-Lock (Reference Loop)	U18 not properly tuned. Defective U18. JU20, JU21 improperly installed. Loss of HSO/UHSO signal (External Ref.). Defective amplifier (Q21, Q20, Q19). Defective Loss-of-Lock Detector circuit.
Distorted Binary Modulation	Pulse stuffing/snatching (+ DEV and - DEV) not properly set, or defective. INSTANTANEOUS DEV not properly set, or defective. Voice Input not connected to station. JU22, 23, 24, 25 improperly installed. JU1-18 improperly installed. Defective amplifier (Q21, 20, 19). Defective oscillator U1, etc. Defective U21. Defective R173.
Mode change transients (BINARY to VOICE, etc.)	OFFSET ADJUST not properly set or defective. Station XCTR LEVEL improperly set. Line Level (600 ohms) too high to station.
Distorted Voice or Tone Modulation	Station XCTR LEVEL improperly set. Station IDC improperly set. JU22, 23, 24, 25 improperly installed. Defective U21. Defective R173. CE1 not tuned properly or defective.
Carrier Frequency in error by 2.083 kHz or 2.500 kHz, etc.	Defective U601. Defective U604. Defective program stored in U604.

VOLTAGE REGULATOR BOARD
MODEL TRN5058A





SHOWN FROM COMPONENT SIDE

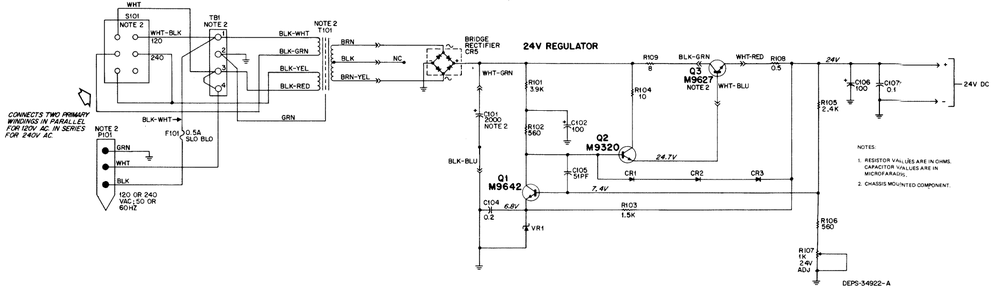
parts list

TRN5058A Voltage Regulator Board — PL-7660-A

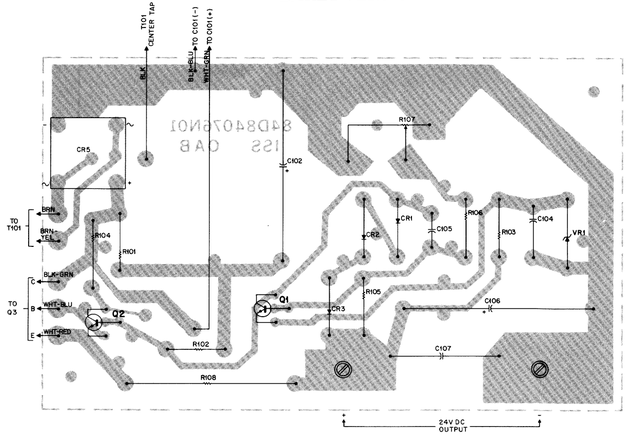
REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		capacitor, fixed: uF 10%; unless otherwise stated
C400	21-83596E13	.001; 500 V
C401		not used
C402	21-83596E13	.001; 500 V
C403, 404	21-11014H32	20 pF 5%; 100 V
C405, 406	23-83214C31	47 20%; 15 V
C407	23-84762H03	10; 20 V
C408	23-83214C31	47 20%; 15 V
		connector, plug:
J400	28-83323N02	male; 8-contact
		transistor: (see note)
Q400	48-869633	PNP; type M9633
Q401	48-869570	NPN; type M9570
Q402	48-869571	PNP; type M9571
		resistor, fixed: ohms 5%; 1/4 W; unless otherwise stated
R400	17-82036G13	0.75; 2 W
R401	6-185A69	6.8k; 1/8 W
R402, 403	6-185A57	2.2k; 1/8 W
R404	6-11009C29	150
R405	6-11009C09	22
R406	6-185A69	6.8k; 1/8 W
R407	6-10621C18	1740 1%
R408	6-10621C62	4990 1%
R409	6-185A51	1.2k; 1/8 W
		integrated circuit: (see note)
U400	51-83629M56	regulator; 9.6 V
U401	51-84320A47	regulator; 5 V
		voltage regulator: (see note)
VR400	48-82256C37	Zener; 6.8 V; 1 W

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

Schematic Diagram, Circuit Board Detail, and Parts List
Motorola No. ***PEPS-34965-A***
4/26/85



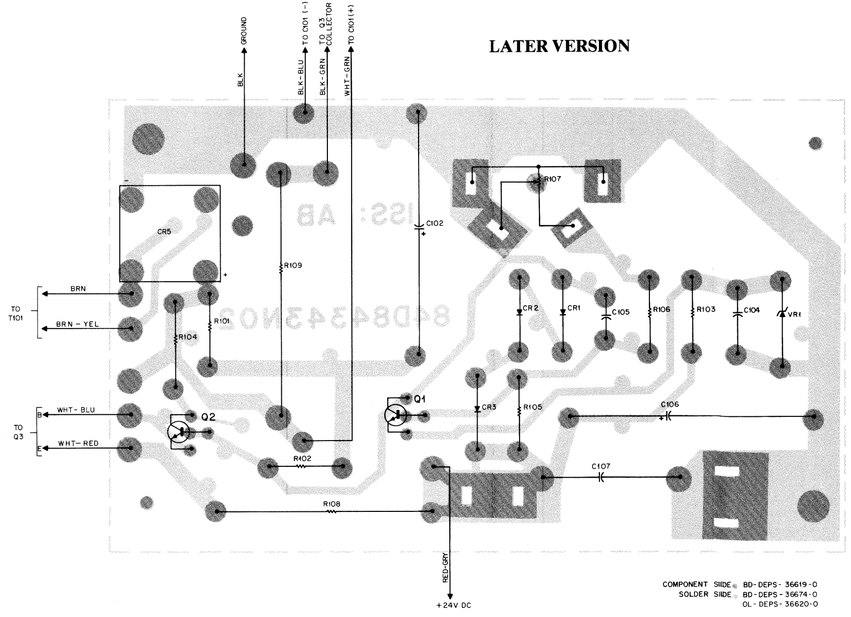
EARLY VERSION



SHOWN FROM COMPONENT SIDE

COMPONENT SIDE - BD-CEPS-34923-O
OL-CEPS-34924-A

LATER VERSION



COMPONENT SIDE - BD-DEPS-36619-O
SOLDER SIDE - BD-DEPS-36674-O
OL-DEPS-36620-O

SHOWN FROM COMPONENT SIDE

parts list

TRN5470A Power Supply Board — PL-8110-A

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		capacitor, fixed:
C102	23-82077C01	100 uF + 150-10%; 35 V
C104	21-82372C05	0.2 uF + 80-20%; 25 V
C105	21-84493B27	51 pF ± 5%; 200 V
C106	23-82077C01	100 uF + 150-10%; 35 V
C107	8-82317B01	0.1 uF ± 10%; 100 V
		diode: (see note)
CR1, 2, 3	48-83654H01	silicon
CR5	48-84621E05	bridge, rectifier; 200 V
		transistor: (see note)
Q1	48-869642	NPN; type M9642
Q2	48-869320	NPN; type M9320
		resistor, fixed: ± 5%; 1/4 W: unless otherwise stated
R101	6-11009A63	3.9k
R102	6-11009A43	560
R103	6-11009A53	1.5k
R104	6-125C01	10; 1/2 W
R105	6-11009A58	2.4k
R106	6-11009A43	560
R107	18-83168C03	variable; 1k
R108	17-82586H08	W.W. 0.5; 5 W
R109	17-82177B55	W.W. 8.0; 7 W
		voltage regulator: (see note)
VR1	48-82256C02	Zener type; 6.8 V
		mechanical parts
	3-84482M01	SCREW, machine; 6-32 x 5/16"; 2 used
	29-83362G01	TERMINAL; 2 used

TRN5469A Power Supply Chassis and Hardware — PL-8111-A

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		capacitor, fixed:
C101	23-83093G21	2000 uF + 100 – 10%; 100 V
		fuse:
F101	65-475395	1/2 amp; 125 V; slow blow type
		transistor: (see note)
Q3	48-869627	NPN; type M9627
		switch:
S101	40-84241G03	2 position; slide
		transformer:
T101	25-83043L01	pri: #1 BLK-WHT, BLK-GRN; res. 29 ohms pri:#2 BLK-YEL, BLK-RED; res. 32 ohms sec: BRN, BRN-YEL with BLK center top; res. 1 ohm
		terminal board:
TB1	31-120965	4 contact
		connector, plug:
P101	28-83176L01	male; 3-contact
		mechanical parts
	2-119913	NUT, 8-32 x 11/32 x 1/8"; 4 used
	3-122922	SCREW, machine; 6-32 x 5/8"; 2 used
	3-134212	SCREW, tapping; 4-40 x 5/16"; 4 used
	3-134169	SCREW, tapping; 4-40 x 1/4"; 4 used
	3-135575	SCREW, tapping; 6-32 x 5/16"; 4 used
	3-136934	SCREW, tapping; 6-32 x 38"; 6 used
	4-844093	WASHER, shoulder; 4 used
	7-83181L01	BRACKET, fuseholder
	7-84139N01	BRACKET, heat sink mounting; 2 used
	9-82083C03	RECEPTACLE, fused
	9-82673A01	SOCKET, transistor; 3 used
	9-83175L01	RECEPTACLE, female; 3 contact
	14-865854	INSULATOR, transistor
	14-84309N01	INSULATOR, paper
	15-83559L01	COVER, transistor
	26-84212E02	HEAT SINK
	29-84151L01	TERMINAL, socket; 3 used
	29-847854	LUG, tongue
	29-84150L01	TERMINAL, plug; 3 used
	42-10217A02	STRAP, tie; 10 used
	42-83123F01	RETAINER; 6 used
	54-84789L01	LABEL, WARNING
	30-83211C04	CABLE and PLUG AC
	37-107998	SLEEVING
	29-812979	LUG, crimp terminal; 4 used

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

Schematic Diagram,
Circuit Board Detail, and Parts List
Motorola No. ***PEPS-34988-B***
4/16/85 PHI

PAGING SYNTHESIZER

NOTES:

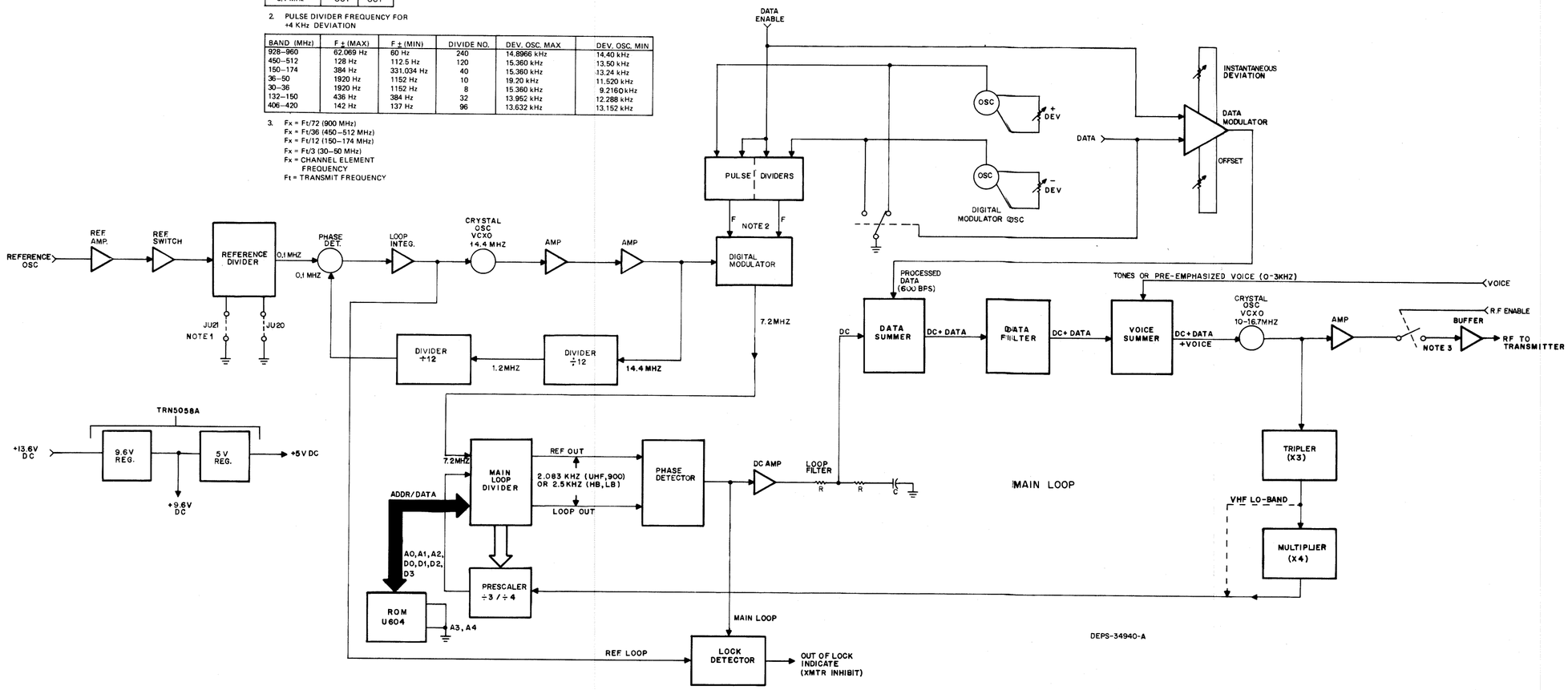
1. JUMPER CHART

HSO FREQ.	JU20	JU21
10 MHz	IN	OUT
5 MHz	IN	IN
1 MHz	OUT	IN
0.1 MHz	OUT	OUT

2. PULSE DIVIDER FREQUENCY FOR ±4 KHz DEVIATION

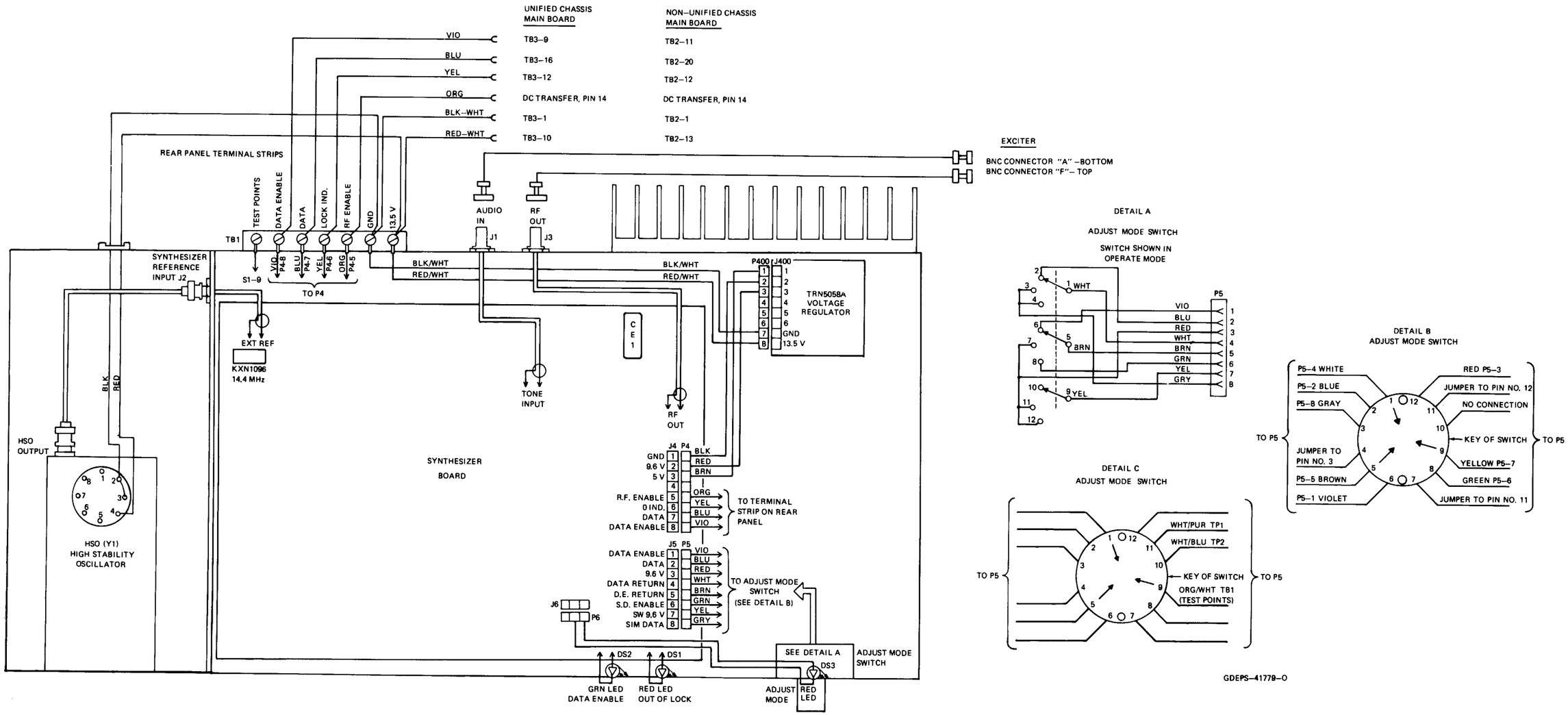
BAND (MHz)	F ± (MAX)	F ± (MIN)	DIVIDE NO.	DEV. OSC. MAX	DEV. OSC. MIN
928–960	62.069 Hz	60 Hz	240	14.8966 kHz	14.40 kHz
450–512	128 Hz	112.5 Hz	120	15.360 kHz	13.50 kHz
150–174	384 Hz	331.034 Hz	40	15.360 kHz	13.24 kHz
36–50	1920 Hz	1152 Hz	10	19.20 kHz	11.520 kHz
30–36	1920 Hz	1152 Hz	8	15.360 kHz	9.2160 kHz
132–150	436 Hz	384 Hz	32	13.952 kHz	12.288 kHz
406–420	142 Hz	137 Hz	96	13.632 kHz	13.152 kHz

3. Fx = Ft/72 (900 MHz)
   Fx = Ft/36 (450–512 MHz)
   Fx = Ft/12 (150–174 MHz)
   Fx = Ft/3 (30–50 MHz)
   Fx = CHANNEL ELEMENT FREQUENCY
   Ft = TRANSMIT FREQUENCY



Block Diagram
Motorola No. DEPS-34940-A
4/26/85 -PHI

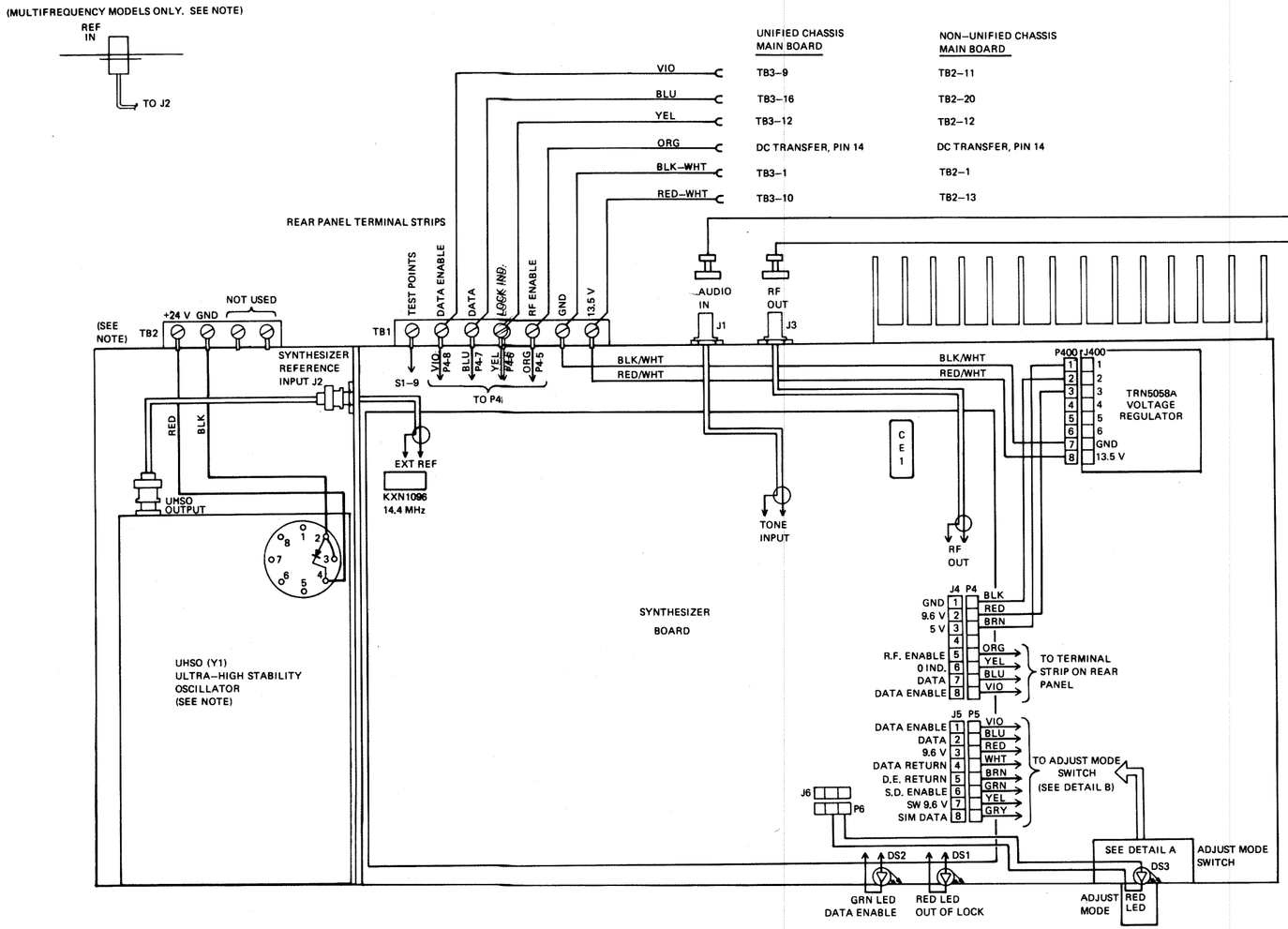
PAGING SYNTHESIZER (HSO INSTALLED)



GDEPS–41779–O

Intercabling Diagram
Motorola No. ***GDEPS-41779-O***
4/26/85

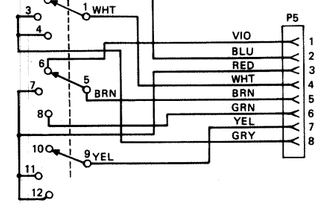
PAGING SYNTHESIZER (UHSO INSTALLED)



DETAIL A

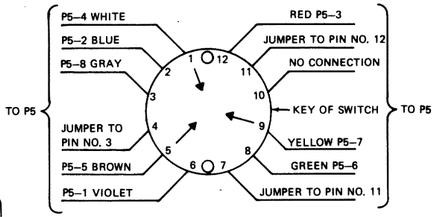
ADJUST MODE SWITCH

SWITCH SHOWN IN OPERATE MODE



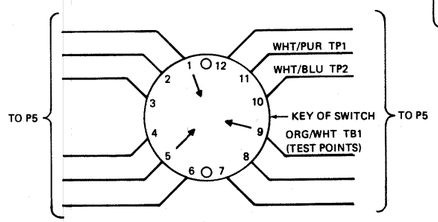
DETAIL B

ADJUST MODE SWITCH



DETAIL C

ADJUST MODE SWITCH



NOTE:
MULTIFREQUENCY MODELS AND DELETE UHSO MODELS DO NOT HAVE TB2 OR UHSO.

GDEPS–34949–D

PAGING SYNTHESIZER

Intercabling Diagram
Motorola No. ***GDEPS-34949-D***
4/16/85 -PHI

parts list

TKN8968A Synthesizer Interconnect Cable — PL-8700-O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		light emitting diode: (see note)
DS3	48-88245C04	RED LED
		connector, plug:
P4	—	consists of:
	15-83142M07	housing, 8-position
	39-82717M01	contact, receptacle; 7 used
P5	—	consists of:
	15-83142M07	housing, 8-position
	39-82717M01	contact, receptacle; 8 used
P6	—	consists of:
	15-84301K19	housing, 3-position
	39-82717M01	contact, receptacle; 2 used
	28-84302K01	plug, polarizing
P400	—	consists of:
	15-83142M07	housing, 8-position
	39-82717M01	contact, receptacle; 5 used
		switch, rotary:
S1	40-84669K01	3-position
		terminal board:
TB1	31-82272B04	7-screw terminal
		non-referenced items
	1-80757D24	FEED-THRU ASSEMBLY
	30-83794C01	CABLE, coaxial: WHT; 5.75" used
	3-135941	SCREW, machine: 6-32 × 1/2"; 4 used
	42-10217A02	STRAP, tie; 5 used
	42-10217A03	STRAP, tie; 4 used

TRN5672A Synthesizer Hardware Kit (900 MHz)
TRN5447A Synthesizer Hardware Kit (LB, HB, UHF) — PL-8108-B

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		oscillator, crystal: (see note)
Y1	48-83851N02	CRYSTAL; (TRN5447A only)
	or 48-83851N03	CRYSTAL; (TRN5672A only)
		non-referenced items
	3-134212	SCREW, tapping: 4-40 × 5/16"; 14 used
	1-80759D38	COVER, synthesizer bottom includes:
	41-84811B01	SPRING
	42-84284B01	RETAINER; 14 used
	2-8364	NUT, hex: 3/8-32 x 1/2 x 3/32"
	2-132616	NUT, hex: 6-32 x 1/4 x 3/32 x 1/8"; 4 used
	3-9669	SCREW, machine: 8-32 x 3/8"; 6 used
	3-134185	SCREW, tapping: 6-32 x 1/4"; 6 used
	3-134309	SCREW, tapping: 4-40 x 3/16"; 2 used
	3-135502	SCREW, tapping: 4-40 x 5/8"; 2 used
	3-136850	SCREW, tapping: 6-32 x 1/2"; 10 used
	4-84152B01	WASHER, shoulder
	7-83804N01	BRACKET, rack mounting; 2 used
	14-84268A01	INSULATOR, transistor
	26-83982N01	HEAT SINK
	27-83803N01	CHASSIS, main
	32-83978N01	GASKET
	32-82796H01	GASKET; 41" used
	32-83979N01	GASKET
	36-82630H01	KNOB, control
	43-10646A09	STANDOFF; 2 used
	43-83981N01	SPACER
	48-82525G18	DIODE, silicon

note: Y1 not field servicable. Order entire kit if replacement is needed.

TKN8967A HSO Cable — PL-8701-O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		non-referenced items
	28-83099K01	BNC CONN; 2 used
	30-83794C01	CABLE, coax; 5.75"

TKN8966A Reference Cable — PL-8702-O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		non-referenced items
	9-84968D01	BNC BULK HEAD MOUNT CONNECTOR
	28-83099K01	BNC CONNECTOR; 50 ohm
	30-83794C01	CABLE, coax 6.5"

Schematic Diagram
Circuit Board Detail, and Parts List
Motorola No. ***PEPS-34989-D***
(Sheet 1 of 3)
7/31/86-PHI

TLB8502A Synthesizer Board; 30-36 MHz
TLB8503A Synthesizer Board; 36-42 MHz
TLB8504A Synthesizer Board; 42-55 MHz — PL-8090-B

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		capacitor, fixed: uF ±10%; 100 V: unless otherwise stated
C2	21-11014H32	20 pF ±5%; 50 V
C3	21-11015A07	.01 +80-20%; 100 V
C4	21-11014H32	20 pF ±5%; 50 V
C5	21-11015B05	220 pF
C6	21-82187B44	1000 pF
C8	21-11014H32	20 pF ±5%; 50 V
C9	21-11015B05	220 pF
C10	8-11017B17	0.1; 50 V
C11	23-11013F10	0.56; 35 V
C12	21-11015B05	220 pF
C13	8-11017B17	0.1; 50 V
C14	21-11015A07	.01 +80-20%
C15	21-11015B05	220 pF ±5%
C16	21-11015A07	.01 +80-20%
C17	8-11017B07	.0068; 50 V
C18	23-11013D55	4.7 ±20%; 20 V
C19	23-84538G06	47 ±20%; 20 V
C19A	21-11015B01	100 pF
C20	8-80027B08	.0039 ±5%
C21	8-11017B06	.0047; 50 V
C22	8-11017B01	.001; 50 V
C23	23-84538G14	1; 35 V
C24	8-80026B04	5; 50 V
C26	21-11015A07	.01 +80-20%
C27	21-11015B01	100 pF
C28	8-80026B04	5; 50 V
C42	21-863396	4000 pF ±1%; 500 V (30-36 MHz)
	21-82537B49	3900 pF ±1% (36-42 MHz)
	8-11017A06	4700 pF ±5%; 50 V (42-50 MHz)
C43	21-863396	4000 pF ±1%; 500 V (30-36 MHz)
	21-82537B49	3900 pF ±1% (36-42 MHz)
	8-11017A06	4700 pF ±5%; 50 V (42-50 MHz)
C44, 45	21-11015A07	.01 +80-20%
C48	21-11014H44	62 pF ±5%
C54 thru 56	21-11015A07	.01 +80-20%
C57	23-84538G04	.01 +80-20%
C58 thru 60	21-11015A07	.01 +80-20%
C61, 62	21-82372C09	0.1 +80-20%; 25 V
C63	23-84538G04	.01 +80-20%
C64 thru 68	21-11015A07	.01 +80-20%
C69	23-11013D55	4.7 ±20%; 20 V
C70 thru 73	21-11015A07	.01 +80-20%
C74	8-83813H23	.068 ±5%; 50 V
C75	8-83813H37	.0068 ±5%
C76	21-84426B48	665 pF ±5%; 500 V
C77	23-84538G29	47 ±20%; 10 V
C78, 79	21-11015A07	.01 +80-20%
C80	8-11017B01	.001; 50 V (30-50 MHz)
C81	8-82905G03	.047 ±5%; 50 V
C82, 83	21-11015A07	.01 +80-20%
C84	23-84538G29	47 ±20%; 10 V
C85, 86	21-84494B29	10 pF ±5%; 500 V
C87, 88	23-84538G29	47 ±20%; 10 V
C89	21-11015A07	.01 +80-20%
C91	21-11015A07	.01 +80-20%
C93	23-84538G29	47 ±20%; 10 V
C94, 95	21-11015A07	.01 +80-20%
C96	8-11017B01	.001; 50 V
C97	21-11015A07	.01 +80-20%
C200	23-84538G06	47 ±20%; 20 V
C202	21-82372C04	.05 +80-20%; 25 V
C203 thru 213	21-11015A07	.01 +80-20%
C701 thru 703	21-11015A07	.01 +80-20%
C704	21-11015B01	100 pF
C705	21-84493B02	22 pF ±5%; 50 V
C711	21-83406D44	47 pF ±5%; 50 V
C714	21-11015A07	.01 +80-20%
C723	21-11015A07	.01 +80-20% (30-50 MHz)
C724	21-11015B09	470 pF
C725	21-82204B64	75 pF ±5%; 50 V (30-50 MHz)
C726	21-82610C42	62 pF ±5%; 50 V (30-50 MHz)
C727	21-11014H41	47 pF ±5%
C728, 730	21-11015A07	.01 +80-20%
C729	21-11015B01	100 pF
C731	21-82355B62	1 pF ±0.25 pF; 50 V
C732, 733	21-11015A07	.01 +80-20%
C736	21-82204B29	43 pF ±3%; 50 V (30-36 MHz)
	21-83406D93	16 pF ±5%; 50 V (36-42 MHz)
C737, 738	21-11015A07	.01 +80-20%
		diode: (see note)
CR1, 2	48-80010E02	silcon
CR3	48-83329G02	silicon
CR4	48-82178A01	germanium
CR5	48-83654H01	silicon
CR6, 7	48-84616A04	hot carrier
CR8	48-83654H01	silicon
		light emitting diode: (see note)
DS1	48-88245C04	red
DS2	48-88245C06	green
		connector, receptacle:
J1, 2, 3	9-84968D01	female; single contact
J4, 5	28-82622L07	male; 8 contact
J6	28-82622L01	male; 3 contact
		coil, rf:
L3	24-82723H07	choke; 10 uH
L8	24-82723H07	choke; 10 uH
L9, 10	24-83961B01	3 turns
L13	24-82723H07	choke; 10 uH
L701	24-82723H07	choke; 10 uH
L702	24-80900A61	choke; 0.62 uH
L705	24-84972A15	variable; 4-1/2 turns (RED); 30-50 MHz
L708	24-82549D09	choke; 15 uH (30-50 MHz)
L709	24-82723H07	choke; 10 uH
L710	24-82723H03	choke; 23 uH
		transistor: (see note)
Q1	48-869548	PNP; type M9548
Q2	48-869643	PNP; type M9643
Q3, 4, 5	48-869642	NPN; type M9642
Q9, 10, 11, 12	48-869642	NPN; type M9642
Q13	48-869643	PNP; type M9643
Q14 thru 18	48-869642	NPN; type M9642
Q19, 20, 21	48-869570	NPN; type M9570
Q22	48-869642	NPN; type M9642
Q23, 24	48-869570	NPN; type M9570
Q25	48-869643	PNP; type M9643
Q26	48-869642	NPN; type M9642
Q30	48-869642	NPN; type M9642
Q31, 32	48-869643	PNP; type M9643
Q33, 34, 35	48-869642	NPN; type M9642
Q36	48-869570	NPN; type M9570
Q37	48-869571	PNP; type M9571
Q38, 39	48-869642	NPN; type M9642
Q40	48-869570	NPN; type M9570
Q41, 42	48-869643	PNP; type M9643
Q43	48-869642	NPN; type M9642
Q701	48-869570	NPN; type M9570
Q704	48-869534	NPN; type M9534
Q706	48-869570	NPN; type M9570
		resistor, fixed: ±5%; 1/4 W: unless otherwise stated
R9	6-11009A25	100
R10	6-11009A49	1k
R11	6-11009A97	100k
R12	6-11009A81	22k
R13, 14	6-11009A67	5.6k
R15	6-11009A55	1.8k
R16	6-11009A61	3.3k
R17	6-11009A57	2.2k
R18	6-11009A87	39k
R19	6-11009A57	2.2k
R20, 21	6-11009A49	1k
R22	6-11009A73	10k
R23	6-11009E81	22k
R24	6-11009A37	330
R25	6-84376L15	9090 ±0.5% (30-36 MHz)
	6-84376L14	8660 ±0.5% (36-42 MHz)
	6-84376L13	8450 ±0.5% (42-50 MHz)
R26	6-84376L15	9090 ±0.5% (30-36 MHz)
	6-84376L14	8660 ±0.5% (36-42 MHz)
	6-84376L13	8450 ±0.5% (42-50 MHz)
R27	6-11009E37	330
R39	6-11009A73	10k
R40	6-11009A89	47k
R40A	6-11009E89	47k
R41	6-11009E73	10k
R42 thru 51	6-11009A73	10k
R52	6-11009A39	390
R53	6-11009E59	2.7k
R54	6-11009E49	1k
R55	6-11009E25	100
R56	6-11009E82	24k
R57	6-11009E81	22k
R58	6-11009A49	1k
R59	6-11009E65	4.7k
R60, 61	6-11009A67	5.6k
R62	6-11009A43	560
R63	6-11009E73	10k
R64, 65	6-11009A73	10k
R66	6-11009A41	470
R67, 68	6-11009A29	150
R70, 71	6-11009A51	1.2k
R71A	6-11009A18	51
R72	6-11009A17	47
R73, 74	6-11009E87	39k
R75	6-11009E97	100k
R76	6-11009E99	120k
R77	6-11009E88	43k
R78	6-11009E64	4.3k
R79	6-11009E39	390
R80	6-11009E73	10k
R81	6-11009E77	15k
R82	6-11009A77	15k
R83, 84	6-11009A67	5.6k
R85	6-11009A57	2.2k
R86	6-11009A67	5.6k
R87	6-11009A89	47k
R88	6-11009A67	5.6k
R89	6-11009A89	47k
R90	6-11009A73	10k
R91, 92	6-11009E59	2.7k
R93, 94	6-11009E65	4.7k
R95	6-11009E57	2.2k
R96	6-11009E75	12k
R97	6-11009E66	5.1k
R98, 99, 100	6-11009A67	5.6k
R101	6-11009A49	1k
R103	6-11009A35	270
R104	6-11009A49	1k
R105	6-11009A65	4.7k
R106	6-11009A41	470
R107, 108	6-11009A67	5.6k
R109	6-11009A65	4.7k
R110	6-11009E45	680
R111	6-11009A29	150
R112	6-11009A39	390
R113	6-11009A33	220
R114	6-11009A01	10
R115	6-11009A56	2k
R116	6-11009A59	2.7k
R116A	6-11009A67	5.6k
R117, 118	6-11009E49	1k
R119	6-11009E73	10k
R120	6-11009F23	0 (resistor jumper)
R121	6-11009E49	1k
R122	6-11009F10	330k
R123	6-11009E87	39k
R125, 126	6-11009A89	47k
R127	6-11009A73	10k
R128	6-11009A89	47k
R129	6-11009A73	10k
R130	6-11009A89	47k
R131, 132	6-11009A73	10k
R133	6-11009B14	470k
R134 thru 136	6-11009A77	15k
R137	6-11009A84	30k
R138	6-11009A77	15k
R139	6-11009A91	56k
R140	6-11009A99	120k
R141	6-11009A67	5.6k
R142	6-11009A44	620
R143	6-11009A87	39k
R146	6-11009A65	4.7k
R147	6-11009A59	2.7k
R148	6-11009A89	47k
R149	6-11009A19	56
R150	6-11009E73	10k
R151	6-11009A73	10k
R152	6-11009E01	10
R153	6-11009E49	1k
R154	6-11009E23	82
R155	6-11009E71	8.2k
R156	6-11009E67	5.6k
R157	6-11009C18	51
R158	6-11009E73	10k
R159	6-11009E01	10
R160	6-11009E65	4.7k
R161, 162	6-11009E59	2.7k
R163	6-11009E33	220
R164, 165	6-11009E73	10k
R166, 167	6-11009E71	8.2k
R168	6-11009E91	56k
R169, 170	6-11009E67	5.6k
R171	6-11009E75	12k
R172	6-11009C72	9.1k
R173	6-11009E65	4.7k
R174	18-84143N06	variable; 50k
R175, 176, 177	18-84143N01	variable; 10k
R180	6-11009A97	100k
R208	6-11009E81	22k
R209	6-11009E51	1.2k
R210	6-11009E89	47k
R211	6-11009A73	10k
R212	6-11009A89	47k
R213	6-11009A65	4.7k
R214	6-11009A73	10k
R700	6-11009A57	2.2k
R701	6-11009A95	82k
R702	6-11009E75	12k
R703	6-11009A18	51
R704	6-11009A29	150
R710	6-11009A65	4.7k
R711	6-11009A53	1.5k
R712	6-11009A18	51
R713	6-11009A29	150
R719	6-11009E59	2.7k (30-50 MHz)
R720	6-124A34	240
R722	6-11009A49	1k
R723	6-11009A57	2.2k
R724, 725	6-11009A49	1k
R726	6-11009A61	3.3k
R727	6-11009A39	390
R728	6-11009A61	3.3k
R729	6-11009A73	10k
R730	6-11009A42	510
R731	6-11009A77	15k
R732	6-11009A53	1.5k
R733	6-11009E47	820
R734	6-11009A09	22
		thermistor:
RT600	6-858402	1k @25°C
		integrated circuit: (see note)
U1	51-84371K76	dual timer
U3 thru 8	51-82884L38	presettable ÷N counter
U9	51-84561L04	quad 2-input NAND gate
U10	51-84561L15	dual "D" flip-flop
U11	51-83627M11	quad 2-input NAND gate
U12	51-82848M23	quad 2-input exclusive OR gate
U13	51-84561L15	dual "D" flip-flop
U14, 15	51-84561L10	decade counter
U16	51-84371K37	dual 4-line to 1-line multiplexer
U17	51-82609M79	quad 2 exclusive OR gate
U18	51-80291B02	14.4 oscillator
U19, 20	51-84561L85	1 ÷ 12 counter
U21	51-83629M18	quad op amplifier
U22	51-83629M32	dual op amplifier
U23	51-82884L62	programmable timer
U601	51-84768F68	prescaler
U602	51-84768F63	programmable divider
U603	51-83977M36	sample and hold phase detector
U604	TRN5481A	ROM (Specify Customer Frequency)
U606	51-84371K74	quad comparator
U607	51-84371K94	quad 2-input OR gate
U609	51-83629M32	dual op amplifier
		non-referenced items
	3-134212	SCREW, tapping: 4-40 × 5/16"; 6 used
	9-84924E02	IC SOCKET; 16 pin
	9-84207B01	METERING TRAY; 7 pin
	26-84030N01	SHIELD, wall multiplier
	26-84031N01	SHIELD, wall binary modulator
	26-84032N01	SHIELD, component side loop filter
	26-84055N01	SHIELD, multi solder side multiplier
	26-84056N01	SHIELD, driver solder side divider
	26-84061N01	SHIELD, component side ref. amplifier
	26-84062N01	SHIELD, component side ref. loop
	26-84063N01	SHIELD, component side binary modulator
	26-84072N01	SHIELD, component side phase detector
	26-84093N01	SHIELD, solder side ampl.
	26-84094N01	SHIELD, solder side loop filter
	26-84095N01	SHIELD, solder side rf loop
	26-84248B01	SHIELD, can
	42-84284B01	RETAINER; 6 used
	29-80014A01	CLIP, coaxial; 3 used
	30-83794C01	CABLE, coaxial; WHT

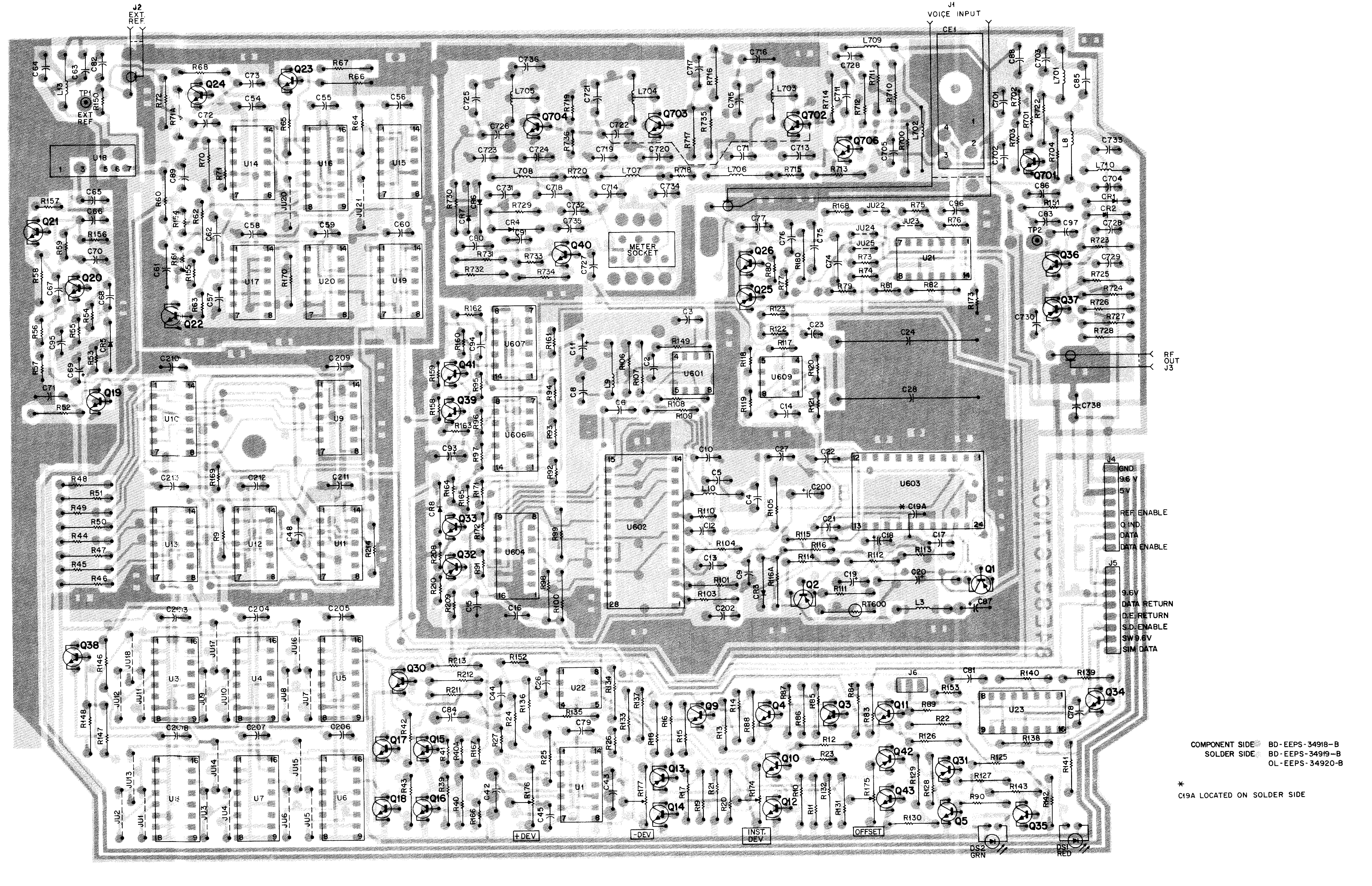
note: For optimum performance, diodes, transistors, and integrated circuits must be ordered by Motorola part numbers.

TRN5960A Synthesizer Hardware Kit (Delete HSO)
TRN9035A Synthesizer Hardware Kit (Multifrequency) — PL-8699-A

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
	3-134212	SCREW, tapping: 4-40 × 5/16"; 14 used
	1-80759D38	COVER, synthesizer bottom includes:
	15-83801N01	COVER, chassis bottom
	41-84811B01	SPRING
	42-84284B01	RETAINER; 14 used
	2-8364	NUT, hex: 3/8-32 x 1/2 x 3/32"
	2-132616	NUT, hex: 6-32 x 1/4 x 3/32 x 1/8"; 4 used
	3-9669	SCREW, machine: 8-32 x 3/8"; 6 used
	3-134185	SCREW, tapping: 6-32 x 1/4"; 6 used (TRN5960A only)
	3-134185	SCREW, tapping: 6-32 × 1/4"; 10 used (TRN9035A only)
	3-134309	SCREW, tapping: 4-40 x 3/16"; 2 used
	3-135502	SCREW, tapping: 4-40 x 5/8"; 2 used
	3-136850	SCREW, tapping: 6-32 x 1/2"; 6 used
	4-84152B01	WASHER, shoulder
	5-84500B03	EYE, special (TRN5960A only)
	7-83804N01	BRACKET, rack mounting; 2 used
	14-84268A01	INSULATOR, transistor
	26-83982N01	HEAT SINK
	27-83803N01	CHASSIS, main
	32-83978N01	GASKET
	32-82796H01	GASKET; 41" used
	32-83979N01	GASKET
	36-82630H01	KNOB, control
	43-10646A09	STANDOFF; 2 used
	43-83981N01	SPACER
	64-83061P01	ADAPTER, coax connector (TRN9035A only)
	75-82200H01	PAD (TRN9035A only)

note: Y1 not field servicable. Order entire kit if replacement is needed.

LOW, HIGH AND UHF BANDS SYNTHESIZER BOARD



COMPONENT SIDE BD-EEPS-34918-B
SOLDER SIDE BD-EEPS-34919-B
OL-EEPS-34920-B

C19A LOCATED ON SOLDER SIDE

SHOWN FROM COMPONENT SIDE

PAGING SYNTHESIZER

EEPS-34912-A

1. Unless otherwise indicated: resistor values are in ohms; capacitor values are in microfarads; and inductor values are in millihenries.
2. Integrated circuits on this board are TTL & CMOS devices.
3. IC types and connections for this board are as follows:

Reference Designation	Type	VCC	Gnd	Mfgr's Description
U1	71K76	14	7	Dual Timer
U3, 4, 5, 6, 7, 8	84L38	16	8	Presettable – N Counter
U9	61L04	14	7	Quad 2-Input NAND Gate
U10	61L15	14	7	Dual D Flip-Flop
U11	27M11	14	7	Quad 2-Input NAND Gate
U12	48M23	14	7	Quad 2-Input Exclusive OR Gate
U13	61L15	14	7	Dual D Flip-Flop
U14, 15	61L10	5		Decade Counter
U16	71K37	16	8	Dual 4-Input Multiplexer
U17	09M79	14	7	Quad 2 Exclusive OR Gate
U18	91B02	—	—	14.4 Osc
U19, 20	61L85	5	6, 7, 10	One – 12 Counter
U21	29M81	4	11	Quad Op Amp
U22	29M32	8	4	Dual Op Amp
U23	84L62	16	8	Programmable Timer
U601	68F68	—	4	– 3 – 4 Prescaler
U602	68F63	10	4	Prog Divider
U603	68F59	18	16	Sample & Hold Phase Det.
U604	89L03	16	8	ROM
U606	71K74	3	12	Quad Comparator
U607	71K94	14	7	Quad 2-Input OR Gate
U609	29M32	14	7	Dual Op Amp

4.

JU21	JU20	External Reference
IN	IN	5 MHz
OUT	IN	10 MHz
IN	OUT	1 MHz
OUT	OUT	100 kHz

5. Set the meter selection switch to positon D for multiplier tuning.

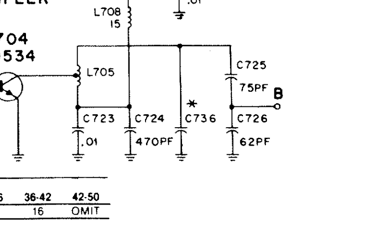
6.

Band	C80
30-50 MHz	.001
All Others	47 pF

7.

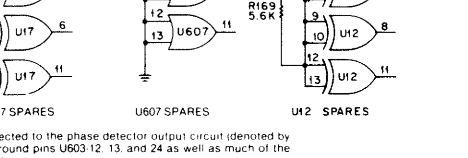
Band (MHz)	C42	C43	R25	R26
30-36	4000	4000	9090	9090
36-42	3900	3900	8660	8660
42-50	4700	4700	8450	8450
VHF 150-174 UHF 450-512 900	3900	3900	9090	9090
UHF 406-420	5000	5000	7680	7680
VHF 132-150	5000	5000	7680	7680

8. C19A is mounted on solder side of board
9. Dashed line is a wire jumper in place for low band operation.
10. For Low Band, connect this circuit between points "A" & "B"



Freq. (MHz)	30-36	36-42	42-50
* C736	43	16	OMIT

11.



12. Foil shields connected to the phase detector output circuit (denoted by dashed lines) surround pins U603-12, 13, and 24 as well as much of the adaptive filter section.

13. JUMPER TABLE

	Jumpers Used
Low Band — 30-36 MHz	JU5, 7, 15, 16, 22, 24
Low Band — 36-42 MHz	JU6, 8, 15, 16, 22, 24
Low Band — 42-50 MHz	JU6, 8, 15, 16, 22, 24
High Band — 136-174 MHz	JU3, 6, 8, 9, 14, 17, 23, 25
UHF Band — 450-512 MHz	JU1, 4, 6, 8, 10, 11, 13, 18, 23, 25
900 MHz Band	JU2, 3, 4, 6, 8, 10, 12, 13, 18, 23, 25
VHF Band — 132-150 MHz	JU3, 5, 7, 9, 14, 17, 23, 25
UHF Band — 406-420 MHz	JU1, 4, 5, 7, 10, 11, 13, 18, 23, 25

14. COMPONENT USAGE TABLE

Band	R137	R134	R700	R120	C23	C77	R180
30-50 MHz	30k	15k	2.2k	0	1 uF	47 uF	100k
150-174 MHz	30k	15k	2.2k	11k	1 uF	47 uF	100k
450-512 MHz	68k	15k	2.2k	100k	1 uF	47 uF	100k
928-960 MHz	68k	7.5k	680	100k	0.47 uF	0.1 uF	220k
132-150 MHz	51k	15k	2.2k	11k	1 uF	47 uF	100k
406-420 MHz	68k	15k	2.2k	100k	1 uF	47 uF	100k

Band	R75	R121	C715	C716	C721	C722	C725	C726
30-50 MHz	100k	1k	—	—	—	—	75 pF	62 pF
150-174 MHz	100k	1k	120 pF	62 pF	100 pF	47 pF	16 pF	11 pF
450-512 MHz	100k	1k	120 pF	62 pF	100 pF	47 pF	16 pF	11 pF
928-960 MHz	62k	680	120 pF	62 pF	100 pF	47 pF	16 pF	11 pF
132-150 MHz	100k	1k	150 pF	100 pF	120 pF	68 pF	20 pF	13 pF
406-420 MHz	100k	1k	150 pF	100 pF	120 pF	68 pF	20 pF	13 pF

Schematic Diagram
Circuit Board Detail, and Parts List
Motorola No. ***PEPS-34989-D***
(Sheet 2 of 3)
7/31/86-PHI

PAGING SYNTHESIZER

parts list

TLD9332A Synthesizer Board: 132-150 MHz
TLD9333A Synthesizer Board: 150-174 MHz
TLE5491A Synthesizer Board: 406-420 MHz
TLE5493A Synthesizer Board: 450-512 MHz
TLF6582A Synthesizer Board: 928-960 MHz

PL-8091-B

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		capacitor, fixed: uF ± 10%; 100 V: unless otherwise stated
C2	21-11014H32	20 pF ±5%; 50 V
C3	21-11015A07	.01 +80-20%; 100 V
C4	21-11014H32	20 pF ±5%; 50 V
C5	21-11015B05	220 pF
C6	21-82187B44	1000 pF
C8	21-11014H32	20 pF ±5%; 50 V
C9	21-11015B05	220 pF
C10	8-11017B17	0.1; 50 V
C11	23-11013F10	0.56; 35 V
C12	21-11015B05	220 pF
C13	8-11017B17	0.1; 50 V
C14	21-11015A07	.01 +80-20%
C15	21-11015B05	220 pF ±5%
C16	21-11015A07	.01 +80-20%
C17	8-11017B07	.0068; 50 V
C18	23-11013D55	4.7 ±20%; 20 V
C19	23-84538G06	4.7 ±20%; 20 V
C19A	21-11015B01	100 pF
C20	8-80027B06	.0039 ±5%
C21	8-11017B06	.0047 50 V
C22	8-11017B01	.001; 50 V
C23	23-84538G14	1; 35 V
	or 23-84762H14	0.47 (928-960 MHz)
C24	8-80026B04	5; 50 V
C26	21-11015A07	.01 +80-20%
C27	21-11015B01	100 pF
C28	8-80026B04	5; 50 V
C30	23-84538G05	10.0 (928-960 MHz)
C40	21-11015A07	.01 (928-960 MHz)
C42, 43	21-82537B49	3900 pF ±1% (150-174 MHz, 450-512 MHz)
	or 21-82537B45	3900 pF ±5% (132-150 MHz, 406-420 MHz)
C44, 45	21-11015A07	.01 +80-20%
C48	21-11014H44	62 pF ±5%
C54 thru 56	21-11015A07	.01 +80-20%
C57	23-84538G04	15
C58, 59, 60	21-11015A07	.01 +80-20%
C61, 62	21-82372C09	0.1 +80-20%; 25 V
C63	23-84538G04	15
C64 thru 68	8-11015A07	.01 +80-20%
C69	23-11013D55	4.7 ±20%; 20 V
C70 thru 73	21-11015A07	.01 +80-20%
C74	8-83813H23	.068 ±5%; 50 V
C75	8-83813H37	.0068 ±5%
C76	21-84426B45	665 pF ±5%; 500 V
C77	23-84538G29	47 ±20%; 10 V
	or 23-84538G03	10 (928-960 MHz)
C78, 79	21-11015A07	.01 +80-20%
C80	21-11014H41	47 pF ±5%
C81	8-82905G03	.01 +80-20%; 50 V
C82, 83	21-11015A07	.01 +80-20%
C84	23-84538G29	47 ±20%; 10 V
C85, 86	21-84494B29	10 pF ±5%; 500 V
C87, 88	23-84538G29	47 ±20%; 10 V
C89	21-11015A07	.01 +80-20%
C91	21-11015A07	.01 +80-20%
C93	23-84538G29	47 ±20%; 10 V
C94, 95	21-11015A07	.01 +80-20%
C96	8-11017B01	.001; 50 V
C97	21-11015A07	.01 +80-20%
C98	21-11015A07	0.001 (928-960 MHz)
C200	23-84538G06	47 ±20%; 20 V
C202	21-82372C04	.05 +80-20%; 25 V
C203 thru 213	21-11015A07	.01 +80-20%
C701 thru 703	21-11015A07	.01 +80-20% (see note)
C704	21-11015B01	100
C705	21-84493B02	22 pF ±5%; 50 V
C711	21-83406D44	47 pF ±5%; 50 V
C712	21-11015A07	.01 +80-20%
C713	21-11015B09	470 pF
C714	21-11015A07	.01 +80-20%
C715	21-82610C09	120 pF (150-174 MHz, 450-512 MHz, 928-960 MHz)
	or 21-82610C70	150 pF ±5% NPO, (132-150 MHz, 406-420 MHz)
C716	21-82610C42	62 pF ±5%; 50 V (150-174 MHz, 450-512 MHz, 928-960 MHz)
	or 21-82610C44	100 pF ±5% N220, (132-150 MHz, 406-420 MHz)
C717	21-84493B02	22 ±5%; 50 V
C718, 719	21-11014H41	47 pF ±5%
C720	21-83596E13	.001; 500 V
C721	21-82610C44	100 pF ±5%; 50 V (150-174 MHz, 450-512 MHz, 928-960 MHz)
	or 21-82610C09	120 pF, ±5% N220, (132-150 MHz, 406-420 MHz)
C722	21-82610C03	47 pF ±5%, 200 V (150-174 MHz, 450-512 MHz, 928-960 MHz)
	or 21-82610C30	68 pF, ±5% N330, (132-150 MHz, 406-420 MHz)
C723	21-11014H25	10 pF ±0.5 pF

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
C724	21-11015B09	470 pF
C725	21-83406D93	16 pF ±5%; 50 V (150-174 MHz, 450-512 MHz, 928-960 MHz)
	or 21-83406D81	20 pF ±5% NPO, (132-150 MHz, 406-420 MHz)
C726	21-83406D90	11 pF ±5%; 50 V (150-174 MHz, 450-512 MHz, 928-960 MHz)
	or 21-83406D57	13 pF ±5% NPO, (132-150 MHz, 406-420 MHz)
C727	21-11014H41	47 pF ±5%
C728, 730	21-11015A07	.01 +80-20%
C729	21-11015B01	100 pF
C731	21-82355B62	1 pF ±0.25 pF; 50 V
C732, 733	21-11015A07	.01 +80-20%
C734, 735	21-11015A07	.01 +80-20%
C737, 738	21-11015A07	.01 +80-20%
C740	23-84538G06	47 ±20%; 20 V
		diode: (see note)
CR1, 2	48-80010B02	silicon
CR3	48-83239G02	silicon
CR4	48-82178A01	germanium
CR5	48-83654H01	silicon
CR6, 7	48-84616A04	hot carrier
CR8	48-83654H01	silicon
		light emitting diode: (see note)
DS1	48-88245C04	red
DS2	48-88245C06	green
		connector, receptacle:
J1, 2, 3	9-84968D01	female: single contact
J4, 5	28-82622L07	male: 8 contact
J6	28-82622L01	male: 3 contact
		coil, rf:
L3	24-82723H07	choke: 10 uH
L8	24-82723H07	choke: 10 uH
L9, 10	24-83961B01	3 turns
L13	24-82723H07	choke: 10 uH
L701	24-82723H07	choke: 10 uH (not used for 928-960 MHz)
L702	24-80900A61	choke: 0.62 uH
L703	24-84972A15	tunable: 4-11/12 turns (RED)
L704	24-83857G08	tunable: 3-1/12 turns (VIO)
L705	24-83857G09	variable: 3-1/12 turns (VIO)
L706	24-82549D09	choke: 15 uH
L707, 708	24-82355G08	choke: 2.6 uH
L709	24-82723H07	choke: 10 uH
L710	24-82723H03	choke: 23 uH
		transistor: (see note)
Q1	48-869548	PNP: type M9548
Q2, 38	48-869643	PNP: type M9643
Q3, 4, 5	48-869642	NPN: type M9642
Q9, 10, 11, 12	48-869642	NPN: type M9642
Q13	48-869643	PNP: type M9643
Q14 thru 18	48-869642	NPN: type M9642
Q19, 20, 21	48-869570	NPN: type M9570
Q22	48-869642	NPN: type M9642
Q23, 24	48-869570	NPN: type M9570
Q25	48-869643	PNP: type M9643
Q26	48-869642	NPN: type M9642
Q30	48-869642	NPN: type M9642
Q31, 32	48-869643	PNP: type M9643
Q33, 34, 35	48-869642	NPN: type M9642
Q36	48-869570	NPN: type M9570
Q37	48-869571	PNP: type M9571
Q38, 39	48-869642	NPN: type M9642
Q40	48-869570	NPN: type M9570
Q41, 42	48-869643	PNP: type M9643
Q43	48-869642	NPN: type M9642
Q701	48-869570	NPN: type M9570 (not used for 928-960 MHz)
Q702, 703	48869534	NPN: type M9534
Q704	48-869534	NPN: type M9534
Q706	48-869570	NPN: type M9570
		resistor, fixed: ± 5%; 1/4 W: unless otherwise stated
R9	6-11009A25	100
R10	6-11009A49	1k
R11	6-11009A03	100k
R12	6-11009A81	22k
R13, 14	6-11009A67	5.6k
R15	6-11009A55	1.8k
R16	6-11009A61	3.3k
R17	6-11009A57	2.2k
R18	6-11009A87	39k
R19	6-11009A57	2.2k
R20, 21	6-11009A49	1k
R22	6-11009A73	10k

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
R23	6-11009E61	22k
R24	6-11009A37	330
R25, 26	6-84376L15	9090 ±0.5% (150-174 MHz, 450-512 MHz, 928-960 MHz)
	or 6-84376L09	7.68k ±0.5% (132-150 MHz, 406-420 MHz)
R27	6-11009E37	330
R39	6-11009A73	10k
R40	6-11009A89	47k
R40A	6-11009E69	47k
R41	6-11009E73	10k
R42 thru 51	6-11009A73	10k
R52	6-11009A39	390
R53	6-11009E59	2.7k
R54	6-11009A49	1k
R55	6-11009E25	100
R56	6-11009E62	24k
R57	6-11009E81	22k
R58	6-11009A49	1k
R59	6-11009E65	4.7k
R60, 61	6-11009A83	5.6k
R62	6-11009A43	560
R63	6-11009E71	10k
R64, 65	6-11009A73	10k
R66	6-11009A41	470
R67, 68	6-11009A59	150
R70, 71	6-11009A51	1.2k
R71A	6-11009A69	51
R72	6-11009A17	47
R73, 74	6-11009E67	39k
R75	6-11009E97	100k (132-174 MHz, 406-512 MHz)
	or 6-11009E92	82k (928-960 MHz)
R76	6-11009E99	120k
R77	6-11009E49	43k
R78	6-11009E64	4.3k
R79	6-11009E39	390
R80	6-11009E73	10k
R81	6-11009E77	15k
R82	6-11009A77	15k
R83, 84	6-11009A67	5.6k
R85	6-11009A57	2.2k
R86	6-11009A37	5.6k
R87	6-11009A69	47k
R88	6-11009A67	5.6k
R89	6-11009A39	390
R90	6-11009A73	10k
	or 6-11009E73	10k (928-960 MHz)
R91, 92	6-11009E59	2.7k
R93, 94	6-11009E65	4.7k
R95	6-11009E57	2.2k
R96	6-11009E75	12k
R97	6-11009E66	5.1k
R99, 99, 100	6-11009A67	5.6k
R101	6-11009A49	1k
R103	6-11009A35	270
R104	6-11009A49	1k
R105	6-11009A65	4.7k
R106	6-11009A41	470
R107, 108	6-11009A67	5.6k
R109	6-11009A65	4.7k
R110	6-11009E15	680
R111	6-11009A57	150
R112	6-11009A39	390
R113	6-11009A33	220
R114	6-11009A01	10
R115	6-11009A56	2k
R116	6-11009A59	2.7k
R116A	6-11009A67	5.6k
R117, 118	6-11009E49	43k
R119	6-11009E73	10k
R120	6-11009B23	82
R121	6-11009E49	1k
	or 6-11009E49	680 (825-960 MHz)
R122	6-11009F10	330k
R123	6-11009E87	33k
R125, 126	6-11009A69	47k
R127	6-11009A73	10k
R128	6-11009A89	47k
R129	6-11009A73	10k
R130	6-11009A89	47k
	or 6-11009E89	47k (928-960 MHz)
R131, 132	6-11009A73	10k
R133	6-11009B14	470k
R134	6-11009A77	15k (132-174 MHz, 406-512 MHz)
	or 6-11009A70	7.5k (928-960 MHz)
R135, 136	6-11009A77	15k
R137	6-11009A84	30k (150-174 MHz)
	or 6-11009A90	51k (132-150 MHz)
	or 6-11009A93	68k (406-512 MHz, 928-960 MHz)
R138	6-11009A77	15k
R139	6-11009A91	56k
R140	6-11009A99	120k

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
R141	6-11009A67	5.6k
R142	6-11009A44	620
R143	6-11009A87	39k
R146	6-11009A65	4.7k
R147	6-11009A59	2.7k
R148	6-11009A69	47k
R149	6-11009A19	56
R150	6-11009E73	10k
R151	6-11009A73	10k
R152	6-11009E01	10
R153	6-11009E49	1k
R154	6-11009E23	82
R155	6-11009E71	8.2k
R156	6-11009E67	5.6k
R157	6-11009C18	51
R158	6-11009E73	10k
R159	6-11009E59	10
R160	6-11009E65	4.7k
R161, 162	6-11009E59	2.7k
R163	6-11009E33	220
R164, 165	6-11009E73	10k
R166, 167	6-11009E71	8.2k
R168	6-11009E91	56k
R169, 170	6-11009E67	5.6k
R171	6-11009E75	12k
R172	6-11009C72	9.1k
R173	6-11009E65	4.7k
R174	18-84143N06	variable: 50k
R175, 176, 177	18-84143N01	variable: 10k
R180	6-11009A97	100k
	or 6-11009B06	220k (928-960 MHz)
R208	6-11009E81	22k
R209	6-11009E51	1.2k
R210	6-11009E69	47k
R211	6-11009A73	10k
R212	6-11009A89	47k
R213	6-11009A65	4.7k
R214	6-11009A73	10k
R700	6-11009A57	2.2k
	or 6-11009A45	680 (928-960 MHz)
R701	6-11009A95	82k (not used for 928-960 MHz)
R702	6-11009E75	12k (not used for 928-960 MHz)
R703	6-11009A19	51 (not used for 928-960 MHz)
R704	6-11009A29	150 (not used for 928-960 MHz)
R710	6-11009A65	4.7k
R711	6-11009A53	1.5k
R712	6-11009A19	51
R713	6-11009A29	150
R714	6-11009A59	2.7k
R715	6-1124A34	240
R716	6-11009A49	1k
R717	6-11009A59	2.7k
R718	6-1124A34	240
R719	6-11009E49	1k
R720	6-1124A34	240
R722	6-11009A49	1k (not used for 928-960 MHz)
R723	6-11009A57	2.2k
R724, 725	6-11009A49	1k
R726	6-11009A61	3.3k
R727	6-11009A39	390
R728	6-11009A61	3.3k
R729	6-11009A73	10k
R730	6-11009A42	510
R731	6-11009A77	15k
R732	6-11009A53	1.5k
R733	6-11009E47	820
R734	6-11009A29	22
R735	6-11009A85	33k
R736	6-11009E77	15k
R737	6-11009E35	270 (928-960 MHz only)
R600	6-858402	**thermistor:** 1k @ 25°C
		integrated circuit: (see note)
U1	51-84371K76	dual timer
U3 thru 8	51-82844L38	presettable ÷N counter
U9	51-84561L04	quad 2-input NAND gate
U10	51-84561L15	dual "D" flip-flop
U11	51-83627M11	quad 2-input NAND gate
U12	51-82848M23	quad 2-input exclusive OR gate
U13	51-84561L15	dual "D" flip-flop
U14, 15	51-84561L10	decade counter
U16	51-84371K37	dual 4-line to 1-line multiplexer
U17	51-82609M79	quad 2 exclusive OR gate
U18	51-80291B02	14.4 oscillator

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
U19, 20	51-84561L85	1 ÷ 12 counter
U21	51-83629M16	quad op amplifier
U22	51-83629M32	dual op amplifier
U23	51-82844L62	programmable timer
U601	51-84768F68	prescaler
U602	51-84768F63	programmable divider
U603	51-83977M36	sample and hold phase detector
U604	TRN5491A	ROM (Specify Customer Frequency
U606	51-84371K74	quad comparator
U607	51-84371K94	quad 2-input OR gate
U609	51-83629M32	dual op amplifier

non-referenced items		
	3-134212	SCREW, tapping, 4-40 .16 .15 .5 16° 6 used
	9-84924E02	IC SOCKET, 16 pin
	9-84207B01	METERING PLUG, 7 pin
	26-84030N01	SHIELD, wall multiplier
	26-84031N01	SHIELD, wall binary modulator
	26-84032N01	SHIELD, component side loop filter
	26-84055N01	SHIELD, multi solder side multiplier
	26-84056N01	SHIELD, driver solder side divider
	26-84061N01	SHIELD, component side ref. amplifier
	26-84062N01	SHIELD, component side ref. loop
	26-84063N01	SHIELD, component side binary modulator
	26-84072N01	SHIELD, component side phase detector
	26-84093N01	SHIELD, solder side ampl
	26-84094N01	SHIELD, solder side loop filter
	26-84095N01	SHIELD, solder side rf loop
	26-84248B01	SHIELD, can: 3 used
	42-84248B01	RETAINER, E-shield
	29-80014A01	CLIP, coaxial: 3 used
	30-83794C01	CABLE, coaxial: WHT

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

C702, C703 not used for 928-960 MHz.

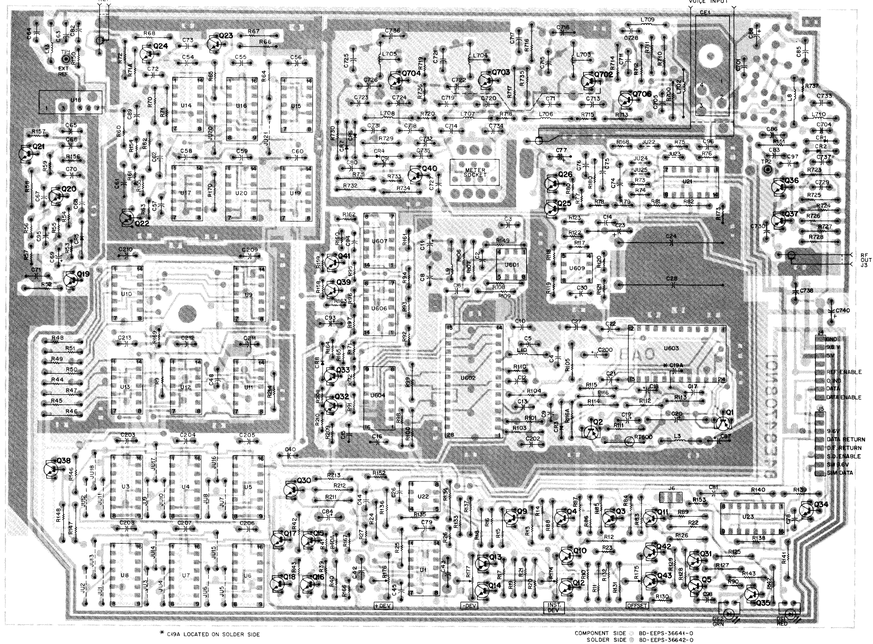
TRN9756A Synthesizer Hardware Kit — PL-9677-O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		crystal: (see note)
Y1	48-82437P01	oscillator
		mechanical parts
	2-8362	NUT, 4-40 × 1/4 × 3/32", 2 used
	2-8364	NUT, 3/8-32 × 1/2 × 3/32"
	2-132616	NUT, 6-32 × 1/4 × 3/32 × 1/8", 4 used
	3-9669	SCREW, machine, 8-32 × 3/8", 6 used
	3-134185	SCREW, tapping, 6-32 × 1/4", 10 used
	3-134212	SCREW, tapping, 4-40 × 3/16", 16 used
	3-134309	SCREW, tapping, 4-40 × 3/16", 2 used
	3-135502	SCREW, tapping, 4-40 × 5/8", 2 used
	3-136850	SCREW, tapping, 6-32 × 1/2", 6 used
	7-8247H01	BRACKET, HSO mounting
	7-83604N01	BRACKET, rack mounting: 2 used
	14-84210A01	INSULATOR, transistor: 2 used
	26-83982N01	HEATSINK
	32-8279EH01	GASKET, 41" used
	32-83979N01	GASKET
	32-83979N01	GASKET
	42-10212A02	TIE WRAP, 2" used
	36-82630H01	KNOB, control
	37-12706	GROMMET, rubber
	42-84284B01	RETAINER, 14 used
	43-10646A09	STANDOFF, 4-40 × .188", 2 used
	43-83981N01	SPACER
	54-83262P01	LABEL, HSO adj torque
	64-83061P01	PLATE, coax connector adapter
	75-82200H01	PAD
	15-83801N01	COVER, bottom
	41-84811B01	SPRING
	29-83883C02	LUG, crimp terminal: 2 used

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

Schematic Diagram
Circuit Board Detail, and Parts List
Motorola No. PEPS-34989-D
(Sheet 3 of 3)
7/31/86-PHI

900 MHZ SYNTHESIZER BOARD



* C99A LOCATED ON SOLDER SIDE

SHOWN FROM COMPONENT SIDE

COMPONENT SIDE ⓒ 8D-EEPS-36641-O
SOLDER SIDE ⓑ 8D-EEPS-36642-O
Ⓞ-EEPS-36643-O

MOTOROLA INC.
Communications
Sector

JUMPER AND CABLE CONNECTIONS
FOR TDN6869A/70M MODEMS

1. GENERAL

Before either of these modems can be used, certain jumpers within the modem must be placed in the proper position to ensure correct operation with the paging station.

2. JUMPER POSITIONING

Remove the housing from the modem and position the jumpers as follows:

Jumper	Position
Carrier Detect Level	-30 dBm Level
Carrier Detect Delay	6 msec. Option
4-Wire/2-Wire Operation	4-Wire Only

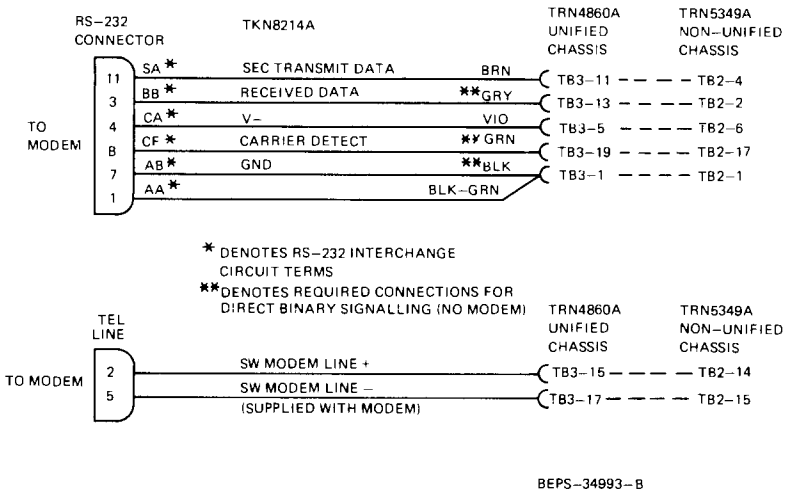
Reinstall the modem housing.

3. CABLE CONNECTIONS

Refer to schematic diagram PEPS-35122 for information on how to connect the two cables supplied.

4. MODEM OPERATION

The front panel rotary switch must be in the DATA position, and the rear panel power switch placed in the ON position for proper operation of the modem. Refer to the separately supplied modem instruction manual for further information.



parts list

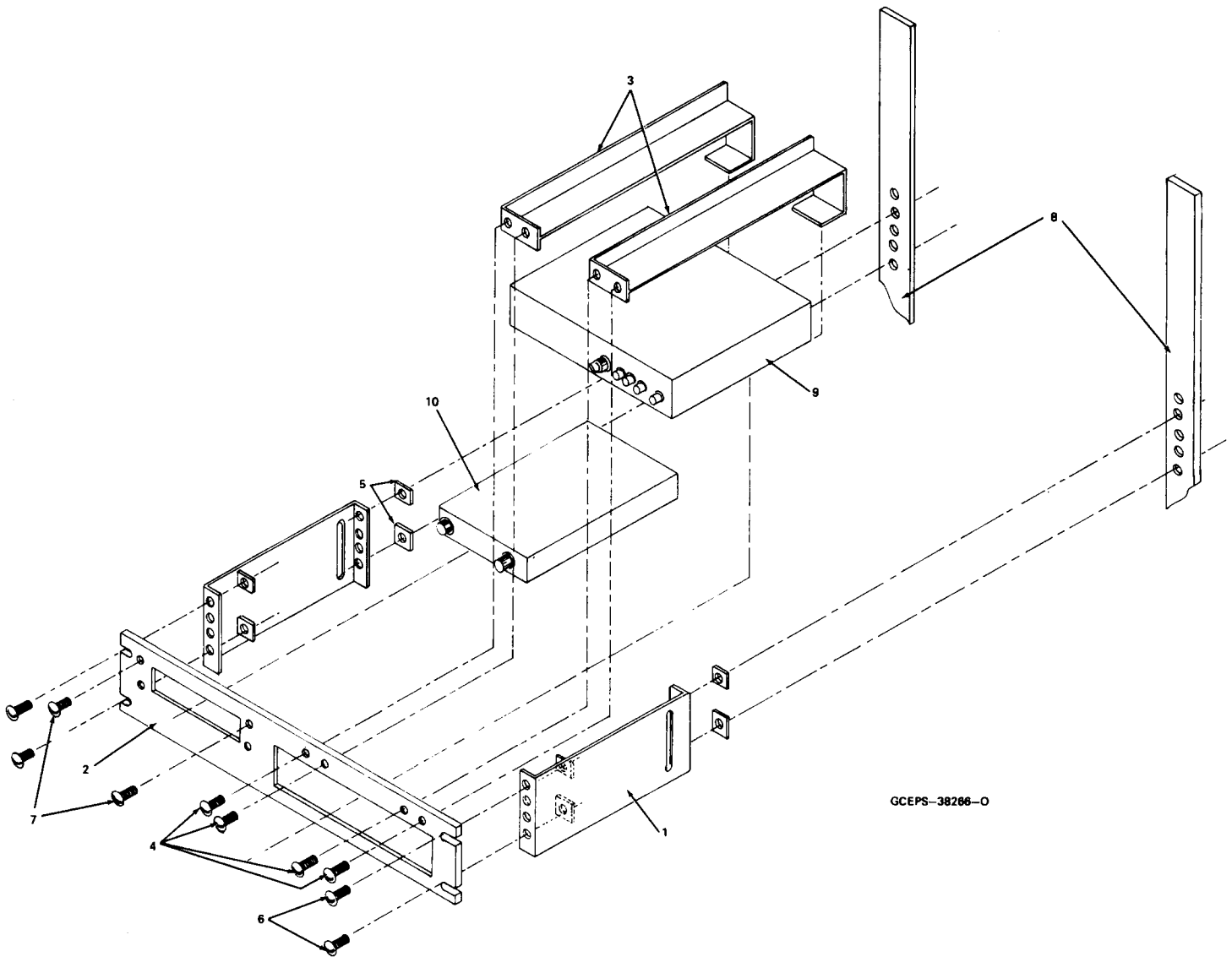
TKN8214A Modem Cable PL-8135-B

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		connector, plug:
	28-84506E01	male; 25-contact
		mechanical parts
	14-84502E01	HOOD, contact
	29-83883C02	LUG, crimp terminal; 5 used
	29-84078B01	LUG, flanged spade
	15-82486M04	HOUSING, cable
	15-84256L03	HOUSING, connector
	39-10184A70	CONTACT, male; 6 used

TKN8214A Modem Cable
Parts List
*Motorola No., **PEPS-35122-B***
9/27/86-PHI

MOTOROLA INC.
Communications
Sector

MODEM AND DELAY LINE HARDWARE
MODEL TRN9042A



technical writing services
1301 E. Algonquin Road, Schaumburg, IL 60196

68P81114E96-A
9/27/86-PHI

On Models	Mount Unit in Rack Hole Numbers
C71J2B, C73J2B, C64J2B, B84J2B, B91J2B, B93J2B	3 and 6 from bottom
C75J2B	15 and 18 from bottom
C71J2B with C180 option C73J2B with C180 option C64J2B with C180 option	72 and 75 from top
B91J2B with U27 option B93J2B with U27 option	1 and 4 from bottom
C75J2B with C308	28 and 31 from bottom

parts list

TRN9042A Modem and Delay Line Hardware PL-8842-A

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
1	7-83000P01	BRACKET; 2 used
2	64-82987P01	PANEL, front
3	64-82987P02	PANEL, bracket; 2 used
4	3-139999	SCREW, tapping; 6-19 × 3/8"; 4 used
5	2-84410P04	NUT, speed; 8 used
6	3-135038	SCREW, tapping; 14-14 × 3/8"; 8 used
7	3-124074	SCREW, tapping; 8-32 × 1/2"; 2 used
8	—	STATION RACK (for reference only)
9	—	MODEM (for reference only)
10	—	DELAY LINE (for reference only)

MOTOROLA INC.
Communications
Sector

WATTMETER OPTIONS

C47AD; 0-150 WATTS/25-1000 MHz
C47AE; 0-400 WATTS/25-525 MHz

1. FUNCTIONAL DESCRIPTION

The C47AD/AE/AF/AG Wattmeter Options provide built-in metering of the transmitter forward and reverse power levels.

2. OPERATING INSTRUCTIONS

Select the desired power level and direction. Read the sampled power level from the meter. High power readings are 0-150 watts, 0-400 watts, or 0-40 watts. Low power readings are 0-25 watts, 0-50 watts or 0-5 watts respectively. The meter functions are listed in the table shown in Figure 1.

NOTE

The meter should be in the OFF position when it is not in use. Do not select low power settings when measuring power levels greater than 25 watts (5 watts for C47AF/AG). The power meter may falsely indicate high reflected power due to directivity in the wattmeter element.

3. RF POWER METER ADJUSTMENT

Step 1. Key the station into a wattmeter and a 50-ohm load with rated station output power.

Step 2. Set meter to FWD-HIGH position.

Step 3. Adjust R1 until it agrees with the wattmeter reading.

Step 4. Reverse the cable connections on the directional coupler.

Step 5. Reduce the power on the station to low power for a full scale reading.

Step 6. Put the meter switch in the REV-LOW position.

Step 7. Adjust R7 on the power meter until it agrees with the wattmeter reading.

Step 8. Dekey the station and return all PA cables and the antenna.

4. DIRECTIONAL COUPLER KIT

4.1 FUNCTIONAL OPERATION

The directional coupler kit (wattmeter element) samples both forward and reflected power outputs of the final power amplifier. Two dc voltages are applied to the rf power meter and main interconnect board. The rf power meter uses these dc voltages to indicate forward and reflected rf power for the station. The dc voltages at the main interconnect board are routed to the optional alarm logic module. This module uses these voltages to indicate station status for possible alarm conditions.

4.2 MAINTENANCE AND TROUBLESHOOTING

The wattmeter element cannot be repaired since it contains hybrid circuitry. Consequently, the entire unit should be replaced if a fault is indicated by the following test procedure (refer to Figure 2).

Step 1. Disconnect the antenna cable and connect a wattmeter and 50-ohm load to the antenna connector.

Step 2. Key the station. RF power from final power amplifier passes through the wattmeter element to a wattmeter and a 50-ohm load. Verify the FWD-to-REF voltage (forward power) and the REV-to-REF voltage (reverse power) conform to those shown in Figure 3.

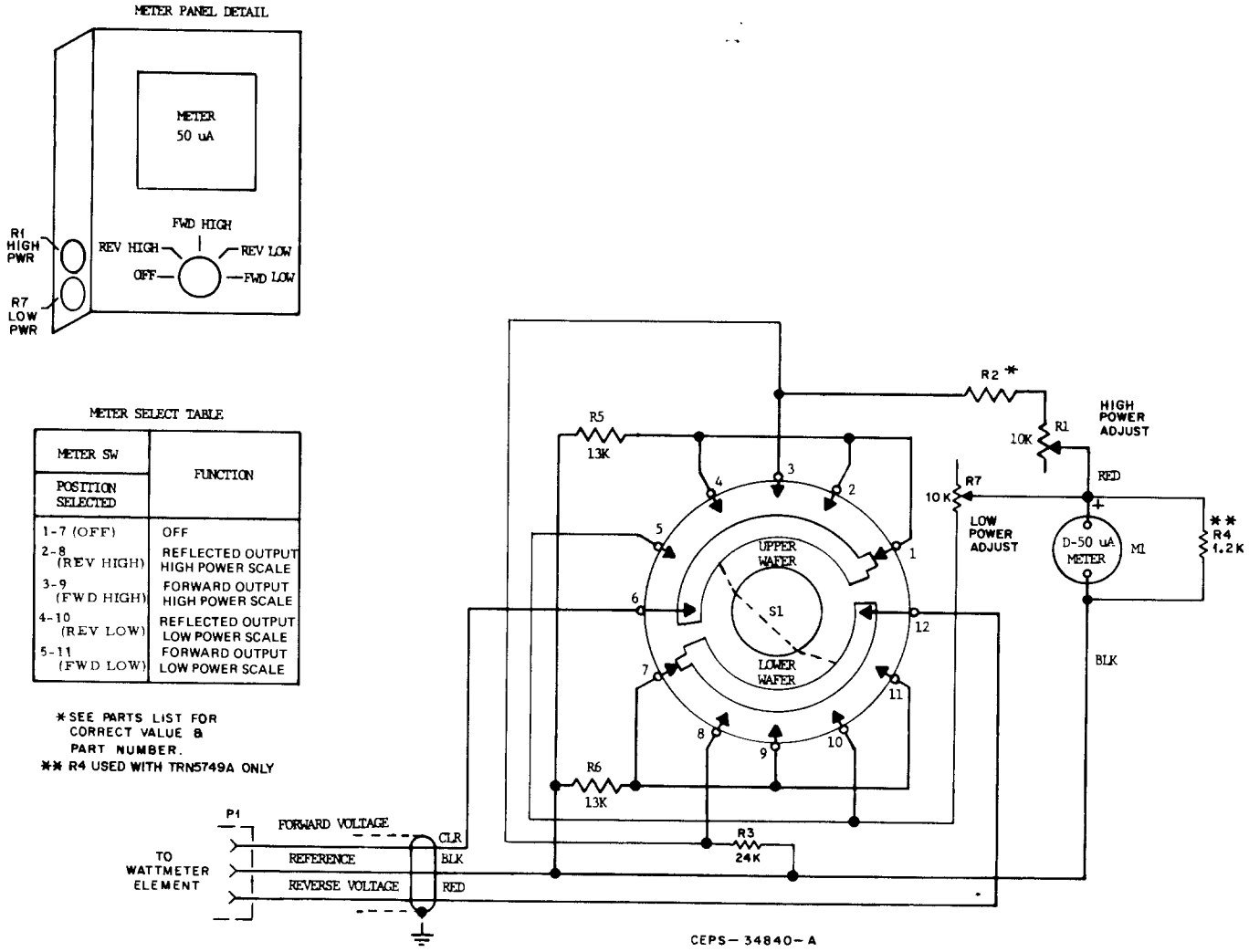


Figure 1. RF Power Meter Diagram, Meter Panel Detail & Meter Select Table

NOTE

The TTN6067A, 68A, 69A, & 70A Directional Coupler Kits are checked at 50 W input (50/100 W line on Figure 3). The TTN6071A, 72A, & 73A Directional Coupler Kits are checked at 100 W input (50/100 W line on Figure 3). The C47AF option (TRN5623A) is checked at 10 W (50/100 W line on Fig. 3). The C47AG option (TRN5749A) is checked at 5 W (50/100 W line on Fig. 3).

Step 3. Dekey the station and replace the wattmeter element if such readings cannot be obtained.

Step 4. Repeat the procedure to ascertain that the new element is in good working condition. Dekey the station.

NOTE

The wattmeter element may falsely generate a reflected power voltage due to directivity in the element. Meter accuracy is 10% of the high full-scale deflection.

Step 5. Reduce RF power to 15 to 25 watts (5.0 watts for C47AF, 2.5 W for C47AG). Repeat Steps 2 through 4.

Step 6. Dekey the station and reconnect all cables in their proper order.

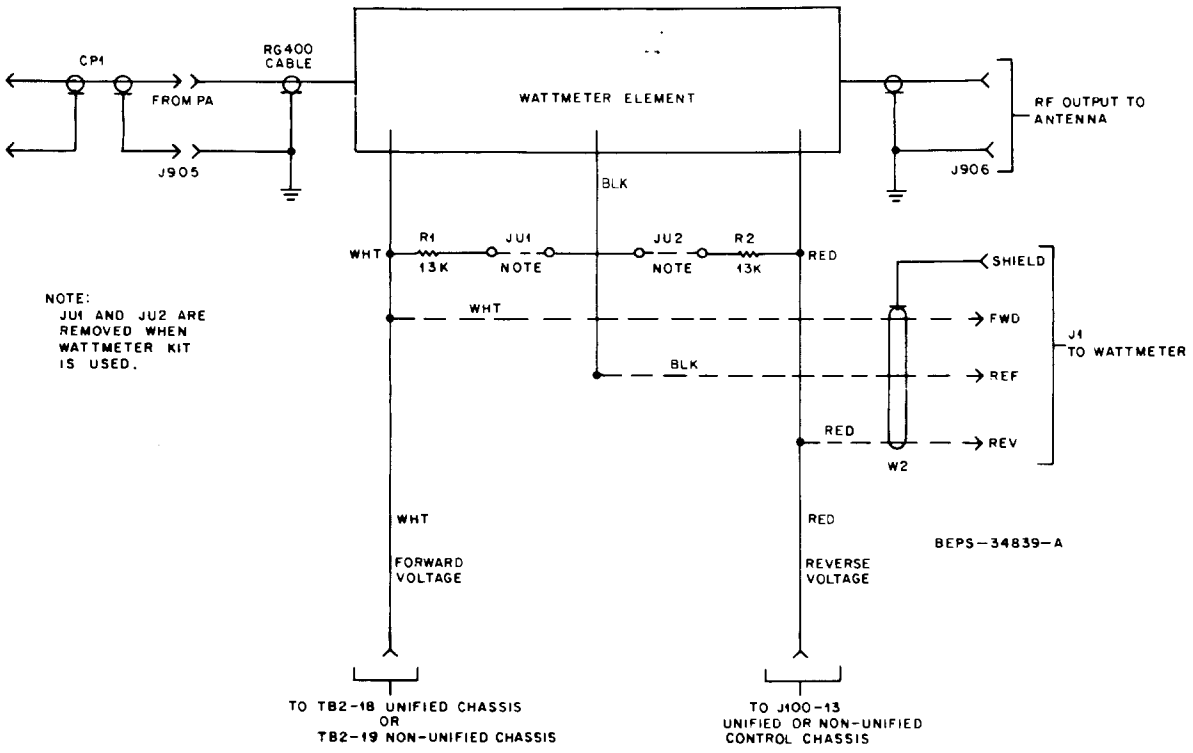


Figure 2. Directional Coupler Kit Diagram

Option Chart

C47AD
TTN6074A Wattmeter Kit 25-1000 MHz, 0-150 W
- *TTN6067A Directional Coupler Kit (25-100 MHz)
- *TTN6068A Directional Coupler Kit (100-225 MHz)
- *TTN6069A Directional Coupler Kit (225-525 MHz)
- *TTN6070A Directional Coupler Kit (525-1000 MHz)

C47AE
TTN6075A Wattmeter Kit 25-525 MHz, 0-400 W
- *TTN6071A Directional Coupler Kit (25-100 MHz)
- *TTN6072A Directional Coupler Kit (100-225 MHz)
- *TTN6073A Directional Coupler Kit (225-525 MHz)

C47AF Wattmeter Kit 50-125 MHz, 0-40 W
- THN6142A Cabinet, 41"
- TRN5623A Wattmeter

C47AG Wattmeter Kit 500-1000 MHz, 0-40 W
- THN6142A Cabinet, 41"
- TRN5749A Wattmeter

* Denotes frequency sensitive component, only one kit is used in each wattmeter kit.

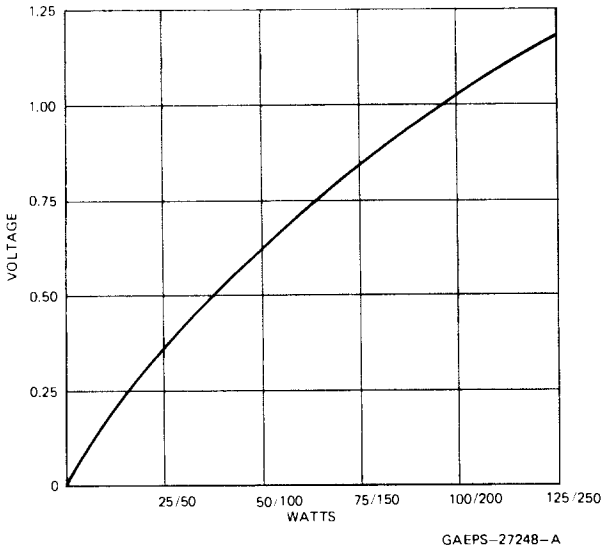


Figure 3. Wattmeter Element Voltage-vs-Power Curve

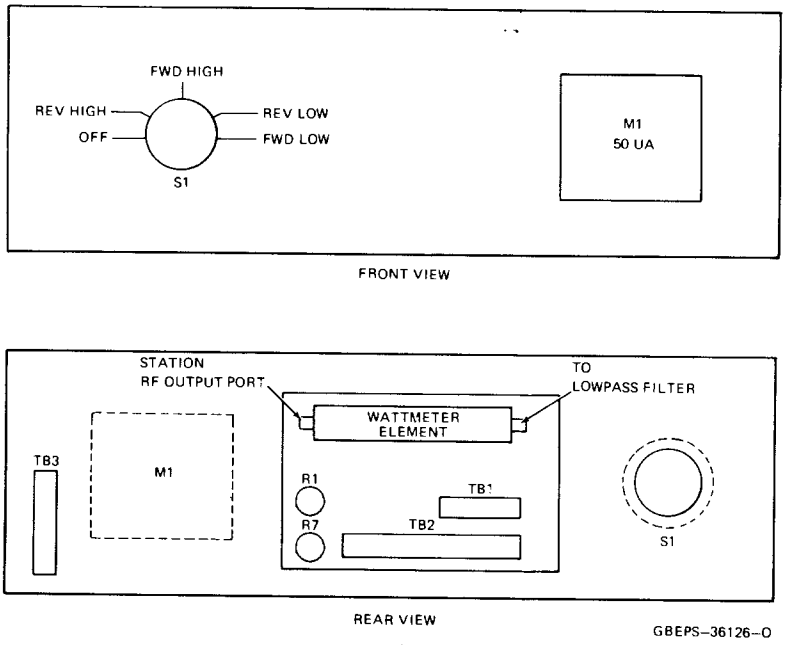


Figure 4. Option C47AF/AG Wattmeter Panel Detail

parts list

TTN6074A Wattmeter (0-150 Watt)
TTN6075A Wattmeter (0-400 Watt) PL-8080-O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		meter:
M1	72-84864B15	0-150 W; 50 uA (TTN6074A)
	or 72-84864B05	0-400 W; 50 uA (TTN6075A)
		connector, plug:
P1	—	consists of:
	15-84860K01	HOUSING, connector; 4-position
	29-84706E06	TERMINAL, female; 3 used
		resistor, fixed: ± 5%; 1/4 W: unless otherwise stated
R1	18-82515B41	var. 10k
R2	6-11009C79	18k (TTN6074A)
	or 6-11009C81	22k (TTN6075A)
R3	6-11009C82	24k
R4		NOT USED
R5,6	6-11009C76	13k
R7	18-82515B41	var. 10k ± 20%
		switch, rotary:
S1	40-82560H02	2-pole, 5-position
		cable:
W1	30-84487C01	3-conductor; 41" used
		non-referenced items
	2-7018	NUT, hex: 3/8-32 x 1/2 x 3/32"; 3 used
	2-82360B26	NUT, speed; 2 used (TTN6073A)
	3-135038	SCREW, tapping: 14-14 x 3/4"; 2 used (TTN6073A)
	4-7698	WASHER, lock #3/8 int.
	7-84001N01	BRACKET, wattmeter
	29-82578C01	LUG, ring tongue; 2 used
	31-490142	TERMINAL STRIP
	36-82869K01	KNOB
	42-76724	CLIP, cable
	3-139564	SCREW, captive: 3/8-24 x 1/2"; 2 used (TTN6067,68,69,70A)
	4-7668	WASHER, lock 3/8 ext; 2 used (TTN6067,68,69,70A)

REMAINDER OF PARTS LISTS ON FOLLOWING PAGE.

parts list

Directional Coupler Kit
TTN6067A 0-150 Watt, 25-100 MHz
TTN6068A 0-150 Watt, 100-225 MHz
TTN6069A 0-150 Watt, 225-525 MHz
TTN6070A 0-150 Watt, 525-1000 MHz
TTN6071A 0-400 Watt, 25-100 MHz
TTN6072A 0-400 Watt, 100-225 MHz
TTN6073A 0-400 Watt, 225-525 MHz — PL-8081-A

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		coupler, adapter:
CP1	1-80758D35	25-100 MHz (TTN6067A, 6068A, 6071A, 6072A)
		includes:
	28-48250	PLUG, adapter; right angle
	28-84579F04	PLUG, coaxial; 2 used
	30-84173E01	CABLE, coaxial; 13 used
	or	
	1-80758D36	225-525 MHz (TTN6069A)
		includes:
	28-82398E02	PLUG, right angle; 2 used
	30-84173E01	CABLE, coaxial; 15 used
	or	
	1-80788D29	225-1000 MHz (TTN6070A, 6073A)
		includes:
	28-852527	PLUG
	28-82398E02	PLUG, right angle
	30-84173E01	CABLE, coaxial; 11 used
		connector, receptacle:
J1	—	consists of:
	15-84861K01	HOUSING, connector; 4-position
	29-84706E05	TERMINAL, male; 3 used
J905,906	—	p/o wattmeter element
		resistor, fixed:
R1,2	6-11009C76	13k ±5%; 1/4 W
		mechanical parts
	1-80758D34	BRACKET, directional coupler: riveted
	58-84918L05	WATTMETER ELEMENT; 25-100 MHz (TTN6067A)
	58-84918L07	WATTMETER ELEMENT; 100-225 MHz (TTN6068A)
	58-84918L09	WATTMETER ELEMENT; 225-525 MHz (TTN6069A)
	58-84918L04	WATTMETER ELEMENT; 525-1000 MHz (TTN6070A)
	58-84918L06	WATTMETER ELEMENT; 25-100 MHz (TTN6071A)
	58-84918L08	WATTMETER ELEMENT; 100-225 MHz (TTN6072A)
	58-84918L10	WATTMETER ELEMENT; 225-525 MHz (TTN6073A)
	2-82360B26	NUT, speed; 2 used (TTN6071A, 6073A)
	2-84410P04	NUT, speed; 2 used (TTN6072A)
	3-135038	SCREW, tapping: 14-14 x 3/4"; 2 used (TTN6071A, 6072A, 6073A)
	3-136924	SCREW, tapping: 4-40 x 5/16"; 2 used
	3-139564	SCREW, captive: 3/8-24 x 1/2"; 2 used (TTN6067A, 6068A, 6069A, 6070A)
	4-7668	WASHER, lock: #3/8 ext; 2 used (TTN6067A, 6068A, 6069A, 6070A)
	29-812979	LUG, crimp terminal
	39-10184A24	CONTACT, receptacle
	42-10217A02	STRAP, tie; 2 used
	64-83525L01	PLATE

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

TRN5623A Wattmeter 0-40 Watt, 50-125 MHz
TRN5749A Wattmeter 0-40 Watt, 500-1000 MHz — PL-8413-O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		rf cable & connector assembly includes:
CP1	1-80765D08	72-76 MHz (TRN5623A only) includes:
	28-84579F04	PLUG, connector UHF (2 used)
	30-84173E01	CABLE, coaxial (22 inches used)
	or 1-80768D03	928-960 MHz (TRN5749A only) includes:
	28-852527	PLUG, connector Type N (2 used
	30-84173E01	CABLE, coaxial (15 inches used)
		meter:
M1	72-84864B18	0-40 W; 50 uA
		resistor, fixed: ±5%; 1/4 W: unless otherwise stated
R1	18-82515B41	var. 10k ±20%
R2	6-11009C77	15k (TRN5749A only)
	or 6-11009C79	18k (TRN5623A only)
R3	6-11009C82	24k
R4	6-11009C51	1.2k (TRN5749A only)
R5, 6	6-11009C76	13k
R7	18-82515B41	var. 10k ±20%
		switch, rotary:
S1	40-82560H02	2-pole, 5-position
		terminal strip:
TB1	31-122068	3 ins., #4 mtg.
TB2	31-12168	6 ins., #4 gnd.
TB3	31-490143	2 ins., #2 mtg. (TRN5749A only)
		non-referenced items
	2-136272	NUT, 3/8-32 x 1/2" x 1/16" (3 used)
	2-82360B34	NUT, speed; 1/4" x 14 (4 used
	3-135038	SCREW, tapping; 14-14 x 3/4" (4 used)
	3-136138	SCREW, tapping; 6-32 x 3/8" (6 used)
	3-136926	SCREW, tapping; 4-40 x 5/16" (2 used)
	4-7691	WASHER, lock; 3/8" (3 used)
	7-84508N01	BRACKET, wattmeter
	29-847854	LUG; slotted tongue
	29-82578C01	LUG; ring tongue (2 used)
	36-82630H01	KNOB
	37-82633B03	GROMMET
	39-10184A24	CONTACT, receptacle
	42-10217A02	STRAP, tie; (10 used)
	58-84918L12	ELEMENT; wattmeter (TRN5749A only)
	64-83168L01	PANEL
	64-83525L01	PLATE
	58-84918L11	ELEMENT; wattmeter (TRN5023A only)

END OF DOCUMENT