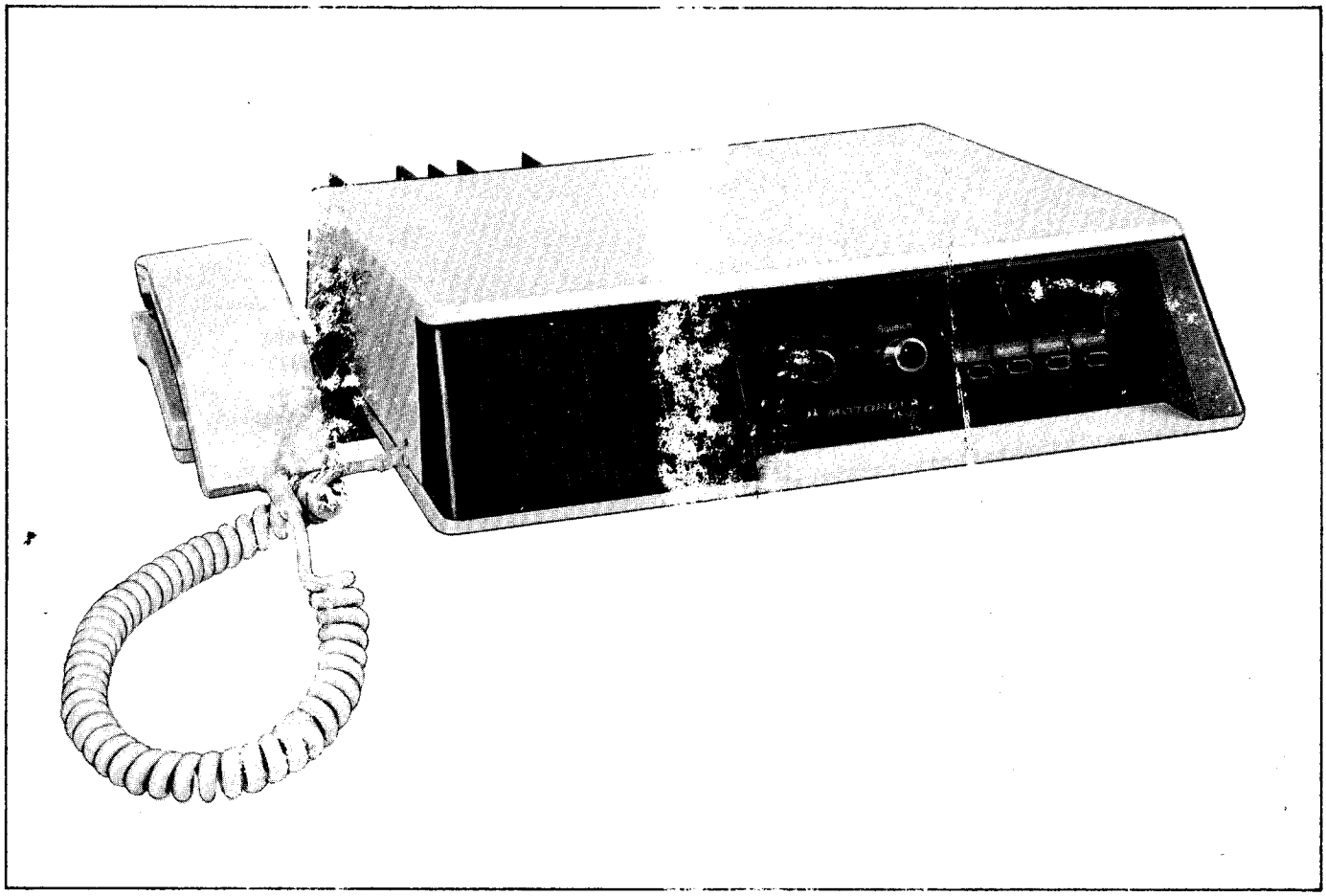
MOTOROLA

FLEXAR
Base Station

68P81035E55-B



NOTE: THE FLEXAR BASE/REPEATER SUPPLEMENT IS IN MANUAL 68P81045E10

THIS MANUAL HAS BEEN
DISCONTINUED

Instruction Manual

68P81035E55-B

"FLEXAR"

BASE STATION
TWO-WAY FM RADIO

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RULE COMPLIANCE CHART PEPS-27482

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MOTOROLA INC.
Communications Division

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

68P81035E55-B
10/25/78-UP

VHF RADIO

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VHF UNIFIED BOARD 68P81039E37
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25 WATT RF POWER AMPLIFIER HARMONIC FILTER AND ANTENNA SWITCH 68P81037E99

UHF RADIO

UHF TRANSMITTER ALIGNMENT PEPS-25628

UHF RECEIVER ALIGNMENT PEPS-25636

UHF UNIFIED BOARD 68P81037E54
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30/25 WATT RF POWER AMPLIFIER HARMONIC FILTER, AND ANTENNA SWITCH 68P81037E78

15 WATT RF POWER AMPLIFIER HARMONIC FILTER, AND ANTENNA SWITCH 68P81037E79

2 WATT RF POWER AMPLIFIER HARMONIC FILTER, AND ANTENNA SWITCH 68P81037E81

800 MHz RADIO

800 MHz TRANSMITTER ALIGNMENT PEPS-27483

800 MHz RECEIVER ALIGNMENT PEPS-27484

800 MHz UNIFIED BOARD 68P81040E78
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800 MHz "FLEXAR" INTERCABLING DIAGRAM EEPS-27479

10-WATT RF POWER AMPLIFIER 68P81040E77

CONTROL

TONE "PRIVATE-LINE" ENCODER/DECODER 68P81029E99

"DIGITAL PRIVATE-LINE" ENCODER/DECODER 68P81030E07

SECTION *NUMBER*

"DIGITAL PRIVATE-LINE" HIGH PASS FILTER 68P81038E31

"FLEXAR" CONTROL 68P81037E59

LOCAL CONTROL BOARD 68P81037E82

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DC REMOTE CONTROL BOARD 68P81037E87

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DESK MICROPHONES 68P81103E48

POWER SUPPLY 68P81037E91

12 V DC POWER SUPPLY 68P81037E92

SAFETY INFORMATION

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

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

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

NEPS-21233-O

VHF FLEXAR SPECIFICATIONS

GENERAL

FREQUENCY RANGE	136-174 MHz
DIMENSIONS	4.06"H x 13.07"W x 13.74"D (103mm x 332mm x 349mm)
WEIGHT	17.5 lbs (7.94 kgs)

TRANSMITTER

RF POWER OUTPUT	25 Watts (136-174 MHz)
SPURIOUS & HARMONIC EMISSIONS*	60 dB below carrier
OUTPUT IMPEDANCE	50 ohms
FREQUENCY STABILITY	±0.0005%; -30°C to +60°C (+25°C reference)
MODULATION	16F3
AUDIO SENSITIVITY	160 mV ±3 dB for 3.0 kHz deviation at 1000 Hz
FM HUM & NOISE	-55 dB below ±3.0 kHz deviation at 1000 Hz
AUDIO RESPONSE	+1, -3 dB from 6 dB/octave pre-emphasis (300 to 3000 Hz)
AUDIO DISTORTION	Less than 3%

*Per EIA specification RS-152B, paragraph 4.

RECEIVER

CHANNEL SPACING	30 kHz
SELECTIVITY - EIA SINAD	-90 dB @ ±30 kHz
INTERMODULATION-EIA SINAD	-85 dB
EIA MODULATION ACCEPTANCE	7 kHz
SENSITIVITY	.50 uV or less for 20 dB quieting .35 uV or less for EIA Sinad
FREQUENCY STABILITY	±0.0005%; -30°C to +60°C (+25°C reference)
SPURIOUS AND IMAGE REJECTION	Greater than 100 dB
SQUELCH THRESHOLD SENSITIVITY	Less than 0.2 uV
AUDIO OUTPUT	Line: +11 dBm with less than 3% distortion Speaker: 3 watts with less than 5% distortion
AUDIO RESPONSE	Line: +1, -3 dB from 6 dB/octave de-emphasis (300-3000 kHz) Speaker: +2, -8 dB from 6 dB/octave de-emphasis (300-3000 kHz)
HUM AND NOISE (UNSQUELCHED)	Speaker: -50 dB from full rated output Line: -45 dB from full rated output

POWER SUPPLY

AC REQUIREMENTS	100,120,220,240 V ac ±20% 50/60 Hz
DC OUTPUT	13.8 V dc nominal

Specifications subject to change without notice.

UHF FLEXAR SPECIFICATIONS

GENERAL

FREQUENCY RANGE	406-420 MHz, 450-512 MHz
DIMENSIONS	4.06"H x 13.07"W x 13.74"D (103mm x 332mm x 349mm)
WEIGHT	17.5 lbs (7.94 kgs)

TRANSMITTER

RF POWER OUTPUT	30 Watts (450-470 MHz), 25 Watts (470-512 MHz), 15 Watts (406-420 MHz), 15 Watts (450-512 MHz), 2 Watts (450-512 MHz)
SPURIOUS & HARMONIC EMISSIONS*	70 dB below carrier (450-512 MHz), 65 dB below carrier (406-420 MHz)
OUTPUT IMPEDANCE	50 ohms
FREQUENCY STABILITY	± 0.0005%; -30°C to +60°C (+25°C reference) ± 0.0002% (Optional) Except 406-420 MHz
MODULATION	16F3
AUDIO SENSITIVITY	160 mV ± 3 dB for 3.0 kHz deviation at 1000 Hz
FM HUM & NOISE	-55 dB below ± 3.0 kHz deviation at 1000 Hz
AUDIO RESPONSE	+1, -3 dB from 6 dB/octave pre-emphasis (300 to 3000 Hz)
AUDIO DISTORTION	Less than 3%

*Per EIA specification RS-152B, paragraph 4.

RECEIVER

CHANNEL SPACING	25 kHz
SELECTIVITY - EIA SINAD	-85 dB @ ± 25 kHz, -75 dB (406-420 MHz)
INTERMODULATION-EIA SINAD	-80 dB, -75 dB (406-420 MHz)
EIA MODULATION ACCEPTANCE	7 kHz (6.5 kHz, 406-420 MHz)
SENSITIVITY	0.40 uV or less for 20 dB quieting 0.3 uV or less for EIA Sinad
FREQUENCY STABILITY	± 0.0005%; -30°C to +60°C (+25°C reference)
SPURIOUS AND IMAGE REJECTION	Greater than 100 dB, 85 dB (406-420 MHz)
SQUELCH THRESHOLD SENSITIVITY	Less than 0.2 uV
AUDIO OUTPUT	Line: +11 dBm with less than 3% distortion Speaker: 3 watts with less than 5% distortion
AUDIO RESPONSE	Line: +1, -3 dB from 6 dB/octave de-emphasis (300-3000 kHz) Speaker: +2, -8 dB from 6 dB/octave de-emphasis (300-3000 kHz)
HUM AND NOISE (UNSQUELCHED)	Speaker: -50 dB from full rated output Line: -45 dB from full rated output

POWER SUPPLY

AC REQUIREMENTS	100,120,220,240 V ac ± 20% 50/60 Hz
DC OUTPUT	13.8 V dc nominal

Specifications subject to change without notice.

800 MHz FLEXAR SPECIFICATIONS

GENERAL

FREQUENCY RANGE	TX 806-821 MHz; RX 851-866 MHz
DIMENSIONS	4.06"H x 13.07" W x 13.74" D (103mm x 332mm x 349mm)
WEIGHT	17.5 lbs. (7.94 kgs)

TRANSMITTER

RF POWER OUTPUT	10 Watts (806-821 MHz)
SPURIOUS & HARMONIC EMISSIONS*	56 dB below carrier
OUTPUT IMPEDANCE	50 ohms
FREQUENCY STABILITY	± .00025%; -30°C to + 60°C (+ 25°C reference)
MODULATION	16F3, 15F2, 16F9
AUDIO SENSITIVITY	160 mV ± 3 dB for 3.0 kHz deviation at 1000 Hz
FM HUM & NOISE	-50 dB below ± 3.0 kHz deviation at 1000 Hz
AUDIO RESPONSE	+ 1, 3 dB for 6 dB/octave pre-emphasis (300 to 3000 Hz)
AUDIO DISTORTION	Less than 3%

*Per EIA specification RS-152B, paragraph 4.

RECEIVER

CHANNEL SPACING	25 kHz
SELECTIVITY-EIA SINAD	-70 dB @ ± 25 kHz
INTERMODULATION-EIA SINAD	-70 dB
EIA MODULATION ACCEPTANCE	7 kHz
SENSITIVITY	.40 uV or less for 20 dB quieting .30 uV or less for EIA Sinad
FREQUENCY STABILITY	± .00025%; -30°C to + 60°C (+ 25°C reference)
SPURIOUS AND IMAGE REJECTION	Greater than 80 dB
SQUELCH THRESHOLD SENSITIVITY	Less than 0.2 uV
AUDIO OUTPUT	Line: + 11 dBm with less than 3% distortion Speaker: 3 watts with less than 5% distrotion
AUDIO RESPONSE	Line: + 1, -3 dB from 6 dB/octave de-emphasis (300-3000 kHz) Speaker: + 2, -8 dB from 6 dB/octave de-emphasis (300-3000 kHz)

POWER SUPPLY

AC REQUIREMENTS	100, 120, 220, 240 V ac ± 20% 50/60 Hz
DC OUTPUT	13.8 V dc nominal

Specifications subject to change without notice.

FCC TRANSMITTER LICENSE DESIGNATIONS

FREQ RANGE (MHz)	FREQ STABILITY (%)	SINGLE FREQ	TWO FREQ
806-825	.00025%	CC5020	CC5021

FCC RECEIVE CERTIFICATION NUMBERS
Single Frequency: RC0228
Two Frequency: RC0229

FCC DESIGNATIONS

VHF Transmitters

Power (Watts)	Range (MHz)	Stability	One-Frequency	Two-Frequency
25	136-150.8	±5 PPM	N/A	N/A
25	150.8-174	±5 PPM	CC3323	CC3324

Receivers
One-frequency Models RC0219
Two-frequency Models RC0220

UHF Transmitters

Power (Watts)	Range (MHz)	Stability	One-Frequency	Two-Frequency
2	450-470	±5 PPM	CC4267	CC4268
2	450-470	±2 PPM	CC4267C	CC4268C
2	470-494	±5 PPM	CC4267-1	CC4268-1
2	470-494	±2 PPM	CC4267C-1	CC4268C-1
2	494-512	±5 PPM	CC4267-2	CC4268-2
2	494-512	±2 PPM	CC4267C-2	CC4268C-2
15	406-420	±2 PPM	N/A	N/A
15	406-420	±5 PPM	N/A	N/A
15	450-470	±5 PPM	CC4265	CC4266
15	450-470	±2 PPM	CC4265C	CC4266C
15	470-494	±5 PPM	CC4265-1	CC4266-1
15	470-494	±2 PPM	CC4265C-1	CC4266C-1
15	494-512	±5 PPM	CC4265-2	CC4266-2
15	494-512	±2 PPM	CC4265C-2	CC4266C-2
30	450-470	±5 PPM	CC4263	CC4264
30	450-470	±2 PPM	CC4263C	CC4264C
25	470-494	±5 PPM	CC4263-1	CC4264-1
25	470-494	±2 PPM	CC4263C-1	CC4264C-1
25	494-512	±5 PPM	CC4263-2	CC4264-2
25	494-512	±2 PPM	CC4263C-2	CC4264C-2

Receivers

One-frequency Models RC0177
Two-frequency Models RC0178

HANDLING PRECAUTIONS FOR CMOS INTEGRATED CIRCUITS

Many of the integrated circuit devices used in communications equipment are of the CMOS (Complementary Metal Oxide Semiconductor) type. Because of their high open circuit impedance, CMOS ICs are vulnerable to damage from static charges. Care must be taken in handling, shipping, and servicing them and the assemblies in which they are used.

Even though protection devices are provided in CMOS IC inputs, the protection is effective only against overvoltage in the hundreds of volts range such as are encountered in an operating system. In a system, circuit elements distribute static charges and load the CMOS circuits, decreasing the chance of damage. However, CMOS circuits can be damaged by improper handling of the modules even in a system.

To avoid damage to circuits, observe the following handling, shipping, and servicing precautions:

(1) Prior to and while servicing a circuit module, particularly after moving within the service area, momentarily touch both hands to a bare metal earth grounded surface. This will discharge any static charge which may have accumulated on the person doing the servicing.

(2) Whenever possible avoid touching any electrically conductive parts of the circuit module with your hands.

(3) Normally, circuit modules can be inserted or removed with power applied to the unit. However, check the INSTALLATION and MAINTENANCE sections of the manual as well as the module schematic diagram to insure there are no objections to this practice.

(4) When servicing a circuit module, avoid carpeted areas, dry environments, and certain types of clothing (silk, nylon, etc.) because they contribute to static buildup.

(5) All electrically powered test equipment should be grounded. Apply the ground lead from the test equipment to the circuit module before connecting the test probe. Similarly, disconnect the test probe prior to removing the ground lead.

(6) If a circuit module is removed from the system, it is desirable to lay it on a conductive surface (such as a sheet of aluminum foil) which is connected to ground through a resistance of approximately 100k.

WARNING

If the aluminum foil is connected directly to ground, be cautious of possible electrical shock from contacting the foil at the same time as other electrical circuits.

(7) When soldering, be sure the soldering iron is grounded.

(8) Prior to connecting jumpers, replacing circuit components, or touching CMOS pins (if this becomes necessary in the replacement of an integrated circuit device), be sure to discharge any static buildup as described in procedure 1. Since voltage differences can exist across the human body, it is recommended that only one hand be used if it is necessary to touch pins on the CMOS device and associated board wiring.

(9) When replacing a CMOS integrated circuit device, leave the device in its metal rail container or conductive foam until it is to be inserted into the printed circuit module.

(10) All low impedance test equipment (such as pulse generators, etc.) should be connected to CMOS device inputs after power is applied to the CMOS circuitry. Similarly, such low impedance equipment should be disconnected before power is turned off.

(11) Replacement modules shipped separately from the factory will be packaged in a conductive material. Any modules being transported from one area to another should be wrapped in a similar material (aluminum foil may be used). NEVER USE NONCONDUCTIVE MATERIAL for packaging these modules.

MOTOROLA

MODEL CHART
FOR
"FLEXAR" BASE STATION
136-174 MHz
25 WATTS RF POWER

CODE:

- [X] = ONE ITEM SUPPLIED WITH EACH RADIO
- [/] = ONE ITEM SUPPLIED WITH EACH RADIO, DEPENDING ON FREQUENCY
- [A] = TWO ITEMS SUPPLIED WITH EACH RADIO, DEPENDING ON FREQUENCY
- [O] = ONE ITEM SUPPLIED WITH EACH RADIO, DEPENDING ON OPTIONS
- [2] = TWO ITEMS SUPPLIED WITH EACH RADIO

L43TRK1100AH

- HANDSET
- [0] LOCAL CONTROL
  [5] DC REMOTE CONTROL
- [0] T1-R1
  [3] T2-R2
- [1] CARRIER SQUELCH
  [3] TONE "PRIVATE-LINE"
  [6] "DIGITAL PRIVATE-LINE"

MODEL NUMBER	NUMBER OF FREQUENCIES	CONTROL	SQUELCH
L43TRK1100AH	1	LOCAL	CARRIER
L43TRK1105A	1	REMOTE	CARRIER
L43TRK1130AH	2	LOCAL	CARRIER
L43TRK1135A	2	REMOTE	CARRIER
L43TRK3100AH	1	LOCAL	TONE "PL"
L43TRK3105A	1	REMOTE	TONE "PL"
L43TRK3130AH	2	LOCAL	TONE "PL"
L43TRK3135A	2	REMOTE	TONE "PL"
L43TRK6100AH	1	LOCAL	"DIGITAL PL"
L43TRK6105A	1	REMOTE	"DIGITAL PL"
L43TRK6130AH	2	LOCAL	"DIGITAL PL"
L43TRK6135A	2	REMOTE	"DIGITAL PL"

ITEM	DESCRIPTION	L43TRK1100AH	L43TRK1105A	L43TRK1130AH	L43TRK1135A	L43TRK3100AH	L43TRK3105A	L43TRK3130AH	L43TRK3135A	L43TRK6100AH	L43TRK6105A	L43TRK6130AH	L43TRK6135A
TUD2121AH	RADIO CHASSIS 136-150 MHz 2-FREQUENCY	/		/		/		/		/		/	
TUD2122AB	RADIO CHASSIS 150-162 MHz 1-FREQUENCY		/		/		/		/		/		/
TUD2122AH	RADIO CHASSIS 150-162 MHz 2-FREQUENCY	/		/		/		/		/		/	
TUD2422AH	RADIO CHASSIS 162-174 MHz 2-FREQUENCY	/		/		/		/		/		/	
TMN1016A	HANDSET	X	X	X	X	X	X	X	X	X	X	X	X
TRN6820A	HANDSET CRADLE		X		X		X		X		X		X
TPN1155A	POWER SUPPLY	X		X		X		X		X		X	
TRN4803A	LOCAL CONTROL BOARD	X		X		X		X		X		X	
TRN6823A	DC REMOTE CONTROL BOARD		X		X		X		X		X		X
TRN6824A	3 WATT AUDIO BOARD	X		X		X		X		X		X	
TRN6177C	TONE "PRIVATE-LINE" ENCODER/DECODER					X	X	X	X				
KLN6209A	"VIBRASPONDER" RESONANT REED					X	X	X	X				
TRN6207A	"DIGITAL PRIVATE-LINE" ENCODER/DECODER									X	X	X	X
TRN6005A	"DIGITAL PRIVATE-LINE" CODE PLUG					A	A	A	A	A	A	A	A
TRN6472A	"DIGITAL PRIVATE-LINE" HIGH PASS FILTER									X	X	X	X
KXN6121AA	TRANSMIT CRYSTAL 150-174 MHz					A	A	A	A				
KXN6121AG	TRANSMIT CRYSTAL 136-150 MHz					A	A	A	A				
KXN6122AA	RECEIVE CRYSTAL 150-174 MHz					A	A	A	A				
KXN6122AG	RECEIVE CRYSTAL 136-150 MHz					A	A	A	A				
TRN6810A	HOUSING (LOCAL CONTROL)	/		/		/		/		/		/	
TRN6813A	HOUSING (DC REMOTE CONTROL)		/		/		/		/		/		/
	ESCUTCHEONS												
TRN6806A	T1-R1 MODELS	O		O		O		O		O		O	
TRN6808A	T2-R2 MODELS		O		O		O		O		O		O
TRN6799A	DC REMOTE CONTROL MODELS		O		O		O		O		O		O
	ESCUTCHEONS FOR DIGITAL CLOCK OPTION												
TRN6802A	T1-R1 MODELS	O		O		O		O		O		O	
TRN6804A	T2-R2 MODELS		O		O		O		O		O		O
	ESCUTCHEONS FOR MIC INTERCON OPTION												
TRN6894A	T1-R1 MODELS	O		O		O		O		O		O	
TRN6896A	T2-R2 MODELS		O		O		O		O		O		O
	ESCUTCHEONS FOR DIGITAL CLOCK AND MIC INTERCOM OPTION												
TRN6817A	T1-R1 MODELS	O		O		O		O		O		O	
TRN6819A	T2-R2 MODELS		O		O		O		O		O		O
68P81109E06	OPERATORS CARD	X	X	X	X	X	X	X	X	X	X	X	X

EPS-26433-O

MOTOROLA

MODEL CHART

FOR

"FLEXAR" 450-470 MHz

25/15/2 WATTS RF POWER

406-420 MHz

15 WATTS RF POWER

CODE:

[X] = ONE ITEM SUPPLIED WITH EACH RADIO

[/] = ONE ITEM SUPPLIED WITH EACH RADIO, DEPENDING ON FREQUENCY

[O] = ONE ITEM SUPPLIED WITH EACH RADIO, DEPENDING ON OPTIONS

[2] = TWO ITEMS SUPPLIED WITH EACH RADIO.

L24TRK1100AH

RF POWER				
406-420	450-470	470-494	494-512
2 --	2	2	2
3 15	15	15	15
4 --	30	25	25

- HANDSET
  - 0 LOCAL CONTROL
  - 5 DC REMOTE CONTROL
- 0 T1-R1
  3 T2-R2
- 1 CARRIER SQUELCH
  3 TONE "PRIVATE-LINE"
  6 "DIGITAL PRIVATE-LINE"

ITEM	DESCRIPTION
	RADIO
TUE1403AB	RADIO CHASSIS 450-470 MHz 1 FREQUENCY
TUE1403AH	RADIO CHASSIS 450-470 MHz 2 FREQUENCY
TUE1404AB	RADIO CHASSIS 470-494 MHz 1 FREQUENCY
TUE1404AH	RADIO CHASSIS 470-494 MHz 2 FREQUENCY
TUE1405AB	RADIO CHASSIS 494-512 MHz 1 FREQUENCY
TUE1405AH	RADIO CHASSIS 494-512 MHz 2 FREQUENCY
TUE1411AB	RADIO CHASSIS 406-420 MHz 1 FREQUENCY
TUE1411AH	RADIO CHASSIS 406-420 MHz 2 FREQUENCY
TUE1413AB	RADIO CHASSIS 450-470 MHz 1 FREQUENCY
TUE1413AH	RADIO CHASSIS 450-470 MHz 2 FREQUENCY
TUE1414AB	RADIO CHASSIS 470-494 MHz 1 FREQUENCY
TUE1414AH	RADIO CHASSIS 470-494 MHz 2 FREQUENCY
TUE1415AB	RADIO CHASSIS 494-512 MHz 1 FREQUENCY
TUE1415AH	RADIO CHASSIS 494-512 MHz 2 FREQUENCY
TUE1423AB	RADIO CHASSIS 450-470 MHz 1 FREQUENCY
TUE1423AH	RADIO CHASSIS 450-470 MHz 2 FREQUENCY
TUE1424AB	RADIO CHASSIS 470-494 MHz 1 FREQUENCY
TUE1424AH	RADIO CHASSIS 470-494 MHz 2 FREQUENCY
TUE1425AB	RADIO CHASSIS 494-512 MHz 1 FREQUENCY
TUE1425AH	RADIO CHASSIS 494-512 MHz 2 FREQUENCY
TMN1016A	HANDSET CRADLE
TRN6820A	HANDSET
TPN1155A	POWER SUPPLY
TRN6809A	LOCAL CONTROL BOARD
TRN6823A	DC REMOTE CONTROL BOARD
TRN6824A	3 WATT AUDIO BOARD
TRN6177C	TONE "PRIVATE-LINE" ENCODER/DECODER
KLN6209A	"VIBRASPONDER" RESONANT REED
TRN6207A	"DIGITAL PRIVATE-LINE" ENCODER/DECODER
TRN6005A	"DIGITAL PRIVATE-LINE" CODE PLUG
TRN8472A	"DIGITAL PRIVATE-LINE" HIGH PASS FILTER MODULE
KXN6121A	TRANSMIT CRYSTAL
KXN6122A	RECEIVE CRYSTAL
TRN6954A	CABLE KIT
TRN6810A	HOUSING (LOCAL CONTROL)
TRN6813A	HOUSING (DC REMOTE CONTROL)
	ESCUTCHEONS
TRN6806A	T1-R1 MODELS
TRN6808A	T2-R2 MODELS
TRN6799A	DC REMOTE CONTROL MODELS
	ESCUTCHEONS FOR DIGITAL CLOCK OPTION
TRN6802A	T1-R1 MODELS
TRN6804A	T2-R2 MODELS
	ESCUTCHEONS FOR MIC INTERCOM OPTION
TRN6894A	T1-R1 MODELS
TRN6896A	T2-R2 MODELS
	ESCUTCHEONS FOR DIGITAL CLOCK AND MIC INTERCOM OPTIONS
TRN6817A	T1-R1 MODELS
TRN6819A	T2-R2 MODELS
TRN6210A	TUNING TOOL
68P81109E06	OPERATORS CARD

MODEL NUMBER	NUMBER OF FREQUENCIES	CONTROL	SQUELCH
L24TRK1100AH	1	LOCAL	CARRIER
L24TRK1105A	1	REMOTE	CARRIER
L24TRK1130AH	2	LOCAL	CARRIER
L24TRK1135A	2	REMOTE	CARRIER
L24TRK3100AH	1	LOCAL	TONE PL
L24TRK3105A	1	REMOTE	TONE PL
L24TRK3130AH	2	LOCAL	TONE PL
L24TRK3135A	2	REMOTE	TONE PL
L24TRK6100AH	1	LOCAL	DIGITAL PL
L24TRK6105A	1	REMOTE	DIGITAL PL
L24TRK6130AH	2	LOCAL	DIGITAL PL
L24TRK6135A	2	REMOTE	DIGITAL PL
L34TRK1100AH	1	LOCAL	CARRIER
L34TRK1105A	1	REMOTE	CARRIER
L34TRK1130AH	2	LOCAL	CARRIER
L34TRK1135A	2	REMOTE	CARRIER
L34TRK3100AH	1	LOCAL	TONE PL
L34TRK3105A	1	REMOTE	TONE PL
L34TRK3130AH	2	LOCAL	TONE PL
L34TRK3135A	2	REMOTE	TONE PL
L34TRK6100AH	1	LOCAL	DIGITAL PL
L34TRK6105A	1	REMOTE	DIGITAL PL
L34TRK6130AH	2	LOCAL	DIGITAL PL
L34TRK6135A	2	REMOTE	DIGITAL PL
L44TRK1100AH	1	LOCAL	CARRIER
L44TRK1105A	1	REMOTE	CARRIER
L44TRK1130AH	2	LOCAL	CARRIER
L44TRK1135A	2	REMOTE	CARRIER
L44TRK3100AH	1	LOCAL	TONE PL
L44TRK3105A	1	REMOTE	TONE PL
L44TRK3130AH	2	LOCAL	TONE PL
L44TRK3135A	2	REMOTE	TONE PL
L44TRK6100AH	1	LOCAL	DIGITAL PL
L44TRK6105A	1	REMOTE	DIGITAL PL
L44TRK6130AH	2	LOCAL	DIGITAL PL
L44TRK6135A	2	REMOTE	DIGITAL PL

EPS-24013-B

X

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MODEL CHART

FOR

"FLEXAR" BASE STATION

806-866 MHz

10 WATTS RF POWER

CODE:

- [X] = ONE ITEM SUPPLIED WITH EACH RADIO
- [/] = ONE ITEM SUPPLIED WITH EACH RADIO, DEPENDING ON FREQUENCY
- [A] = TWO ITEMS SUPPLIED WITH EACH RADIO, DEPENDING ON FREQUENCY
- [O] = ONE ITEM SUPPLIED WITH EACH RADIO, DEPENDING ON OPTIONS
- [2] = TWO ITEMS SUPPLIED WITH EACH RADIO

L43TRK1100AH

- HANDSET
- [0] LOCAL CONTROL
  [5] DC REMOTE CONTROL
- [0] T1-R1
  [3] T2-R2
- [1] CARRIER SQUELCH
  [3] TONE "PRIVATE-LINE"
  [6] "DIGITAL PRIVATE-LINE"

MODEL NUMBER	NUMBER OF FREQUENCIES	CONTROL	SQUELCH
L35TRK1100AH	1	LOCAL	CARRIER
L35TRK1105A	1	REMOTE	CARRIER
L35TRK1130AH	2	LOCAL	CARRIER
L35TRK1135A	2	REMOTE	CARRIER
L35TRK3100AH	1	LOCAL	TONE "PL"
L35TRK3105A	1	REMOTE	TONE "PL"
L35TRK3130AH	2	LOCAL	TONE "PL"
L35TRK3135A	2	REMOTE	TONE "PL"
L35TRK6100AH	1	LOCAL	"DIGITAL PL"
L35TRK6105A	1	REMOTE	"DIGITAL PL"
L35TRK6130AH	2	LOCAL	"DIGITAL PL"
L35TRK6135A	2	REMOTE	"DIGITAL PL"

ITEM	DESCRIPTION
TUF1041AH	RADIO CHASSIS 2-FREQUENCY
TKN8028A	CABLE RAD INTERCONN 2 FREQ
TKN8029A	CABLE RAD INTERCONN 1 FREQ
TMN1016A	HANDSET
TRN6820A	HANDSET CRADLE
TPN1155A	POWER SUPPLY
TRN6809A	LOCAL CONTROL BOARD
TRN6823A	DC REMOTE CONTROL BOARD
TRN6824A	3 WATT AUDIO BOARD
TRN6177C	TONE "PRIVATE-LINE" ENCODER/DECODER
KLN6209A	"VIBRASPONDER" RESONANT REED
TRN6207A	"DIGITAL PRIVATE-LINE" ENCODER/DECODER
TRN6005A	"DIGITAL PRIVATE-LINE" CODE PLUG
TRN8472A	"DIGITAL PRIVATE-LINE" HIGH PASS FILTER
KXN1091A	CRYSTAL 806-821 MHz TRANSMIT
KXN1090A	CRYSTAL 851-866 MHz RECEIVE
TRN6810A	HOUSING (LOCAL CONTROL)
TRN6813A	HOUSING (DC REMOTE CONTROL)
	ESCUTCHEONS
TRN6806A	T1-R1 MODELS
TRN6808A	T2-R2 MODELS
TRN6799A	DC REMOTE CONTROL MODELS
	ESCUTCHEONS FOR DIGITAL CLOCK OPTION
TRN6802A	T1-R2 MODELS
TRN6804A	T2-R2 MODELS
	ESCUTCHEONS FOR MIC INTERCOM OPTION
TRN6894A	T1-R2 MODELS
TRN6896A	T2-R2 MODELS
	ESCUTCHEONS FOR DIGITAL CLOCK AND MIC INTERCOM OPTIONS
TRN6817A	T1-R1 MODELS
TRN6819A	T2-R2 MODELS
68P81109E06	OPERATORS CARD

EPS-27480-O

MOTOROLA

VHF
UNIFIED BOARD
MODEL CHART

CODE:
[X] = ITEM SUPPLIED

MODEL NUMBER	NUMBER OF FREQUENCIES	FREQUENCY RANGE	ITEM: TLD2071A	TLD2072A	TLD2073A	TLD5661A	TLD5662A	TLD5663A	TLD2301A	TLD2302A	TLD2303A	TRN6830A
		DESCRIPTION: RF DECK 136-150 MHz		RF DECK 150-162 MHz	RF DECK 162-174 MHz	MAIN BOARD 136-150 MHz 2-FREQUENCY	MAIN BOARD 150-162 MHz 2-FREQUENCY	MAIN BOARD 162-174 MHz 2-FREQUENCY	POWER AMPLIFIER 25 WATTS 132-150 MHz	POWER AMPLIFIER 25 WATTS 150-162 MHz	POWER AMPLIFIER 25 WATTS 162-174 MHz	MAIN BOARD HARDWARE KIT
TUD2121AH	2	136-150 MHz	X			X			X			X
TUD2122AB	1	150-162 MHz		X			X			X		X
TUD2122AH	2	150-162 MHz		X				X		X		X
TUD2123AH	2	162-174 MHz			X			X			X	X

EPS-26434-A

MOTOROLA

UHF
UNIFIED BOARD
MODEL CHART

CODE:

[X] = ITEM SUPPLIED

MODEL NUMBER	NUMBER OF FREQUENCIES	TLE1813A	TLE1814A	TLE1815A	TLE1821A	TLE1823A	TLE1824A	TLE1825A	TLE1833A	TLE1834A	TLE1835A	TRN8163A	TRN8164A	TRN8165A	TLE1791A	TLE1843A	TLE1844A	TLE1845A	TLE8981A	TLE8983A	TLE8984A	TLE8985A	TLE8991A	TLE8993A	TLE8994A	TLE8995A	TRN6826A
		POWER AMPLIFIER 2 W 450-470 MHz	POWER AMPLIFIER 2 W 470-494 MHz	POWER AMPLIFIER 2 W 494-512 MHz	POWER AMPLIFIER 15 W 406-420 MHz	POWER AMPLIFIER 15 W 450-470 MHz	POWER AMPLIFIER 15 W 470-494 MHz	POWER AMPLIFIER 15 W 494-512 MHz	POWER AMPLIFIER 30 W 450-470 MHz	POWER AMPLIFIER 25 W 470-494 MHz	POWER AMPLIFIER 25 W 494-512 MHz	SENSE RESISTOR 2 W MODELS	SENSE RESISTOR 15 W MODELS	SENSE RESISTOR 25/30 W MODELS	RF DECK 406-420 MHz	RF DECK 450-470 MHz	RF DECK 470-494 MHz	RF DECK 494-512 MHz	MAIN BOARD 1 FREQUENCY 406-420 MHz	MAIN BOARD 1 FREQUENCY 450-470 MHz	MAIN BOARD 1 FREQUENCY 470-494 MHz	MAIN BOARD 1 FREQUENCY 494-512 MHz	MAIN BOARD 2 FREQUENCY 406-420 MHz	MAIN BOARD 2 FREQUENCY 450-470 MHz	MAIN BOARD 2 FREQUENCY 470-494 MHz	MAIN BOARD 2 FREQUENCY 494-512 MHz	UNIFIED BOARD HARDWARE KIT
TUE1403AB	1	X										X			X											X
TUE1403AH	2	X										X			X								X			X
TUE1404AB	1		X									X				X				X						X
TUE1404AH	2		X									X				X				X				X		X
TUE1405AB	1			X								X					X				X					X
TUE1405AH	2			X								X					X								X	X
TUE1411AB	1				X								X		X				X							X
TUE1411AH	2				X								X		X							X				X
TUE1413AB	1					X							X			X				X						X
TUE1413AH	2					X							X			X							X			X
TUE1414AB	1						X						X			X					X					X
TUE1414AH	2						X						X			X					X			X		X
TUE1415AB	1							X					X			X						X				X
TUE1415AH	2							X					X			X						X			X	X
TUE1423AB	1								X					X			X			X						X
TUE1423AH	2								X					X			X				X					X
TUE1424AB	1									X				X			X									X
TUE1424AH	2									X				X			X									X
TUE1425AB	1										X			X			X									X
TUE1425AH	2										X			X			X									X

EPS-24014-B

MOTOROLA

UNIFIED BOARD

MODEL CHART

CODE:

[X] = ITEM SUPPLIED

MODEL NUMBER	NUMBER OF FREQUENCIES	FREQUENCY RANGE	ITEM	DESCRIPTION
TUF1041AH	2	806-870 MHz	TLF1123A	RF DECK 851-866 MHZ
			TLF6331A	MAIN BOARD 806-870 MHZ 2-FREQUENCY
			TLF1131A	POWER AMPLIFIER 10 WATTS (806-821 MHz) 2 FREQUENCY
			TRN8626A	MAIN BOARD HARDWARE KIT

EPS-27481-O

OPTIONS CHART

OPTION	ADD	DELETE	APPLICABILITY	DESCRIPTION
L32	TPN6105A 12 V only kit	Station Power Supply	All Models	Allows for use in 12 V dc systems.
L45	TRN6798A Digital Clock	Escutcheon Change	All Local and Local/ Remote Models	12 Hour Digital Clock
L46	TRN6798A Digital Clock	Escutcheon Change	All Local and Local/ Remote Models	24 Hour Digital Clock
L113	TMN1005AV Microphone	Nothing	All Local and Local/ Remote Models	Addition of desk-stand microphone.
L169	TRN6796A Local/ Remote Board	Nothing	All Local Control Models	Provides local/remote control operation.
L226	Escutcheon Change	Escutcheon Change	All Local/Remote Control Models	Intercom
L301	TMN6067A Handset	Nothing	DC Remote Models Only	Handset used for servicing on DC remote models.
L302	TRN6822A Auto-Level Board	Nothing	All Local/Remote and DC Remote Control Models	Provides automatic compensation for line level differences.
L305	TRN8418A Converter	Nothing	All Models	Permits operation on 240 V ac line.
L306	TRN6821A 2 ppm Heater	Nothing	All Models	Provides 2 ppm stability for transmit frequency (450-512 MHz Only)
L313	TKN6065B 8' Desk Cable TRN6821A 2 ppm Heater	Nothing	All Models	Provides paging interface cabling and 2 PPM stability for transmit frequency.
L318	TMN1005AV Microphone	TMN1067A Handset	All Local and Local/ Remote Models	Desk stand microphone instead of handset.
L328	TRN8418A Converter	Nothing	All Models	Provides operation on 100 V ac line.
L329	TRN8418A Converter	Nothing	All Models	Provides operation on 220 V ac line.
L501	Nothing	1-KXN6121AA	All Models	Omit one transmit crystal.
L502	Nothing	2-KXN6121AA	All Models	Omit two transmit crystals.
L521	Nothing	1-KXN6122AA	All Models	Omit one receive crystal.
L522	Nothing	2-KXN6122AA	All Models	Omit two receive crystals.

EPS-25546-A

INSTALLATION AND ADJUSTMENTS

1. PRE-OPERATIONAL INSTRUCTIONS

1.1 When unpacking the radio from its shipping carton, refer to the model chart at the front of this manual. If any item is missing, contact your Motorola representative immediately.

1.2 FCC regulations state that a station license must be obtained for each radio installation by the owner of the equipment. The station licensee is responsible for ensuring that the transmitter power, frequency, and deviation are within the limits permitted under the station license. Adjustments to the transmitter section of the radio may be made only by a technician possessing an FCC commercial radiotelephone operator's license. No license is required to install, check out, or operate the radio.

1.3 Each radio set is adjusted, tested, and inspected before shipment. However, it is recommended that both the transmitter and receiver sections of the radio be checked for proper operation just prior to installation.

1.4 The radio should be tested with all cables and accessories supplied with the radio connected as they will be in the final installation. The frequency, deviation, and output power of the transmitter should be checked, as well as the sensitivity, squelch operation, and audio quality of the receiver. Radios with "Private-Line" (PL) or "Digital Private-Line" (DPL) coded squelch capabilities should be operated in that mode to verify proper encode/decode performance. In planning the installation, keep the antenna cable run as short as possible and provide a 117 V AC grounded 3-wire convenience outlet within reach of the AC cord. Connect the antenna cable to the antenna jack on the rear of the station and plug in the AC cord.

1.5 The screw terminals located on the bottom of the radio are used for DC remote control connections, paging, and optional microphone connections. Refer to Figure 1, Table 1 and Table 2 for connections.

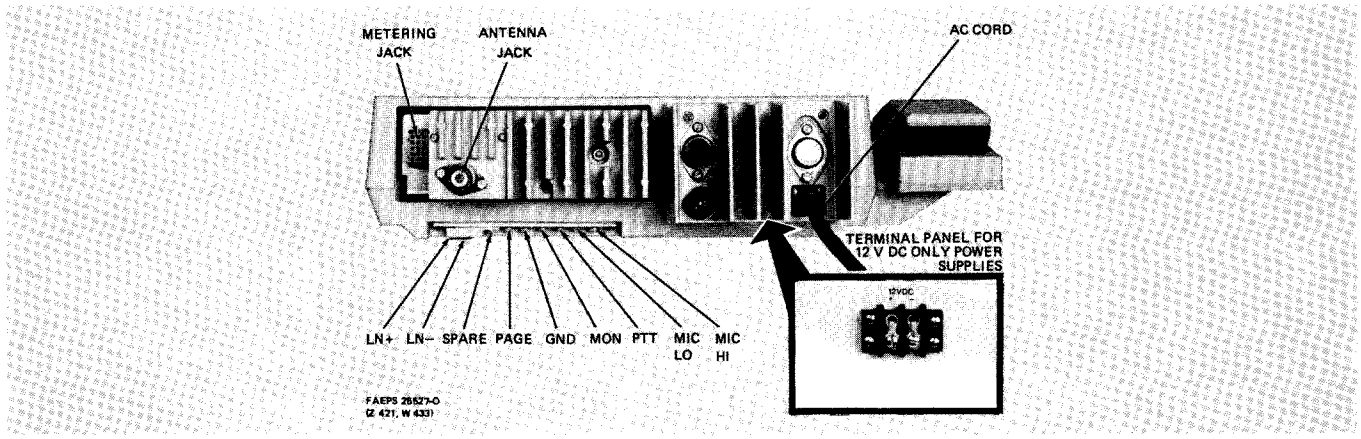

Figure 1. Flexar Radio Set Rear Detail

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Table 1. Optional Microphone Connections

Figure 1 Reference	TMN1005AV Microphone Connection
MIC HI	Brown
MIC LOW	Brown Lead Shield
PTT	Green
MON	White
GND	Black

NOTE

JU1 is in on the TMN1005AV Microphone.

Table 2. Paging and DC Remote Control Connections

Figure 1 Reference	Function
PAGE	Paging PTT
MIC HI	Paging Tone Input
MIC LO	Paging Ground
LINE +	DC Remote Control Input
LINE-	DC Remote Control Input

NOTE

When interfacing external equipment with the FLEXAR Base Station, refer to the applicable instruction manual for the equipment being used.

NOTE

If outside transmission lines are used for the remote control lines, spark gaps should be placed where the line enters the building. A spark gap should be connected between each side of the line and ground.

2. SERVICING

2.1 HOUSING REMOVAL

Step 1. Remove the four screws on the bottom of the station that are used to secure the housing.

Step 2. Press gently inward on both sides of the station housing and lift the housing off the radio chassis.

2.2 RF SECTION REMOVAL

The rf section folds outward on a hinge for ease of servicing. It can be folded outward by removing the three screws that secure the rf chassis to the station chassis near the power supply. Also, the heatsink for the power amplifier folds down when the screw from the rear of the heatsink is removed.

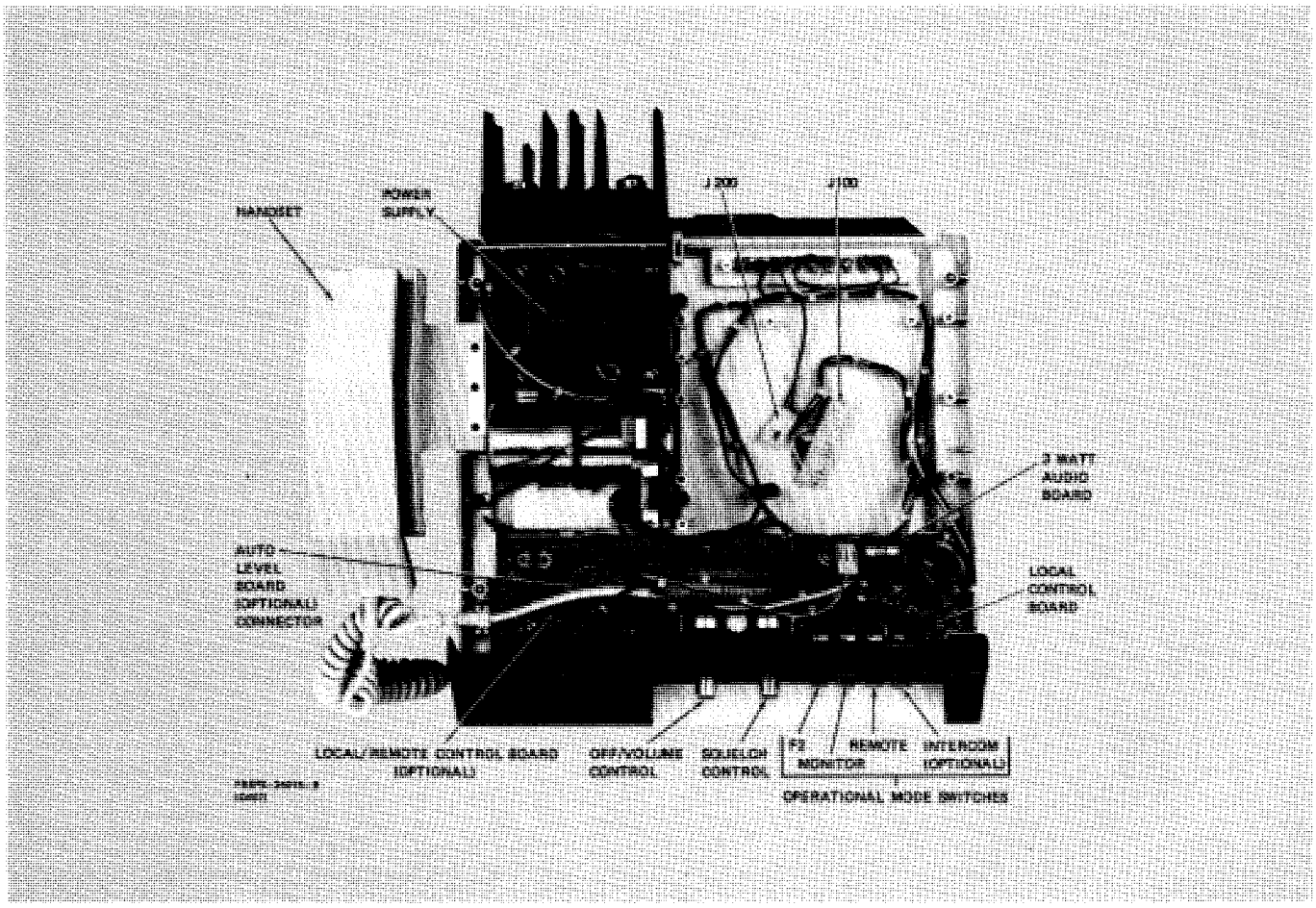

Figure 2. Circuit Board Location

2.3 POWER SUPPLY REMOVAL

Step 1. Remove the three screws securing the handset cradle to the housing.

Step 2. Remove the four screws securing the power supply to the housing.

Step 3. Remove the power supply by lifting upward.

Step 4. Remove the two screws securing the heatsink. The heatsink folds out for servicing.

2.4 CIRCUIT BOARD REMOVAL

To facilitate the removal of circuit boards, the rf section should be folded out and the power supply removed. When removing the local board, the volume and squelch knobs located on the FLEXAR front panel must be removed. The boards are then removed by unscrewing the captive screws that secure the boards to the chassis.

NOTE

On the circuit boards where a polarized capacitor is used, an arrow is shown pointing toward the marked side of the capacitor, which is not necessarily the positive lead.

2.5 SERVICING PROCEDURES

2.5.1 When servicing local or local/remote model receiver sections, move JU11 (on the local control board) from pin N (normal) to pin T (test). This allows frequency selection using the F2 switch without keying the transmitter.

2.5.2 When servicing the receiver section of dc remote control models, the jumper labeled LIN DIS (line disable) should be repositioned to the DIS pin. Frequency selection is accomplished by repositioning the REM (remote) jumper to the desired frequency pin.

CAUTION

When servicing the receiver section, the transmit crystals should be removed to prevent damage to the signal generator due to accidental keying of the radio.

3. PREOPERATIONAL ADJUSTMENTS

3.1 Insure that all external equipment (remote control units, paging units, etc.), if used, is properly connected and functioning correctly. Refer to the receiver and transmitter alignment procedures for the general test procedures. On two-frequency models the tests should be performed on both frequencies. For "Private-Line" or "Digital Private-Line" models check operation, where applicable, with and without coded squelch.

3.2 The following general tests may be used to verify proper operation of the FLEXAR base station.

1. Power Output
2. Transmitter Frequency
3. Transmitter Deviation
4. 20 dB Receiver Quieting
5. VSWR (If greater than 3:1, check the antenna installation.)
6. Squelch operation (PL and DPL encode/decode operation.)

3.3 In addition to the previous tests, line level and remote control operation checks should also be performed.

NOTE

Radios are shipped with the input and output line levels set for 0 dBm.

NOTE

On radios with the automatic line level adjust option it is extremely important that all remote control units are connected during line level adjustments.

4. LINE LEVEL SETTING

NOTE

On local/remote models the REMOTE BUTTON located on the front panel of the FLEXAR station MUST BE ENABLED (IN) to allow remote control operation.

4.1 LEVEL SETTING FOR LOCAL/REMOTE MODELS

4.1.1 Local/Remote Models Without Automatic Line Level Option

Step 1. Insure that the remote control units are properly connected and the radio is operating correctly.

Step 2. Apply a 1000 uV on-frequency signal with modulation of 1 kHz at ± 3 kHz deviation at the antenna input.

Step 3. Depress MONITOR switch in front panel.

Step 4. Connect an ac voltmeter across the LN+ and LN- terminals on the radio.

Step 5. Adjust the line level control labeled RL on the local/remote board for 0 dBm as indicated on the meter.

Step 6. Disconnect the rf signal generator and connect a suitable dummy load to the antenna connector.

Step 7. Connect a 1 kHz audio oscillator across the LN+ and LN- terminals and adjust for 0 dBm.

Step 8. On local/remote stations, ground the pin labeled TEST on the local/remote board. This step keys the transmitter.

Step 9. Adjust the exciter level control labeled EX for a level 6 dB above the modulation sensitivity level (± 3 kHz deviation).

NOTE

Modulation sensitivity level + 6 dB is 6 dB above the level required for ± 3 kHz deviation. If a deviation monitor is not available, 320 mV at P100-6 will approximate the level required.

Step 10. Remove the ground connected in Step 8.

Step 11. Apply 160 mV, 1 kHz signal to P100-6 and adjust microphone level control ML (R20) on the local remote board for the same level as the receiver line level set in Step 5.

NOTE

For all local/remote model FLEXAR base stations which do not use the automatic line level adjustment option, it is imperative that the receive output line level and the incoming line level from the remote controlling point be the same. For example, if due to path loss, the incoming level from the control point is -10 dBm, the receiver output level should be also sent -10 dBm at the base station.

4.1.2 Local/Remote Models With Automatic Line Level Option

Step 1. Insure that JU2 is cut on the local/remote board.

NOTE

Most systems use a receiver line output level of 0 dBm although + 11 dBm can also be used (if allowable on transmission line). For 0 dBm, JU1 and JU2 on the TRN6822A Auto Level Board are in; JU1 and JU2 are out for + 11 dBm systems. Also insure that all but one of the remote control units are connected in a line bridging mode.

Step 2. Insure that the remote control units are properly connected and the radio is operating correctly.

Step 3. Apply a 1000 uV on-frequency signal with modulation of 1 kHz at ± 3 kHz deviation at the antenna input.

Step 4. Depress MONITOR switch in front panel.

Step 5. Connect an ac voltmeter across the LN+ and LN- terminals on the radio.

Step 6. Adjust the line level control labeled RL on the local/remote board for 0 dBm as indicated on the meter.

Step 7. Disconnect the rf signal generator and connect a suitable dummy load to the antenna connector.

Step 8. Connect a 1 kHz audio oscillator across the LN+ and LN- terminals and adjust for 0 dBm.

Step 9. On local/remote stations ground the pin labeled TEST on the local/remote board. This step keys the transmitter.

Step 10. Adjust the exciter level control labeled EX for a level 6 dB above the modulation sensitivity level (± 3 kHz deviation).

NOTE

Modulation sensitivity level + 6 dB is 6 dB above the level required for ± 3 kHz deviation. If a deviation monitor is not available, 320 mV at P100-6 will approximate the level required.

Step 11. Remove the ground connected in Step 9.

Step 12. Apply 160 mV, 1 kHz signal to P100-6 and adjust microphone level control ML (R20) on the local remote board for the same level as the receiver line level set in Step 6.

NOTE

Steps 13 and 14 are required only for systems where the path loss between the control point and the station is greater than 15 dB.

Step 13. For local/remote stations connect an audio oscillator (160 mV, 1 kHz) to P100-6 and an ac voltmeter to the pin labeled "A" on the TRN6822A Auto Level Board. Adjust the microphone level control R20 on local/remote board for a maximum dip in amplitude at pin "A".

Step 14. Connect an ac voltmeter to the control line (1 kHz). If JU1 and JU2 are in (on the TRN6822A Auto Level Board) the ac voltmeter reading should be 0 dBm ± 2 dB; if JU1 and JU2 are out, the reading should be ± 11 dBm ± 2 dB.

4.2 LEVEL SETTING FOR DC REMOTE CONTROL MODELS

4.2.1 DC Remote Control Models Without Automatic Line Level Option

Step 1. Insure that the remote control units are properly connected and the radio is operating properly.

Step 2. Apply a 1000 uV on-frequency signal with modulation of 1 kHz at ± 3 kHz deviation at the antenna input.

Step 3. Slide PL MON ← switch on dc remote board in direction of arrow.

Step 4. Connect an ac voltmeter across the LN+ and LN- terminals on the radio.

Step 5. Adjust the line level control labeled LINE on the dc remote board for 0 dBm as indicated on the meter.

Step 6. Disconnect the rf signal generator and connect a suitable dummy load to the antenna connector.

Step 7. Connect a 1 kHz audio oscillator across the LN+ and LN- terminals and adjust for 0 dBm.

Step 8. Actuate the PTT switch on the service handset. This step keys the transmitter.

Step 9. Adjust the exciter level control labeled XMIT for a level 6 dB above the modulation sensitivity level (± 3 kHz deviation).

NOTE

Modulation sensitivity level + 6 dB is 6 dB above the level required for ± 3 kHz deviation. If a deviation monitor is not available, 320 mV at P100-6 will approximate the level required.

Step 10. Release handset PTT.

Step 11. Apply 160 mV, 1 kHz signal to P100-6 and adjust R32 for the same level as the receiver line level set in Step 5.

4.2.2 DC Remote Control Models With Automatic Line Level Option

Step 1. Insure that JU6 is cut on the dc remote board.

NOTE

Most systems use a receiver line output level of 0 dBm although + 11 dBm can also be used (if allowable on transmission line). For 0 dBm, JU1 and JU2 on the TRN6822A Auto Level Board are in; JU1 and JU2 are out for + 11 dBm systems. Also insure that all but one of the remote control units are connected in a line bridging mode.

Step 2. Insure that the remote control units are properly connected and the radio is operating correctly.

Step 3. Apply a 1000 uV on-frequency signal with modulation of 1 kHz at ± 3 kHz deviation at the antenna input.

Step 4. Slide PL MON ← switch on dc remote board in direction of arrow.

Step 5. Connect an ac voltmeter across the LN+ and LN- terminals on the radio.

Step 6. Adjust the line level control labeled LINE on the dc remote board for 0 dBm as indicated on the meter.

Step 7. Disconnect the rf signal generator and connect a suitable dummy load to the antenna connector.

Step 8. Connect a 1 kHz audio oscillator across the LN+ and LN- terminals and adjust for 0 dBm.

Step 9. Actuate the PTT switch on the service handset. This step keys the transmitter.

Step 10. Adjust the exciter level control labeled XMIT for a level 6 dB above the modulation sensitivity level (± 3 kHz deviation).

NOTE

Modulation sensitivity level + 6 dB is 6 dB above the level required for ± 3 kHz deviation. If a deviation monitor is not available, 320 mV at P100-6 will approximate the level required.

Step 11. Release handset PTT.

Step 12. Apply 160 mV, 1 kHz signal to P100-6 and adjust R32 for the same level as the receiver line level set in Step 6.

4.3 REMOTE CONTROL DC CURRENT LEVEL SETTING

FLEXAR Remote Control Base Stations use the detection of various levels and directions of remote control currents to activate the various remote control functions. The following dc line currents are employed:

FUNCTION	CURRENT AND DIRECTION LEVEL
PL MONITOR	-2.5 mA
KEY F1	+ 5.5 mA
KEY F2	+ 12.5 mA
F1 PAGE	-12.5 mA

Upon installation, each remote controller should be checked for proper current operation. Refer to the manual of the specific remote control unit being used.

On dc remote models the line disable jumper must be in the remote position to allow remote control.

800 MHZ FLEXAR BASE STATION

POWER AMPLIFIER AND RF DECK SERVICING PROCEDURES

1. INTRODUCTION

Due to the constraints imposed by the 800 MHz frequency range, special design techniques have been used in the RF Deck and Power Amplifier assemblies. As a result, unconventional procedures are required to properly service these assemblies. Detailed instructions on these unique servicing procedures are provided in the following paragraphs.

For main board servicing information (circuits not part of the RF Deck or Power Amplifier asemblies), refer to the schematic diagrams, circuit board details, and alignment procedures in this manual. Theory of operation is shown on the schematic diagreams.

2. GENERAL MICROSTRIP REPAIR PROCEDURES

2.1 MICROSTRIP CIRCUITS

The following table indicates those circuits on which microstrips are used.

ASSEMBLY	CIRCUITS USING MICROSTRIP
RF Deck	RF Amplifier Mixer Injection Doubler
Power Amplifier	Driver Power Doubler Final Amplifier Harmonic Filter/Antenna Switch

When faults are suspected in these circuits, they should first be inspected for visible defects such as broken leads, cracked microstrips, and broken or disconnected components.

NOTE

Cracked microstrips can often be found by sliding the tip of a modeling knife blade or some other sharp object along the surface of the ceramic substrate. Usually, a noticeable "bump" will be felt as the sharp object passes over the crack in the microstrip.

Carefully inspect all chip capacitors for evidence of leaching. Figure 1 shows several examples of leached capacitors. All visible defects should be corrected before any further troubleshooting steps are taken. If it is necessary to replace parts, follow the soldering instructions given in paragraph 2.2.

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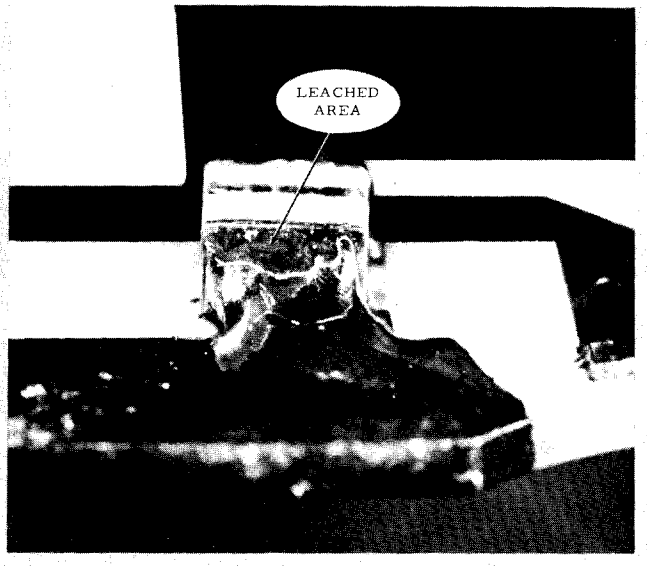


FAEPS-15974-O

(a) On Microstrip

FAEPS-15973-O

Figure 1. Examples of Leached Chip Capacitors

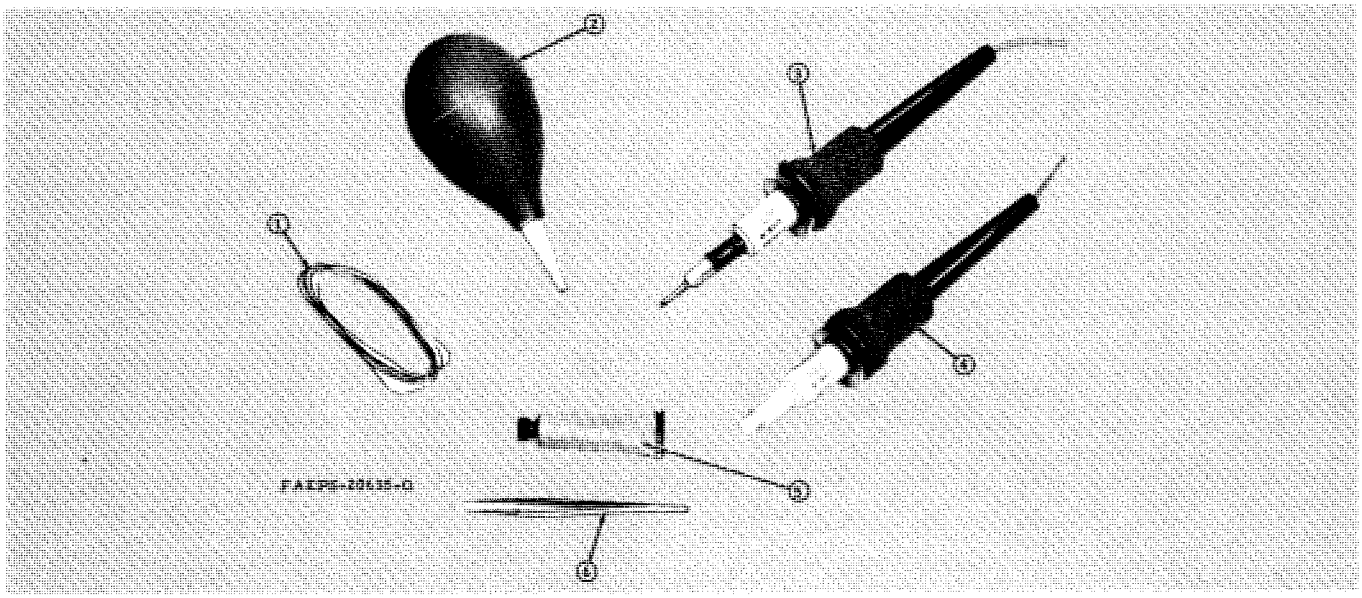


Figure 6. Recommended Tools for Power Amplifier Repairs

ITEM NUMBER	DESCRIPTION	MOTOROLA PART NUMBER
1	Silver solder; alloy content 1.4% silver, 36.1% lead, 62.5% tin	10-10041A61
2	Solder remover	ST-726
3	50-watt soldering iron with 1/8" chisel tip	ST-648
4	50-watt soldering iron	ST-646
	1/4" chisel tip	ST-1174
5	Wakefield thermal compound	11-83166A01
6	Tweezers	ST-492
Not shown	Modeling knife	ST-1172
	Five extra modeling knife blades	ST-1173

2.2 SOLDERING TECHNIQUES

2.2.1 When soldering microstrip circuits, always use silver solder with an alloy content of 1.4% silver, 36.1% lead, and 62.5% tin. Solder which satisfies this requirement may be obtained from Motorola; order part number 10-10041A61. Figure 2 shows recommended tools for microstrip repairs.

2.2.2 To remove and replace chip capacitors, perform the following operations:

Step 1. Remove the chip capacitor, using two soldering irons as shown in Figure 3.

Step 2. Dispose of the chip capacitor after it is removed. ***Chip capacitors must not be reused.***

Step 3. Install a new chip capacitor, using a low- wattage soldering iron (50 watts or less) with a chisel tip. See Figure 4.

CAUTION

Excessive heat applied during capacitor installation can cause leaching of the metallic contact area.

A reflow type technique *must* be used and the soldering iron tip *must not* be allowed to touch the chip capacitor end termination. After each solder operation, check for capacitor end metalization leaching. Figure 1 shows several examples of leached capacitors. If solder does not adhere to the complete end termination, assume that the termination is leached. Remember that leaching is probably the result of allowing the soldering iron to contact the capacitor end termination.

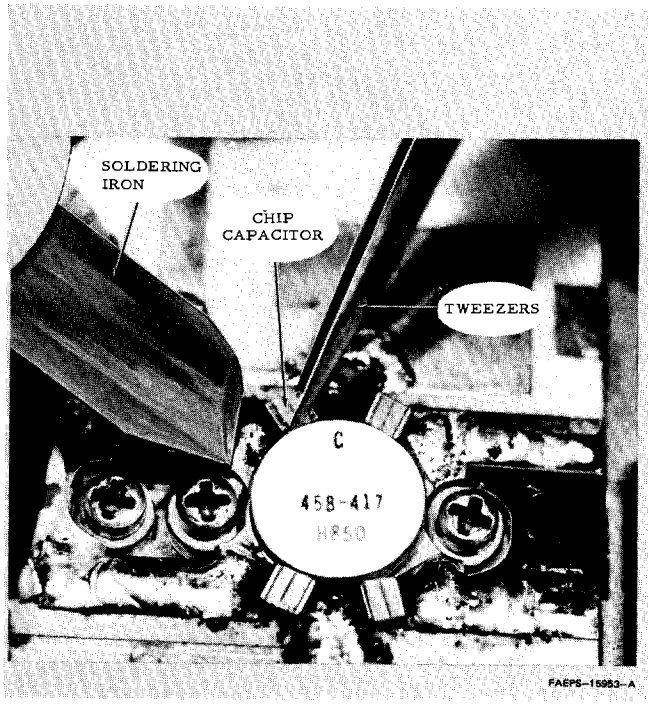


Figure 3. Chip Capacitor Removal Using Two Soldering Irons

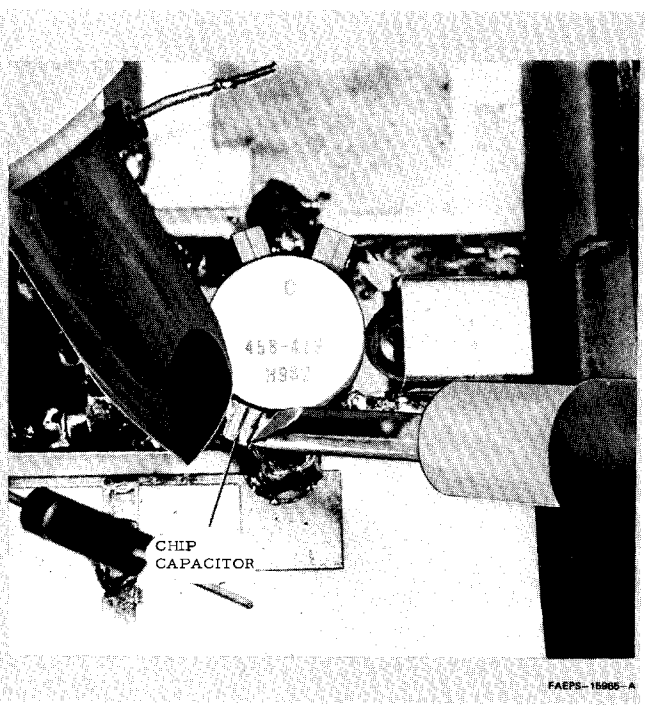


Figure 4. Chip Capacitor Installation Using a 50-Watt Soldering Iron With Chisel Tip

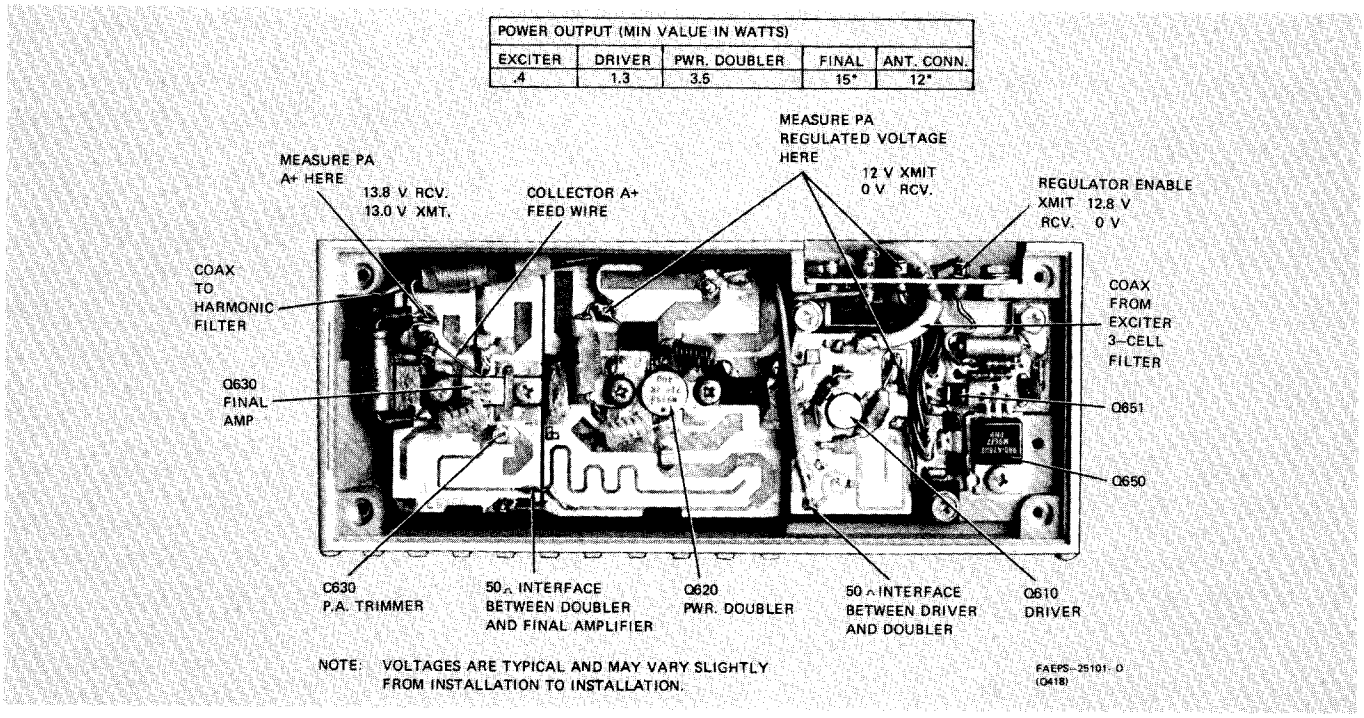


Figure 5. Power Amplifier, Troubleshooting Locations

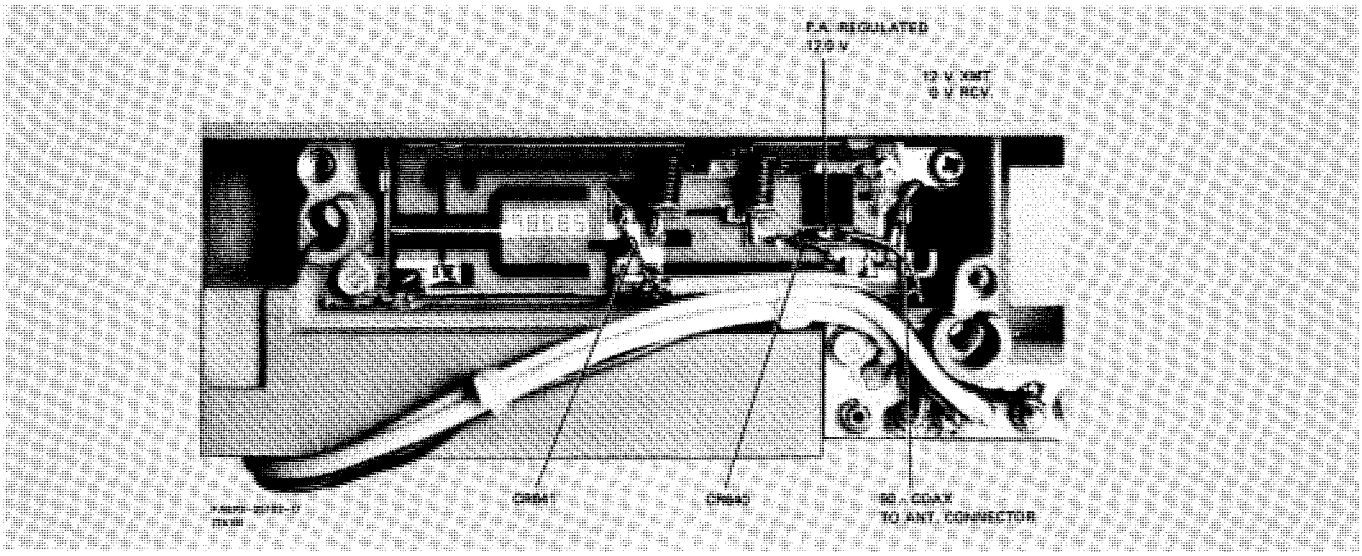


Figure 6. Harmonic Filter and Antenna Switch, Troubleshooting Locations

3. POWER AMPLIFIER TROUBLESHOOTING PROCEDURES

3.1 VISUAL INSPECTION

As an initial step, perform a visual inspection of the Power Amplifier circuits as described in paragraph 2.1. Correct all visible defects before any further troubleshooting steps are taken.

3.2 VOLTAGE CHECKS

Check the PA A + and PA regulated voltage at the locations indicated in Figures 5 and 6. If regulated voltage is not present, check regulator enable operation at feedthru noted in Figure 5. Troubleshoot main PC board push-to-talk circuit if enable is not present.

3.3 DEFECTIVE STAGE ISOLATION

3.3.1 General

If the visual and voltage checks do not reveal the cause of improper power amplifier operation, functional tests are required to determine which circuit is operating improperly. These functional tests are detailed below.

3.3.2 Exciter Test Procedure

Disconnect the coax cable from the exciter 3-cell filter. Connect a short length of coax (less than 8") from the 3-cell filter to a UHF-rated wattmeter. The wattmeter must be terminated in a 50 ohm resistive load. Verify that the power output of the exciter is at least 0.4 watts. If it is less than 0.4 watts, locate the cause of insufficient exciter output, referring to the schematic diagrams, circuit board detail, and alignment procedures provided elsewhere in this manual. If the exciter power output is acceptable, proceed to the Driver test. Remember to reconnect the coax to the exciter 3-cell filter.

3.3.3 Driver Test Procedure

Make sure the coax between the exciter and the Driver is intact. Unsolder the center conductor of the coax at the 50 ohm interface between the Driver and Power Doubler, leaving the grounded braid in place. (See Figure 5). Connect a short length of coax from this interface to a UHF-rater wattmeter terminated in a 50 ohm resistive load. Verify that the Driver power output is at least 1.3 watts.

If the Driver power output is less than 1.3 watts, it will be necessary to replace or repair the Driver module. See Section 4, Power Amplifier Circuit Replacement. If the Driver power output is acceptable, proceed to the Power Doubler test. Remember to reconnect the interface cable between the Driver and the Power Doubler.

3.3.4 Power Doubler Test Procedure

Make sure the interface cable between the Driver and Power Doubler is intact. Remove the wire jumper at the 50 ohmiinterface between the Power Doubler and the Final Amplifier. Connect a short length of coax (less than 8") from the Power Doubler output to a wattmeter. Be sure the wattmeter is rated for 800 MHz and is terminated in a 50 ohm resistive load.

Verify that the Power Doubler output is at least 3.5 watts. If the output is less than 3.5 watts, it will be necessary to replace or repair the Power Doubler module. See Section 4, Power Amplifier Circuit Replacement. If the Power Doubler output is acceptable, proceed to the Final Amplifier test. Remember to reconnect the Power Doubler-Final Amplifier interface with 22 gauge solid copper wire.

3.3.5 Final Amplifier Test Procedure

Make sure that the wire interface between the Power Doubler and the Final Amplifier is intact. Disconnect the center conductor at the coax on the output of the Final Amplifier stage, leaving the grounded braid in place. Connect a short length of coax (8" or less) from the Final Amplifier stage output to a wattmeter. Be sure the wattmeter is rated for 800 MHz and terminated in a 50 ohm resistive load. The Final Amplifier stage output power should be at least 15 watts.

NOTE

The piston trimmer capacitor on the input of the Final Amplifier has been factory adjusted for proper PA performance. It should not need adjustment unless the Final Amplifier transistor is replaced.

If the Final Amplifier power output is less than 15 watts, it will be necessary to replace or repair the Final Amplifier module. See Section 4, Power Amplifier Circuit Replacement. If the Final Amplifier power output is acceptable, the problem has been isolated to the Harmonic Filter and Antenna Switch module. Leave the Final Amplifier stage terminated in the 50 ohm load and proceed to the Harmonic Filter and Antenna Switch test.

3.3.6 Harmonic Filter and Antenna Switch Test Procedure

To test this module, perform the following steps:

Step 1. First, visually inspect the substrate and components for defects. Carefully check for cracks and leaching of chip capacitors.

Step 2. Check the voltage drop across each of the switching diodes, CR640 and CR641. Each should measure 0.7 $\pm$0.2 volts in the transmit mode. If either diode measures incorrectly, replace it before proceeding further.

Step 3. Test for dc continuity between the center conductor of the antenna connector and the center conductor of the coax feeding the connector at the 50 ohm point (see Figure 6). If this connector assembly tests faulty, disconnect the coax from the substrate and remove the connector from the heatsink assembly. Figure 11 shows the Antenna Connector Assembly.

4. POWER AMPLIFIER CIRCUIT REPLACEMENT

4.1 GENERAL

It is ***strongly recommended*** that the entire faulty PA stage be removed if the transistor is defective. Part placement and substrate positioning is extremely critical. Transistor replacement should *not* be attempted without the proper tools or by inexperienced personnel.

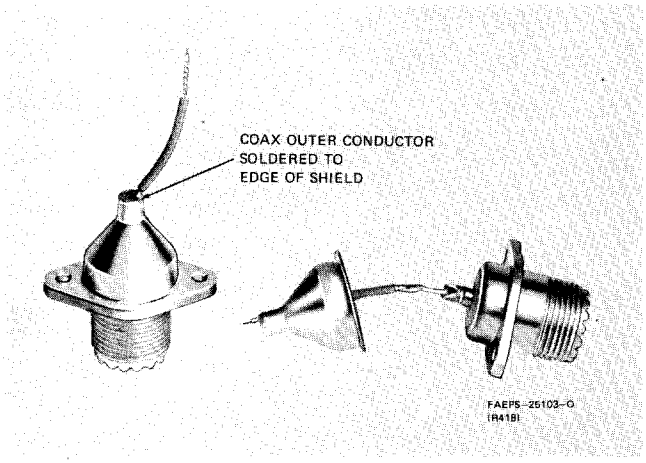


Figure 7. Antenna Connector Assembly

4.2 MICROSTRIP MODULE REMOVAL

To remove the Driver, Power Doubler, Final Amplifier or Harmonic Filter/Antenna Switch microstrips use the following procedure.

Step 1. Unsolder supply voltage choke or wire from its attachment at the microstrip.

Step 2. Disconnect the coaxial input and output lines from the microstrip.

Step 3. Disconnect all foil bridges between groukd pads of the faulty module and adjacent microstrips.

Step 4. Remove the two screws attaching the transistor to the PA heatsink. Remove the microstrip and its carrier assembly. In the case of the driver circuit, also remove the two mounting screws. Then lift out the microstrip, carrier and heatsink assembly.

4.3 MICROSTRIP MODULE REPLACEMENT

To replace the driver, power doubler, final amplifier or harmonic filter/antenna switch microstrips use the following procedure.

Step 1. Apply Wakefield Thermal Compound (Motorola Part No. 11-83166A01) to the mounting surface of the transistor (bottom side).

CAUTION

Thick coatings of thermal compound or foreign material on the transistor mounting surface will cause poor thermal contact and may result in early transistor failure.

Step 2. Place the microstrip assembly on the heatsink, and start but do not tighten the transistor mounting screws. Align the microstrip with adjacent microstrips and tighten mounting screws.

Step 3. Reconnect supply voltage leads, coax inputs and outputs, and foil ground straps.

5. POWER AMPLIFIER TRANSISTOR REPLACEMENT

NOTE

It is ***strongly recommended*** that the entire faulty PA stage be removed if the transistor is defective.

5.1 DRIVER TRANSISTOR REPLACEMENT

To replace the Driver transistor, perform the following steps:

Step 1. With the microstrip still in place, in the casting, remove all components that rest on the four transistor leads. Using a modeling knife and 50 watt soldering iron, pry up each lead. Make sure solder is completely melted before attempting to lift the lead.

Step 2. Now remove the mounting screws and lift out the driver microstrip. See Section 4, Power Amplifier Circuit Replacement, for details on removal.

Step 3. Clean the microstrip surface with alcohol or other solvent which leaves no residue.

Step 4. Lightly pre-tin the underside of the replacement transistor but do not leave excess solder.

Step 5. Install transistor on its small heatsink taking care to position the transistor leads and heatsink properly before tightening the transistor stud nut.

Step 6. Install the assembly into the PA heatsink and tighten the two mounting screws.

Step 7. Solder the transistor leads, components and interconnections at this time.

5.2 POWER DOUBLER AND FINAL AMPLIFIER TRANSISTOR REPLACEMENT

NOTE

If the Power Doubler or Final Amplifier transistors are replaced, the power amplifier must be retuned. Refer to paragraph 6.

The Power Doubler and Final Amplifier are very similar in construction. Both require ***extremely precise*** component placement and substrate spacing if the transistor is to be successfully replaced. To replace the transistor, perform the following steps.

Step 1. Lift all components that mount on the transistor leads.

Step 2. Unsolder each transistor lead, using a modeling knife to pry the lead up from the substrate. Apply enough heat to insure complete melting of the solder.

Step 3. Remove excess solder from transistor pads and clean with alcohol or other non-residue solvent.

Step 4. ***Lightly*** tin the bottom of each transistor lead and apply a thin layer of Wakefield compound to the mounting surface.

Step 5. Observing proper lead location, position the transistor such that each lead rests on its proper pad. Make sure that leads do not short to adjacent pads.

Step 6. Replace mounting screws and tighten securely, maintaining proper transistor alignment. Solder all leads back in exactly the same location, as close to the transistor as possible. See Figure 8 for critical part placement.

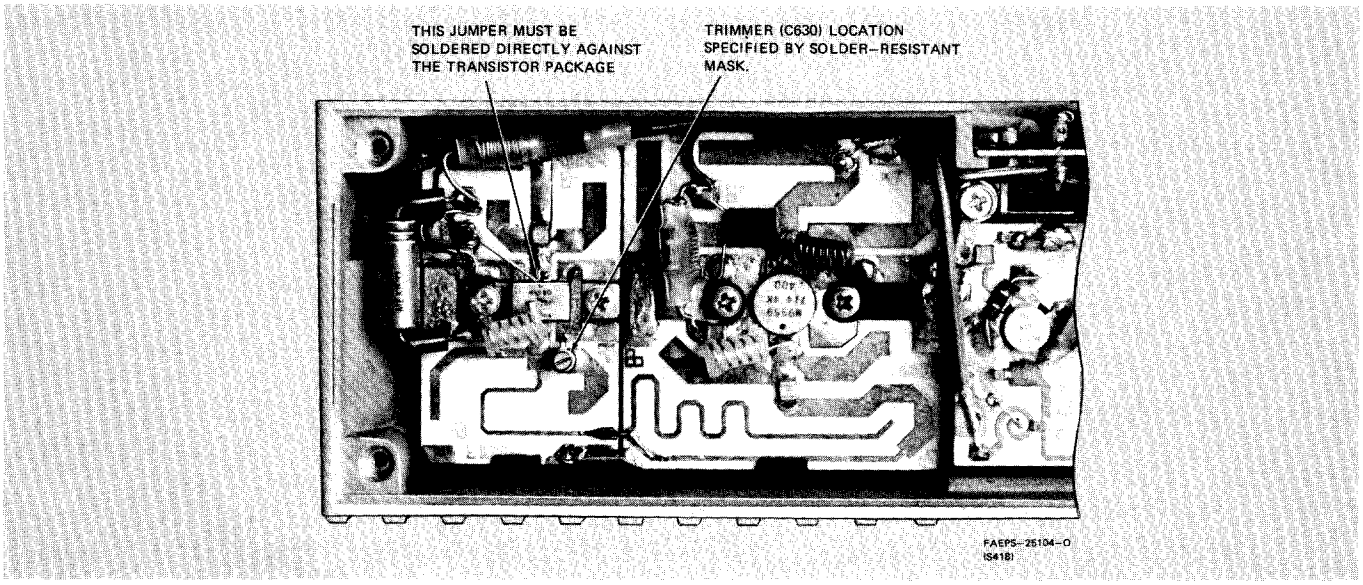


Figure 8. Critical Parts Location

6. FINAL AMPLIFIER ALIGNMENT PROCEDURE

The following procedure should be performed only if the Power Doubler or Final Amplifier transistors are replaced. C630 is factory set and must ***not*** be retuned unless one of these stages is replaced. If total retuning is necessary, perform the following steps.

Step 1A. If the transmitter frequency is above 807 MHz, remove the channel element and replace it with one at or below 807 MHz.

NOTE

It is necessary to tune the radio up initially below 807 MHz. If a channel element of 807 MHz is not available, the procedure in Step 1B may be used.

Step 1B. Remove the channel element and connect a 44.8 MHz signal to pin 3 of the transmit channel element socket through a 0.1 uF disc capacitor. (To identify pin 3 note that pin 6 of the socket is grounded by solder side plating.) Using an RF voltmeter, set the injection level to produce 0.25 volts from pin 3 to ground.

Step 2. Perform Steps 1-8 of the Transmitter Alignment Procedure PEPS-27483 at 806.4 MHz (44.8 MHz x 18) or at the transmitter frequency if it is below 807 MHz.

Step 3. Preset the final amplifier trimmer capacitor C630 fully clockwise. Then tune counterclockwise for 12.5 watts output.

Step 4. Install the operating channel element and tune the radio per the standard tuning procedure. If ***and only if*** output power is below 12 watts, tune C630 to 12 $\pm$ 0.5 watts output.

CAUTION

Failure to ***properly*** tune C630 could result in spurious emissions exceeding FCC regulations.

EXPLANATION OF SECTION 89.652

The following is an excerpt from section 89.652 of the FCC Rules and Regulations:

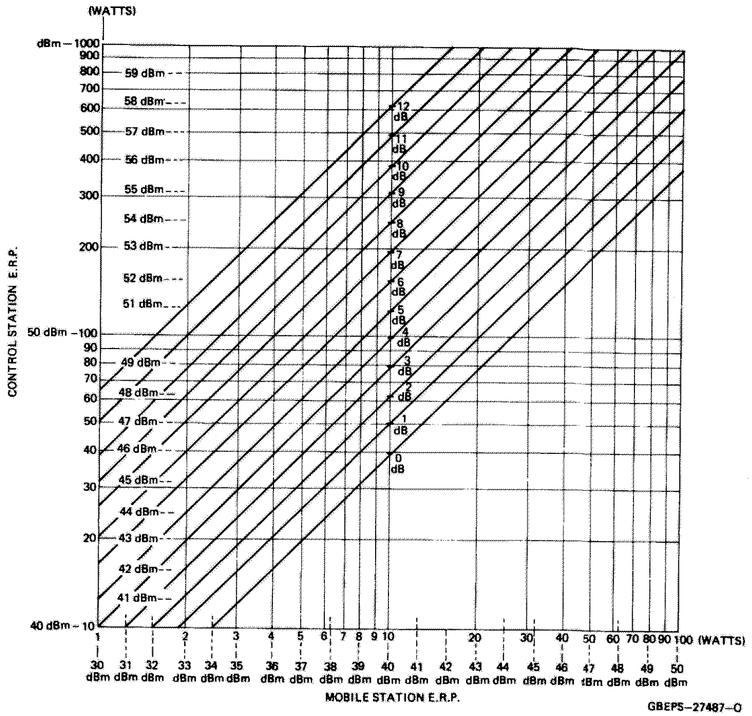
The strength of the signal of a control station, controlling a single mobile relay station, may not exceed, by more than 6 dB, at the antenna terminal of the mobile relay receiver, the signal strength produced thereby a unit of the associated mobile station.

The measurement of the signal strength of the mobile unit must be made when such unit is transmitting from the control station location or, if that is not practical from a location which is not more than one-fourth mile from the control station site.

The following charts can be used to assist the user in complying with 6 dB rule. The In Liine Attenuation Chart depicts the mobile station's (horizontal axis) and control station's (vertical axis). Effective Radiiated Power in either watts or dBm. The series of slanted lines crossing the chart displays the attenuation that must be added to the antenna network of the control station to comply with the 6 dB rule.

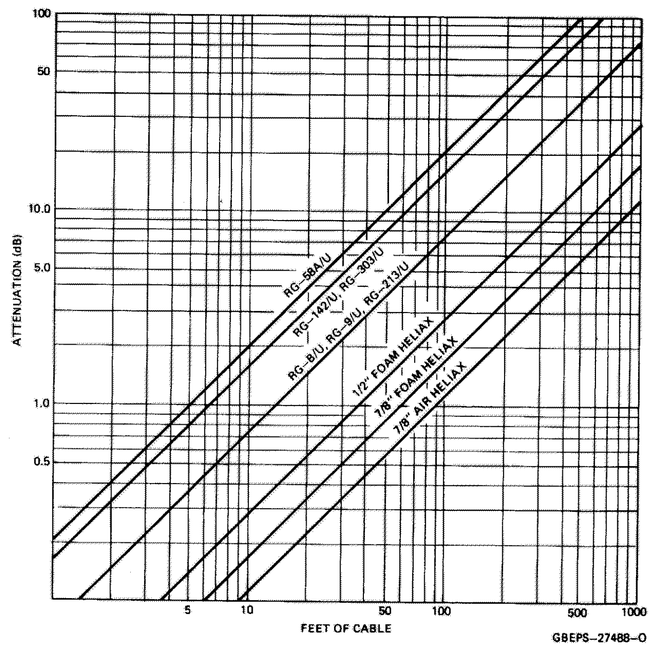
For example, suppose the mobile station has 30 watts (44.7 dBm) ERP and the control station has 150 watts (44.7 dBm) ERP and the control station has 150 watts (51.76 dBm) ERP. Using the chart, the control station will need 1 dB of in-line attenuation to meet the FCC requirements.

IN-LINE ATTENUATION CHART



ATTENUATION VS.

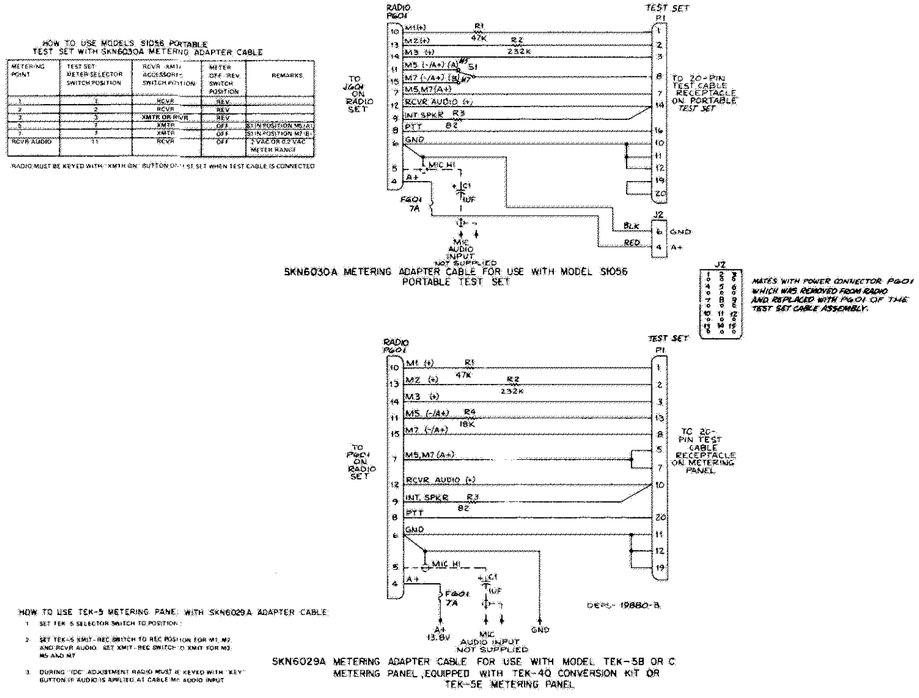
FEET OF COMMONLY USED COAXIAL CABLE AT 810 MHz



Required Test Equipment for "FLEXAR" Radio Servicing

General Type	Application	Recommended Model	Min. Specifications
AC-DC VOM	DC Voltage Measurements, general	Motorola T1009	Measurement range: 0-15 V dc Sensitivity: 20,000 ohms/volt
DC Multimeter	DC voltage readings requiring a high input resistance meter	Motorola S1063	Measurement range: 0-15 V dc Input resistance: 11 megohms
AC Voltmeter	Audio Voltage Measurements	Motorola S1053	Measurement range: 0-10 V ac Input resistance: 10 megohms
RF Voltmeter***	RF Voltage Measurements	Motorola S1339	Measurement range: 100 uV—3 V from 1 MHz-900 MHz Inputs: 50 ohms and high impedance
Oscilloscope	Waveform Observation	Motorola R1004	Vertical sensitivity:10 mV—10 V/division Horizontal time base: 1 usec.—1 sec/division
RF Wattmeter***	Transmitter Output Power Measurements	Motorola S1350 with appropriate element and T1013 RF Dummy Load	Measurement range: 0-30 Watts
Frequency Meter***	Transmitter Frequency Measurement	Motorola R1200 Series, S1343 Series, or S1344 Series. Model R1200 Service Monitor with high stability oscillator (X suffix) option. Frequency calibration recommended every 6 months or less. (806-900 MHz)	Measurement range: 136-900 MHz Frequency resolution: 10 Hz
Deviation Meter***	Transmitter Modulation Deviation Measurement	Motorola S1344 (136-512 MHz) Motorola R1200 (806-870 MHz) Service Monitor	Measurement range: 0-10 kHz deviation Frequency Range: 136-900 MHz
RF Signal Generator***	Receiver Alignment and Troubleshooting	Motorola S1329A Motorola R1200 Service Monitor with attenuator calibrated at 860 MHz (806-870 MHz)	Frequency Range: (136-900 MHz) Output Level: 0.1 uV-100,000 uV Must be capable of at least ±3 kHz deviation when modulated by 1 kHz tone
Audio Signal Generator	Audio Circuit Troubleshooting	Motorola S1067	Frequency Range: 20 Hz-20 kHz Output Level: 50 mV-1 V
PL Tone Generator*	Tone-Coded "Private-Line" Decoder Troubleshooting	Motorola SLN6221A	Frequency Range: 50 Hz-200 Hz Output Level: 0-500 mV
DPL Test Set***	"Digital Private-Line" Encoder-Decoder Troubleshooting	Motorola SLN6413A	
Radio Test Set w/appropriate metering cable (SKN6029A for TEK-5 and SKN6030A for Portable Test Set)	Meter reading at circuit metering points for alignment and troubleshooting	Motorola S1056 Portable Test Set, TEK5B or C Metering Panel with TEK40 Conversion kit, or TEK5E Metering Panel. See Figure 2	See Figure 2
10.7 MHz Signal Source	Adjustment of Receive frequency		1 mV Output Accuracy ± 10 Hz
16.9 MHz Signal Source (800 MHz)	Adjustment of Receive Frequency		1 mV Output Accuracy ± 10 Hz
Tuning Tool Kit	Receiver and Transmitter Alignment	Motorola TRN6210A	

*Required for Tone-Coded "Private-Line" Models only
**Required for "Digital Private-Line" Models only
***Depends on frequency range of the "Flexar" radio

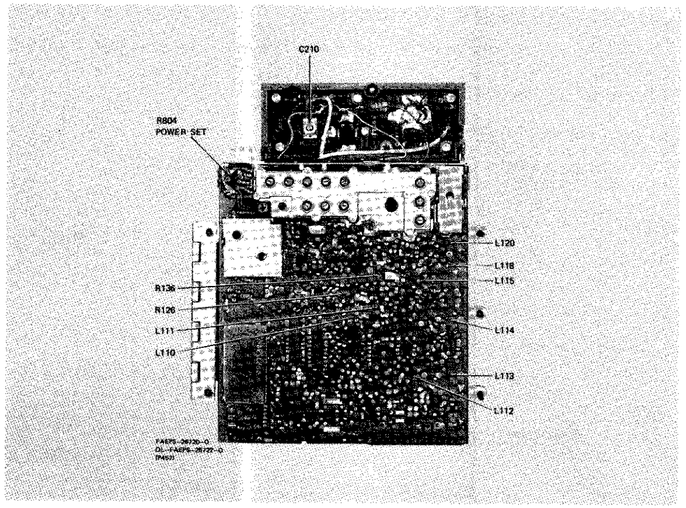


parts list

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
SKN6029A and SKN6030A Metering Adapter Cable		PL-4075-A
		CAPACITOR, fixed:
C1	23-82783B10	1 uF ±20%; 50 V (not supplied)
		FUSE, cartridge:
F1	65-86099	7.5 amp
		CONNECTOR, receptacle: includes:
J602	15-83292K01	SHELL, female; 2 contact
	29-84706E04	TERMINAL, 2 req'd.
		CONNECTOR, plug:
P1	9-855266	female; 20 contact
P601		includes:
	15-80315A39	INSULATOR, 15-circuit
	29-84706E03	TERMINAL, male; 12 req'd.
		RESISTOR, fixed; 1/4 W:
R1	6-124A89	47k ±5%
R2	6-10621E24	232k, 1%
R3	6-124C23	82 ±10%
R4	6-124A79	18k ±5%
		SWITCH:
S1	40-82148F01	spdt
		FUSEHOLDER:
XF1	14-82882A01	BODY, fuseholder
	14-82883A01	CAP, fuseholder
	42-82884A01	CLIP, fuseholder; 2 req'd.

Test Equipment List and Metering Adapter Cable Diagram Parts List
Motorola No. PEPS-20882-F
10/20/78-UP

VHF TRANSMITTER ALIGNMENT PROCEDURE



TRANSMITTER METERING

Transmitter Meter Readings, Using TEK-5 Metering Panel or S1056B Portable Test Set

METER	MEASUREMENT	READING,(uA)	REMARKS
3	Buffer Amplifier Input	8 (MIN)	
5	Exciter Amplifier Collector Current	25(TYP.) 40 (MAX)	
7	PA Current	11 (TYP.) 17 (MAX)	Multiply M7 x 0.336 to obtain PA Final Current in Amps

Transmitter Meter Readings With 20,000 Ohm/Volt Voltmeter

METERING FUNCTION	VOLTMETER LEAD CONNECTIONS +	VOLTMETER LEAD CONNECTIONS —	VOLTMETER SCALE	TYPICAL READING
M3 Buffer Ampl. Input	J601-14	Chassis Ground	50 uA, DC	8 uA min.
M5 Exciter Output Amplifier Collector Current	J601-7	J601-11	100 mA, DC	17 mA. Typ. 100 mA. Max.
M7 PA Current	J601-7	J601-15	500 mA, DC	270 mA Typ. 385 mA Max.

TRANSMITTER

PREALIGNMENT NOTES

1. In some cases, peak readings may occur at two points in the tuning range of a coil. Always choose point where slug is nearest top of coil form (away from circuit board).

2. Unnecessary tuning adjustments should be avoided. Usually, only a "touch-up" transmitter alignment is needed. Complete transmitter alignment is needed in the following cases:

   a. After changing transmitter operating frequency.
   b. After replacing a component in a frequency-sensitive network.

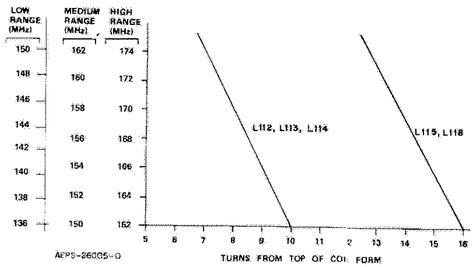
3. Before beginning a complete alignment, preset tuning adjustments as follows:

   a. Set L120 7 turns from top of form.
   b. Set C210 1/4 turn counterclockwise from tight.
   c. Set L110 (and L111 in 2-frequency models) 7 turns from circuit board.

CAUTION

Low or no meter 3 reading will be obtained if L110 and L111 are not properly preset.

   d. Set L112, L113, L114, L115, and L118 according to the following chart:



   e. Set power set control R804 fully counterclockwise (viewed from solder side of board) for maximum transmitter power output.

4. Key transmitter for each step in alignment procedure and de-key after alignment step is completed. Avoid keying an unaligned transmitter for prolonged periods.

5. Two-frequency radios should be aligned on lowest operating frequency.

6. Transmitter frequency calculations:

   $f_c = 9\, f_{osc.}$, where f_c = carrier frequency, and f_{osc} = crystal oscillator frequency.

SET-UP

1. If a TEK-5 Metering Panel or a S1056B Portable Test Set is available, connect the metering panel or test set to J601 using the appropriate metering adapter cable. The metering adapter cables and directions for their use are shown on PEPS-20882. Metering may be accomplished with a 20,000 ohm-per-volt voltmeter if a test set or metering panel is not available. Refer to the metering tables on this page.

2. Connect an rf wattmeter, terminated in a resonant antenna or 50-ohm resistive dummy load, to radio set antenna connector J602.

3. Connect a dc power supply to the power leads of the test cable. Set the power supply output to 13.8 volts.

TRANSMITTER ALIGNMENT

1		L110, 111, 112, 113, 114, 115, 118, 120, C210 (25 W)		Preset controls per chart, set power set pot R804 to maximum CCW position as viewed from bottom of main board.
2	3	L112, 113	Peak	Tune the oscillator output coils L112 and L113 in that order for peak reading on M3.
3	3 or 5	L114		If the buffer output coil, L114, has been preset, and if position 5 does not read, tune L114 for dip in position 3. If only a minimum adjustment is being made and there is a position 5 reading, tune L114 for a peak reading in position 5.
4	5	L115, 118	Peak	Tune the tripler coils L115 and L118, in that order, for a peak reding in position 5.
5	Wattmeter or 5	L120	Peak	Tune coil L120 CCW from bottom of main board for peak power output on wattmeter.
6	Wattmeter	C210 (25 Watt)	Peak	Tune C210 for peak power output.
(Step 7 for multi-freq. only)				
*7	Wattmeter	L112, 118, 120	Peak	Tune L112, L118, & L120 in that order for peak power output.
*8	Wattmeter	L112		Detune L112 for a wattmeter reading of 15 watts.
*9	Wattmeter	L120, 118	Peak	Tune L120 & L118 for peak power on wattmeter. If wattmeter reading increases more than 5 watts repeat Step 8.
*10	3	L112	Peak	Retune L112 for maximum Meter 3 reading.
10A.	Final Output	L114	M3, M5	Dip M3 while maintaining M5 as high as possible.
11	Wattmeter	C210	Peak	Retune C210 for peak power out on wattmeter.
11A.	Power Output	L113	M3	Peak. Retune L113 for a peak on M3.
12	Wattmeter	R804 Power Set		Adjust R804 to reduce power output to 28 watts. For multi-frequency operation, set R804 so that the channel with the lowest power output is 28 watts.
13	Wattmeter	R804 Power Set		Close PA and tighten heatsink to chassis. Repeat Step 12. M7 should be below 17 uA.

NOTE

Two-frequency radios should be tuned on lower frequency except where indicated with an asterisk.

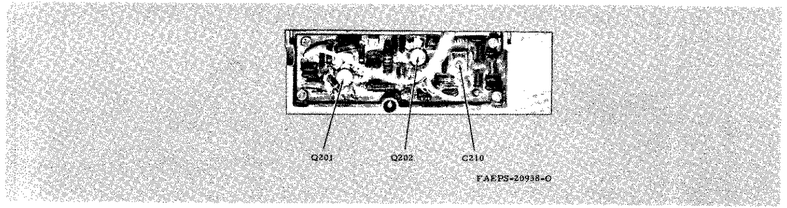
TRANSMITTER ALIGNMENT PROCEDURE (cont'd.)
IDC ADJUSTMENT

NOTE

If the maximum power output obtainable is less than 28 watts, go back to Step 2 of the exciter alignment procedure and repeat the alignment a second time. If the maximum obtainable power output is still below 28 watts, proceed as follows:

IF MAXIMUM IS BETWEEN 26 AND 28 WATTS:
Set R804 so that power output just begins to drop (less than 1/2 watt).

IF MAXIMUM IS LESS THAN 25 WATTS:
The transmitter may be malfunctioning. Refer to the transmitter schematic diagram for troubleshooting information.



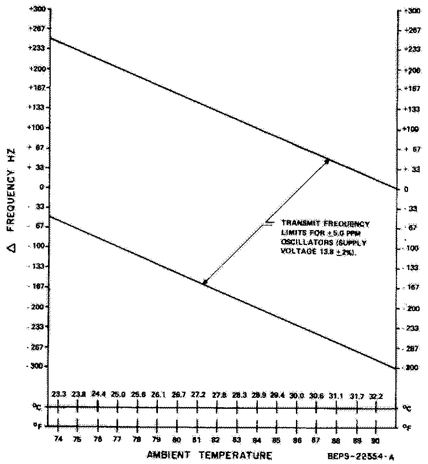
OSCILLATOR FREQUENCY ADJUSTMENT

Oscillators should be set on frequency AFTER transmitter has been aligned and BEFORE modulation dieviation is set.

NOTE

The transmit frequency of this radio should only be adjusted when the ambient temperature is 82°F (28°C). Because of temperature and voltage variations between factory and field locations, the frequency measured may not correspond to the assigned frequency. If the measured frequency is between the limits shown on the graph given below make no attempt to correct the frequency.

ACCEPTABLE LIMITS FOR FIELD FREQUENCY MEASUREMENTS



If the measured frequency does not fall within the limits shown on this graph, it is recommended that the radio be returned to a room temperature environment (approximately 82°F, 28°C) and the frequency reset using the procedure described below.

SET-UP

1. Set up the frequency meter or counter controls as required.
2. In tone-coded *"Private-Line" (PL)* radios, remove the "Vibrasponder" resonant reed from its socket on the PL board.
   In *"Digital Private-Line" (DPL)* radios, set encoder amplitude to zero by adjusting R342 (fully CCW from plating side of board).

Frequency Adjustment Procedure

STEP	PROCEDURE
1	Select F1
2	Key transmitter with no modulation
3	Adjust L110 for F1 frequency ± 100 Hz
	Two-Frequency Models Only
4	Select F2
5	Adjust L111 for F2 frequency ± 100 Hz

Oscillator frequency adjustment must be made BEFORE setting the IDC controls

SET-UP

1. Set the deviation meter operating controls as needed.
2. In tone coded *"Private-Line"* radios, remove the "Vibrasponder" resonant reed from its socket on the PL board.

   In *"Digital Private-Line"* radios, set encoder amplitude to zero by adjusting R342 (fully CCW from plating side of board.)
3. Disconnect mic input lead (red) from main circuit board.
4. Connect the output of an audio signal generator to J601 as follows:

   High side through a 1 uF capacitor (+ end toward the radio) to J601-5.
   Low side to J601-6 or radio chassis.

NOTE

The transmitter must be keyed by pressing the KEY button on the test set or by shorting J601-8 to J601-6 or the radio chassis. DO NOT USE THE MICROPHONE PTT SWITCH TO KEY THE TRANSMITTER DURING IDC ADJUSTMENT.

5. Connect an ac VTVM across the audio signal generator output.

IDC Adjustment Procedure

STEP	PROCEDURE
1	Set audio signal generator output frequency to 1000 Hz and output level to 0.8 V.
2	Select F1 and key transmitter. Adjust F1 "IDC" control R126 for ± 5 kHz deviation meter reading.
3	On 2-freq. models, select F2 and key transmitter. Adjust F2 "IDC" control R136 for ± 5 kHz deviation meter reading.
4	Reduce audio signal generator output level until deviation meter reads ± 3.0 kHz. Audio oscillator output level should be 160 mV ± 3 dB.
	Tone Coded "Private-Line" Models Only
5	Insert resonant reed into socket on PL board and disconnect audio oscillator from J601.
6	Key transmitter and adjust Tone Level control R433 for PL tone deviation reading of ± 800 Hz.
7	Reconnect audio signal generator to J601-5 and -6 and repeat Steps 1 through 3. Be sure overall deviation does not exceed ± 5 kHz, including PL tone.
	or
	"Digital Private-Line" Models Only (see note)
5	Disconnect the audio signal generator from J601.
6	Key the transmitter and adjust Code Level set control R342 for a DPL code deviation reading of 900 Hz.
7	Reconnect the audio signal generator to J601-5 and -6. Repeat Steps 5 and 6. Be sure overall deviation does not exceed ± 5 kHz, including DPL code. 1 through 3.

NOTE

DEVIATION MEASUREMENT

To obtain accurate measurement of transmitter deviation in radios equipped with "Digital Private- Line" binary-coded squelch, the frequency response of the deviation measuring equipment must be 1 Hz. If a deviation meter with this low frequency response characteristic is not available, the transmitter deviation can be checked by making the transmitter send continuous Turn-Off code during the measurement. Since the Turn- Off code waveform is sinusoidal, standard test equipment will then provide an accurate deviation measurement. To make the transmitter send continuous Turn-Off code, short together the base and emitter plating of PTT Inverter Q309 and key the transmitter.

RECEIVER

PREALIGNMENT NOTES

1. On "Digital Private-Line" and "Private-Line" radio sets, disable the DPL or PL decoder by depressing the front panel MONITOR pushbutton.

2. In some cases, peak meter readings may occur at two points in the tuning range of a coil. Always choose point where the slug is nearest the top of the coil form (away from the circuit board).

3. Unnecessary tuning adjustments should be avoided. Usually, the receiver will require only a "touch-up" alignment. Complete receiver alignment is necessary in the following cases:

   a. After changing the receiver operating frequency.
   b. After replacing a component in a frequency-sensitive network.

4. Before beginning a complete receiver alignment, preset tuning adjustments as follows:

   a. If a PREAMP is used, set L201, 202, 203 fully CCW out of rf deck.
   b. Set L205, 206, 207, 208, 209, 210, 211, 212 fully CCW out of rf deck.
   c. Set L12, 13, 15 flush with bottom of coil form by turning CCW.
   d. Set L213 seven turns clockwise from top of coil.
   e. Set L18, 20, 21, 23 flush with bottom of coil form by turning CCW.

5. Receiver frequency calculations:

   $f_{osc} = \frac{f_c - 10.7\ MHz}{3}$ and $f_{inj} = 3\ f_{osc} = f_c - 10.7\ MHz$;

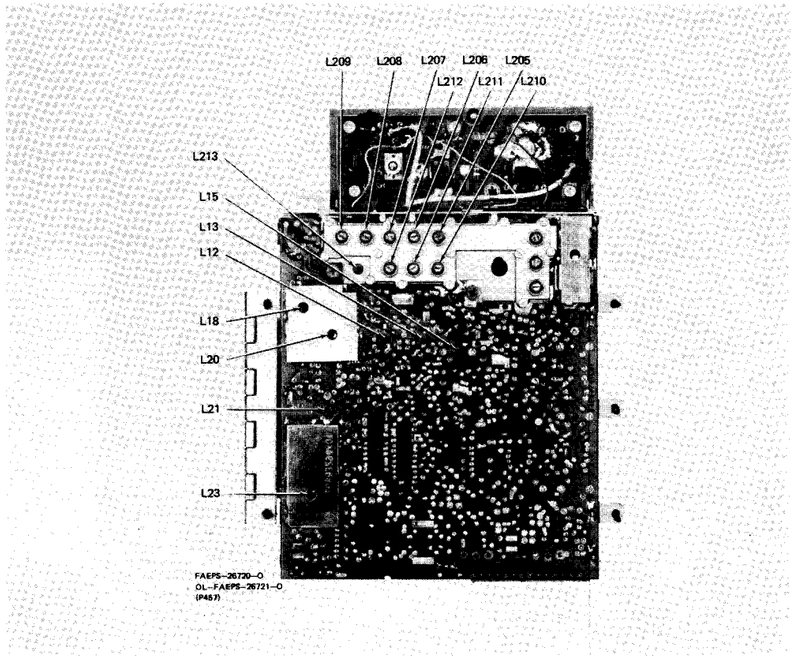
   Where f_c = carrier frequency, f_{osc} = oscillator crystal frequency, and f_{inj} = mixer injection freq.

6. Two-frequency radios should be tuned on the higher operating frequency.

TEST EQUIPMENT SET-UP

1. If a TEK-5 Metering Panel or a S1056-59 Portable Test Set is available, connect the metering panel or test set to J601 using the appropriate metering adapter cable. The metering adapter cables and directions for their use are shown in Figure 6. Metering may be accomplished with a 20,000 ohm-per-volt voltmeter if a test set or metering panel is not available. Refer to the voltmeter metering table on this page. Voltage readings with a VOM will not be accurate if metering panel or test set is connected simultaneously.

2. Connect a dc power supply to the power leads of the test cable. Set the power supply output to 13.8 volts.



RECEIVER METERING

Typical Receiver Meter Readings With TEK-5 Metering Panel or S1056-59 Portable Test Set

METER	MEASUREMENT	READING, uA
1	IF Amplifier Signal Level	8-14 (No Signal) 50 (40 uV Input)
2	Quadrature Detector Output	22 ± 1
3	Injection Oscillator Output	18-28 uA

Receiver Meter Readings With 20,000 Ohm/Volt Voltmeter

METERING POINT	VOLTMETER LEAD CONNECTIONS +	—	VOLTMETER SCALE	TYPICAL READINGS
M1 IF Ampl. Signal Level	J601-10	Chassis Ground	2.5 V DC	.25-.5 V (No Signal) 1.75 V (40 uV Input)
M2 Quadrature Detector Output	J601-13	Chassis Ground	10 V DC	5.1 V ± .2 V (5.5 V Using DC Multimeter)
M3 Injection Osc. Output	J601-14	Chassis Ground	50 uA DC	18-28 uA

RECEIVER ALIGNMENT PROCEDURE

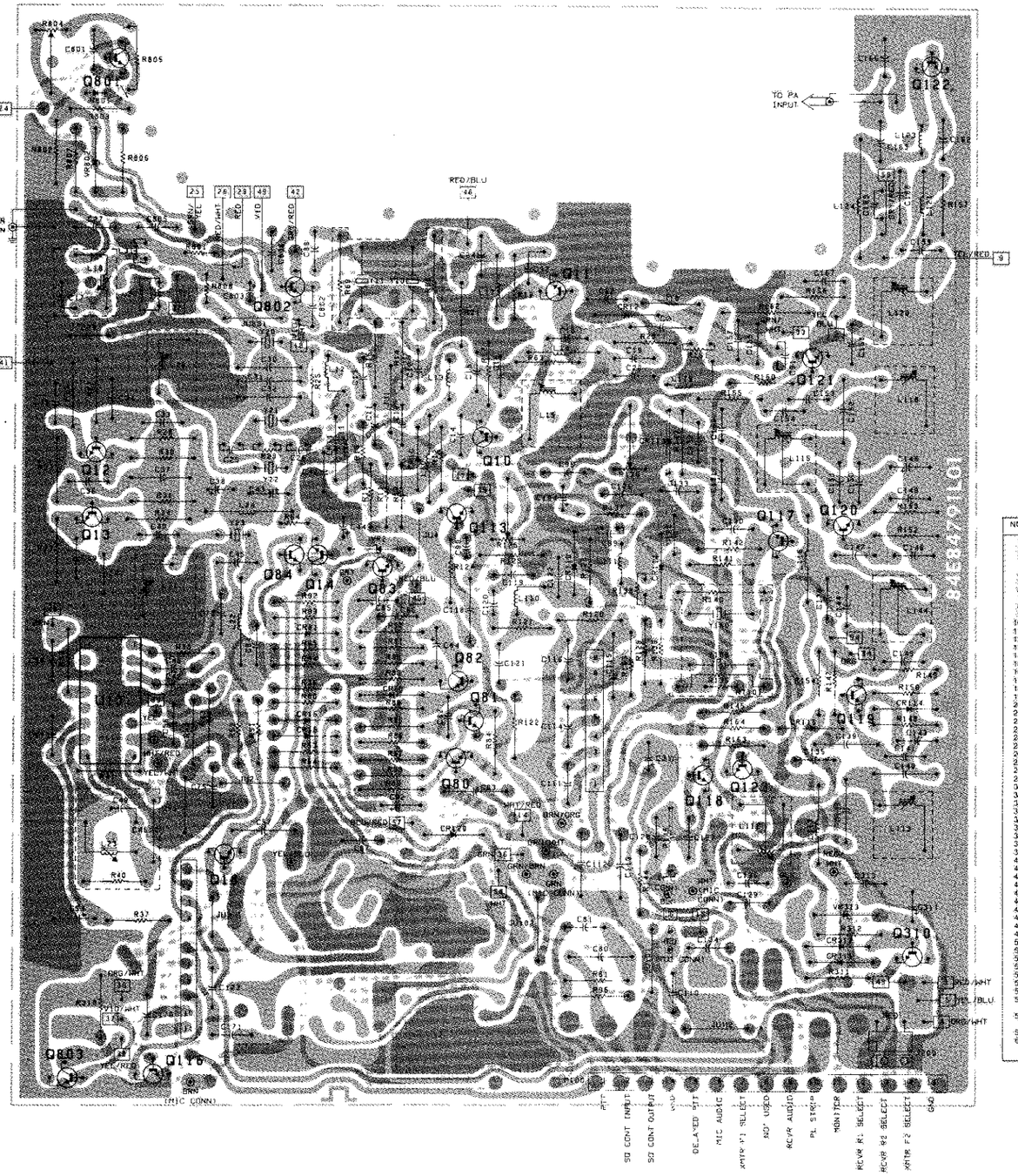
NOTE
Transmitter alignment must be performed before receiver alignment.

	Step	Input Signal	Signal Input Point	Adjust	Monitoring Point	Desired Reading
1	Quadrature Detector	10.7 MHz @ 1 mV	Near Q12; allow signal to "spray" into circuit (Note 1)	L23	Meter 2	22 ± 1 uA
						or
					DC Multimeter at J601-13	5.5 V DC
2	Injection Oscillator			Freq Select Switch in "F1", adjust L13	Meter 3	Peak
				Freq Select Switch in "F2", adjust L12	Meter 3	Peak
				Freq Select Switch to lowest freq position, then:		
				L15	Meter 3	Max
				L210		Dip
				L211		Peak
				L212		Dip
3	Preamp Input	Receive freq. @ 10 mV (Note 2)	Antenna Connector	L201, 202, 203, 204	Meter 1	Peak. (Adjust signal generator input level to keep M1 in the 25 uA-35 uA range)
4	Preselector	Adjust un-modulated signal generator to receive freq. (max. on M1; ± 18 kHz of formula frequency)	Antenna Connector	Set Freq. Select Switch to highest freq. position, then adjust L209, 208, 207, 206, 205	Meter 1	Peak. (Adjust signal generator input level to keep M1 in the 25 uA-35 uA range). Repeat, and then peak M1 by adjusting L213
5	IF Tuning	Receive Freq. (counted)	Antenna Connector	L18, 20, 21	Meter 1	Peak M1 with L18, 20, 21. (Adjust signal generator in put level to keep M1 in the 35 uA-40 uA range). If two peaks are present, choose the one nearest the top of the coil form. Repeak, and then detune L211/2 turn ccw.
6	Injection Touch-Up	Receive Freq. (no modulation). Adjust level for 30 uA reading on M1.	Antenna Connector	Set Freq. Select Switch to lowest freq. position, then adjust L15	Meter 1	Detune ccw for a minimum M1
				L212, 211, 210; then repeat.	Meter 1	Peak
				L15	Meter 3	Peak
7	Fine Freq. Adj.	Receive freq. (counted)	Antenna Connector	L13 for freq. #1 L12 for freq. #2 (2 freq radios only)	Radio Speaker	Audio zero beat. Repeat after a 20 minute warmup
		10.7 MHz Osc.	"Spray" into base of Q12 (Note 1)			

NOTES:
1. With a wire connected to a 10.7 MHz signal source output, "spray" the signal near Q12 (that is, place the wire close to Q12) but do not allow the wire to make physical contact with any part of the i-f amplifier.
2. To set signal generator on frequency, either use a counter on the generator output, or use the zero beat method. Do not use meter 2 to set frequency.

20 DB QUIETING SENSITIVITY MEASUREMENT

1. Connect an ac voltmeter across the speaker.
2. On PL model radio sets, disable PL by depressing the MONITOR button on the radio set front panel.
3. Turn the SQUELCH control fully counterclockwise.
4. Turn on the radio set and adjust the VOLUME control until a reading of 2 volts is obtained on the ac voltmeter.
5. Connect an rf signal generator to the radio set antenna connector. Set the signal generator to the carrier frequency, and set the generator output level control to minimum.
6. Slowly increase the output level of the rf signal generator until the ac voltmeter reads 0.2 volts.
7. Note the signal generator output signal level. This signal level is the 20 dB quieting sensitivity of the receiver.



VHF UNIFIED BOARD

CIRCUIT BOARD DETAIL

SHOWN FROM SOLDER SIDE

COMPONENT SIDE   BD-EEPS-26511-0
SOLDER SIDE   BD-EEPS-26512-0
® OL-EEPS-26460-0

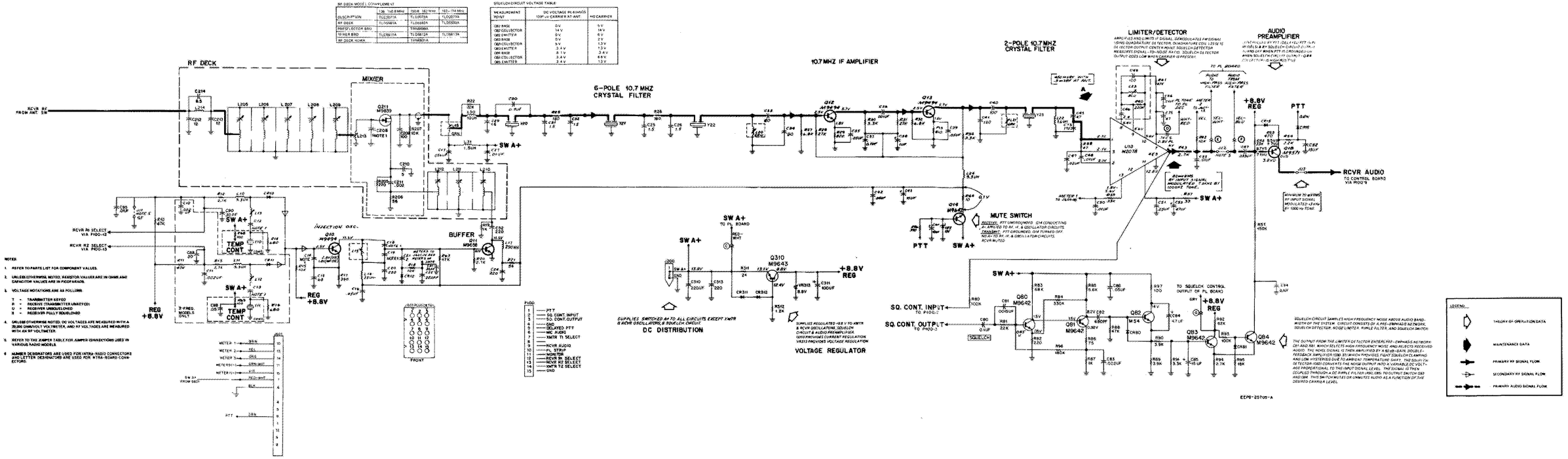
XSTR BASE DETAILS

NO	FUNCTION	ON-BOARD SOURCE	COLOR	OFF-BOARD DESTINATION	REMARKS
1	—	—	—	—	NOT USED
2	SW A + TO RF AMP	R156	YEL-BLU	R311	TO #5
3	SW A + TO J601	R311	RED-WHT	J601-7	FORWARD POWER METERING
4	SW A + TO Q803 EMITTER	R311	ORG-WHT	Q803 EMITTER	TO #30
5	SW A + TO RF AMP	R311	YEL-BLU	R156	TO #2
6				—	NOT USED
7				—	NOT USED
8	—	—	—	—	NOT USED
9	POWER CONTROL	C168	YEL-RED	Q803 COLLECTOR	TO #38
10	RECEIVER INJECTION	C52	WHT	TO PRESELECTOR	—
11	—	—	—	—	NOT USED
12	—	—	—	—	NOT USED
13	—	—	—	—	NOT USED
14	PTT	JU102	WHT-RED	PA FEEDTHRU CAPACITOR	TO ANT. SWITCH
15	—	—	—	—	NOT USED
16	—	—	—	—	NOT USED
17	—	—	—	—	NOT USED
18	POWER CONTROL	Q802 EMITTER	VIO-WHT	Q803 BASE	TO #37
19	—	—	—	—	NOT USED
20	—	—	—	—	NOT USED
21	—	—	—	—	NOT USED
22	—	—	—	—	NOT USED
23	—	—	—	—	NOT USED
24	THERMAL SHUTBACK	C801	WHT-ORG	PA FEEDTHRU CAPACITOR	—
25	A +	R801	GRN-YEL	PA FEEDTHRU CAPACITOR	TO POWER AMP
26	SW A +	R801	RED-WHT	R311	TO #43
27	SW A +	R808	YEL	PA FEEDTHRU CAPACITOR	TO FINAL PA
28	—	—	—	—	NOT USED
29	RECEIVER RF AMP A +	R22	RED	RECEIVER RF AMP	FROM RF DECK
30	SW A + TO Q803	Q803 EMITTER	ORG-WHT	R311	TO #4
32	—	—	—	R68	TO #9
33	TRANSMITTER METER 5	R162	GRN-WHT	—	NOT USED
34	TRANSMITTER METER 3	R147	ORG	J601-11	—
35	—	—	—	J601-14	—
36	PTT	JU102	GRN	—	NOT USED
37	POWER CONTROL	Q803 BASE	VIO-WHT	J601-8	—
38	POWER CONTROL	Q803 COLLECTOR	YEL-RED	Q802 EMITTER	TO #18
39	RECEIVER METER 2	R42	YEL	C168	TO #9
40	RECEIVER METER 1	C50	BRN	J601-13	—
41	METER GROUND	R35	—	J601-10	NOT USED
42	POWER CONTROL	Q802 COLLECTOR	GRY-RED	L124	TO #55
43	SW A +	R311	RED-WHT	R801	TO #26
44	—	—	—	—	NOT USED
45	RECEIVER HEATER	C87	RED-BLU	R68	TO #46
46	RECEIVER HEATER	R68	RED-BLU	C87	TO #45
47	—	—	—	—	NOT USED
48	—	—	—	—	NOT USED
49	TRANSMITTER METER 7	R801	VIO	J601-15	—
50	—	—	—	—	NOT USED
51	—	—	—	—	NOT USED
52	—	—	—	—	NOT USED
53	—	—	—	—	NOT USED
54	—	—	—	—	NOT USED
55	POWER CONTROL	L124	GRY-RED	Q802 COLLECTOR	TO #42
56	—	—	—	—	NOT USED
57	CODE DISABLE	CR120 ANODE	BLU-RED	PIN "CD" ON CODED SQUELCH BOARD	CODED SQ ONLY
58	CODE DISABLE	CR120 CATHODE	WHT	#59	CODED SQ ONLY
59	CODE DISABLE	P100-10	WHT	CR120 CATHODE	TO 58
60	MONITOR	P100-11	ORG-BLU	PIN "MS" ON PL BOARDS (BASE OF Q315 ON DPL MODELS)	CODED SQ ONLY

VHF UNIFIED BOARD

VHF UNIFIED BOARD

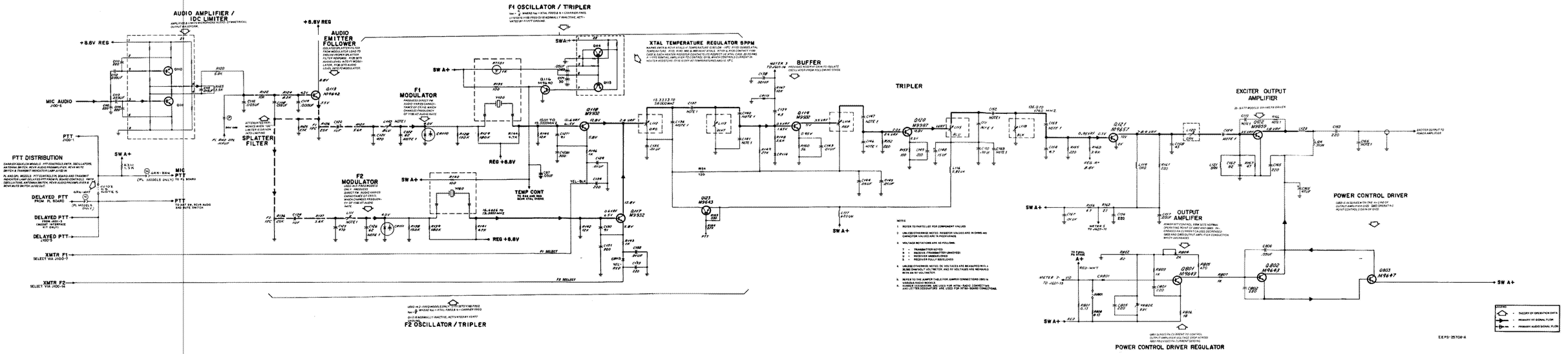
RECEIVER SECTION



68P81039E37-A
(Sheet 2 of 4)
10/25/78-UP

VHF UNIFIED BOARD

EXCITER SECTION



VHF UNIFIED BOARD

PARTS LISTS

68P81039E37-A
(Sheet 4 of 4)
10/25/78-UP

PARTS LIST

TLD3651A Main Board: 1-Freq. (136-150.8 MHz)
TLD3661A Main Board: 2-Freq. (136-150.8 MHz)
TLD3652A Main Board: 1-Freq. (150.8-162 MHz)
TLD3662A Main Board: 2-Freq. (150.8-162 MHz)
TLD3653A Main Board: 1-Freq. (162-174 MHz)
TLD3663A Main Board: 2-Freq. (162-174 MHz) PL-6042-A

NOTE: This parts list covers six models of the Main Board. Where differences exist, a letter code is added to the reference symbol to indicate the frequency range of the applicable unit. A notation in the Description column indicates when the unit is a 2-frequency model.

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		CAPACITOR, fixed: pF ±5%; 500 V; unless otherwise stated
C10, 11	21-82428B25	.002 uF ±20% (2-Freq.)
C12L	21-82610C87	47
C12M, C13M	21-82355B15	24
C12H	21-82204B53	15
C13L	21-82610C87	47 (2-freq.)
C13H	21-82204B53	15 (2-freq.)
C14L	21-82133G75	30 N150
C14M, H	21-82133G77	18
C15	21-82610C30	68; 200 V
C16	21-82372C04	.05 uF +80-20%; 25 V
C17	21-84000B107	.056 uF ±10%; 100 V (attached to L18)
C18L	21-83406D68	27
C18M	21-83406D98	24
C18H	21-83406D79	18
C19L	21-82355B07	30 5%; N330
C19M, H	21-83406D79	18
C20	21-83596E10	220 ±20%
C21	21-84500B18	2
C22	21-83596E10	220 ±20%
C23		NOT USED
C24	21-83596E10	220 ±20%
C25, 26	21-82450B51	1.5
C27	21-82428B04	.01 uF -30+70%; 100 V
C28		NOT USED
C29	21-82133G49	16
C30	21-82450B26	0.3 ±10%
C31, 32	21-82450B51	1.5
C33	21-82204B69	60; 100 V
C34	21-82204B68	90; 100 V
C35	21-82372C04	.05 uF +80-20%; 25 V
C36	21-82187B20	.001 uF ±10%; 100 V
C37	21-82372C01	0.1 uF +80-20%; 25 V
C38	23-84665P04	1 uF -0+100%; 50 V
C39	21-82372C04	.05 uF +80-20%; 25 V
C40	21-83798B01	100; 200 V
C41	21-84499B06	120
C42	21-82372C04	.05 uF +80-20%; 25 V
C43	23-84538G04	15 uF +20%; 20 V
C44	23-84665Y01	10 uF -0+100%; 25 V
C45	21-82204B60	47; 100 V
C46	21-82450B14	2.4
C47	21-82428B25	.02 uF -20+80%; 200 V
C48	21-82428B59	.01 uF -20+80%; 200 V
C49	21-82358G12	100; 100 V (attached to L23)
C50	21-82428B59	.01 uF -20+80%; 200 V
C51	21-82372C04	.05 uF +80-20%; 25 V
C52	21-83596E10	220 ±20%
C53	23-84538G04	47 uF ±20%; 20 V
C54		NOT USED
C55	8-84896D07	.022 uF ±10%; 100 V
C56	21-82428B59	.01 uF -20+80%; 200 V
C57	8-82905G08	.033 uF ±10%; 50 V
C58		NOT USED
C59		NOT USED
C60		NOT USED
C61		NOT USED
C62		NOT USED
C63		NOT USED
C64		NOT USED
C65		NOT USED
C66		NOT USED
C67		NOT USED
C68		NOT USED
C69		NOT USED
C70		NOT USED
C71, 72		NOT USED
C73	21-84494B08	170
C74		NOT USED
C75	21-82610C03	47; 200 V
C76 thru 79		NOT USED
C80	8-84496D05	0.1 uF ±20%; 100 V
C81	21-82187B18	.0015 uF ±10%; 100 V
C82	21-8454X2	680 ±10%
C83	8-84496D07	.022 uF ±10%; 100 V
C84	23-84533C02	4.7 uF ±20%; 20 V
C85	23-84538G04	15 uF ±20%; 20 V
C86, 87, 88	23-82372C04	.05 uF +80-20%; 25 V
C89	21-8454Z1	30 ±10%; 75 V (2-freq.)
C90, 91	21-8454Z1	30 ±10%; 75 V
C92	23-84538G04	15 uF ±20%; 20 V
C93		NOT USED
C94	21-82372C09	.01 uF +80-20%; 25 V
C95	21-82428B04	.01 uF +70-30%; 100 V
C96 thru 109		NOT USED
C110, 111	21-83596E10	220 ±20%
C112, 113	8-82905G08	.033 uF ±10%; 50 V
C114	21-83596E10	220 ±20%
C115	8-82905J10	.015 uF ±10%; 50 V
C116	21-83596K35	.005 uF; 200 V
C117		NOT USED
C118	8-82905G21	.018 uF
C119	21-82187B18	.0015 uF ±10%; 100 V
C120	23-84665F04	1 uF +150-0%; 50 V
C121	21-8505I0	470 ±10%; 300 V
C122	21-82204B51	62; 100 V
C122H	21-82610C21	62; 200 V
C123	21-82372C04	.05 uF +80-20%; 200 V
C124	23-84665P04	1 uF -0+100%; 50 V (2-freq.)
C125	21-8505I0	470 ±10%; 300 V (2-freq.)
C126L, M	21-82204B51	62; 100 V (2-freq.)
C126H	21-82610C21	62; 200 V (2-freq.)
C127	21-84494B52	91
C128	21-84494B15	300
C129	21-82428B59	.01 uF -20+80%; 200 V
C130	21-84494B52	91 (2-freq.)
C131	21-84494B15	300 (2-freq.)
C132	21-82428B59	.01 uF -20+80%; 200 V (2-freq.)
C133	21-83596E10	220 ±20%; (2-freq.)
C134	21-83596E10	220 ±20%
C135	21-82428B59	.01 uF -20+80%; 200 V
C136L	21-82204B29	43 ±3%; 200 V
C136M	21-82133G39	36
C136H	21-82133G75	30
C137L	21-82450B16	.62
C137M	21-82450B29	.51
C137H	21-82450B29	.51
C138	21-82187B20	.001 uF ±10%; 100 V
C139L, M	21-82450B10	4.3
C139H	21-82450B11	3.3
C140L	21-82133G35	56
C140M	21-83406D18	47
C140H	21-82133G39	36
C141	21-8261OC09	100; 200 V
C142		NOT USED
C143	21-82428B59	.01 uF -30+70%; 100 V
C144, 145	21-82372C04	.05 uF +80-20%; 25 V
C146L	21-8654I0	180 ±3%
C146M	21-82204B54	150; 200 V
C146H	21-82610C44	100; 100 V
C147L	21-82610C29	51 ±10%
C147M	21-82610C03	47; 200 V
C147H	21-83406D71	33
C148	23-84638G04	15 uF ±20%; 20 V
C149	21-83596E10	220 ±20%
C150	21-82187B20	.001 uF ±10%; 100 V
C151L	21-82133G21	10 ±0.5 pF
C151M	21-82133G22	8 ±0.5 pF
C151H	21-82133G26	6 ±0.25 pF
C152L, M	21-82405B16	0.75
C152H	21-82405B16	0.75
C153L	21-82989E31	14 ±2.5%
C153M	21-83406D72	12
C153H	21-82133G22	8 ±0.5 pF
C154	21-82133G41	4.7 ±0.25 pF
C155		NOT USED
C156	21-83596E10	220 ±20%
C157	21-82372C04	.05 uF +80-20%; 25 V
C158	21-83406D87	43
C159L	21-82133G14	7.5 ±0.5 pF
C159M	21-83406J24	5.6 ±.25 pF
C159H	21-82204B33	5 ±0.25 pF
C160, 161		NOT USED
C162	21-82610C20	82; 200 V
C163	21-83596E10	220 ±20%
C164		NOT USED
C165	21-82877B24	220 ±10%; 75 V
C166L	21-84494B39	19 ±3%
C166M, H	21-83406J05	18
C167	21-82428B04	.01 uF -30+70%; 100 V
C168	23-84538G06	47 uF ±20%; 20 V
C169L	21-82877B36	200 ±10%; 75 V
C169M, H	21-82877B35	200 ±10%; 75 V
C170, 171	21-83466D77	30
C172L	21-82428B47	.022 uF; 200 V
C310	23-84665F06	220 uF +150-0%; 25 V
C311	23-84665F03	100 uF +100-0%; 25 V
C312, 313	21-83596E10	220 ±20%
C801, 802	21-83596E10	220 ±20%
C803-C804	21-83596E10	220 ±20%
C805	21-83596E10	220 ±20%
C806	21-82372C10	.05 uF ±20%; 25 V
CR10	48-83510F03	DIODE: (SEE NOTE I) silicon
CR11	48-83510F03	silicon (2-freq.)
CR12	48-82139G01	germanium
CR13, 14		NOT USED
CR15, 16	48-83654H01	silicon
CR80, 81	48-83654H01	silicon
CR110	48-82190H13	silicon
CR111	48-82190H13	silicon (2-freq.)
CR112		NOT USED
CR113	48-83654H01	silicon (2-freq.)
CR114	48-83654H01	silicon
CR115	48-82139C101	germanium
CR311, 312	48-83654H01	silicon
CR801	48-82466H13	silicon
J601	--	CONNECTOR, plug: includes:
	15-83292K01	HOUSING, connector; 15-contact
	29-84706E06	CONTACT, female: .660" long; 8 used
		COIL, rf:
L1 thru 9		NOT USED
L10	24-82835G26	9.3 uH
L11	24-82835G20	2.3 uH (2-freq.)
L12	24-83601K01	18-1/2 turns (2-freq.)
L13	24-83601K01	18-1/2 turns
L14	24-82723H03	2-1/2 turns
L15	24-84972A01	2-1/2 turns; coded yellow
L16		290 nH
L17	24-82723H04	290 nH
L18	24-84419D08	33-1/2 turns; coded grn
L19		NOT USED
L20, 21	24-84419D03	33-1/2 turns; coded green
L22	24-82835G22	5.6 nH
L23	24-84419D04	23-1/2 turns; coded blue (attached to C49)
L24	24-82835G20	9.3 uH
L25 thru 29		NOT USED
L30	24-82549D25	10 uH
L31	24-82835G04	1.9 uH
L110L	24-82922C09	22-1/2 turns
L110M, H	24-83601K01	18-1/2 turns
L111L	24-84922C09	18-1/2 turns
L111M, H	24-83601K01	18-1/2 turns (2-freq.)
L112	24-84972A06	8-1/2 turns; coded orange
L113	24-84972A04	8-1/2 turns; coded white
L114	24-84972A05	8-1/2 turns; coded red
L115	24-84972A06	8-1/2 turns; coded blue
L116	24-82835G13	0.82 uH
L117	24-82135G08	620 uH
L118	24-84972A11	3-1/2 turns; coded black
L119	24-83884G08	5-1/2 turns; coded orange
L120	24-83857G09	5-1/2 turns; coded green
L121	24-83961B01	3 turns; coded brown
L122		NOT USED
L123	24-84881C06	3-1/4 turns
L124	24-800484	.31 uH
		TRANSISTOR: (SEE NOTE I)
Q10	48-869494 or 48-869932	NPN; type M9494 NPN; type M9932
Q11	48-869658	NPN; type M9658
Q12, 13	48-869494 or 48-869932	NPN; type M9494 NPN; type M9932
Q14	48-869642	NPN; type M9642
Q15 thru 17		NOT USED
Q18	48-869571	NPN; type M9571
Q80, 81, 83, 84	48-869642	NPN; type M9642
Q82	48-134674	NPN; type M54 part of ref. Z1
Q110, 111		NOT USED
Q112	48-869642	NPN; type M9642
Q113, 114, 115		part of Z2
Q116	48-869640	NPN; type M9640
Q117	48-869494	NPN; type M9494
Q118, 119	48-869494 or 48-869932	NPN; type M9932 NPN; type M9494
Q120	48-869638	NPN; type M9638
Q121	48-869657	PNP; type M9657
Q122, 125, 126	48-869643	PNP; type M9643 part of Z3
Q310	48-869643	PNP; type M9643
Q801, 802	48-869643	PNP; type M9643
		RESISTOR, fixed: ±10%; 1/4 W: unless otherwise stated
R1 thru 9		NOT USED
R10	6-124A89	47k ±5%
R11	6-124A89	47k ±5% (2-freq.)
R12	6-124C59	2.7k
R13	6-124C59	2.7k (2-freq)
R14	6-124C45	680
R15	6-124C73	10k
R16	6-124C45	680 (2-freq.)
R17	6-124C39	390
R18	6-124C73	10k
R19	6-124C49	1k
R20	6-124C59	2.7k
R21	6-124C19	56
R22	6-124A81	22k
R23, 24		NOT USED
R25, 26	6-124A31	180 ±5%
R27	6-124C69	6.8k
R28	6-124C83	27k
R29	6-124C47	820
R30	6-124C61	3.3k
R31	6-124C83	27k
R32	6-124C69	6.8k
R33	6-124C47	820
R34	6-124C61	3.3k
R35		NOT USED
R36	6-124C39	390
R37	6-124C13	33
R38	6-124C17	47
R39	6-124C85	39k
R40	6-124D06	220k
R41	6-124A89	47k ±5%
R42	6-124C73	10k
R43	6-124A59	2.7k ±5%
R44, 45		NOT USED
R47 thru 50		NOT USED
R51	6-124A92	68k ±5%
R52	6-124A78	16k ±5%
R53	6-124C43	560
R54	6-124C57	2.2k
R55		NOT USED
R57		NOT USED
R58		NOT USED
R59		NOT USED
R60		NOT USED
R61, 62		NOT USED
R63	6-124C89	47k
R64	6-124C25	100
R65 thru 67		NOT USED
R68	6-125A25	100 ±5%; 1/2 W
R69	6-125A25	100 ±5%; 1/2 W (2-freq.)
R70 thru 79		NOT USED
R80	6-124C97	100k
R81	6-124A81	22k ±5%
R83	6-124C33	220k
R83	6-124C93	68k
R84	6-124D10	330k
R85	6-124A17	5.6k ±5%
R86	6-124A22	75k ±5%
R87	6-124A49	1k ±5%
R88	6-124C89	47k
R89, 90	6-124C63	3.9k
R91	6-124C61	3.3k
R92	6-124A92	68k ±5%
R93	6-124A97	100k ±5%
R94	6-124C59	2.7k
R95	6-124A89	47k ±5%
R96	6-124D04	180k ±5%
R97	6-124C25	100
R98 thru 109		NOT USED
R110		NOT USED
R111 thru 119		NOT USED
R120	6-124A69	6.8k ±5%
R121		NOT USED
R122	6-124A73	10k ±5%
R123		NOT USED
R124	6-124A71	8.2k ±5%
R125	6-124C59	2.7k
R126	18-84944C02	variable; 25k ±20%; 0.1 W
R127	6-124C67	5.6k
R128	6-124B02	150k ±5%
R129	6-124B04	180k ±5%
R130 thru 134		NOT USED
R135	6-125A25	100 ±5%; 1/2 W
R136	18-84944C02	variable; 25k ±20%; 0.1 W (2-freq.)
R137	6-124C67	5.6k (2-freq.)
R138	6-124B02	150k ±5% (2-freq.)
R139	6-124B04	180k ±5% (2-freq.)
R140	6-125A25	100 ±5%; 1/2 W (2-freq.)
R141	6-124A65	3.9k ±5% (2-freq.)
R142	6-124C75	12k (2-freq.)
R143	6-124A69	1k ±5% (2-freq.)
R144	6-124A73	10k ±5%
R145	6-124C75	12k
R146	6-124A49	1k ±5%
R147	6-124A73	10k ±5%
R148	6-124A67	5.6k ±5%
R149	6-124A49	1k ±5%
R150	6-124A19	56 ±5%
R151		NOT USED
R152	6-124C33	220
R153	6-124A29	150 ±5%
R154	6-124C27	120
R155	6-124A33	220 ±5%
R156	6-124B61	4.7 ±5%
R157	6-124A17	47 ±5%
R158		NOT USED
R159		NOT USED
R160	6-124A63	1.5k ±5%
R161	6-124A33	220 ±5%
R162	6-125A11	27 ±5%; 1/2 W
R163	6-124A37	330 ±5%
R164	6-124A59	2.7k ±5%
R165	6-124A63	1.5k ±5%
R166L	6-125C25	100; 1/2 W
R110	6-124C53	1.5k
R3[1]	6-124A10	24 ±5%
R3[2]	6-124C91	1.2k
R801	17-82036G24	.13 ±5%; 2 W
R802	6-125C23	82; 1/2 W
R803	6-124A49	1k ±5%
R804	18-84944C01	variable; 2k ±20%; 0.1 W
R805	6-124A61	470
R806	6-124A07	18
R807	6-124A49	1k ±5%
R808	17-80236G24	.13 ±5%; 2 W

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
U1		INTEGRATED CIRCUIT: (SEE NOTE II)
U10	51-84320A78	type M2078
		DIODE: (SEE NOTE I)
VR2	48-82256C50	Zener; 13 V
VR313	48-82256C56	Zener; 8.8 V
VR802	48-82256C56	Zener; 8.8 V
		CRYSTAL UNIT: (SEE NOTE II)
Y10L	--	KXN6121AG
Y11L	--	KXN6121AG
Y10M, H	--	KXN6122AA
Y11M, H	--	KXN6122AA (2-freq.)
Y20	48-84396K05	10.7 MHz
Y21	48-84574K03	10.7 MHz
Y22	48-84396K02	10.7 MHz
Y23	48-84574K01	10.7 MHz
Y100L	--	KXN6121AH
Y100M, H	--	KXN6121AA
Y160L	--	KXN6121AH
Y160M, H	--	KXN6121AA (2-freq.)
		HYBRID CIRCUIT:
Z1	51-84333C80	audio ampl./IDC limiter
Z2	51-84333D83	temperature regulator; 5 PPM

NOTES:
I. For optimum performance, diodes, transistors and integrated circuits must be ordered by Motorola part numbers.
II. When ordering quarts crystal units or ceramic resonators, specify carrier frequency, crystal (or resonator) frequency and crystal (or resonator) type number.

TLD5611A Mixer Board (130-150.8 MHz)
TLD5612A Mixer Board (150.8-162 MHz)
TLD5613A Mixer Board (162-174 MHz) PL-5888-O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		NON-REFERENCED ITEMS
	1-80788B58	HEAT SINK ASSEMBLY includes:
	14-861196	INSULATOR, transistor
	26-84716D01	HEAT SINK TRANSISTOR Q121
	1-80707D47	CABLE ASSEMBLY includes:
	42-102173A02	STRAP, tie; 11 used
	76-83960B01	CORE, ferrite; 3 used
		CAPACITOR C312
	1-80707D39	CIRCUIT BOARD ASSEMBLY includes:
	39-10184A10	CONTACT, plug; 18 used
	9-83407K01	SOCKET, crystal; 4-contact; 2 used
	26-82048L01	SHIELD, coil: .510 x .510 x .780"
	26-82550L01	HEAT SINK: .300 x .100 x .990
	26-83264F01	SHIELD, coil: .735 x .735 x 1.05"
	26-84169L01	SHIELD, oscillator
	26-84171L01	SHIELD
	26-84598A01	SHIELD, coil: .510 x .510 x .960" (1.250" hole); 6 used
	26-84598A02	SHIELD, coil: .510 x .510 x .960" (1.250" hole); 3 used
	29-10134A92	LUG, strain relief; 26 used

TRN6831A RF Deck Hardware Kit PL-6044-O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
	1-80707D50	COVER ASSEMBLY includes:
	15-84960L01	COVER, rf deck
	42-82034M01	RETAINER, tuning slug
	3-84589G02	SCREW, set; 6-36 x 7/16"; 11 used
	15-84958L01	COVER, preamplifier
	3-136935	SCREW, machine 2-56 x 1/4"; 23 used

LEGEND
L = 136-150.8 MHz
M = 150.8-162 MHz
H = 162-174 MHz

TLD5591A RF Deck (136-150.8 MHz)
TLD5592A RF Deck (150.8-162 MHz)
TLD5593A RF Deck (162-174 MHz) PL-5883-O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		CAPACITOR, fixed:
C207	21-84760C01	470 pF (feedthru)
		COILS, rf:
L205L, 209L	24-84672L10	76-1/2 turns; coded brn-blk
L205M, 209M	24-84672L12	24-3/4 turns; coded brn-red
L205H, 209H	24-84672L14	24-3/4 turns; coded blk-yel
L206L, 207L, 208L	24-84672L11	27 turns; coded brn-brn
L206M, 207M, 208M	24-84672L13	27 turns; coded brn-orn
L206H, 207H, 208H	24-84672L15	27 turns; coded blk-grn
L210L	24-84672L16	28-1/2 turns; coded brn-blu
L210M	24-84672L19	26 turns; coded brn-wht
L210H	24-84672L22	26 turns; coded red-red
L211L	24-84672L17	28 turns; coded brn-vio
L211M	24-84672L20	26 turns; coded red-blk
L211H	24-84672L23	26 turns; coded red-orn
L212L	24-84672L18	28-1/2 turns; coded brn-gry
L212M	24-84672L21	26 turns; coded red-brn
L212H	24-84672L24	26 turns; coded red-yel
	1-136935	SCREW, machine; 2-56 x 1/4"; 3 used

NON-REFERENCED ITEMS

	1-80707D49	HOUSING ASSEMBLY, includes: ref. item C207
	15-84945L01	HOUSING
	29-82164N01	TERMINAL, stake-on
	14-84886A01	INSULATOR, stand off

TRN6830A Hardware Kit, Main Board PL-6043-O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		CAPACITOR, fixed:
C629 thru 633	21-82812H04	1000 pF
		TRANSISTORS: (SEE NOTE)
Q116	48-869640	NPN; type M9640
Q122	48-869859	NPN; type M9859
Q803	48-869647	PNP; type M9647

NON-REFERENCED ITEMS

	1-80707D13	TRANSISTOR & HEAT SINK ASSEMBLY includes: ref. item Q122
	14-861196	INSULATOR, transistor
	26-84411K01	HEAT SINK
	1-80707D38	FEKOTHRO ASSEMBLY, power amplifier includes: ref. items C629 thru C633
	7-83134K01	BRACKET, mounting
	27-82018M01	CHASSIS
	15-82060M01	HOUSING
	2-10056A74	NUT, spring; 6-32
	3-134185	SCREW, tapping; 6-32 x 1/4" 2 used
	3-134186	SCREW, tapping; 6-32 x 5/16" 5 used
	3-135506	SCREW, tapping; 6-32 x 1/4" 2 used
	3-136782	SCREW, machine; 2-56 x 3/16" 2 used
	3-136935	SCREW, machine; 2-56 x 1/4"; 3 used
	14-83572K01	INSULATOR, transistor
	14-84268A01	INSULATOR, transistor
	14-84849K01	INSULATOR, capacitor
	15-84403K01	COVER, coaxial
	15-84959L01	COVER, shoe
	22-10133A19	PIN: .250" x .125"; 2 used
	26-83294K01	SHIELD
	26-83336L01	SHIELD, receiver
	26-84170L01	SHIELD, oscillator
	26-84604K03	SHIELD, power amplifier
	26-84848K01	SHIELD, exciter
	42-10217A02	STRAP, cable harness
	42-82799L01	CLIP
	76-84069B02	CORE, ferrite bead; 2 used

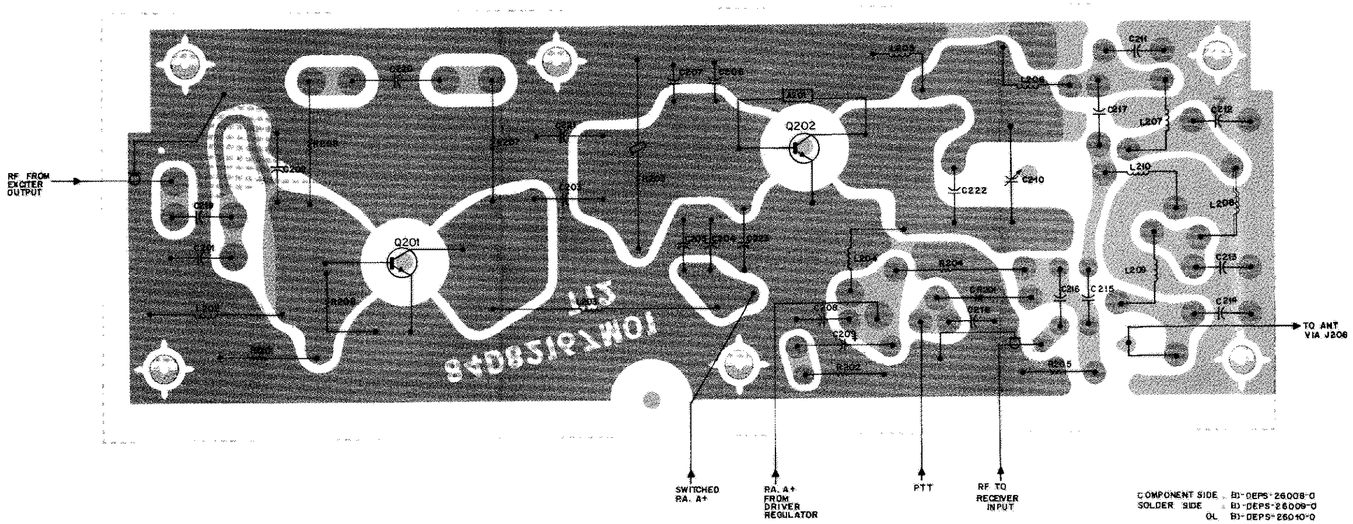
TRN8499A Preselector Board PL-5886-O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		CAPACITOR, fixed:
C212, 213	21-84713A16	12 pF ±5%; 50 V
C214	21-82989E20	8.5 pF ±0.25 pF; 500 V
		COIL, rf:
L214	24-83542L09	4-1/8 turns

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		CAPACITORS, fixed: pF:
C208L	21-82240K03	13 ±5%; 50 V
C208M	21-84511B73	10 ±.25 pF; 50 V
C208H	21-84511B88	6.8 ±.25 pF; 50 V
C209	21-82358G12	100 ±5%; 100 V
C210	21-82877B17	5 ±5%; 75 V
C211	21-82213Z21	.002 uF -0+100%; 75 V
		COIL, rf:
L213	24-84783E04	3-1/2 turns
		TRANSISTOR: (SEE NOTE)
Q211	48-869839	FET; type M9839
		RESISTOR, fixed: ±5%; 1/8 W:
R205	6-185A35	270
R206	6-185B64	56
R207	6-185A73	10k

25-WATT RF POWER AMPLIFIER HARMONIC FILTER, AND ANTENNA SWITCH

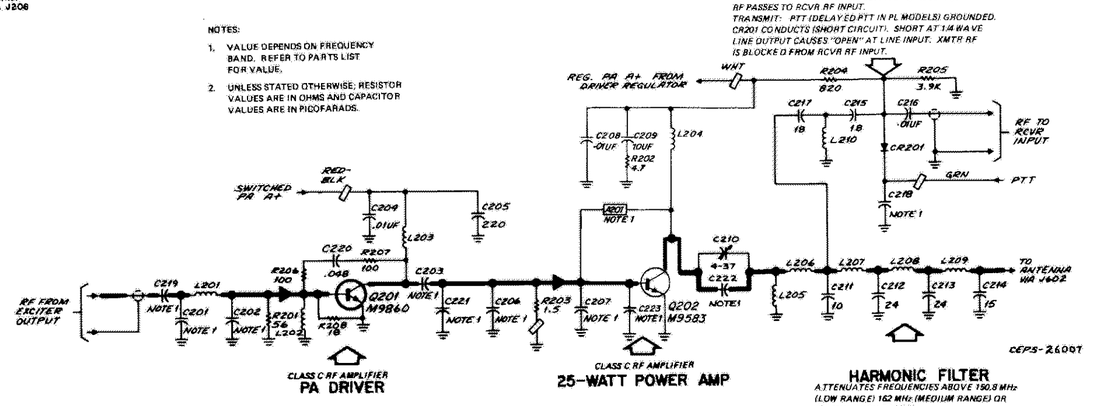
MODELS TLD2301A (132-150 MHz)
TLD2302A (150-162 MHz)
TLD2303A (162-174 MHz)



SHOWN FROM COMPONENT SIDE

FUNCTION

Provides a filtered 25-watt frequency-modulated rf signal to the antenna; the antenna switches the antenna between the transmitter and the receiver.



PARTS LIST SHOWN ON BACK

68P81037E99-A
7/6/78-UP

25-WATT PA, HARMONIC FILTER, ANTENNA SWITCH

PARTS LIST

LEGEND
L = 136-150.8 MHz
M = 150.8-162 MHz
H = 162-174 MHz

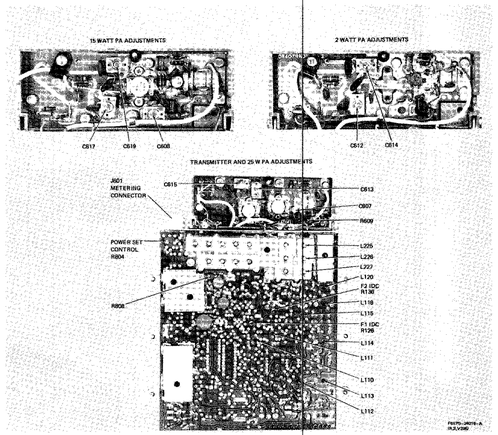
TLD2301A Power Amplifier (136-150.8 MHz)
TLD2302A Power Amplifier (150.8-162 MHz)
TLD2303A Power Amplifier (162-174 MHz) PL-5904-O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
A201L	1-80739B40	FEEDBACK, assembly: RC Network
		CAPACITOR, fixed: pF ±5% 500 V; unless otherwise stated
C201L	21-868822	51 ±3%
C201M	21-868822	51 ±3%
C201H	21-84494B28	43
C202	21-84494B34	68
C203L	21-84494B07	150
C203M	21-84494B31	75
C203H	21-84494B27	140 ±3%
C204, 208, 216	21-832501	.01 uF +60-40%; 250 V
C205	21-83596E10	220 ±20%
C206L	21-84494B34	68
C206M	21-84494B34	68
C206H	21-84494B02	62
C207L	21-84494B31	75
C207M	21-84494B31	75
C207H	21-84494B34	68
C209	23-84762H03	10 uF; 20 V
C210	20-84579B03	variable: 4-37.5 pF
C211	21-84494B29	10 ±2%; 300 V
C212, 213	21-84494B41	24
C214	21-84494B38	15
C215L	21-82204B58	20 ±5%; N220; 500 V
C215M	21-83406D79	18
C215H	21-83406D79	18
C217L	21-82204B58	20 ±5%; N220; 500 V
C217M	21-83406D79	18
C217H	21-83406D79	18
C218L	21-84494B04	100
C218M	21-84494B04	100
C218H	21-84494B52	91
C219L	21-868822	51 ±3%
C219M	21-868822	51 ±3%
C219H	21-84494B24	39
C220	8-82905G03	.047 uF ±10%; 50 V
C221L	21-84494B34	68
C221H	21-868822	51 ±3%
C222L	21-84494B41	24
C222M	21-84494B38	15
C222H	21-84494B38	15
C223M	21-84494B34	68
		DIODE: (SEE NOTE)
CR201	48-83510F04	Pin
		COIL:
L201		part of printed circuit board plating
L202	24-83977B01	choke
L203L	24-824998	153 nH
L203M	24-84346A02	230 nH
L203H	24-84346A02	230 nH
L204	24-84614A03	2-1/2 turns
L205	24-84614A05	1-1/2 turns
L206	24-83884G04	7-1/2 turns
L207L	24-83884G09	6-1/2 turns; coded BLU
L207M	24-83884G09	6-1/2 turns; coded BLU
L207H	24-83884G08	5-1/2 turns
L208L	24-83884G04	7-1/2 turns
L208M	24-83884G04	7-1/2 turns
L208H	24-83884G09	6-1/2 turns
L209L	24-83884G09	6-1/2 turns
L209M	24-83884G09	6-1/2 turns
L209H	24-83884G08	5-1/2 turns
L210L	24-83884G09	6-1/2 turns
L210M	24-83884G08	5-1/2 turns
L210H	24-83884G08	5-1/2 turns
		TRANSISTOR: (SEE NOTE)
Q201	48-869860	NPN; type M9860
Q202	48-869583	NPN; type M9583

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		RESISTOR, fixed: ±10%; 1/2 W unless otherwise stated
R201	6-124C19	56; 1/4 W
R202	6-124B61	4.7; 1/4 W
R203	17-82036G07	1.5; 1 W
R204	6-125C47	820
R205	6-124C63	3.9k; 1/4 W
R206, 207	6-125C25	100
R208	6-125C07	18
NON-REFERENCED ITEM		
	26-82320L03	HEATSINK

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

UHF TRANSMITTER ALIGNMENT PROCEDURE



PREALIGNMENT NOTES

1. In some cases, peak readings may occur at two points in the tuning range of a coil. Always choose point where slug is nearest top of coil form (away from circuit board).

2. Unnecessary tuning adjustments should be avoided. Usually, only a "touch-up" transmitter alignment is needed. Complete transmitter alignment is needed in the following cases:

   a. After changing transmitter operating frequency.
   b. After replacing a component in a frequency-sensitive network.

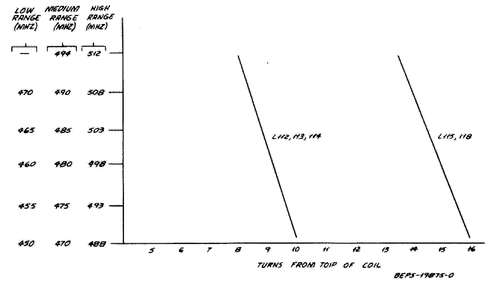
3. Before beginning a complete alignment, preset tuning adjustments as follows:

   a. Check supply voltage (13.8 V ±0.1 V).
   b. Set L120 seven turns from top of form (10 turns for 406-420 MHz models).
   c. Set L110 (and L111 in 2-frequency models) seven turns from circuit board.

NOTE

Low or no meter 3 reading will be obtained if L110 and/or L111 are not properly present.

   d. Starting with slugs of L225, L226, and L227 flush with tension nuts, adjust to six turns above tension nuts.
   e. Set R804 and R808 fully CCW (as viewed from the bottom of the radio).
   f. Set L112, L113, L114, L115, and L118 according to the following chart:



   g. For 25/30 watt models, set C613 one turn CCW from fully CW and C615 three turns CCW from fully CW.
      For 15 watt models, set C608, C617, and C619 one-half turn CCW from fully CW.
      For 2 watt models, set C612 and C614 three turns CW from fully CW.

4. Key transmitter for each step in alignment procedure and de-key after alignment step is completed. Avoid keying an unaligned transmitter for prolonged periods.

5. Two-frequency radios should be aligned on lowest operating frequency.

6. Transmitter frequency calculations:

   where $f_c = 27f_{osc}$, where f_c = carrier frequency, and f_{osc} = crystal oscillator frequency.

7. Check that JU5 is in for 2 and 25/30 watt models and out for 15 watt models.

SET-UP

1. If a TEK-5 Metering Panel or a S1056B Portable Test Set is available, connect the metering panel or test set to J601 using the appropriate metering adapter cable. The metering adapter cables and directions for their use are shown in Figure 2. Metering may be accomplished with a 20,000 ohm-per-volt voltmeter if a test set or metering panel is not available. Refer to the metering tables on this page.

2 Connect an rf wattmeter, terminated in a resonant antenna or 50-ohm resistive dummy load, to radio set antenna connector J602.

TRANSMITTER ALIGNMENT

NOTE

Two-frequency radios should be tuned on lowest frequency.

STEP	ADJUST	METERING POINT	DESIRED READING
1. Oscillator output	L112, then L113	M3	Peak
2. Buffer Output	L114	M3	Dip if no M5 reading
		M5	Peak if M5 has a reading
3. First Tripler Output	L115 then L118	M5	Peak
4. Second Tripler Output	L120	Wattmeter	Peak if wattmeter has reading
		M5	Peak if no wattmeter reading
5. Predriver output	C607 (30/25 W only)	Wattmeter	Peak. If no wattmeter reading, go to step 6.
6. Second Tripler Output Filter	L225, 226, 227	Wattmeter	Peak. (If no wattmeter reading, turn C607 1/4 T clockwise and repeat Step 6, for 30/25 watt.)
7. Predrive and Final Output	C607, 613, 615 (30/25 W only)	Wattmeter	Peak
Repeat all adjustments made to this point (Steps 8-14 for 25/30 watt models only)			
8. Predriver Output	C607	Wattmeter	Adjust for 20 watts output (30/25 watt models)
9. Second Tripler Output	L225, 226, 227	Wattmeter	Peak each coil while keeping wattmeter reading between 20 and 25 watts with C607
10. Oscillator Output	L112	Wattmeter	Adjust for 15 watts output
	L113	Wattmeter	Adjust for 15 watts output if not obtainable by tuning L112 alone
11. Second Tripler Output	L120	Wattmeter	Peak. If wattmeter reading is greater than 20 watts, repeat Steps 10 and 11.
12. Repeat Step 9			
13. Oscillator	L112, then L113	M3	Peak
14. Predriver Output	C607	Wattmeter	Peak
On 30/25 watt models: For widespace operation (greater than 2 MHz frequency separation) go to Step 17; otherwise go to Step 23. On 15 watt models: Go to Step 15. On 2 watt models: Go to Step 16.			
15A. 15 Watt Power Amplifier	C608,C617,C619	Wattmeter	Peak
15B. Repeat Steps 1-4			
15C. Oscillator Output	L112	Wattmeter	Adjust for a 5 watt reading
15D. Oscillator Output	L120	Wattmeter	Peak
15E. Oscillator Output	L112	M3	Peak
Repeat Step 6. For widespaced operation (greater than 2 MHz separation) on 15 watt models, go to Step 17; otherwise go to Step 23.			
16A. 2 Watt Power Amplifier	C612,C614	Wattmeter	Peak (note: C614 is not adjustable in 470-494 MHz models)
16B. Repeat Steps 1 through 3 and Step 6			
16C. Buffer Output	L114	Wattmeter	Adjust for 2.0 watts reading
16D. Second Tripler Output Filter	L227,L226,L225	Wattmeter	Peak L227,L226,L225 (in this order) for maximum
16E. Second Tripler Output Filter	L120	Wattmeter	Peak
16F. Buffer Output	L114	M5	Peak
16G. Oscillator Output	L112,L113	M3	Adjust L112 and L113 (in this order) for maximum
For widespaced operation (greater than 2 MHz separation) on 2 watt models, go to Step 27; otherwise go to Step 28.			
17. Oscillator Output	L112	M3	Peak on higher frequency
18. First Tripler Output	L115	M5	Peak on higher frequency
19. Buffer Output	L114	M5	Peak on lower frequency
20. Predriver Output (30/25 Watt Models Only)	C607	Wattmeter	Adjust for 20 watts on higher frequency
21. Second Tripler	L225	Wattmeter	Peak on higher frequency
22. Predriver Output (30/25 Watt Models Only)	C607	Wattmeter	Peak
23. Power Set	R804	Wattmeter	Adjust for: 33 watts for 30 watt models. 28 watts for 25 watt models. 17 watts for 15 watt models. For widespaced radios, tune on lowest power frequency
24. Final Output (30/25 Watt Models Only)	C613,C615	Wattmeter	Peak. For widespaced radios peak on lower frequency. If the difference between power levels is greater than 3.0 watts, re-adjust C613 until difference is less than 3.0 watts. Repeat Steps 23 and 24 as required. Go to Step 26.
25. Final Output (15 Watt Models Only)	C617,C619	Wattmeter	Peak. For widespaced radios, peak on lower frequency. If the difference between power levels at two frequencies is greater than 3.0 watts, re-adjust C617 until difference is less than 3.0 watts.
26. Thermal Shut-back (30/25 Watt Models Only)	R609	Wattmeter	Adjust for 16 watts by jumpering base of Q604 to ground with a 6.2k resistor. Go to Step 29.
27A. First Tripler Output	L115	M5	Peak on higher frequency
27B. Buffer Output	L114	M5	Peak on higher frequency
27C. Second Tripler	L226	Wattmeter	Adjust for 0.5 watts on lower frequency
27D. Second Tripler	L225,L227	Wattmeter	Adjust L227 then L225 for peak on lower frequency.
27E. Second Tripler	L226	Wattmeter	Peak on higher frequency and adjust to balance power on both frequencies.
28. Power Set	R804	Wattmeter	Adjust for 2.2 watts. On two frequency radios adjust for 2.2 watts on frequency with lower power reading.
29.			Close power amplifier and secure with captive screws.
M7 should read 17 uA for each power level 2, 15 or 25/30 watts.			

NOTE

For units on which adjustment of R804 provides insufficient power cutback, R808 also should be used.

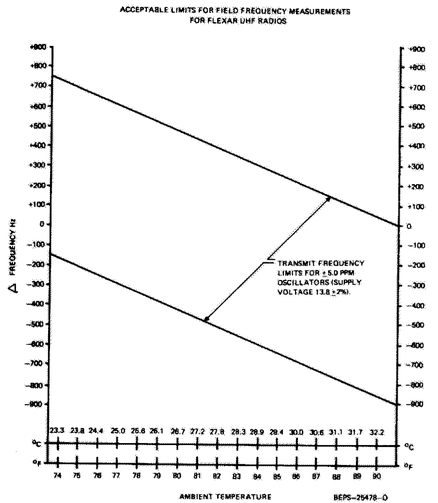
OSCILLATOR FREQUENCY ADJUSTMENT

Oscillator should be set on frequency AFTER transmitter has been aligned and BEFORE modulation deviation is set.

NOTE

The transmit frequency of this radio should only be adjusted when the ambient temperature is 82°F (28°C). Because of temperature and voltage variations between factory and field locations, the frequency measured may not correspond to the assigned frequency. If the measured frequency is between the limits shown on the graph given below make no attempt to correct the frequency.

If the measured frequency does not fall within the limits shown on this graph, it is recommended that the radio be returned to a room temperature environment (approximately 82°F, 28°C) and the frequency reset using the procedure described below.



SET-UP FOR RADIOS WITH 5 PPM STABILITY

1. Set up the frequency meter or counter controls as required.
2. *In tone-coded "Private-Line" (PL) radios,* remove the "Vibrasponder" resonant reed from its socket on the PL board.

   In "Digital Private-Line" (DPL) radios, set encoder amplitude to zero by adjusting R342 (fully CCW from plating side of board).

Frequency Adjustment Procedure

STEP	PROCEDURE
1	Select F1
2	Key transmitter with no modulation
3	Adjust L110 for F1 frequency ± 100 Hz
	Two-Frequency Models Only
4	Select F2
5	Adjust L111 for F2 frequency ± 100 Hz.

SET-UP FOR RADIOS WITH 2 PPM STABILITY

1. Set up the frequency meter or counter controls as required.
2. *In tone-coded "Private-Line" (PL) radios,* remove the 'Vibrasponder" resonant reed from its socket on the PL board.

   In "Digital Private-Line" (DPL) radios, set encoder amplitude to zero by adjusting R342 (fully CCW from plating side of board).
3. Allow 20 minute warmup time for crystal heaters.

Frequency Adjustment Procedure

STEP	PROCEDURE
1	Select F1
2	Key transmitter with no modulation
3	Adjust L110 for F1 frequency ± 30 Hz
	Two-Frequency Models Only
4	Select F2
5	Adjust L111 for F2 frequency ± 30 Hz

IDC ADJUSTMENT

Oscillator frequency adjustment must be made *BEFORE* setting the IDC controls.

SET-UP

1. Set the deviation meter operating controls as needed.
2. *In tone coded "Private-Line" radios,* remove the "Vibrasponder" resonant reed from its socket on the PL board.

   In "Digital Private-Line" radios, set encoder amplitude to zero by adjusting R342 (fully CCW from plating side of board).
3. Connect the output of an audio signal generator to P100-6 as follows:

   High side through a 1 uF capacitor (+ end toward the radio) to P100-6. Low side to radio chassis ground.
4. Connect an ac voltmeter across the audio signal generator output.

NOTE

The transmitter must be keyed by pressing the KEY button on the test set or by shorting P6-3 to the radio chassis. DO NOT USE THE MICROPHONE PTT SWITCH TO KEY THE TRANSMITTER DURING IDC ADJUSTMENT.

IDC Adjustment Procedure

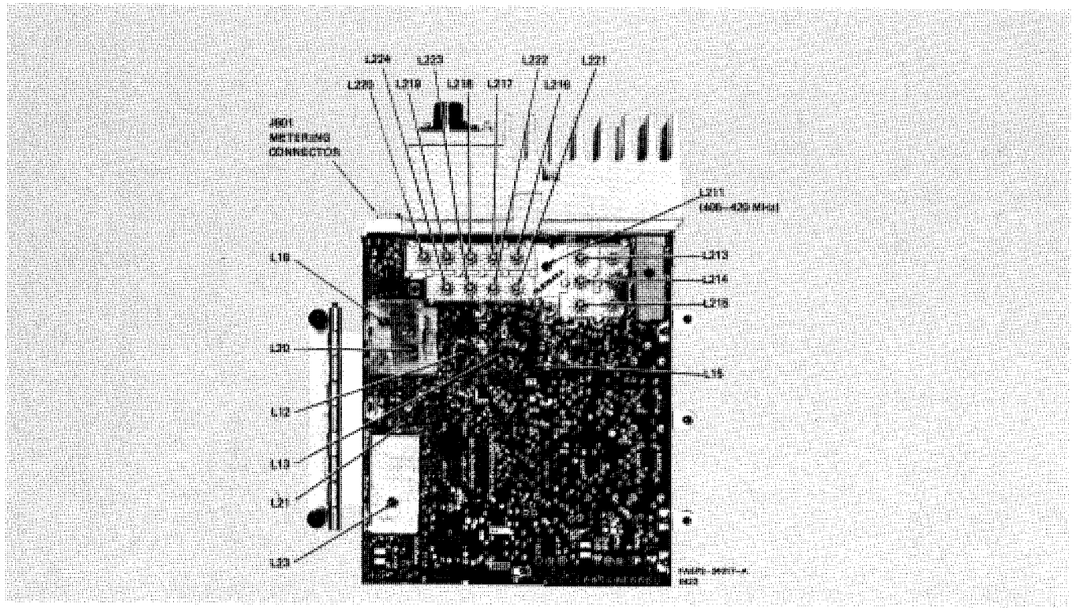
STEP	PROCEDURE
1.	Set audio signal generator output frequency to 1000 Hz and output level to 0.8 V.
2.	Select F1 and key transmitter. Adjust F1 "IDC" control R126 for ± 5 kHz deviation meter reading.
3.	On 2-freq. models, select F2 and key transmitter. Adjust F2 "IDC" control R136 for ± 5 kHz deviation meter reading.
4.	Reduce audio signal generator output level until deviation meter reads ± 3.0 kHz. Audio oscillator output level should be 160 mV ± 3 dB at P100-6 or 160 mV ± 6 dB at P4-2.
	Tone Coded "Private-Line" Models Only
5.	Insert resonant reed into socket on PL board and disconnect audio oscillator from P100-6.
6.	Key transmitter and adjust Tone Level control R433 for PL tone deviation reading of ± 750 Hz.
7.	Reconnect audio signal generator to P100-6 and repeat steps 1 through 3. Be sure overall deviation does not exceed ± 5 kHz, including PL tone.
	or
	"Digital Private-Line" Models Only (See Note)
5.	Disconnect the audio signal generator from P100-6.
6.	Key the transmitter and adjust Code Level set control R342 for a DPL code deviation reading of ± 750 Hz.
7	Reconnect the audio signal generator to P100-6. Repeat steps 5 and 6. Be sure overall deviation does not exceed ± 5 kHz, including DPL code. Repeat 1 through 3.

NOTE

DEVIATION MEASUREMENT

To obtain accurate measurement of transmitter deviation in radios equipped with "Digital Private-Line" binary-coded squelch, the frequency response of the deviation measuring equipment must be 1 Hz. If a deviation meter with this low frequency response characteristic is not available, the transmitter deviation can be checked by making the transmitter send continuous Turn-Off code during the measurement. Since the Turn-Off code waveform is sinusoidal, standard test equipment will then provide an accurate deviation measurement. To make the transmitter send continuous Turn-Off code, short together the base and emitter plating of PTT Inverter Q309 on the DPL board and key the transmitter.

UHF RECEIVER ALIGNMENT PROCEDURE



RECEIVER METERING

Typical Receiver Meter Readings With TEK-5 Metering Panel or S1056B Portable Test Set

METER	MEASUREMENT	READING, uA
1	IF Amplifier Signal Level	8-14 (No Signal) 50 (40 uV Input)
2	Quadrature Detector Output	22 ± 1 uA
3	Injection Oscillator Output	15-25 uA

Receiver Meter Readings With 20,000 Ohm/Volt Voltmeter

METERING POINT	VOLTMETER LEAD CONNECTIONS +	-	VOLT METE R SCALE	TYPICAL READINGS
M1 IF Ampl . Signal Level	J601-10	Chassis Ground	2.5 V DC	.25 - .5 V (No Signal) 1.75 V (40 uV Input)
M2 Quadrature Detector Output	J601-13	Chassis Ground	10 V DC	5.2 V ± .2 V
M3 Injection Osc. Output	J601-14	Chassis Ground	50 uA DC	15-25 uA

RECEIVER

PREALIGNMENT NOTES

1. On "Digital Private-Line" and "Private-Line" radio sets, disable the DPL or PL decoder by depressing the front panel MONITOR pushbutton; on remote only models actuate the PL MONITOR switch on the dc remote board.

2. In some cases, peak meter readings may occur at two points in the tuning range of a coil. Always choose point where the slug is nearest the top of the coil form (away from the circuit board).

3. Unnecessary tuning adjustments should be avoided. Usually, the receiver will require only a "touch-up" alignment. Complete receiver alignment is necessary in the following cases:

   a. After changing the receiver operating frequency.
   b. After replacing a component in a frequency-sensitive network.

4. Before beginning a complete receiver alignment, preset tuning adjustments as follows:

   a. Set L221, 222, 223, 224 nine turns CCW from fully in position.
   b. Set L213, 214, 215, 216, 217, 218, 219, 220 seven turns CCW from fully in position.
   c. Set L18, 20, 21, 23 flush with main circuit board.
   d. Set L211 flush with RF deck casting (406-420 MHz only).
   e. Set L12, 13, 15 flush with main circuit board.

5. Receiver frequency calculations:

   $$f_{osc} = \frac{f_c - 10.7\ MHz}{9} \text{ and } f_{inj} = 9f_{osc} = f_c - 10.7\ MHz;$$

   Where f_c = carrier frequency, $f_c = f_{osc}$ = oscillator crystal frequency, and f_{inj} = mixer injection freq.

6. Two-frequency radios should be tuned on the higher operatring frequency.

7. Check power supply voltage (13.8 V dc; ± 0.1 V)

8. Preset the SQUELCH control fully CCW. Depress MONITOR button and adjust OFF-VOLUME control for a comfortable listening level. On dc remote control models the service handset is required to listen to the receiver output.

TEST EQUIPMENT SET-UP

If a TEK-5 Metering Panel or a S1056B Portable Test Set is available, connect the metering panel or test set to J601 using the appropriate metering adapter cable. The metering adapter cables and directions for their use are shown. Metering may be accomplished with a 20,000 ohm-per-volt voltmeter if a test set or metering panel is not available. Refer to the voltmeter metering table on this page.

RECEIVER ALIGNMENT PROCEDURE

NOTE
Transmitter alignment must be performed before receiver alignment.

CAUTION
To prevent accidental destruction of the signal generator, remove the transmit crystal(s) and connect JU11 (on the local control board) to position "T" under these conditions receiver frequency can be changed by the F2 switch without actuating the PTT switch.

STEP	INPUT SIGNAL	SIGNAL INPUT POINT	ADJUST	MONITORING POINT	DESIRED READING
1 Quadrature Detector	10.7 MHz @ 1 mV	Near Q12; allow signal to "spray" into circuit (Note 1)	L23	Meter 2	22 ± 1 uA
				or	
				dc voltmeter at J601-13	5.8 V DC
2 Injection Oscillator			F2 Switch in "F1", adjust L13	Meter 3	Peak
			F2 Switch in "F2", adjust L12	Meter 3	Peak
			F2 Switch to lowest freq. position, then:		
			L15	Meter 3	Max
			L221		Peak
			L222		Dip
			L223		Peak
			L224		Dip
3 Preselector	Adjust unmodulated signal gen. to receive freq.	Antenna Connector	Set F2 Switch to highest freq. position, then adjust L220,219,218,217, 216		Peak.(Adjust signal generator output level to keep M1 in the 25 uA-35 uA range)
4 Preamp Input	Receive freq. (Note 2)	Antenna Connector	L213,214,215 L211(406-420 MHz)	Meter 1	Peak.(Adjust signal generator input level to keep M1 in the 25 uA-35 uA range)
5 IF Tuning	Receive Freq. (counted)	Antenna Connector	L18,20,21	Meter 1	Peak M1 with L18,20,21, then detune L21 1/2 turn ccw. (adjust signal level to maintain 25-35 uA on M1
6 Injection Touch-Up (lowest frequency)	Receive Freq.(no modulation) Adjust level for 30 uA reading on M1	Antenna Connector	L15	Meter 1	Detune CW for 20 uA reading on M1
			L224, 223, 222, 221; then repeat L15	Meter 1 Meter 3	Peak Peak
7 Fine Freq. Adj	Receive Freq.(counted)	Antenna Connector	L13 for freq #1 L12 for freq #2 (2 freq radios only)	Radio Speaker	Audio zero beat
	10.7 MHz Osc.	"Spray" into base of Q12 (Note 1)			
8 Final Touch-Up	Set to highest receive frequency (no modulation)	Antenna Connector	Detune CCW 1/2 turn L216, 217, 218, 219, 220. Next, peak L220, 219, 218, 217, 216,and 215 in descending order		Maximum M1 (Adjust signal level to maintain approx. 20-30 uA on M1
9 (406-420 MHz Only) Touch-Up for Widespace receive	Set to lower freq.	Antenna Connector	L213, 214, 215, 211, 216, 217, 218, 219, 220 in descending order.	M1	Peak (Adjust signal level to maintain approx. 20-30 uA reading
10. See note 3.					
11.	Spray 10.7 MHz to the base of Q12.	-	Readjust L23	M2	Adjust to level recorded in Step 10.

NOTES:
1. With a wire connected to a 10.7 MHz signal source output, "spray" the signal near Q12 (that is, place the wire in a close proximity to Q12) but do not allow the wire to make physical contact with any part of the i-f amplifier.

2. To set signal generator on frequency without a frequency counter, open receiver squelch and adjust the signal generator frequency until receiver quiets. Carefully adjust signal generator frequency for 22 uA meter 2 reading or for a 6.0 volt dc voltmeter reading at U10-6.

3. Momentarily reconnect the transmitter to a 50 ohm load. Key up, and record the meter 2 reading. Proceed with Step 11.

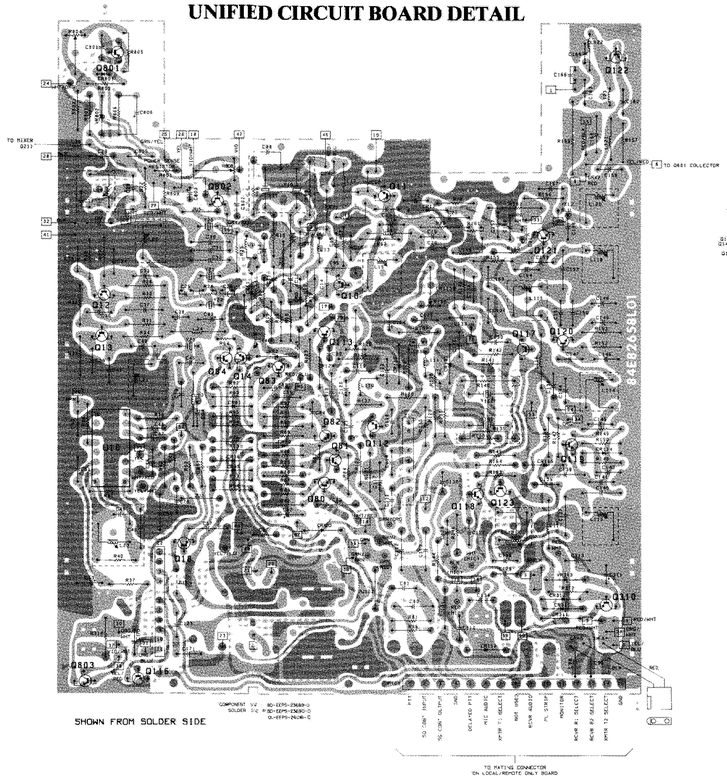
20 DB QUIETING SENSITIVITY MEASUREMENT

1. Connect an ac voltmeter across the speaker; on dc remote models, connect to P4 on dc remote board.
2. On PL model radio sets, disable PL by depressing the MONITOR button on the radio set from panel.
3. Turn the SQUELCH control fully counterclockwise.
4. Turn the radio set and adjust the VOLUME control until a reading of 2 volts is obtained on the ac voltmeter.
5. Connect an rf signal generator to the radio set antenna connector. Set the signal generator to the carrier frequency, and set the generator output level control to minimum.
6. Slowly increase the output level of the rf signal generator until the ac voltmeter reads 0.2 volts.
7. Note the signal generator output signal level. This signal level is the 20 dB quieting sensitivity of the receiver.

NOTE
For stations with the automatic line level adjust option, the signal generator output should be increased rapidly. If not, the agc action may produce erroneous results.

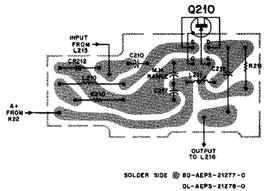
UHF UNIFIED BOARD
CIRCUIT BOARD DETAIL

UNIFIED CIRCUIT BOARD DETAIL

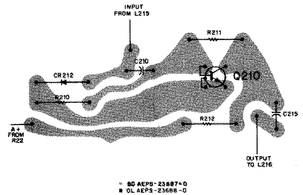


TRANSISTOR BASE DETAILS

JUMPER TABLE		
	IN	OUT
JU1	Single-Frequency Models	Two-Frequency Models
JU2	Carrier Squelch Models	Coded Squelch Models
JU3	All Models	—
JU4	± 5 PPM Stability Models	± 2 PPM Stability Models
JU5	25/30 and 2 Watt Models	15 Watt Models
JU101	Single-Frequency Models	Two-Frequency Models
JU102	Carrier Squelch Models	Coded Squelch Models
JU301	—	All Models

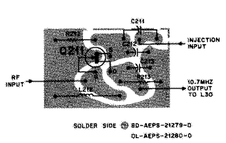


406-420 MHz



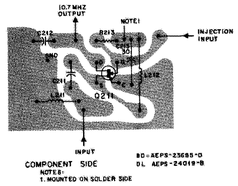
450-512 MHz

RF AMPLIFIER CIRCUIT BOARD DETAIL



SHOWN FROM SOLDER SIDE

406-420 MHz



450-512 MHz

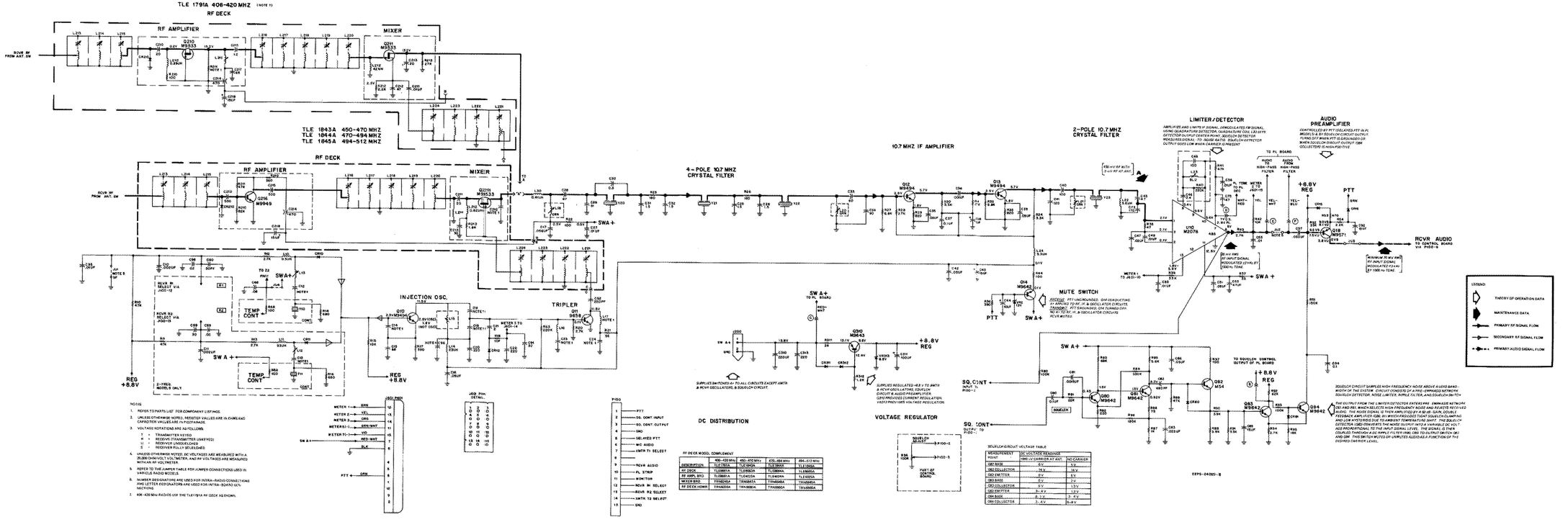
MIXER CIRCUIT BOARD DETAIL

UHF UNIFIED BOARD

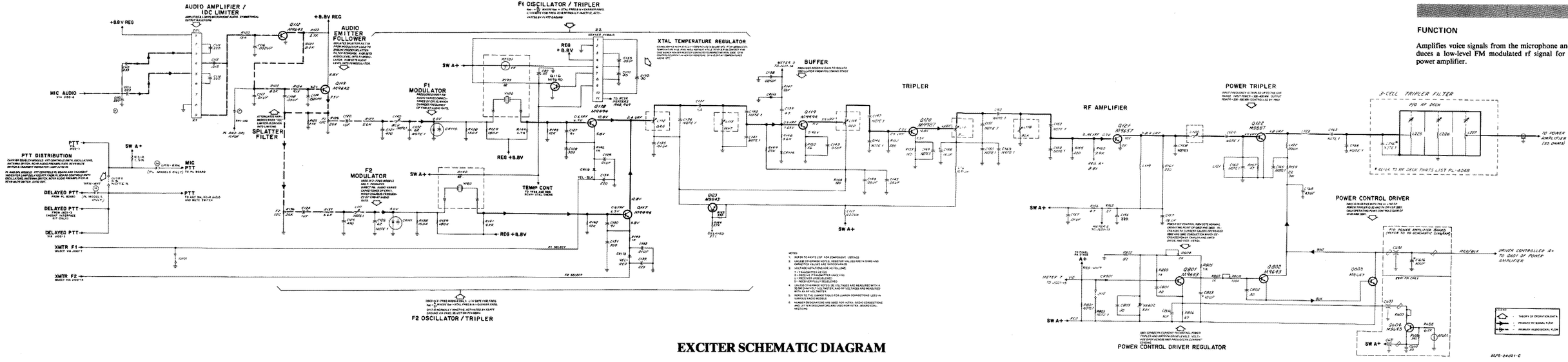
RECEIVER SECTION

FUNCTION

Amplifies, mixes, filters, and demodulates received rf energy from antenna (via antenna switch) and provides an amplified audio signal.



RECEIVER SCHEMATIC DIAGRAM



EXCITER SCHEMATIC DIAGRAM

FUNCTION

Amplifies voice signals from the microphone and produces a low-level FM modulated rf signal for the rf power amplifier.

PARTS LIST

TLE8981A Main Board 1 Freq. (406-420 MHz)
TLE8991A Main Board 2 Freq. (406-420 MHz)
TLE8983A Main Board 1 Freq. (450-470 MHz)
TLE8993A Main Board 2 Freq. (450-470 MHz)
TLE8984A Main Board 1 Freq. (470-494 MHz)
TLE8994A Main Board 2 Freq. (470-494 MHz)
TLE8925A Main Board 1 Freq. (494-512 MHz)
TLE8995A Main Board 2 Freq. (494-512 MHz)
TRN6826A Hardware Kit PL-5754-C

NOTE: This parts list covers six models of the Main Board. Where differences exist, a letter code is added to the reference symbol to indicate the frequency range of the applicable unit. A notation in the Description column indicates when the unit is a 2-frequency model.

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		CAPACITOR, fixed: pF ±5%; 500 V; unless otherwise stated
C10, 11	21-82428B25	.002 uF ±20%; (2-freq)
C12LL	21-82610C57	47
C12L	21-82355B15	24
C12M, H	21-82204B53	15
C13LL	21-82610C57	47 (2-freq)
C13L	21-82355B15	24 (2-freq)
C13M, H	21-82204B53	15 (2-freq)
C14LL	21-82133G75	30
C14L, M, H	21-82133G77	18
C15	21-82610C30	68; 200 V
C16	21-82372C04	.05 uF +80-20%; 25 V
C17	21-84008H07	.056 uF ±10%; 100 V (attached to L18)
C18LL	21-83406D69	30
C18L	21-82610C01	40; 200 V
C18M	21-84715F41	24
C18H	21-859472	22 pF 5%; 500 V
C19LL	21-83406D67	22
C19L, M, H	21-863466	5
C20	21-83596E10	220 ±20%
C21	21-82450B18	2
C22	21-83596E10	220 ±20%
C23LL	21-83406D63	6
C23L	21-84493B54	4.25 ±0.25 pF
C23M, H	21-83406D76	3.9 ±0.25 pF
C24LL	21-82133G39	36
C24L, M, H	21-859696	20
C25, 26	21-82450B51	1.5
C27	21-82428B04	.01 uF -30+70%; 100 V
C28	21-82204B60	47; 100 V
C29LL	21-82204B28	43; 100 V
C29	21-82204B61	51; 100 V
C30	21-82450B26	0.3 ±10%
C31, 32	21-82450B51	1.5
C33	21-82204B69	60; 100 V
C34	21-82204B68	90; 100 V
C35	21-82372C04	.05 uF +80-20%; 25 V
C36	21-82187B20	.001 uF ±10%; 100 V
C37	21-82372C01	011 uF +80-20%; 25 V
C38	23-84665F04	1 uF -0+100%; 50 V
C39LL	21-82204B28	43
C39L, M, H	21-82372C04	.05 uF +80-20%; 25 V
C40	21-83798B01	100; 200 V
C41	21-84494B06	120
C42	21-82372C04	.05 uF +80-20%; 25 V
C43	23-84538G04	15 uF ±20%; 25 V
C44	23-84665F01	10 uF -0+100%; 25 V
C45	21-82204B60	47; 100 V
C46	21-82450B14	2.4
C47	21-82428B26	.02 uF -20+80%; 200 V
C48	21-82428B59	.01 uF -20+80%; 200 V
C49	21-82358G12	100; 100 V (attached to L23)
C50	21-82428B59	.01 uF -20+80%; 200 V
C51	21-82372C04	.05 uF +80-20%; 25 V

68P81037E54-C
(Sheet 4 of 4)
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REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
C52LL		NOT USED
C52L, M, H	21-83596E10	220 ±20%
C53	23-84538G06	47 uF ±20%; 20 V
C54		NOT USED
C55	8-83813H31	.01 uF ±10%; 100 V
C56	21-82428B59	.01 uF +80-20%; 200 V
C57	8-82905G08	.033 uF ±10%; 50 V
C60		NOT USED
C71, 72		NOT USED
C73	21-84484B08	170
C75	21-82610C03	47; 200 V
C76-79		
C80	8-84496D05	0.1 uF ±20%; 100 V
C81	21-82187B18	.0015 uF ±10%; 100 V
C82	21-865452	680 ±10%
C83LL		NOT USED
C83L, M, H	8-84496D07	.022 uF ±10%; 100 V
C84	23-84538G02	4.7 uF ±20%; 20 V
C85	23-84538G04	15 uF ±20%; 20 V
C86, 87	21-82372C04	.05 uF +80-20%; 25 V
C88LL	8-84496D07	.022 uF ±10%; 100 V
C88L, M, H	21-82372C04	.05 uF +80-20%; 25 V
C89	21-864521	30 ±10%; 75 V
C90, 91	21-864521	30 ±10%; 75 V
C92	23-84538G04	15 uF ±20%; 20 V
C93L, M, H		NOT USED
C94	21-82372C09	0.1 uF +80-20%; 25 V
C95	21-82428B04	.01 uF +70-30%; 100 V
C96LL, L, M		NOT USED
C96H	21-83406D70	8 ±5%
C97		NOT USED
C98, 99	21-82428B01	.02 uF +60-40%; 100 V
C100 thru 109		NOT USED
C110, 111	21-83596E10	220 ±20%
C112, 113	8-82905G08	.033 uF ±10%; 50 V
C114	21-83596E10	220 ±20%
C115	8-82905G10	.015 uF ±10%; 50 V
C116	21-82428B47	.002 uF; 200 V
C117	8-83813H28	.01 uF; 100 V
C118	8-82905G40	.03 uF; 50 V
C119	21-82428B45	820 pF
C120	23-84665F04	1uF +150-0%; 50 V
C121	21-850510	470 ±10%; 300 V
C122LL	21-83406D17	62
C122, L, M	21-82204B51	62; 100 V
C122H	21-82610C21	62; 200 V
C123	21-82372C04	.05 uF +80-20%; 25 V
C124	23-84665F04	1 uF +80-20%; 50 V (2-freq)
C125	21-850510	470 ±10%; 300 V (2-freq)
C126LL	21-83406D17	62
C126L, M	21-82204B51	62; 100 V (2-freq)
C126H	21-82610C21	62; 200 V (2-freq)
C127	21-84494B52	91
C128	21-84494B15	300
C129	21-82428B59	.01 uF -20+80%; 200 V
C130	21-84494B52	91 (2-freq)
C131	21-84494B15	300 (2-freq)
C132	21-82428B59	.01 uF -20+80%; 200 V (2-freq)
C133	21-83596E10	220 ±20% (2-freq)
C134	21-83596E10	220 ±20%
C135	21-82428B59	.01 uF -20+80%; 200 V
C136LL	21-00849321	43
C136L	21-82133G39	36
C136M	21-83406D12	33
C136H	21-82133G75	30
C137	21-82450B34	1
C138	21-82187B20	.001 uF ±10%; 100 V
C139	21-82450B10	4.3
C140LL	21-00865302	56
C140L	21-83406D18	47
C140H	21-82133G39	36
C141LL	21-82877B35	220
C141L, M, H	21-82204B54	150; 200 V
C142		NOT USED
C143	21-82428B59	.01 uF +80-20%; 200 V
C144, 145	21-82372C04	.05 uF +80-20%; 25 V
C146LL	21-82877B35	220
C146L, M	21-82204B5	150; 200 V
C146H	21-82610C44	100; 100 V
C147LL	21-84493B31	57
C147L, M	21-82610C03	47; 200 V
C147H	21-83406D42	43
C148	23-84538G04	15 uF ±20%; 20 V
C149LL	21-82877B36	250 ±10%; 75 V
C149L, M, H	21-83596E10	200 ±20%
C150LL	21-82187B20	.001 uF ±10%; 100 V
C150L, M, H	21-83596E10	200 ±20%
C151LL	21-82133G01	10
C515L	21-83406D14	8 ±0.5 pF
C151M	21-82133G14	7.5 ±0.5 pF
C151H	21-82133G26	6 ±0.5 pF
C152LL	21-82450B48	0.75
C152L, M, H	21-82450B29	0.51
C153LL	21-82133G19	15
C153L	21-82133G21	10 ±0.5 pF
C153M	21-83406D94	9 ±0.5 pF
C153H	21-82133G22	8 ±0.5 pF
C154LL	21-82133G19	15
C154L, M, H	21-82133G41	4.7 ±0.25 pF
C155		NOT USED
C156	21-83596E10	220 ±20%
C157	21-82372C04	.05 uF +80-20%; 25 V
C158LL	21-00849321	43
C158L, M	21-84493B31	57; 200 V
C158H	21-83406D56	24
C159LL	21-00849319	8
C159L	21-82204B33	5 ±0.25 pF
C159M	21-83406D80	4.7 ±0.25 pF
C159H	21-82204B33	5 ±0.5 pF
C160, 161		NOT USED
C162LL	21-83406D68	27
C162L, M, H	21-83406D56	24
C163LL	21-82355B38	6.8
C163L	21-83406D64	5.6 ±0.25 pF
C163M	21-83406D80	4.7 ±0.25 pF
C163H	21-84493B54	4.25 ±0.25 pF
C164		NOT USED
C165LL	21-82877B05	150 ±10%; 75 V
C165L, M, H	21-82877B24	220 ±10%; 75 V
C166LL	21-84511B85	7.5
C166L, M	21-867807	8 ±5%; 75 V
C166H	21-861428	5 ±10%; 75 V
C167	21-82428B04	.01 uF +30-20%; 100 V
C168	23-84538G06	47 uF ±20%; 20 V
C169LL	21-82877B36	250 ±10%; 75 V
C169L, M, H	21-82877B34	150 ±10%; 50 V
C170, 171	21-83406D77	30
C310	23-84665F06	220 uF +150-0%; 25 V
C311	23-84665F03	100 uF +150-0%; 25 V
C312LL	21-83596E10	220 ±20%
C312L, M, H		NOT USED
C313	21-83596E10	220 ±20%
C629-633	21-861219	1000 +100-0%; 50 V feed thru
C801, 802	21-83406D77	30 ±5%
C803	23-84665F01	10 uF +100-0%; 25 V
C804		NOT USED
C805	21-83406D77	30
C806	23-84538G01	1.0 uF ±20%; 35 V
		DIODE: (SEE NOTE I)
CR10	48-83510F03	silicon
CR11	48-83510F03	silicon (2-freq)
CR12	48-82139G01	germanium
CR13, 14		NOT USED
CR15, 16	48-83654H01	silicon
CR80, 81	48-83654H01	silicon
CR110	48-82190H13	silicon
CR111	48-82190H13	silicon (2-freq)
CR112 thru 114	48-83654H01	silicon
CR115	48-82139G01	germanium
CR120	48-83654H01	silicon
CR310LL	48-82525G13	silicon
CR310L, M, H		NOT USED
CR311, 312	48-83654H01	silicon
CR801	48-82466H13	silicon
		CONNECTOR, plug:
J601		includes:
	15-83292K01	HOUSING, connector 15 contact
	29-84706E06	CONTACT, female (8 used)
		COIL, rf:
L1 thru 9		NOT USED
L10	24-82835G20	9.3 uH
L11	24-82835G20	9.3 uF (2-freq)
L12	24-83601K01	18-1/2 turns (2-freq)
L13	24-83601K01	18-1/2 turns
L14	24-82723H03	23 uH
L15	24-84972A01	2-1/2 turns; coded yellow
L16	24-83884G03	1-1/2 turns; coded brown
L17LL	24-83884G06	4-1/2 turns; coded white
L17L, M	24-83884G06	4-1/2 turns; coded white
L17H	24-83884G01	3-1/2 turns; coded red
L18	24-84419D03	33-1/2 turns; coded green (attached to C17)
L19		NOT USED
L20, 21	24-84419D03	33-1/2 turns; coded green
L22	24-82835G41	5.6 uH
L23	24-84419D04	23-1/2 turns; coded blue (attached to C49)
L24	24-82835G20	9.3 uH
L25 thru 29		NOT USED
L30	24-82723H05	0.41 uH
L110LL	24-84922C09	21-1/2 turns
L110L, M, H	24-83601K01	18-1/2 turns
L111L	24-84922C09	21-1/2 turns (2 freq)
L111L, M, H	24-83601K01	18-1/2 turns (2 freq)
L112	24-84972A06	8-1/2 turns; coded orange
L113	24-84972A04	8-1/2 turns; coded white
L114	24-84972A05	8-1/2 turns; coded red
L115	24-84972A26	3-1/2 turns; coded blue
L116	24-82835G13	0.82 uH
L117	24-82135G08	620 uH
L118	24-84972A11	3-1/2 turns; coded black
L119	24-83884G08	5-1/2 turns; coded orange
L120	24-83857G09	5-1/2 turns; coded green
L121	24-83961B01	3 turns; coded brown
L122	24-82723H25	.033 uH
L123	24-84881C04	1-1/4 turns
		TRANSISTOR: (SEE NOTE)
Q10	48-869494	NPN; type M9494
	or48-869932	NPN; type M9932
Q11	48-869658	NPN; type M9658
Q12, 13	48-869494	NPN; type M9494
	or48-869932	NPN; type M9932
Q14	48-869642	NPN; type M9642
Q15-17		NOT USED
C18	48-869571	NPN; type M9571
Q80, 81	48-869642	NPN; type M9642
Q82	48-134674	NPN; type M54
Q83, 84	48-869642	NPN; type M9642
Q112	48-869643	PNP; type M9643
Q113	48-869642	NPN; type M9642
Q114, 115		P/O Z2
Q116	48-869640	NPN; type M9640
Q117-119	48-869494	NPN; type M9494(Q117-2 freq.)
	or 48-869932	
Q121	48-869657	NPN; type M9657
Q122	48-869887	NPN; type M9887
Q123	48-869643	PNP; type M9643
Q124-126		P/O Z3
Q310	48-869643	PNP; type M9643
Q301, 802	48-869643	PNP; type M9643
Q803	48-869647	PNP; type M9647
C804	48-869643	PNP; type M9643
		RESISTOR, fixed: ±10%; 1/4 W; unless otherwise stated
R1 thru 9		NOT USED
R10	6-124A89	47k ±5%
R11	6-124A89	47k ±5% (2 freq)
R12	6-124C59	2.7k
R13	6-124C59	2.7k (2 freq)
R14	6-124C45	680
R15	6-124C73	10k
R16	6-124C45	680 (2 freq)
R17	6-124C39	390
R18	6-124C73	10k
R19		NOT USED
R20	6-124C59	2.7k
R21	6-124C19	56
R22	6-124C25	100
R23, 24		NOT USED
R25, 26	6-124A31	180 ±5%
R27	6-124C69	6.8k
R28	6-124C83	27k
R29	6-124C47	820
R30	6-124C61	3.3k
R31	6-124C83	27k
R32	6-124C69	6.8k
R33	6-124C47	820
R34	6-124C61	3.3k
R35		NOT USED
R36	6-124C39	390
R37	6-124C13	33
R38	6-124C17	47
R39	6-124C85	33k
R40	6-124D06	220k
R41	6-124A89	47k ±5%
R42	6-124C73	10k
R43	6-124A59	2.7k ±5%
R44, 45		NOT USED
R47 thru 50		NOT USED
R51	6-124B02	150k ±5%
R52	6-124A85	33k ±5%
R53	6-124C41	470
R54	6-124C57	2.2k
R56-62		NOT USED
R63	6-124D06	220k
R64	6-124C25	100
R65-67		NOT USED
R68	6-125A25	100 ±5%; 1/2 W
R69	6-125A25	100 ±5%; 1/2 W (2 freq)
R80	6-124C97	100k
R81	6-124A81	22k ±5%
R82	6-124C33	220
R83	6-124C93	68k
R84	6-124D10	330k
R85	6-124A67	5.6k ±5%
R86	6-124A22	75 ±5%
R87	6-124A49	1k ±5%
R88	6-124C89	47k
R89, 90	6-124C63	3.9k
R91	6-124C61	3.3k
R92	6-124A92	62k ±5%
R93	6-124A97	100k ±5%
R94	6-124C59	2.7k
R95	6-124A79	18k ±5%
R96	6-124B04	180k ±5%
R97	6-124C25	100
R98 thru 109		NOT USED
R111 thru 119		NOT USED
R120	6-124A76	13k ±5%
R121, 122	6-124A71	8.2k ±5%
R123	6-124C59	2.7k
R124	6-124A72	9.1k
R125	6-124C59	2.7k
R126	18-84944C02	variable; 25k ±20%; 0.1 W
R127	6-124C67	5.6k
R128	6-124C02	150k ±5%
R129	6-124B04	180k ±5%
R130 thru 134		NOT USED
R135	6-125A23	82 ±5%; 1/2 W
R136	18-84944C02	variable; 25k ±20%; 0.1 W (2 freq)
R137	6-124C67	5.6k (2 freq)
R138	6-124B02	150k ±5% (2 freq)
R139	6-124B04	180k ±5%; (2 freq)
R140	6-125A23	82 ±5%; 1/2
R141	6-124A65	4.7k ±5% (2 freq)
R142	6-124C75	12k (2 freq)
R143	6-124A49	1k ±5%; (2 freq)
R144	6-124A65	4.7k ±5%
R145	6-124C75	12k
R146	6-124A49	1k ±5%
R147	6-124A81	22k ±5%
R148	6-124A67	5.6k ±5%
R149	6-124A83	27k ±5%
R150	6-124A19	56 ±5%
R151		NOT USED
R152	6-124C33	220
R153	6-124A29	150 ±5%
R154	6-124C27	120
R155	6-124A33	220 ±5%
R156	6-124B61	4.7 ±5%
R157	6-124A17	47 ±5%
R158		NOT USED
R159	17-83122D09	22 ±5%; 3 W
R160	6-124A63	3.9k ±5%
R161	6-124A33	220 ±5%
R162	6-125A11	27 ±5%; 1/2 W
R163	6-124A37	330 ±5%
R164	6-124A59	2.7k ±5%
R310	6-124C53	1.5k
R311	6-124A10	24 ±5%
R312	6-124C51	1.2k
R801 (2 W)	17-82036G13	0.75 ±5%; 2 W
R801 (15 & 30 W)	17-82036G48	0.1 ±5%; 2 W
R802	6-125C23	82; 1/2 W
R803	6-124A49	1k ±5%
R804	18-84944C01	variable; 2k ±20%; 0.1 W
R805	6-124A49	1k ±5%
R806	6-124A17	47 ±5%
R807	6-124A49	1k ±5%
R808	18-84944C07	100k ±20%
R809	82036G48	0.1 ±5%; 2 W
		THERMISTOR
RT101	6-83600K06	10k @ 25°C
		INTEGRATED CIRCUIT: (SEE NOTE I)
U10	51-84320A78	type M2078
		DIODE: (SEE NOTE I)
VR2	48-82256C50	Zener; 13 V
VR313	48-82256C56	Zener; 8.8 V
VR802	48-82256C56	Zener; 8.8 V
		CRYSTAL UNIT: (SEE NOTE II)
Y10	--	KXN6122AA
Y11	--	KXN6122AA (2 freq)
Y20	48-84396K05	10.7 MHz
Y21	48-84574K03	10.7 MHz
Y22	48-84396K02	10.7 MHz
Y23	48-84574K01	10.7 MHz
Y100	--	KXN6121AA
Y160	--	KXN6121AA
		HYBRID CIRCUIT:
Z1	1-80798B94	audio ampl./DC limiter
Z2	1-80798B95	temperature regulator; 5 PPM
	or1-80798B96	temperature regulator; 2 PPM
NON-REFERENCED ITEMS		
	1-80788B58	HEAT SINK ASSEMBLY includes:
	14-861196	INSULATOR, transistor
	26-84716D01	HEAT SINK TRANSISTOR C121
	1-80794B80	CABLE ASSEMBLY includes:
	42-10217A02	STRAP, tie 11 used
	76-83960B01	CORE, ferrite; 3 used
		CAPACITOR C312
		CONNECTOR J601
	1-80794B81	CIRCUIT BOARD ASSEMBLY includes:
	39-10184A10	CONTACT, plug: 17 used
	6-10277A17	GROMMET (plastic)
	9-83487K01	SOCKET, crystal; RCVR.
	9-83487K02	SOCKET, crystal; TRANS.
	26-82048L01	SHIELD, coil; .510 x .510 x .780"
	26-82570L01	HEATSINK: .320 x .100 x .590
	26-83264F01	SHIELD, coil; .735 x .735 x 1.05"
	26-84169L01	SHIELD, oscillator
	26-84170L01	SHIELD
	26-84171L01	SHIELD
	26-84598A01	SHIELD, coil .510 x .510 x .960" (.300" hole); 6 used
	26-84598A02	SHIELD, coil .510 x .510 x .960" (.250" hole); 3 used
	1-80785B73	TRIPLER ASSEMBLY; includes
	14-861196	INSULATOR, transistor
	26-84411K01	HEAT SINK
		TRANSISTOR Q122
	1-80794B86	CAPACITOR ASSEMBLY, feed thru includes:
	7-83134K01	BRACKET, mounting
	27-83283L01	CHASSIS
		CAPACITORS C629 thru C633
	2-10054A74	NUT, spring: 6-32
	3-134186	SCREW, tapping: 6-32 x 5/16" 5 used
	3-134212	SCREW, tapping; 4-40 x 5/16" 2 used
	3-135506	SCREW, tapping; 6-32 x 1/4" 2 used
	3-138028	SCREW, tapping; 2-56 x 5/32" 4 used
	14-83572K01	INSULATOR, transistor
	14-84268A01	INSULATOR, transistor; .520 x .660"
	14-84849K01	INSULATOR, coaxial cap; 2 used
	15-84403K01	COVER, coaxial; 2 used
	15-84410K01	COVER, mixer
	22-10133A19	PIN; .250 x .125"; 2 used
	26-82571L01	HEAT SINK
	26-83294K01	SHIELD; .990 x 1.930"
	26-83336L01	SHIELD, receiver
	26-84604K02	SHIELD, power amplifier
	26-84848K01	SHIELD, tripler; 1.750 x .205"
	42-84284B01	RETAINER; 6 used
	3-10916A13	SCREW, metric; 6 used
	1-80791B46	CRYSTAL HEATER, includes: 1-80789B55 Thermistor & Bracket.

NOTES:

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

II. When ordering quartz crystal units or ceramic resonators, specify carrier frequency, crystal (or resonator) frequency and crystal (or resonator) type number.

TLE1791A RF Deck (403-420 MHz)
TLE1843A RF Deck (450-470 MHz)
TLE1844A RF Deck (470-494 MHz)
TLE1845A RF Deck (494-512 MHz)

LEGEND
LL = 403-420 MHz
L = 450-470 MHz
M = 470-494 MHz
H = 494-512 MHz

PL-5753-A

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		CAPACITOR, fixed: pF ±5%; 50 V unless otherwise stated
C210LL	21-84713A29	20
C210L, M, H	21-847065	500 -0+100%; 25 V
C211LL	21-82213E12	.01 uF ±20%; 100 V
C211L, M, H	21-82877B12	20 ±7.5%; 75 V
C212LL	21-84713A09	47
C212L, M, H	21-82877B12	20 ±7.5%; 75 V
C213LL	21-84713A29	20
C213L, M, H	21-864521	30 ±10%; 75 V
C214	21-84760C01	470 ±20%; 500 V (feedthru type)
C215LL	21-82450B08	1.2
C215L, M, H	21-847065	500 -0+100%; 25 V
C216LL, L, M	21-82785H56	5 ±0.5 pF; 1700 V
C216H	21-83366K08	4 ±0.5 pF; 1700 V
C217	21-82358G23	68
C218	23-84538C04	15 uF ±20%; 20 V
		DIODE: (SEE NOTE)
CR210	48-83654H01	silicon
		COIL, RF:
L210	24-82723H04	choke, 0.29 uH
L211	24-84881C01	2-1/2 turns
L212	24-82723H17	0.82 uH
L213LL	24-84641G11	8-9/16 turns; RED
L213L	1-80748B40	8 turns; ORG
L213M	1-80766B07	7-5/8 turns; BRN-PPL
L213H	1-80766B16	7-1/2 turns; RED-ORG
L214LL	24-84641G07	8-9/16 turns; BLU
L214M	24-84641G20	7-5/8 turns; RED-BLK
L214H	24-84641G25	7-1/2 turns; RED-GRN
L215LL	24-84641G11	8-9/16 turns; RED
L215L	1-80748B48	8 turns; ORG
L215M	1-80766B07	7-5/8 turns; BRN-PPL
L215H	1-80766B16	7-1/2 turns; RED-ORG
L216LL	24-84641G10	8-9/16 turns; BLU
L216L	1-80748B41	8 turns; RED
L216M	1-80766B08	7-5/8 turns; BRN-BLU
L216H	1-80766B17	7-1/2 turns; RED-RED
L217LL	24-84641G07	8-9/16 turns; BLK
L217M	24-84641G20	7-5/8 turns; RED-BLK
L217H	24-84641G25	7-1/2 turns; RED-GRN
L218LL	24-84641G07	8-9/16 turns; BLU
L218L	24-84641G01	7-5/8 turns; BLK
L218M	24-84641G20	7-5/8 turns; RED-BLK
L218H	24-84641G25	7-1/2 turns; RED-GRN
L219LL	24-84641G07	8-9/16 turns; BLU
L219L	24-84641G01	7-5/8 turns; BLK
L219M	24-84641G20	7-5/8 turns; RED-BLK
L219H	24-84641G25	7-1/2 turns; RED-GRN
L220LL	24-84641G13	8-9/16 turns; BLU
L220L	1-80748B41	8 turns; RED
L220M	1-80766B08	7-5/8 turns; BRN-BLU
L220H	1-80766B17	7-1/2 turns; RED-RED
L221LL	24-84641G08	8-5/8 turns; CLR
L221L	24-84641G26	8 turns; BLU-BLU
L221M	24-84641G27	7-3/4 turns; BLU-WHT
L221H	24-84641G29	7-5/8 turns; BLU-GRY
L222LL	24-84641G08	8-5/8 turns; CLR
L222L	24-84641G01	8 turns; BLK
L222M	24-84641G14	7-3/4 turns; BRN-YEL
L222H	24-84641G20	7-5/8 turns; RED-BLK
L223LL	24-84641G08	8-5/8 turns; CLR
L223L	24-84641G01	8 turns; BLK
L223M	24-84641G14	7-3/4 turns; BRN-YEL
L223H	24-84641G20	7-5/8 turns; RED-BLK
L224LL	24-84641G09	8-5/8 turns; WHT
L224L	1-80748B46	8 turns; BRN
L224M	1-80766B10	7-5/8 turns; BRN-BLU
L224H	1-80766B19	7-5/8 turns; RED-BRN
L225LL	24-84641G11	8-9/16 turns; RED
L225L	1-80748B40	8 turns; ORG
L225M	1-80766B07	7-5/8 turns; BRN-PPL
L225H	1-80766B16	7-1/2 turns; RED-ORG
L226LL	24-84641G07	8-9/16 turns; BLU
L226L	24-84641G01	7-5/8 turns; BLK
L226M	24-84641G20	7-5/8 turns; RED-BLK
L226H	24-84641G25	7-1/2 turns; RED-GRN
L227LL	24-84641G11	8-9/16 turns; RED
L227L	1-80748B40	8 turns; ORG
L227M	1-80766B07	7-5/8 turns; BRN-PPL
L227H	1-80766B16	7-1/2 turns; RED-ORG
		TRANSISTOR: (SEE NOTE)
Q210, 211	48-869653	FET; M9533
Q216	48-869949	NPN; M9949
		RESISTOR, fixed: ±10%; 1/8 W:
R210LL	6-185B67	100
R210L, M, H	6-185C03	82k
R211LL	6-185C12	470k
R211L, M, H	6-185B99	47k
R212LL	6-185B83	2.2k
R212L, M, H	6-124C43	560
R213LL	6-185B93	15k
R213L, M, H	6-185B82	1.8k
NON-REFERENCED ITEMS		
	1-80796B92	HOUSING ASSEMBLY includes:
	15-84402K03	HOUSING
		CAPACITOR C214
	3-1465	SCREW, machine: 4-40 x 3/16"; 15 used
	14-84886A01	INSULATOR, standoff; 2 used
	1-80748B42	COVER ASSEMBLY, 3-cell; 2 used, includes:
	2-84773E04	NUT, tension; 3 used
	3-84589G01	SET SCREW; 5-40 x 7/16"; 3 used
	15-84396G01	COVER, 3-cell
	1-80748B43	COVER ASSEMBLY, 4-cell includes:
	2-84773E04	NUT, tension; 4 used
	3-84589G01	SET SCREW; 5-40 x 7/16"; 4 used
	15-84394G01	COVER, 4-cell
	1-80748B44	COVER ASSEMBLY, 5-cell includes:
	2-84773E04	NUT, tension; 5 used
	3-84589G01	SET SCREW; 5-40 x 7/16"; 5 used
	15-84397G01	COVER, 5-cell
	3-138028	SCREW, machine; 2-56 x 5/32"; 25 used
	4-474216	WASHER, insulating
	15-84409K01	COVER, rf
	29-5324	LUG, solder: .037" wire hole
	29-134245	LUG, solder: .046" wire hole, 3 used

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

30/25 - WATT RF POWER AMPLIFIER HARMONIC FILTER, AND ANTENNA SWITCH

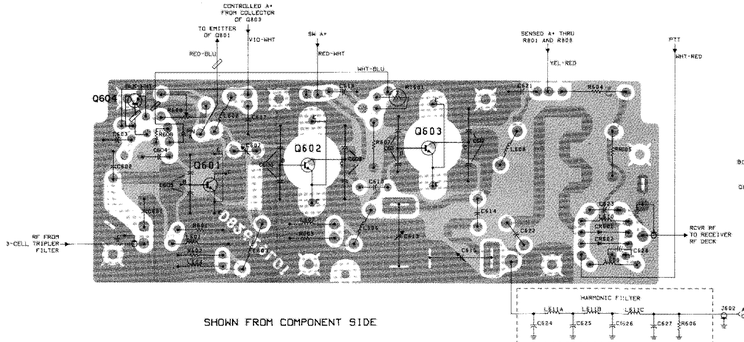
MODELS TLE1833A (450-470 MHz - 30 WATTS)
TLE1834A (470-494 MHz - 25 WATTS)
TLE1835A (495-512 MHz - 25 WATTS)

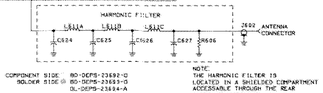
PARTS LIST

TLE1833A Power Amplifier (450-470 MHz) 30 W
TLE1834A Power Amplifier (470-494 MHz) 25 W
TLE1835A Power Amplifier (494-512 MHz) 25 W PL-5758-A

REFERENCE SYMBOL*	MOTOROLA PART NO.	DESCRIPTION
		CAPACITOR, fixed: pF ±5%; 500 V; unless otherwise stated
C601	21-83406D54	4; 500 V
C602L	21-83406D95	14; 500 V
C602M	21-83740D05	12 pF; 5%; 500 V
C602H	21-83740D05	12 pF; 5%; 500 V
C603	21-82204B34	22
C604	21-82204B34	22
C605L	21-82112K19	75
C605M, H	21-82112K13	70
C606		22 pF ±5%; 850 V
C607	20-84882C03	variable; 6.6-19.8; 63 V
C608		NOT USED
C609	21-82112K08	50
C610L	21-83740D05	12
C610M, H	21-83740D04	10 ±0.5 pF
C611	21-82112K05	34
C612L	21-82112K08	50
C612M	21-82112K03	44
C612H	21-82112K02	40
C613	20-83201B11	variable; 1.5-18; 100 V
C614	20-83406D87	43
C615	20-83201B11	variable; 1.5-18; 100 V
C616	23-82601A31	15 uF -10-150%; 25 V
C617	21-82372C10	.05 uF ±20%; 25 V
C618		NOT USED
C619	21-82372C10	.05 uF ±20%; 25 V
C620	23-8260A31	15 uF -10+150%; 25 V
C621	21-82428B08	.02 uF -40+10%; 100 V
C622	21-84494B38	15; 500 V
C623	21-82428B04	.01 uF -30-70%; 100 V
C624	21-83366K06	10 ±0.25 pF; 1700 V
C625, 626	21-83366K07	32; 1700 V
C627	21-83366K06	10 ±0.25 pF; 1700 V
C628L	21-82877B46	18 ±10%; 75 V
C628M	21-82358Q75	15.5 ±2%; 25 V
C628H	21-82358Q78	14.3 ±2%; 25 V
		DIODE: (SEE NOTE)
CR601, 602	48-83510F05	silicon
		COIL, rf:
L601	24-83961B01	3 turns, coded brown
L602	24-83884G03	1-1/2 turns, coded brown
L603	24-83961B01	3 turns, coded brown
L604	24-82723H05	0.41 uH, coded yellow
L605		part of circuit board plating
L606	24-83884G03	1-1/2 turns, coded brown
L607	24-82723H05	0.41 uH, coded yellow
L608	24-83884G03	1-1/2 turns, coded brown
L609	24-82723H25	33 uH
L610	24-82723H01	1.2 uH
L611	42-84438K02	fixed wire loop
J602	9-82442E06	CONNECTOR, receptacle: single contact
		TRANSISTOR: (SEE NOTE)
C601	48-869888	NPN; type M9888
Q602	48-869851	NPN; type M9851
C603L	48-869741	NPN; type M9741
C603M, H	48-869950	NPN; type M9950
C604	48-869643	PNP; type M9643
		RESISTOR, fixed: ±5%; 1/4 W: unless otherwise stated
R601	6-124A07	18
R602	6-124A01	10
R603	6-124D55	2.7 ±10%
R604	6-125C47	820 ±10%; 1/2 W
R605	6-124C59	2.7k ±10%
R606	6-125C97	100k ±10%; 1/2 W
R607		NOT USED
R608	6-124A81	22k
R609	18-84944C04	variable; 500 ±20%; 0.1 W
RT601	6-84563L01	SENSOR, thermal: 1.5k @ 97°C

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		NON-REFERENCED ITEMS
	1-80794B79	FILTER ASSEMBLY includes:
	3-134185	SCREW, tapping; 6-32 x 1/4" 2 used
	3-134212	SCREW, tapping; 4-40 x 5/16" 2 used
	15-83337L01	COVER, heat sink
	42-84438K02	CLIP, jumper
	64-84437K01	PLATE, filter CAPACITORS C624 & C627 CONNECTOR J602 RESISTOR R606
	2-7003	NUT, hex; 8-32 x 5/16 x 1/8"
	3-134186	SCREW, tapping; 6-32 x 5/16" 7 used
	3-135084	SCREW, tapping; 4-40 x 5/16" 3 used
	3-138517	SCREW, tapping; 4-40 x 7/16" 2 used
	3-139807	SCREW, machine; 6-32 x 1-1/8"
	3-400138	SCREW, machine; 4-40 x 3/16"
	4-7666	WASHER, lock; #6 (external tooth)
	4-114583	WASHER, lock; #4 (split) (TRN6950A & TRN6852A)
	14-83433L01	INSULATOR; 4.96 x 1.74 x .005" (mylar)
	26-83338L01	HEAT SINK
	42-10128A10	RING, retaining (plastic)
	43-83854G01	SPACER, threaded
	76-83960B01	CORE, ferrite
	1-80785B95	CABLE ASSEMBLY, receiver includes:
	30-859004	CABLE, coaxial; 6.88" long
	37-82603D60	SLEEVE, numbered; blank
	42-82999L01	CLIP; .407" long
	1-80786B98	CABLE ASSEMBLY includes:
	30-859004	CABLE, coaxial; 9.63" long
	42-82999L01	CLIP; .407" long

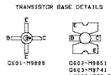


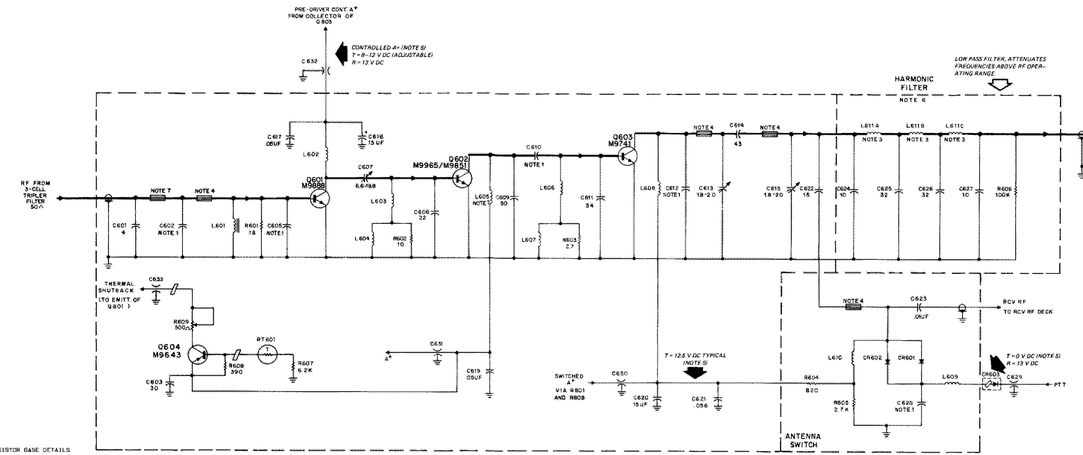


COMPONENT SIDE 80-DEPS-23692-O
SOLDER SIDE 80-DEPS-23693-O
DL-DEPS-23694-A

NOTE:
THE HARMONIC FILTER IS LOCATED IN A SHIELDED COMPARTMENT ACCESSABLE THROUGH THE REAR COVER OF THE HEATSINK.

TRANSISTOR BASE DETAILS





NOTES:

1. VALUE DEPENDS ON FREQUENCY BAND. REFER TO PARTS LIST FOR VALUE
2. UNLESS OTHERWISE STATED, RESISTOR VALUES ARE IN OHMS AND CAPACITOR VALUES ARE IN MICROFARADS.
3. INDUCTORS L611 ARE WIRES.
4. 50 OHM MICROSTRIP TRANSMISSION LINE.
5. THESE VOLTAGES ARE MEASURED WITH A+ 13.6 V DC.
6. THE HARMONIC FILTER COMPONENTS ARE MOUNTED IN A SHIELDED COMPARTMENT BETWEEN THE HEATSINK AND THE BACKPLATE COVER OF THE HEATSINK.
7. DISTRIBUTED ELEMENT; PART OF CIRCUIT BOARD PLATING.

LEGEND:
- THEORY NOTE
- MAINTENANCE NOTE
- PRIMARY SIGNAL FLOW

ANTENNA SWITCH ISOLATES RCVR INPUT DURING TRANSMISSION. THE 50 OHM MICROSTRIP LINE IS A 1/4 WAVELENGTH SECTION.

RECEIVE: PTT UNGROUNDED, CR601, 602 NON-CONDUCTING (OPEN CIRCUIT). 1/4 WAVE LINE 2 = 50 OHMS. PA OUTPUT CIRCUIT IS HIGH IMPEDANCE TO RECEIVED RF. RF PASSES TO RCVR RF INPUT.

TRANSMIT: PTT GROUNDED. CR601, 602 CONDUCT SHORT AT 1/4 WAVE LINE OUTPUT CAUSES "OPEN" AT LINE INPUT. XMTR RF IS BLOCKED FROM RCVR RF INPUT.

DEPS-22969-B

FUNCTION

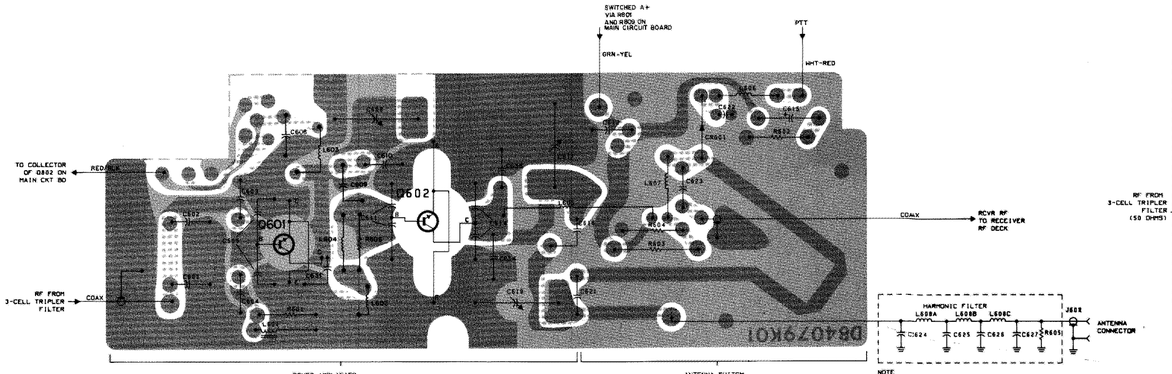
Provides a filtered 30-watt (25 watt for 470-512 MHz band) frequency-modulated rf signal to the antenna; the antenna switch switches the antenna between the transmitter and the receiver.

30/25 WATT RF POWER AMPLIFIER, HARMONIC FILTER, AND ANTENNA SWITCH

68P81037E78-B
7/6/78-UP

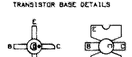
15-WATT RF POWER AMPLIFIER
HARMONIC FILTER, AND ANTENNA SWITCH

MODELS TLE1821A (403-420 MHz)
TLE1823A (450-470 MHz)
TLE1824A (470-494 MHz)
TLE1825A (494-512 MHz)

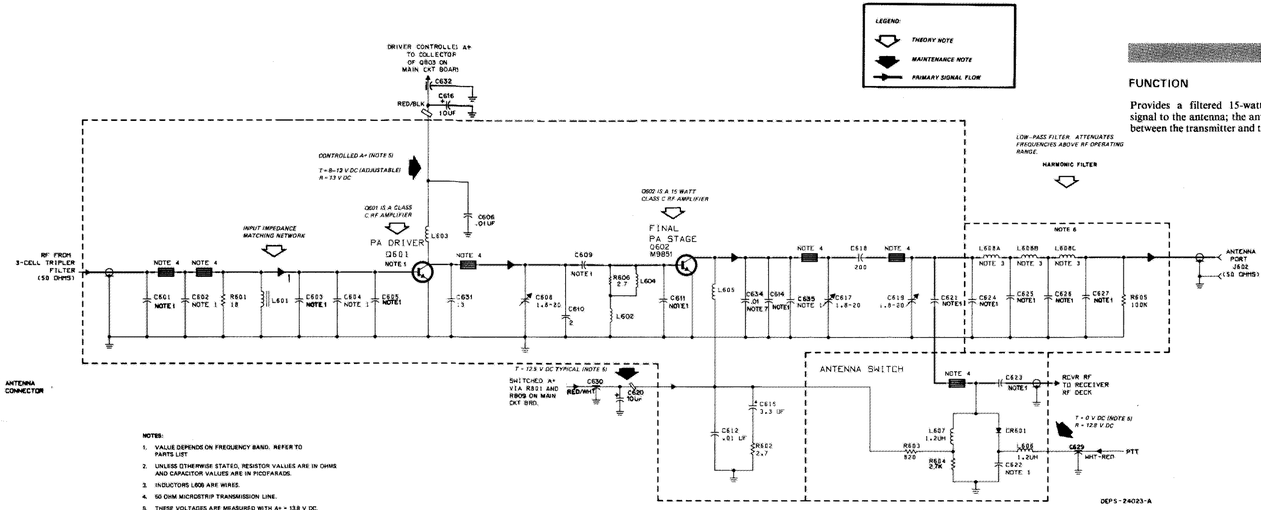


SHOWN FROM COMPONENT SIDE

TRANSISTOR BASE DETAILS



Q601-M8888 Q602-M8851



NOTES:

1. VALUE DEPENDS ON FREQUENCY BAND. REFER TO PARTS LIST
2. UNLESS OTHERWISE STATED, RESISTOR VALUES ARE IN OHMS AND CAPACITOR VALUES ARE IN PICOFARADS.
3. INDUCTORS L608 ARE WIRES.
4. 50 OHM MICROSTRIP TRANSMISSION LINE.
5. THESE VOLTAGES ARE MEASURED WITH A+ = 13.8 V DC.
6. THE HARMONIC FILTER COMPONENTS ARE MOUNTED IN THE PA HEATSINK BENEATH THE PA CIRCUIT BOARD.
7. THE LEAD LENGTH OF D832 IS CRITICAL. WHEN REPLACING PART, TOTAL LEAD LENGTH SHOULD BE 3/8 INCHES LONG.

FUNCTION

Provides a filtered 15-watt frequency-modulated rf signal to the antenna; the antenna switches the antenna between the transmitter and the receiver.

PARTS LIST SHOWN ON BACK

68P81037E79-B
7/6/78-UP

PARTS LIST

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION

LEGEND
LL = 406-420 MHz
L = 450-470 MHz
M = 470-494 MHz
H = 494-512 MHz

TLE1821A Power Amplifier (406-420 MHz) 15 W
TLE1823A Power Amplifier (450-470 MHz) 15 W
TLE1824A Power Amplifier (470-494 MHz) 15 W
TLE1825A Power Amplifier (494-512 MHz) 15 W PL-5752-B

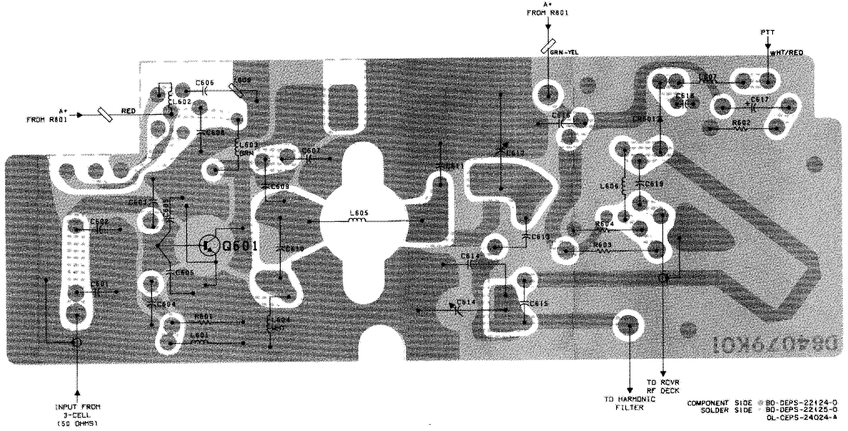
		CAPACITOR, fixed: pF ±5%; 500 V; unless otherwise stated
C601LL	21-83406D84	6.8
C601L, M, H	21-83406D54	4 ±0.25 pF
C602LL	21-83406D72	12
C602L	21-83406D90	11 ±0.5 pF
C602M, H	21-83406D94	9 ±0.5 pF
C603LL	21-83406D93	16
C603L, M, H	21-83406D97	15
C604LL	21-83406D55	18
C604L	21-82204B41	13; NP0
C604M	21-83406D95	14
C604H	21-83406D72	12
C605LL	-	See Note 2
C605L	-	See Note 2
C605M	-	See Note 2
C605H	-	See Note 2
C606	21-82428B04	.01 uF +70-30%; 100 V
C608	20-83201B11	variable 1.8-20 pF; 400 V
C609LL	21-84494B73	17
C609L	21-82204B11	13; NP0
C609M, H	21-84494B29	10
C610	21-83406D52	2
C611	-	See Note 2
C612	21-82428B06	.01 uF +70-30%; 100 V
C613		NOT USED
C614	-	See Note 2
C615	23-83397D01	3.3 uF ±20%; 25 V
C616	23-84665F01	10 uF +100-0%; 25 V
C617	20-83201B11	variable 1.8-20 pF; 400 V
C618	21-84494B11	200
C619	20-83201B11	variable 1.8-20 pF; 400 V
C621LL	21-82355B15	24
C621L, M, H	21-84494B38	15
C622LL, L	21-8235G78	14.3 ±20%; 25 V
C622M	21-82358G72	12.5 ±2%; 25 V
C622H	21-82358G24	12 ±3%; 100 V
C623LL	21-82355B15	24
C623L, M, H	21-82428B06	.01 uF +70-30%; 100 V
C624LL	21-83366K	12
C624L, M, H	21-83366K06	10 ±0.25 pF; 1700 V
C625LL		36
C625L, M, H	21-83366K07	32; 1700 V
C626LL		36
C626L, M, H	21-83366K07	32; 1700 V
C627LL		12
C627L, M, H	21-83366K06	10 ±0.25 pF; 1700 V
C629, 630	21-861219	1000 +100-0%
C631	21-84494B36	13
C632	21-861219	1000 +100-0%
C634	21-832501	.01 uF +60-40%; 250 V
C635LL, L, M	21-84494B37	11
C635H	21-84494B29	10
CR601	48-83510F03	DIODE: (SEE NOTE 1) silicon
J602	9-82442E06	CONNECTOR, receptacle: coaxial; chassis mounted
L601	24-83961B01	COIL: 3-turns; coded Brown
L602, 603	24-83884G03	1-1/2 turns; coded Brown
L604	24-82723H05	410 mH
L605	30-10286A72	wire #24 gauge solid insulation 1"
L606, 607	24-82723H01	1.2 uH
L608	42-84438K01	fixed wire loop

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
C601LL, L C601M, 601H C602		TRANSISTOR: (SEE NOTE 1) part of PK817 kit (See note 2) part of RPX4000A kit (see note 2) part of PK818 kit (see note 2)
		RESISTOR, fixed: ±10%; 1/4 W; unless otherwise stated
R601	6-124A07	18 ±5%
R602	6-124D55	2.7
R603	6-125C47	820; 1/2 W
R604	6-124C59	2.7k
R605	6-125C97	100k; 1/2 W
R606	6-124D55	2.7
		NON-REFERENCED ITEMS
	76-84069B01	FERRITE BEAD
	1-80785B63	CAPACITOR ASSEMBLY includes:
	4-83755H01	WASHER, shoulder
	64-84605K01	PLATE, mounting
		CAPACITORS C629 & C630
	1-80785B64	CAPACITOR & RESISTOR ASSEMBLY includes:
	64-84437K01	PLATE, filter
		COMPONENTS C624 thru C627, R605, & L608
	2-7003	NUT, 8-32 x 5/16 x 1/8"
	3-129997	SCREW, machine; 4-40 x 5/16" 3 req'd.
	3-134185	SCREW, tapping; 6-32 x 1/4"; 2 req'd.
	3-134186	SCREW, tapping; 6-32 x 5/16"; 7 req'd.
	3-134212	SCREW, tapping; 4-40 x 5/16"; 2 req'd.
	3-139575	SCREW, machine; 6-32 x 1-1/8"
	4-84152B01	WASHER, shoulder
	14-84268A01	INSULATOR, transistor (.520 x .660")
	14-84439K01	INSULATOR (1.07 x 1.82")
	14-84440K01	INSULATOR (2.19 x 1.82")
	26-84412K01	HEATSINK
	76-84069B01	FERRITE BEAD: (.047 x .138 x .236")
	42-10128A10	RING, retaining

NOTE:
1. For optimum performance, diodes, transistors, and integrated circuits, must be ordered by Motorola part numbers.
2. C605L and C601L should be replaced together. Order part kit PK817. C605M, C605H, C601M and C601H should be replaced together. Order parts kist RPX4000A. C611, C614, and C602 should be replaced together. Order part kit PK818.

PARTS LIST

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
TLE1813A Power Amplifier (450-470 MHz) 2 W TLE1814A Power Amplifier (470-494 MHz) 2 W TLE1815A Power Amplifier (494-512 MHz) 2 W		PL-5768-A
		CAPACITOR, fixed: pF; 500 V;
C601	21-83406D54	4 ±.25 pF
C602L	21-83406D90	11 ±5%
C602M	21-83406D94	9 ±.5 pF
C602H	21-840848	6 ±.5 pF
C603	21-83406D97	15 ±5%
C604L	21-83406D93	16 ±5%
C604M	21-83406D72	12 ±5%
C605	21-82112K03	44 ±5%; 1700 V
C606M	21-82428B01	.02 uF +60-40%; 100 V
C607	21-838284	3.9 ±.25 pF
C608L, H	21-82428B06	.01 uF +70-30%; 100 V
C608M	21-83406D90	11 ±5%
C609L	21-847874	12 ±5%
C609M	21-82204B32	10 ±.25 pF
C609H	21-851846	8 ±.25 pF
C610	21-122235	18 ±5%
C611	21-840848	6 ±.5%
C612	20-83201B11	variable; 1.8-20; 100 V
C613	21-84494B11	200 ±5%
C614L, H	20-83201B11	variable; 1.8-20; 100 V
C614M	21-82450B08	1.2 ±5%
C615	21-84494B38	15 ±5%
C616	21-82428B06	.01 uF +70-30%; 100 V
C617	23-83397D01	3.3 uF ±20%; 25 V
C618L	21-82358G78	14.3 ±2%
C618M	21-82358G72	12.5 ±2%; 100 V
C618H	21-82358G24	12 ±3%; 100
C619	21-82428B06	.01 uF +70-03%; 100 V
C624	21-83366K06	10 ±.5 pF; 1700 V
C625, 626	21-83366K07	32 ±5%; 1700 V
C627	21-83366K06	10 ±.5 pF; 1700 V
CR601	48-83510F03	DIODE: (SEE NOTE) silicon
J602	9-82442E06	CONNECTOR, receptacle: female, single contact
L604	24-83884C06	COIL, RF: choke, 4-1/2 turns (coded WHT)
L602M	10-519	bare wire
L603	24-83884G03	choke, 1-1/2 turns (coded BRN)
L605	3019151A17	flat wire (.8")
L606, 607	24-83723H01	choke: 1.2 uH
L608	42-84434K01	fixed: wire loop
L609	76-83960B03	ferrite bead
Q1	48-869888 or48-869922	TRANSISTOR: (SEE NOTE) NPN: type M9888 (450-470 MHz) NPN: type M9922 (470-512 MHz)
R601L, H	6-124A07	RESISTOR, fixed: 18 ±5%; 1/4 W
R601M	6-124A03	12 ±5%; 1/4 W
R602	6-124D55	2.7 ±10%; 1/4 W
R603	6-125C47	820 ±10%; 1/2 W
R604	6-124C59	2.7k ±10%; 1/4 W
	MECHANICAL PARTS	
	2-7003	NUT, 8-32 x 5/16 x 1/8"
	3-134185	SCREW, tapping 6-32 x 1/4": 2 used
	3-134186	SCREW, tapping 6-32 x 5/16": 6 used
	3-134212	SCREW, tapping 4-40 x 5/16": 2 used
	3-136138	SCREW, machine 6-32 x 3/8"
	3-139575	SCREW, machine 6-32 x 1-1/8"
	14-84439K01	INSULATOR
	14-84440K01	INSULATOR, with hole
	26-82321L01	HEATSINK
	29-5370	LUG, solder
	42-10128A10	"O" RING
	42-82143C03	CLAMP, cable
	76-84069B01	CORE, ferrite bead; 2 used



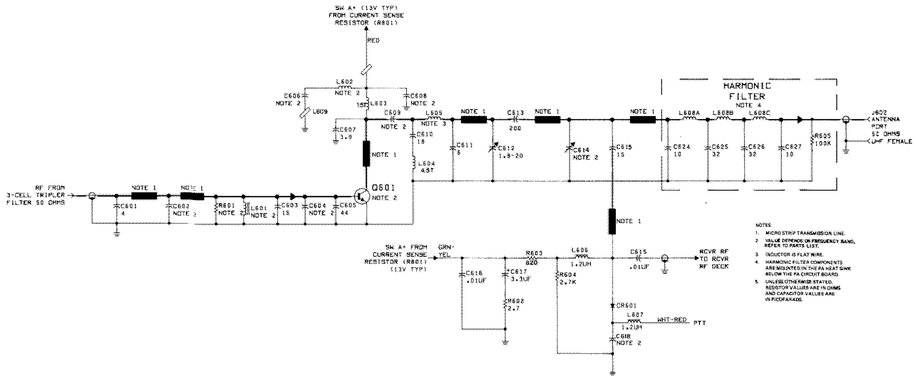
SHOWN FROM COMPONENT SIDE

2-WATT RF POWER AMPLIFIER HARMONIC FILTER, AND ANTENNA SWITCH

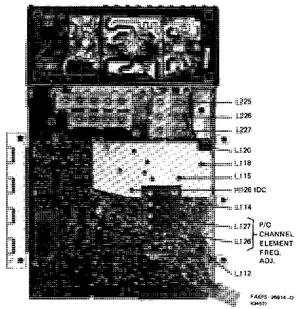
MODELS TLE1813A (450-470 MHz)
TLE1814A (470-494 MHz)
TLE1815A (494-512 MHz)

FUNCTION

Provides a filtered 2-watt frequency-modulated rf signal to the antenna; the antenna switch switches the antenna between the transmitter and the receiver.



TRANSMITTER



Transmitter Adjust Locations

TRANSMITTER METERING

TRANSMITTER METER READINGS, USING TEK-5 METERING PANEL OR S1056B PORTABLE TEST SET

METER	MEASUREMENT	READING, (uA)
3	2nd Buffer Amplifier Input	12 (TYP.))
5	Exciter Amplifier Collector Current	36 (TYP.))

TRANSMITTER METER READINGS WITH 20,000 OHM/VOLT VOLTMETER

METERING FUNCTION	VOLTMETER LEAD CONNECTIONS +	—	VOLTMETER SCALE	TYPICAL READING
M3 2nd Buffer Ampl. Input	J601-14	Chassis Ground	50 uA, DC	20 uA (TYP.)
M5 Exciter Output Amplifier Collector Current	J601-7	J601-11	150 mA, DC	110 mA (TYP.)

PREALIGNMENT NOTES

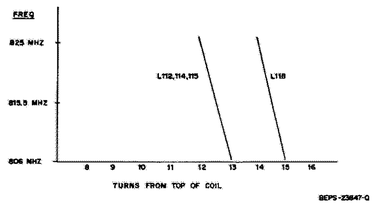
1. In some cases, peak readings may occur at two points in the tuning range of a coil. Always choose point where slug is nearest top of coil form (away from circuit board).

2. Unnecessary tuning adjustments should be avoided. Usually, only a "touch-up" transmitter alignment is needed. Complete transmitter alignment is needed in the following cases:

   a. After changing transmitter operating frequency.
   b. After replacing a component in a frequency-sensitive network.

3. Before beginning a complete alignment, preset tuning adjustments as follows:

   a. Set L120 8 turns from top of form.
   b. Starting with slugs of L225, 226, and 227 flush with tension nut, set slugs 4 turns above nut.
   c. Set L112, L114, L115, and L118 according to the following chart:



4. Key transmitter for each step in alignment procedure and de-key after alignment step is completed. Avoid keying an unaligned transmitter for prolonged periods.

5. Two-frequency radios should be aligned on lowest operating frequency.

6. Transmitter frequency calculations:

   $f_c = 18f_{osc}$, where f_c = carrier frequency, and f_{osc} = crystal oscillator frequency.

SET-UP

1. If a TEK-5 Metering Panel or a S1056B Portable Test Set is available, connect the metering panel or test set to J601 using the appropriate metering adapter cable. The metering adapter cables and directions for their use are shown in Figure 4. Metering may be accomplished with a 20,000 ohm-per-volt voltmeter if a test set or metering panel is not available. Refer to the metering tables on this page.

2. Connect an rf wattmeter, terminated in a resonant antenna or 50-ohm resistive dummy load, to radio set antenna connector J602.

3. Connect a dc power supply to the power leads of the test cable. Set the power supply output to 13.8 volts.

TRANSMITTER ALIGNMENT 800 MHz MAXAR

NOTES

1. Two-Frequency radios should be tuned on lowest frequency.

2. If repairs have been made on either the Final Amp or Power Doubler refer to servicing section for alignment procedure.

STEP	ADJUST	METERING POINT	DESIRED READING
1 1st Buffer Output	L112	M3	Peak
2 2nd Buffer Output	L114	M3	Dip if no M5 reading.
		M5	Peak if M5 has a reading (coincident with dip in meter 3).
3 First Tripler Output	L115, then L118	M5	Peak
4 Second Tripler Input	L120	M5	Dip M5
5 Second Tripler Output Filter	L225, L226, L227. Start with L226	Wattmeter	Peak
6 Second Tripler Input	L120	M5	Dip
7 Second Tripler Output Filter	L225, 226, 227	Wattmeter	Peak Detune L114 as necessary to maintain 8-10 watts while peaking.
8 2nd Buffer Output	L114	M5	Peak L114 on meter 5 coincident with Dip in meter 3.

NOTE

IF THE MAXIMUM POWER OUTPUT OBTAINABLE IS LESS THAN 12 WATTS:
Go back to Step 1 of the Transmitter Alignment Procedure and repeat the alignment a second time.

IF MAXIMUM IS LESS THAN 10 WATTS:
The transmitter may be malfunctioning. Refer to the transmitter schematic diagram for troubleshooting information.

TRANSMITTER ALIGNMENT PROCEDURE (Cont'd.)

OSCILLATOR FREQUENCY ADJUSTMENT

Oscillators should be set on frequency AFTER transmitter has been aligned and BEFORE modulation deviation is set.

SET-UP

1. Set up the frequency meter or counter controls as required.

2. *In tone-coded "Private-Line" (PL) radios,* remove the "Vibrasponder" resonant reed from its socket on the PL board.
   In "Digital Private-Line" (DPL) radios, set encoder amplitude to zero by adjusting R342 (fully CCW from plating side of board).

FREQUENCY ADJUSTMENT PROCEDURE

STEP	PROCEDURE
1	Select F1
2	Key transmitter with no modulation
3	Adjust L126 for F1 frequency ± 100 Hz at 25 °C ± 3 °C
	Two-Frequency Models Only
4	Select F2
5	Adjust L127 for F2 frequency ± 100 Hz at 25 °C ± 3 °C

NOTE

DEVIATION MEASUREMENT

To obtain accurate measurement of transmitter deviation in radios equipped with "Digital Private-Line" binary-coded squelch, the frequency response of the deviation measuring equipment must be less than 1 Hz. If a deviation meter with this low frequency response characteristic is not available, the transmitter deviation can be checked by making the transmitter send continuous Turn-Off code during the measurement. Since the Turn-Off code waveform is sinusoidal, standard test equipment will then provide an accurate deviation measurement. To make the transmitter send continuous Turn-Off code, short together the base and emitter plating of PTT Inverter Q309 and key the transmitter.

IDC ADJUSTMENT 800 MHz MAXAR

Oscillator frequency adjustment must be made BEFORE setting the IDC controls.

1. Set the deviation meter operating controls as needed.
2. *In tone coded "Private-Line" radios,* remove the "Vibrasponder" resonant reed from its socket on the PL board.
   In "Digital Private-Line" radios, set encoder amplitude to zero by adjusting R342 (fully CCW from plating side of board).
3. Disconnect mic input lead (red) from main circuit board.
4. Connect the output of an audio signal generator to J601 as follows:

   High side through a 1 uF capacitor (+ end toward the radio) to J601-5.
   Low side to J601-6 or radio chassis.

NOTE

The transmitter must be keyed by pressing the KEY button on the test set or by shorting J601-8 to J601-6 on the radio chassis. DO NOT USE THE MICROPHONE PTT SWITCH TO KEY THE TRANSMITTER DURING IDC ADJUSTMENT. The transmitter must be momentarily keyed with the handset or mic (depress F2 switch on front panel for F2 frequency) to change frequency on two freq stations.

5. Connect an ac VTVM across the audio signal generator output.

IDC ADJUSTMENT PROCEDURE:

STEP	PROCEDURE
1	Set audio signal generator output frequency to 1000 Hz and output level to 0.8 V.
2	Select F1 and key transmitter. Adjust F1 "IDC" control R126 for ± 5 kHz deviation meter reading.
3	On 2-freq. models, key transmitter and select channel (F1 or F2) that yields highest deviation. Adjust "IDC" control R126 for ± 5 kHz deviation meter reading on this channel.
4	Reduce audio signal generator output level until deviation meter reads ± 3.0 kHz. Audio oscillator output level should be 160 mV ± 3 dB.
	TONE CODED "PRIVATE-LINE" MODELS ONLY
5	Insert resonant reed into socket on PL board and disconnect audio oscillator from J601.
6	Key transmitter and adjust Tone Level control R433 for PL tone deviation reading of 800 Hz.
7	Reconnect audio signal generator to J601-5 and -6 and repeat Steps 1 through 3. Be sure overall deviation does not exceed ± 5 kHz, including PL tone.
	or
	"DIGITAL PRIVATE-LINE" MODELS ONLY (SEE NOTE)
5	Disconnect the audio signal generator from J601.
6	Key the transmitter and adjust Code Level set control R342 for a DPL code deviation reading of 900 Hz.
7	Reconnect the audio signal generator to J601-5 and -6. Repeat Steps 1 through 3. Be sure overall deviation does not exceed ± 5 kHz, including DPL code.

RECEIVER

PREALIGNMENT NOTES

1. On "Digital Private-Line" and "Private-Line" radio sets, disable the DPL or PL decoder by depressing the front panel MONITOR pushbutton.

2. In some cases, peak meter readings may occur at two points in the tuning range of a coil. Always choose point where the slug is nearest the top of the coil form (away from the circuit board).

3. Unnecessary tuning adjustments should be avoided. Usually, the receiver will require only a "touch-up" alignment. Complete receiver alignment is necessary in the following cases:

   a. After changing the receiver operating frequency.
   b. After replacing a component in a frequency-sensitive network.

4. Before beginning a complete receiver alignment, preset tuning adjustments as follows:

   a. Set L221, 222, 223, 224 5 turns CCW from fully in position.
   b. Set L213, 214, 215 5 turns CCW from fully in position.
   c. Set L216, 217, 218, 219, 220 4 turns CCW from fully in position.
   d. Set L15 15 turns from top of coil form.
   e. Set L18, 20, 21, 23 flush with top of coil form.

5. Receiver frequency calculations:

$$f_{osc} = \frac{f_c - 16.9\ MHz}{18} \quad \text{and} \quad f_{inj} = 18f_{osc} = f_c - 16.9\ MHz;$$

   Where f_c = carrier frequency, f_{osc} = oscillator crystal frequency, and f_{inj} = mixer injection freq.

6. Two-frequency radios should be tuned on the lower operating frequency.

TEST EQUIPMENT SET-UP

1. If a TEK-5 Metering Panel or a S1056B Portable Test Set is available, connect the metering panel or test set to J601 using the appropriate metering adapter cable. The metering adapter cables and directions for their use are shown in Figure 1. Metering may be accomplished with a 20,000 ohm-per-volt voltmeter if a test set or metering panel is not available. Refer to the voltmeter metering table on this page.

2. Connect a dc power supply to the power leads of the test cable. Set the power supply output to 13.8 volts.

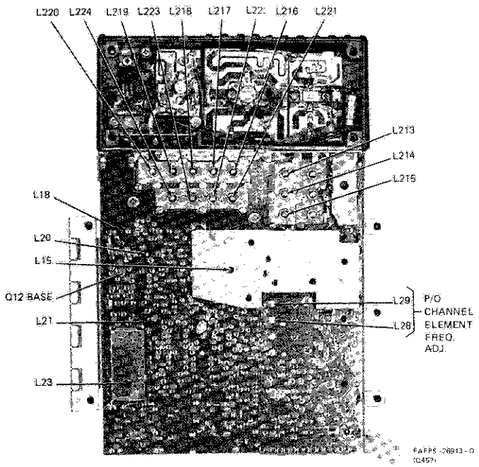


Figure 1. Receiver Adjustment Locations

RECEIVER METERING

TYPICAL RECEIVER METER READINGS WITH TEK-5 METERING PANEL OR S1056B PORTABLE TEST SET

METER	MEASUREMENT	READING, uA
1	2nd IF Amplifier Signal Level	16-22 (No Signal) 18-25 (20 dBq)
2	Quadrature Detector Output	22 ± 1
3	Injection Oscillator Output	10-28

RECEIVER METER READINGS WITH 20,000 OHM/VOLT VOLTMETER

METERING POINT	VOLTMETER LEAD CONNECTIONS +	VOLTMETER LEAD CONNECTIONS —	VOLTMETER SCALE	TYPICAL READINGS
M1 2nd IF Ampl. Signal Level	J601-10	Chassis Ground	2.5 V DC	0.5-0.8 V (No Signal) 0.6-0.9 V (20 dBq)
M2 Quadrature Detector Output	J601-13	Chassis Ground	10 V DC	5.2 V ± .2 V
M3 Injection Osc. Output	J601-14	Chassis Ground	50 uA DC	20-35 uA

RECEIVER ALIGNMENT PROCEDURE

RECEIVER ALIGNMENT PROCEDURE AND TEST EQUIPMENT LIST

NOTE

Transmitter alignment must be performed before receiver alignment.

STEP	INPUT SIGNAL	SIGNAL INPUT POINT	ADJUST	MONITORING POINT	DESIRED READING
1 Quadrature Detector	16.9 MHz @ 1 mV	Near Q12; allow signal to "spray" into circuit (Note 1)	L23	Meter 2	22 ± 1 uA
				or	
				VOM or VTVM at J1-13	5.3 V DC
2 Injection Oscillator			Freq Select Switch to lowest freq position, then:		
			L15	Meter 3	Max
			L221		Dip
			L222		Peak
			L223		Dip
			L224		Peak
3 Preselector	Receive freq @ 10 mV (Note 2)	Antenna Connector	1. Set Freq. Select Switch to lowest freq. position, then adjust L220, 219, 218, 217, 216. 2. Back out (CCW) all screws half turn and repeat peaking of L220-L216.	Meter 1	Peak. (Adjust signal generator input level to keep M1 in the 24 uA-35 uA range)
4 Preamp Input	Receive freq @ 10 mV (Note 2)	Antenna Connector	L213, 214, 215	Meter 1	Peak. (Adjust signal generator input level to keep M1 in the 25 uA-35 uA range)
5 Frequency Adjustment	Receive freq (counted)	Antenna Connector	L28 for freq F1 L29 for freq F2 (2 freq radios only)	Radio Speaker	Audio zero beat
		or			
	16.9 MHz Osc.	"Spray" into base of Q12 (Note 1)			
6 IF Tuning	Receive freq (counted)	Antenna Connector	1. L21, 20, 18 2. Repeat Peaking	Meter 1	Peak. (Adjust signal level to maintain 45-50 uA on Meter F1)
7 Final Injection Adjustment	Receive freq (no modulation)	Antenna Connector	L224, L220 thru L216, L213, 214, L215 in that order		Maximum quieting (Adjust signal level to maintain approx. 28 dBq)
8 Repeat Step 5					
9 Final Quadrature Adjust			Disconnect generator and connect 50 ohm load. Key transmitter on F1 and note Meter 2 reading. Inject 16.9 MHz from signal source and adjust L23 for same Meter 2 (±0.5 uA) as noted earlier.	Meter 2	Same Meter 2 in both transmitter and receiver ON mode.

NOTES:

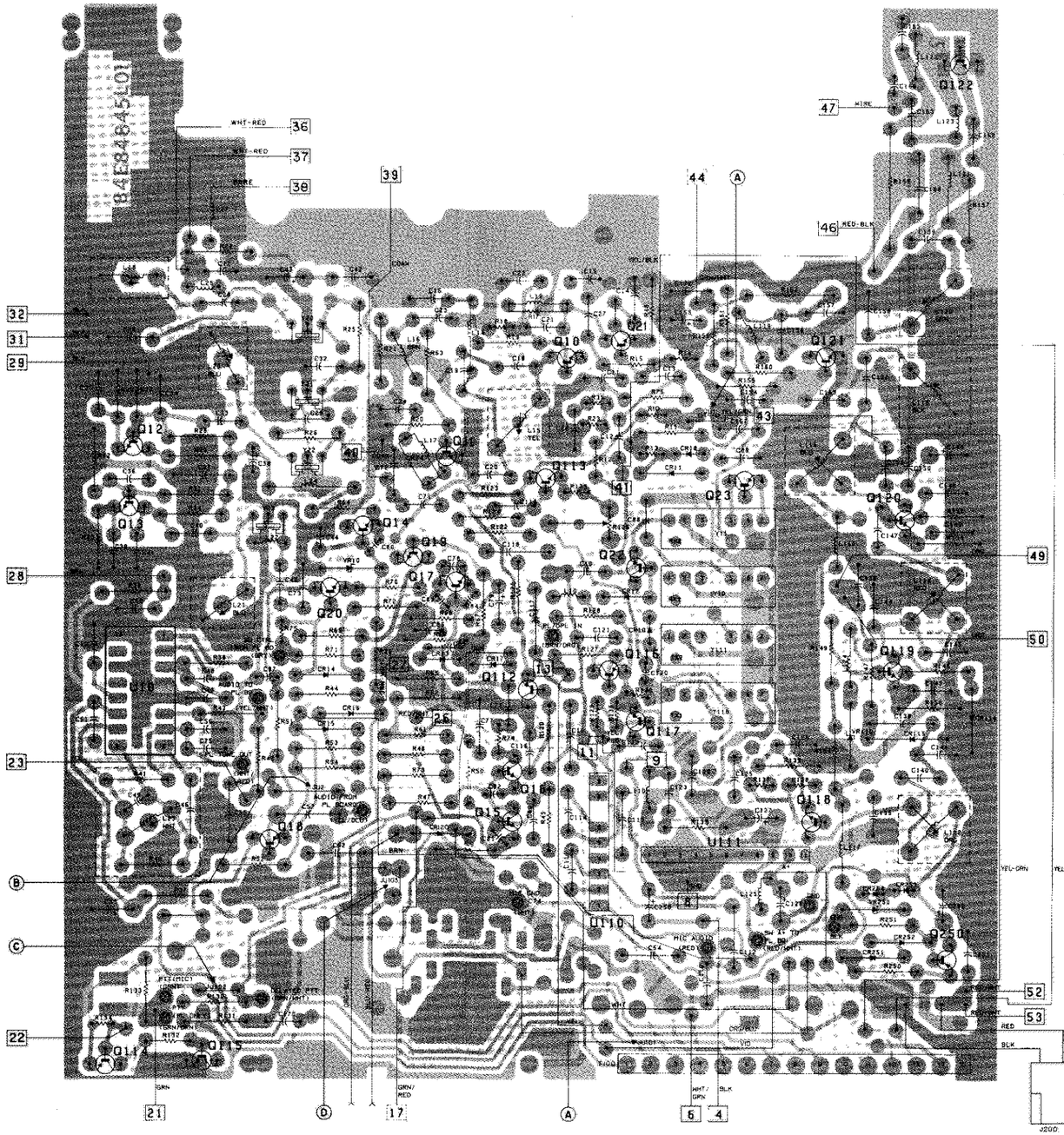
1. With a wire connected to a 16.9 MHz signal source output, "spray" the signal near Q12 (that is, place the wire in close proximity to Q12) but do not allow the wire to make physical contact with any part of the i-f amplifier.
2. To set signal generator on frequency without a frequency counter, open receiver squelch and adjust the signal generator frequency until receiver quiets. Carefully adjust signal generator frequency for a 22 uA Meter 2 reading or for a 5.3 volt dc vtvm reading at U10-6.

20 dB QUIETING SENSITIVITY MEASUREMENT

1. Connect an ac vtvm across the speaker.
2. On PL model radio sets, disable PL by depressing the MONITOR button on the radio set front panel.
3. Turn the SQUELCH control fully counterclockwise.
4. Turn on the radio set and adjust the VOLUME control until a reading of 2 volts is obtained on the ac vtvm.
5. Connect an rf signal generator to the radio set antenna connector. Set the signal generator to the carrier frequency, and set the generator output level control to minimum.
6. Slowly increase the output level of the rf signal generator until the ac vtvm reads 0.2 volts.
7. Note the signal generator output signal level. The signal level is the 20 dB quieting sensitivity of the receiver.

800 MHz UNIFIED BOARD

CIRCUIT BOARD DETAIL



COMPONENT SIDE ● 80-EEPS-24654-O
SOLDER SIDE ○ 80-EEPS-24655-O
BL-EEPS-26012-O

JUMPER TABLE

JUMPER NUMBER	IN	OUT	LOCATION
J01, J1101	SINGLE-FREQUENCY RECEIVER MODELS	TWO-FREQUENCY RECEIVER MODELS	A
J107	CARRIER SQUELCH MODELS & REMOTE ONLY DPL MODELS	PRIVATE LINE (PL) SQUELCH MODELS	B
J1100	CARRIER SQUELCH MODELS	PL W/ DPL SQUELCH MODELS	C
J1103	PL MODELS	CARRIER SQUELCH MODELS	D

CIRCUIT BOARD WIRE CONNECTIONS

NO.	FUNCTION	ON BOARD SOURCE	COLOR	OFF BOARD DEST-NATION	REMARKS
1	OMITTED				
2	OMITTED				
3	OMITTED				
4	GND	C250	BLK		
5	OMITTED				
6	MIC AUDIO	Q710	WHT /GRN	TO J600 "A"	
7	OMITTED				
8	GND	U111			NOT USED
9	SW A+	C250			NOT USED
10	OMITTED				
11	F2 XMTR SELECT	R129	YEL-RED	TO P100 "K"	
12	OMITTED				
13	F1 XMTR SELECT	R127	YEL-BLK	TO P100 "J"	
14	OMITTED				
15	OMITTED				
16	OMITTED				
17	KEYED A+	Q714 COLLECTOR	GRN-RED	TO P.A. Q656	
18	UNMITTED				
19	OMITTED				
20	OMITTED				
21	PTT	R133	GRN	TO J601 "B"	
22	PF INHIBIT	Q114 BASE			NOT USED
23	RCVR METER 2	R40	YEL	TO J601 "J"	
24	OMITTED				
25	OMITTED				
26	SW A+	R73			NOT USED
27	DELAYED PTT	R30			NOT USED
28	RCVR METER 1	R49	WHT	TO J601 "D"	
29	GND	C35	BLK	TO J601 "A"	
30	OMITTED				
31	GND	R27	BLK	TO P.A.	
32	P.A. GND	C31	BLK	TO P.A. HEAT SINK	
33	UNMITTED				
34	UNMITTED				
35	UNMITTED				
36	SW RCVR A+	L35	WHT-RED	TO C215 RF DECK	
37	SW RCVR A+	L25	WHT-RED	TO C236 RF DECK	
38	6.0 MHz IF INPUT	L27	WHT	TO L226 RF DECK	SLEEVED WIRE
39	RF IN - OUT	D72	COAX CENTER	TO 1ST DOUBLER	
40	RF IN - GND	D70	COAX GND	TO 1ST DOUBLER	
41	F2 RCVR SELECT	R13	YEL-BLK	TO P100 "J"	
42	UNMITTED				
43	F1 RCVR SELECT	R10	YEL-GRN	TO P100 "J"	
44	XMTR METER 5	C172	GRN-WHT	TO J601 "I"	
45	OMITTED				
46	12 V REGULATED	R159	RED-BLK	TO P.A. Q667	
47	EXCITER OUTPUT	C166	WIRE	TO RF DECK C216	SLEEVED WIRE
48	OMITTED				
49	RCVR METER 2	C138	ORG	TO RF DECK L203	
50	METER 3	C138	ORG	TO J601 "H"	
51	OMITTED				
52	SW A+	C251	RED-WHT	TO P.A. Q656	
53	SW A+	C251	RED-WHT	TO J601 "J"	

XMTR BASE DETAILS

PL & DPL CONNECTIONS TO MAIN BOARD

PIN	WIRE COLOR	FUNCTION
C	RED/WHT	SWITCHED A+ TO PL BOARD (PL & DPL)
D	WHT-RED	PL TONE FROM PL BOARD DETECTOR (PL & DPL ONLY)
E	YEL/WHT	AUDIO TO PL BOARD HIGH PASS FILTER (PL & DPL ONLY)
F	YEL/BLK	AUDIO FROM PL BOARD HIGH PASS FILTER OUTPUT (PL & DPL)
A	GRAY	SQUELCH CONTROL FROM PL BOARD SQUELCH SWITCH (PL & DPL)
M	GRN/BRN	MIC PTT TO PL BOARD PTT INPUT (PL & DPL)
N	GRN/WHT	DELAYED PTT FROM PL BOARD (PL & DPL ONLY)
P	BRN/ORG	PL TONE FROM PL BOARD ENCODER OUTPUT (PL & DPL ONLY)
T	BLK	PL BOARD GROUND (PL & DPL)

CONNECTIONS LOCATED ON PL OR DPL BOARD

PL

MS	ORG/BLU	FROM MONITOR SWITCH (PL ONLY)
TD	BLU-RED	PL TONE DISABLE (PL ONLY)
J1107 TO TD	GRAY	PL SQUELCH SWITCH (PL ONLY)

DPL

Q315 BASE	ORG/BLU	FROM MONITOR SWITCH (DPL ONLY)
TD	BLU-RED	DPL TONE DISABLE (DPL ONLY)
J1107 TO TD	GRAY	DPL SQUELCH SWITCH (DPL ONLY)

P100

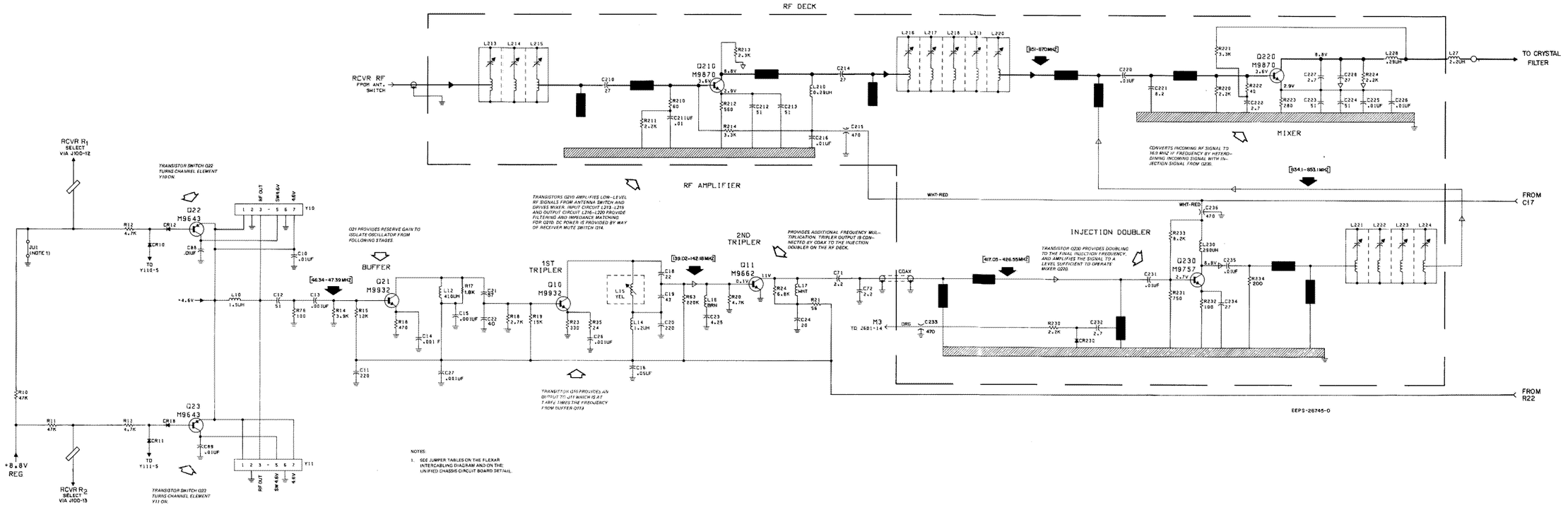
PTT	1
SQ. CONTROL INPUT	2
SQ. CONTROL OUTPUT	3
GND	4
DELAYED PTT	5
MIC AUDIO	6
T1	7
	8
RCVR AUDIO	9
DPL/PL TONE DISABLE	10
MONITOR	11
R1 SELECT	12
R2 SELECT	13
T2	14
GND	15

68P81040E78-O
(Sheet 1 of 5)
10/20/78-UP

800 MHz UNIFIED BOARD

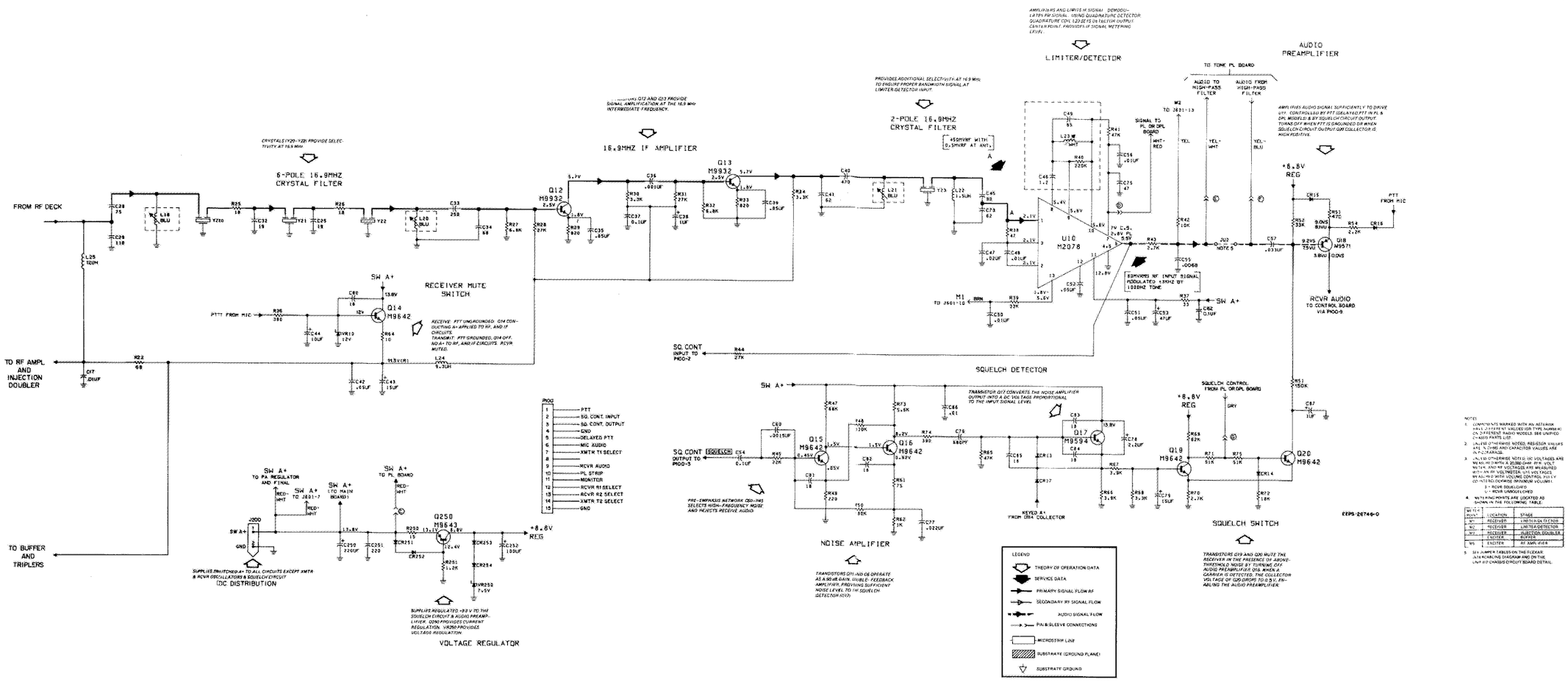
800 MHz UNIFIED BOARD

RF DECK SECTION



800 MHz UNIFIED BOARD

RECEIVER SECTION



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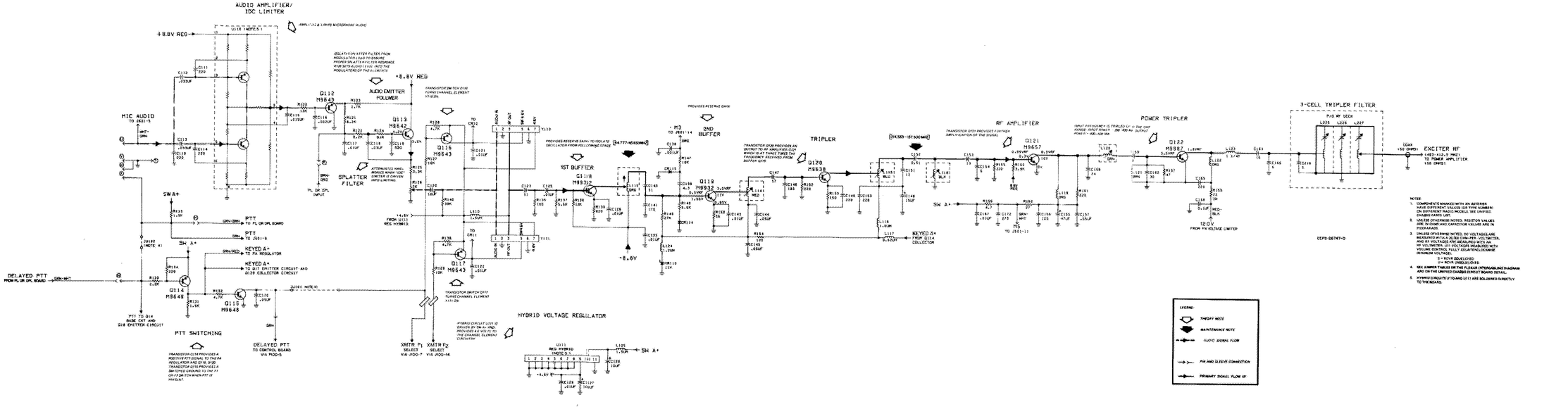
68P81040E78-O
(Sheet 3 of 5)
10/20/78-UP

800 MHz UNIFIED BOARD

800 MHz UNIFIED BOARD

EXCITER SECTION



REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		integrated circuit: (see note 1)
U10	51-84320A78	M2078
U110	1-80798B94	IDC hybrid circuit
U111	1-80798B67	voltage Reg. hybrid circuit
		voltage regulator:
VR10	48-82256C25	Zener; 12 V
VR110	48-82256C34	Zener; 11 V
VR250	48-82256C44	Zener; 7.5 V
		crystal: (see note 2)
Y10		KXN1090A
Y11		KXN1090A
Y20, 21, 22	48-84331L01	16.9 MHz (3-crystal set)
Y23	48-84334L01	16.9 MHz
Y110		KXN1091A
Y111		KXN1091A
		non-referenced items (rf deck)
	3-1465	SCREW, machine: 4-40 x 3/16"; 15 req.d.
	14-84886A01	INSULATOR, standoff; 2 req'd.
	1-80798B69	FILTER HOUSING ASSEMBLY
	1-80748B42	COVER ASSEMBLY, 3-cell includes:
	2-84773E04	NUT, tension; 3 req'd.
	3-84589G01	SET SCREW; 5-40 x 7/16"; 3 req'd.
	15-84396G01	COVER, 3-cell
	1-80748B43	COVER ASSEMBLY, 4-cell; includes:
	2-84773E04	NUT, tension; 4 req'd.
	3-84589G01	SET SCREW; 5-40 x 7/16"; 4 req'd.
	15-84394G01	COVER, 4-cell
	1-80748B44	COVER ASSEMBLY, 5-cell; includes:
	2-84773E04	NUT, tension; 5 req'd.
	3-84589G01	SET SCREW; 5-40 x 7/16"; 5 req'd.
	15-84397G01	COVER, 5-cell
		non-referenced items—TRN8626A main board hardware kit
	1-80785B73	HEAT SINK (Q122)
		non-referenced items TLF8331A main board kit
	5-10277A17	GROMMET PLASTIC
	14-861196	INS. TRANS. (Q121)
	26-84716D01	HEAT SINK (Q121)
	26-82048L01	SHIELD (L120)
	28-83264F01	SHIELD (L23)
	26-84171L01	SHIELD IF CRT, ANGLE)
	26-84480G01	SHIELD FLTR COIL (L21)
	26-84598A01	SHIELD COIL (L112) (L114) (L115) (L118) (L15)
	36-84598A02	SHIELD COIL (L18) (L20)
	28-83441F12	CONN. MALE 15 pin; wht
	29-10134A02	LUG TERM BRS SLDR
	76-84069B02	CORE FER BEAD

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

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
R29	5-124A47	820
R30	6-124A81	3.3k
R31	6-124A83	27k
R32	6-124A69	6.8k
R33	6-124A47	820
R34	6-234A61	3.3k
R35	6-124A10	24
R36	6-124A39	390
R37	6-124A13	33
R38	6-124A17	47
R39	6-124A85	33k
R40	6-124B06	220k
R41	6-124A88	47k
R42	6-124A73	10k
R43	6-124A59	2.7k
R44	6-124A83	27k
R45	6-124A81	22k
R47	6-124A93	68k
R48	6-124B10	330k
R49	6-124A33	220
R50	6-124B04	180k
R51	6-124B02	150k
R52	6-124A85	33k
R53	6-124A41	470
R54	6-124A57	2.2k
R61	6-124A22	75
R62	6-124A49	1k
R63	6-124B06	220k
R64	6-124A01	10
R65	6-124A89	47k
R66	6-124A83	3.9k
R67	6-185A63	3.9k; 1/8 W
R68	6-124A61	3.3k
R69	6-124A92	62k
R70	6-124A59	2.7k
R71	6-124A90	51k
R72	6-124A79	18k
R73	6-124A67	5.6k
R74	6-124A39	390
R75	6-124A90	51k
R76	6-124A25	100
R120	6-124A76	10k
R121	6-124A71	8.2k
R122	6-124A71	8.2k
R123	6-124A59	2.7k
R124	6-124A72	9.1k
R125	6-124A61	3.3k
R126	18-84944C01	var. 2k
R127	6-124A73	10k
R128	6-124A65	4.7k
R129	6-124A73	10k
R130	6-124A57	2.2k
R131	6-124A53	1.5k
R132	6-185A65	4.7k; 1/8 W
R133	6-124A53	1.5k
R134	6-185A33	100
R135	6-124A25	4.7k
R136	6-124A85	5.6k
R137	6-124A87	12k
R138	6-124A75	820
R139	6-124A47	39k
R140	6-124A87	10k
R147	6-124A73	5.6k
R148	6-124A67	27k
R149	6-124A83	56
R150	6-124A19	220
R152	8-124A33	150
R153	6-124A29	120
R154	6-124A27	220
R155	6-124A33	4.7
R156	6-124B61	47
R157	6-124A17	22 ±5%; 3 W
R159	17-83122D09	3.9k
R160	8-124A83	220
R181	8-124A33	27, 1/2 W
R182	6-125A11	60
R210	screened on	2.2k
R211	screened on	560
R212	screened on	2.3k
R213	screened on	3.3k
R214	screened on	2.2k
R220	screened on	3.3k
R221	screened on	40
R222	screened on	260
R223	screened on	2.2k
R224	screened on	2.2k
R230	screened on	750
R231	screened on	100
R232	screened on	8.2k
R233	screened on	8.2k
R234	screened on	200
R250	6-124A05	15
R251	6-124A51	1.2k

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
L21	24-84419D02	23-1/2 turns, blu
L22	24-82835G04	1.5 uH
L23	24V80807A52	wht
L24	24-82835G20	9.3 uH
L25	24-82835G24	12 uH
L27	24-82549D48	2.2 uH
L28		in element Y10
L29		in element Y11
L110	24-82835G04	1.5 uH
L112	24-84972A06	8-1/2 turns, org
L114	24-84972A05	8-1/2 turns, red
L115	24-84972A04	3-1/2 turns, blu
L116	24-82835G14	1.0 uH
L117	24-82135G08	620 nH
L118	24-84972A11	3-1/2 turns, blk
L119	24-83854G08	5-1/2 turns, org
L120	24-83857G09	5-1/2 turns, grn
L121	24-83961B01	3 turns, brn
L122	24-82723H25	2-3/4 turns, org
L123	24-84881C04	2-1/4 turns
L124	24-82723H01	1.2 uH
L125	24-82835G04	1.5 uH
L126		in element L110
L127		in element L111
L210	24-82723H04	290 nH
L213	24-84641G31	4-1/2 turns, blu/yel
L214	24-84641G32	4-1/2 turns, blu/org
L215	24-84641G31	4-1/2 turns, blu/yel
L216	24-82641G31	4-1/2 turns, blu/yel
L217	24-8481G32	4-1/2 turns, blu/org
L218	24-84641G32	4-1/2 turns, blu/org
L219	24-84641G32	4-1/2 turns, blu/org
L220	24-84641G31	4-1/2 turns, blu/yel
L221	24-84641G30	4-1/2 turns, blu/red
L222	24-84641G32	4-1/2 turns, blu/org
L223	24-84641G32	4-1/2 turns, blu/org
L224	24-8461G30	4-1/2 turns, blu/red
L225	24-84641G11	8-9/16 turns, pink
L226	24-84641G07	8-9/16 turns, blu
L227	24-84641G11	8-9/16 turns, pink
L228	24-82723H04	choke 290 nH
L230	24-82723H04	choke 290 nH
		transistor: (see note 1)
Q10	48-869932	NPN; type M9932
Q11	48-869662	NPN; type M9662
Q12	48-869932	NPN; type M9932
Q13	48-869932	NPN; type M9932
Q14	48-869642	NPN; type M9642
Q15	48-869642	NPN; type M9642
Q18	48-869642	NPN; type M9642
Q17	48-869594	NPN; type M9594
Q18	48-869571	PNP; type M9571
Q19	48-869642	NPN; type M9642
Q20	48-869642	NPN; type M9642
Q21	48-869932	NPN; type M9932
Q22	48-869643	PNP; type M9643
Q23	48-869643	NPN; type M9643
Q112	48-869643	PNP; type M9643
Q113	48-869642	PNP; type M9642
Q114	48-869649	PNP; type M9649
Q115	48-869648	NPN; type M9648
Q118	48-869643	PNP; type M9643
Q117	48-869643	PNP; type M9643
Q118	48-869932	NPN; type M9932
Q119	48-869932	NPN; type M9932
Q120	48-869638	NPN; type M9638
Q121	48-869657	NPN; type M9657
Q122	48-869887	NPN; type M9887
Q210	48-869870	NPN; type M9870
Q220	48-869870	NPN; type M9870
Q230	48-869757	NPN; type M9757
Q250	48-869643	PNP; type M9643
		resistor, fixed: ±5%; **1/4 W;** unless otherwise stated:
R10	6-124A89	47k
R11	6-124A89	47k
R12	6-124A65	4.7k
R13	6-124A65	4.7k
R14	6-124A63	3.9k
R15	6-124A75	12k
R16	6-124A41	470
R17	6-124A79	18k
R18	6-124A59	2.7k
R19	6-124A77	15k
R20	8-124A59	2.7k
R21	6-124A19	56
R22	6-124A21	68
R23	6-124A37	330
R24	6-185A69	6.8k 1/8 W
R25	6-124A07	18
R26	6-124A07	18
R27	8-123A69	6.8k
R28	6-124A83	27k

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
C122	21-82428B59	.01 uF
C123	21-84493B27	51 ±5%; NPO
C125	21-82428B59	.01 uF
C126	21-82428B59	.01 uF
C127	23-84538G05	10 uF ± 20%; 20 V
C128	23-84538G05	10 uF ± 20%; 20 V
C129	21-82428B59	.01 uF
C135	21-82428B59	.01 uF ± 10%; 100 V
C138	21-82187B20	.001 uF ± 10%; 100 V
C139	21-82450B10	4.3 ±5%; 500 V
C140	21-83406D50	51 ±5%; N080
C141	21-84494B08	170 ± 5%; 500 V
C143	21-82428B59	.01 uF
C144	21-82372C04	.05 uF; 25 V
C145	21-82372C04	.05 uF; 25 V
C146	21-84494B46	180 ± 3%; 500 V
C147	21-82610C05	57 ±5%; N150
C148	21-84538G04	15 uF ± 20%, 20 V
C149	21-83596E10	220 ± 20%; 500 V
C150	21-83596E10	220 ± 20%; 500 V
C151	21-83406D83	12 ±5%; N150
C152	21-82450B29	0.4 ±5%; 500 V
C153	21-82204B41	13 ±5%; NPO
C154	21-83406D63	6 ±0.25 pF; NPO
C155	21-84538G06	47 uF ± 20%; 20 V
C156	21-82204B06	100 N1500
C157	21-82372C04	.05 uF, 25 V
C158	21-83406D56	24 ±5%; NPO
C159	21-82204B31	8 ±0.25 pF; N330
C162	21-82810C14	30 ±5%; N150
C163	21-848525	16 ±5%; NPO
C165	21-82877B24	220 ±10%; N1400
C166	21-861428	6 ±0.5; N150
C167	21-82428B04	.01 uF + 70-30%; 100 V
C168	21-82372C03	0.1 uF; 25 V
C170	21-82372C04	.05 uF; 25 V
C172	21-82187B10	270 pF ± 10%; 500 V
C210	21-84873H57	27 ±5%; NPO
C211	21-84547A11	.01 uF ± 20%; 50 V
C212	21-84873H58	51 ±5%; NPO
C213	21-84873H58	51 ±5%; NPO
C214	21-84873H57	27 ±5%; NPO
C215	21-84760C01	470 ± 20%; 250 V
C216	21-82785H56	5 ±0.5 pF; 850 V
C220	21-84547A11	.01 ± 20%; 50 V
C221	21-84873H56	8.2 ±0.5 pF; NPO
C222	21-84873H60	2.7 ±0.25 pF; NPO
C223	21-84873H58	51 ±5%; NPO
C224	21-84873H58	51 ±5%; NPO
C225	21-84547A11	.01 uF ± 20%; 50 V
C226	21-84547A11	.01 uF ± 20%; 50 V
C227	21-84873H60	2.7 ±0.25 pF; NPO
C228	21-84873H57	27 ±5%; NPO
C231	21-84547A11	.01 uF ± 20%; 50 V
C232	21-84873H60	2.7 ±0.25 pF; NPO
C233	21-84760C01	470 ± 20%; 250 V
C234	21-84873H57	27 ±5%; NPO
C235	21-84547A11	.01 uF ± 20%; 50 V
C236	21-84760C01	470 ± 20%; 250 V
C250	23-84665F06	220 uF + 150-10%; 25 V
C251	21-83596E10	220 ± 20%; 500 V
C252	23-84665F03	100 uF + 100-10%; 25 V
C253	21-83596E10	220 ± 20%; 500 V
		diode: (see note 1)
CR10-CR18	48-83654H01	silicon
CR114	48-83654H01	silicon
CR115	48-82139G01	silicon
CR120	48-83654H01	silicon
CR230	48-82139G01	germanium
CR251	48-83654H01	silicon
CR252	48-83654H01	silicon
CR253	48-83654H01	silicon
CR254	48-83654H01	silicon
J200	1-80794B83	Power Plug
J601		**connector, receptacle:** consists of: 15-83292K01 HOUSING, receptacle, 15 contact; 29-84706E08 PINS, connector, 11 used
		coil, rf
L10	24-82835G04	1.5 uH
L12	24-82723H05	410 nH
L14	24-82723H01	1.2 uH
L15	24-84972A01	2-1/2 turns, yel
L16	24-83884G03	2-1/2 turns, brn
L17	24-83884G06	2-1/2 turns, wht
L18	24-84419D02	23-1/2 turns, blu
L20	24-84419D02	12-1/2 turns, blu

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
Radio Set Model Breakdown		
TUF1041AH Unified Chassis		
TLF1131A Power Amplifier (See separate parts list)		
TLF6331A Main Board Kit		
TRN8626A Main Board Hardware Kit		
TLF1122A RF Deck		
TLF6233A RF Deck Kit		
TRN8088A RF Deck Hardware Kit		
TLF6243A Injection Doubler		
TLF6253A RF Amplifier		
TLF6263A Mixer		
TUF1041AH Unified Chassis		PL-6268-O

Unified Chassis components are numbered as follows:

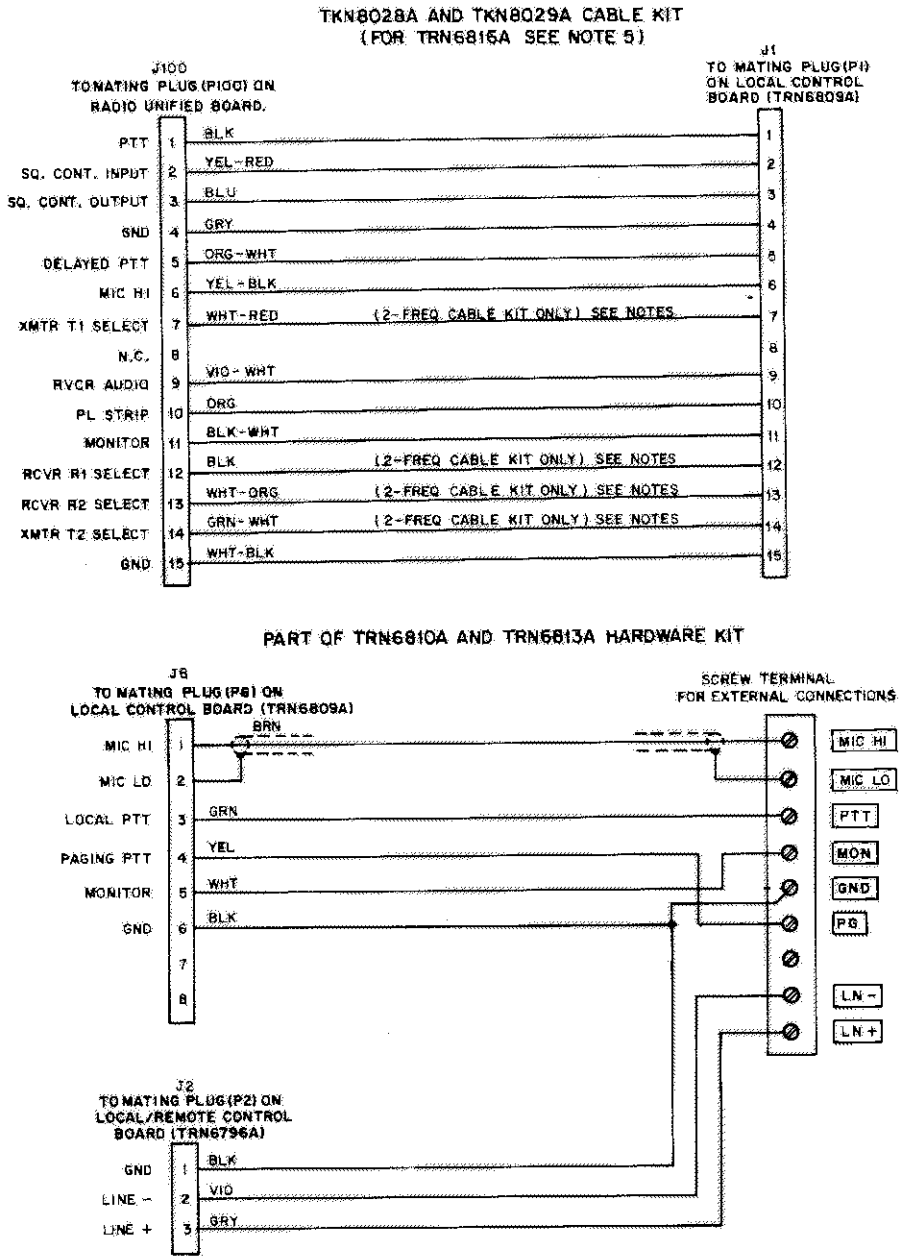
COMPONENT NUMBER	CIRCUIT
1-99	Receiver
100-199	Exciter
200-249	RF Deck
250-299	DC Distribution and Regulator
600-699	Power Amplifier*

*Power Amplifier parts are listed separately; see Power Amplifier section

		capacitor, fixed: pF-20, + 80%; 200 V, unless other wise stated:
C10	21-82428B59	.01 uF
C11	21-83596E10	220 ± 20%; 500 V
C12	21-84493B27	51 5%; NPO
C13	21-82187B44	.001 uF ± 10%
C14	21-82187B44	.001 uF ± 10%
C15	21-82187B44	.001 uF ± 10%
C16	21-82372C04	.05 uF; 25 V
C17	21-82428B59	.01 uF
C18	21-83406D67	22 ±5%; NPO
C19	21-82610C02	43 ±5%; NPO
C20	21-83996E10	220 ± 20%; 500 V
C21	21-82610C47	57 ±5%; N220
C22	21-84493B24	40 ±5%; N150
C23	21-863205	4.25 ±0.25; NPO
C24	21-859696	20 ±0.25 pF; N470
C25	21-84493B35	19 ±5%; NPO
C26	21-82187B44	.001 uF ± 10%; 100 V
C27	21-82187B44	.001 uF ± 10%; 100 V
C28	21-84426B10	75 ±5%; 500 V
C29	21-859939	110 ±5%; 500 V
C32	21-84493B35	19 ±5%; NPO
C33	21-82537B52	250 ±1%; 100 V
C34	21-84493B14	68 ±5%; NPO
C35	21-82372C04	.05 uF; 25 V
C36	21-82187B20	.001 uF ± 10%; 100 V
C37	21-82372C01	0.1 uF; 25 V
C38	23-84665F04	1 uF + 150-10%; 50 V
C39	21-82372C04	.05 uF; 25 V
C40	21-82187B07	470 ± 10%; 500 V
C41	21-84493B30	62 ±5%; NPO
C42	21-82372C04	.05 uF; 25 V
C43	23-84538G04	15 uF ± 20%; 20 V
C44	23-84665F01	10 uF + 100-10%; 25 V
C45	21-865941	90 ±2%; 300 V
C46	21-82450B08	1.2 ±5%; 500 V
C47	21-82428B26	.02 uF
C48	21-82428B59	.01 uF
C50	21-82428B59	.01 uF
C51	21-82372C04	.05 uF; 25 V
C52	21-82372C04	.05 uF; 25 V
C53	23-84538G06	47 uF ± 20%; 20 V
C54	21-82372C03	0.1 uF; 25 V
C55	8-83813H37	.0068 ± 5%; 100 V
C56	21-82428B59	.01 uF
C57	8-82905G08	.033 uF ± 10%; 50 V
C60	21-82187B18	.0015 uF ± 10%; 100 V
C62	21-82372C01	0.1 uF; 25 V
C71	21-82204B26	2.2 ±0.1 pF; NPO
C72	21-82204B26	2.2 ±0.1 pF; NPO
C73	21-84493B30	62 ±5%; NPO
C75	21-82610C03	47 ±5%; N220
C76	21-865452	680 ± 10%
C77	8-84496D07	.022 uF ± 10%; 100 V
C78	23-84538G08	2.2 uF ± 20%; 20 V
C79	23-84538G04	15 uF ± 20%; 20 V
C80 thru 85	21-8277B46	18 pF ± 10%; N150
C86	21-82213E12	.01 uF ± 20%; 100 V
C87	23-84538G01	1 uF ± 20%; 35 V
C88	21-82428B59	.01 uF
C89	21-82428B59	.01 uF
C110	21-83596E10	220 ± 20%; 500 V
C111	21-83596E10	220 ± 20%; 500 V
C112	8-82905G08	.033 uF ± 10%; 50 V
C113	8-82905G08	.033 uF ± 10%; 50 V
C114	21-83596E10	220 ± 20%; 500 V
C115	8-82905G10	.015 uF ± 10%; 50 V
C116	21-82428B47	.002 uF ± 5%; 200 V
C117	8-83813H28	.01 uF ± 5%; 100 V
C118	8-82905G40	.03 uF ± 10%; 50 V
C119	21-82428B45	820
C120	23-84538G05	10 uF ± 20%; 20 V
C121	21-82428B59	.01 uF

FLEXAR INTERCABLING DIAGRAM

INCLUDING SERVICE KIT TRN6816A



NOTES:

1. FOR TWO-FREQUENCY STATIONS WITH TWO TRANSMITTER CHANNEL ELEMENTS AND ONE RECEIVER CHANNEL ELEMENT USE TKN8028A CABLE KIT WITH THE FOLLOWING CHANGES.

JU1	IN – LOCATED ON UNIFIED CIRCUIT BOARD
JU101	OUT – LOCATED ON UNIFIED CIRCUIT BOARD
J1–PIN 13	CUT WHT–ORG WIRE AT J100–13 & TIE TO CABLE

2. FOR TWO-FREQUENCY STATIONS WITH TWO RECEIVER CHANNEL ELEMENTS AND ONE TRANSMITTER CHANNEL ELEMENT USE TKN8028A CABLE KIT WITH THE FOLLOWING CHANGES.

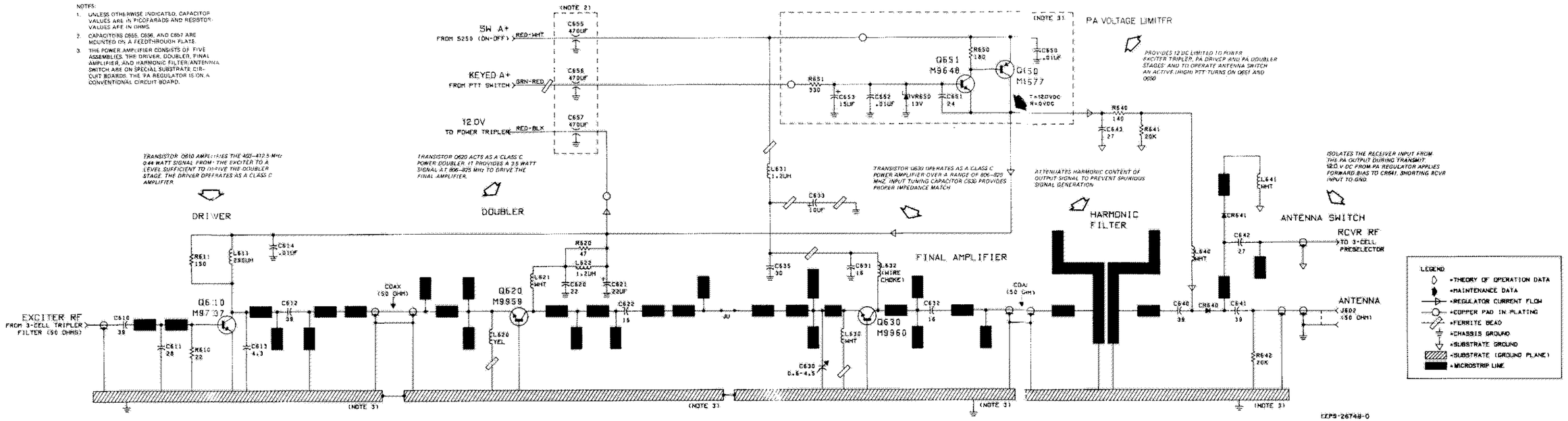
JU1	OUT – LOCATED ON UNIFIED CIRCUIT BOARD
JU101	IN – LOCATED ON UNIFIED CIRCUIT BOARD
J1–PIN 14	CUT GRN–WHT WIRE AT J100–14 & TIE TO CABLE

3. ALL WIRES ARE INCLUDED IN TKN8028A 2-FREQ. CABLE KITS. SEE JUMPER TABLE ON UNIFIED CIRCUIT BOARD DETAIL FOR STANDARD JUMPER CONFIGURATION.
4. IN TKN8029A ONE-FREQUENCY CABLE KITS WIRE FROM J1 PINS 7, 12, 13, AND 14 TO J100 ARE OMITTED. SEE JUMPER TABLE ON UNIFIED CIRCUIT BOARD DETAIL FOR STANDARD JUMPER CONFIGURATION.
5. THE TRN6816A SERVICE KIT CONSISTS OF A LONGER RADIO INTERCONNECT CABLE (1-1/2 FEET) AND POWER CABLE (2 FEET) AS WELL AS AN EXTENDER CARD FOR THE AUTO LEVEL OPTION AND THE 3 WATT AUDIO BOARD. WHEN USING THE TRN6816A SERVICE KIT, MODIFY THE RADIO INTERCONNECT CABLE PER NOTES 1 THROUGH 4.

CEPS-27479-O

Motorola No. CEPS-27479-O
10/20/78-UP

10-WATT RF POWER AMPLIFIER



68P81040E77-O
(Sheet 1 of 2)
10/20/78-UP

10-WATT RF POWER AMPLIFIER

PARTS LIST

Power Amplifier Model Breakdown:	Reference Series
TLF1131A Power Amplifier	-
TRN8084A PA Hardware Kit	-
TRN8085A Regulator Board	650-659
TLF6271A Driver*	610-619
TLF6281A Doubler*	620-629
TLF6291A Final Amplifier*	630-639
TLF6301A Harmonic Filter and Antenna Switch	640-649

* It is recommended that these not be ordered as kits. Refer to notes I, II, and III below for instructions on ordering.

TLF1131A Power Amplifier PL-6291-O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		CAPACITOR, fixed: pF ±5%; NP0; unless otherwise stated
C610	21-84873H63	39
C611	21-84873H62	28
C612	21-84873H63	39
C613	21-84873H64	4.3; 0.25
C614	21-84547A11	.01 uF ±20%; 50 V
C620	21-84873H18	22
C621	23-82397D16	22 uF ±20%; 15 V
C622	21-84736E08	16
C630	19-82127J03	var. 0.6 to 4.5 (NOTE II)
C631	21-84736E08	16
C632	21-84736E08	16
C633	23-868502	10 uF ±25 V
C635	21-82610C14	30; N150
C640	21-84736E12	39
C641	21-84736E12	39
C642	21-84873H57	27
C643	21-84873H57	27
C650	21-82213E12	.01 ±20%; 100 V
C651	21-82877B01	24 ±10%; N150
C652	21-82213E12	.01 uF ±20%; 100 V
C653	23-82783B24	15 uF ±10%; 25 V
C655	21-821474	470 ±20%; 250 V
C656	21-84874K01	470 ±20%; 250 V
C657	21-84874K01	470 ±20%; 250 V
		DIODE:
CR640	48-83510F04	Pin Diode
CR641	48-83510F04	Pin Diode
		COIL, RF:
L611	24-82723H04	290 nH choke
L620	24-83884G04	molded choke, yel.
L621	24-83884G06	molded choke, wht.
L622	24-82190C15	choke, 1.2 uH
L630	24-83884G06	molded choke, wht.
L631	24-82190C15	choke, 1/2 uH
L632	30-84985L01	wire choke (NOTE II)
L640	24-83884G05	molded choke, wht.
L641	24-83884G05	molded choke, wht.
		TRANSISTOR:
Q610	48-869737	NPN; type M9737
Q620	48-869959	NPN; type M9959 (NOTE I)
Q630	48-869960	NPN; type M9960 (NOTE II)
Q650	48-869677	PNP; type M9677
Q651	48-869648	NPN; type M9648
		RESISTOR, fixed: ±5%; 1/4 W; unless otherwise stated
R610	6-124A09	22
R611	6-124A29	150
R620	6-124A17	47
R640	Screened On	140
R641	Screened On	20k
R642	Screened On	20k
R650	6-124A31	180
R651	6-124A37	330
		VOLTAGE REGULATOR:
VR650	48-82256C50	Zener, 13 V

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		NON-REFERENCED ITEMS
	1-80798B78	Driver Hybrid Circuit
	1-80798B79	Doubler Hybrid Circuit
	1-80798B82	Final Amplifier Hybrid Circuit
	26-83529L01	Driver Heat Sink
	42-83530L01	Driver Carrier (Plastic)
	30-84116G01	Driver Wire Jumper
	76-83960B01	Ferrite Core (small)
	76-83969B01	Ferrite Core (large)
	42-83352L01	Doubler Carrier (Plastic)
	42-84417K01	Final Amp Carrier (Plastic)
	9-82442E06	Antenna Connector
	15-84630L01	Antenna Connector Hood
	14-84603L01	Regulator Board Insulator
	3-135084	Screw, 4-40 x 5/16; for Transistors Q620 & Q630
	3-136774	Screw, 4-40 x 1/4; for Transistor Q650
	76-84069B02	Core Ferrite Bead

NOTES:

I. It is recommended that this part be ordered as part of 1V80798B79 because of critical part placement.

II. It is recommended that these parts be ordered as part of 1V80798B82 because of critical part placement.

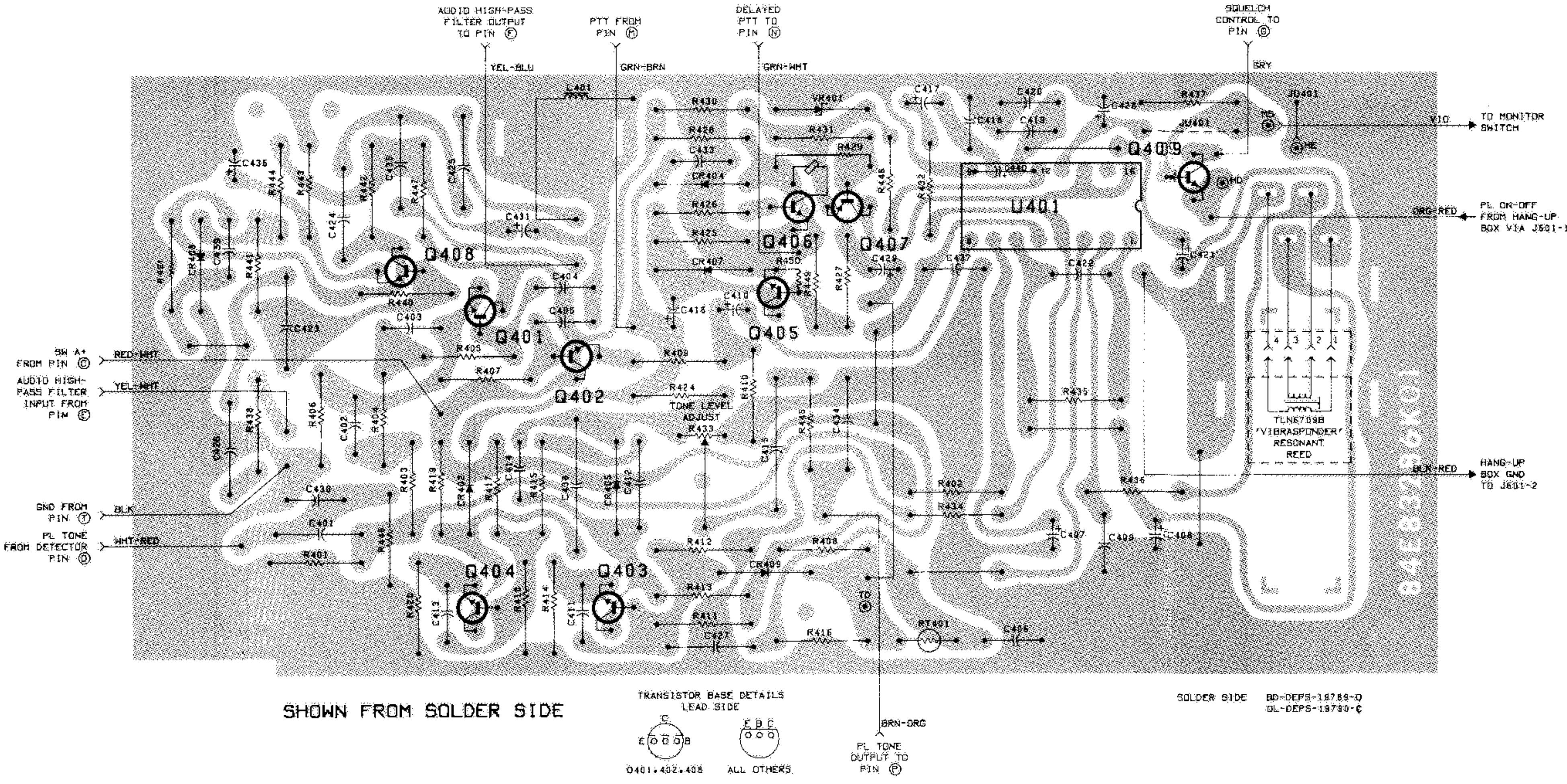
III. All other parts should be ordered individually.

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION

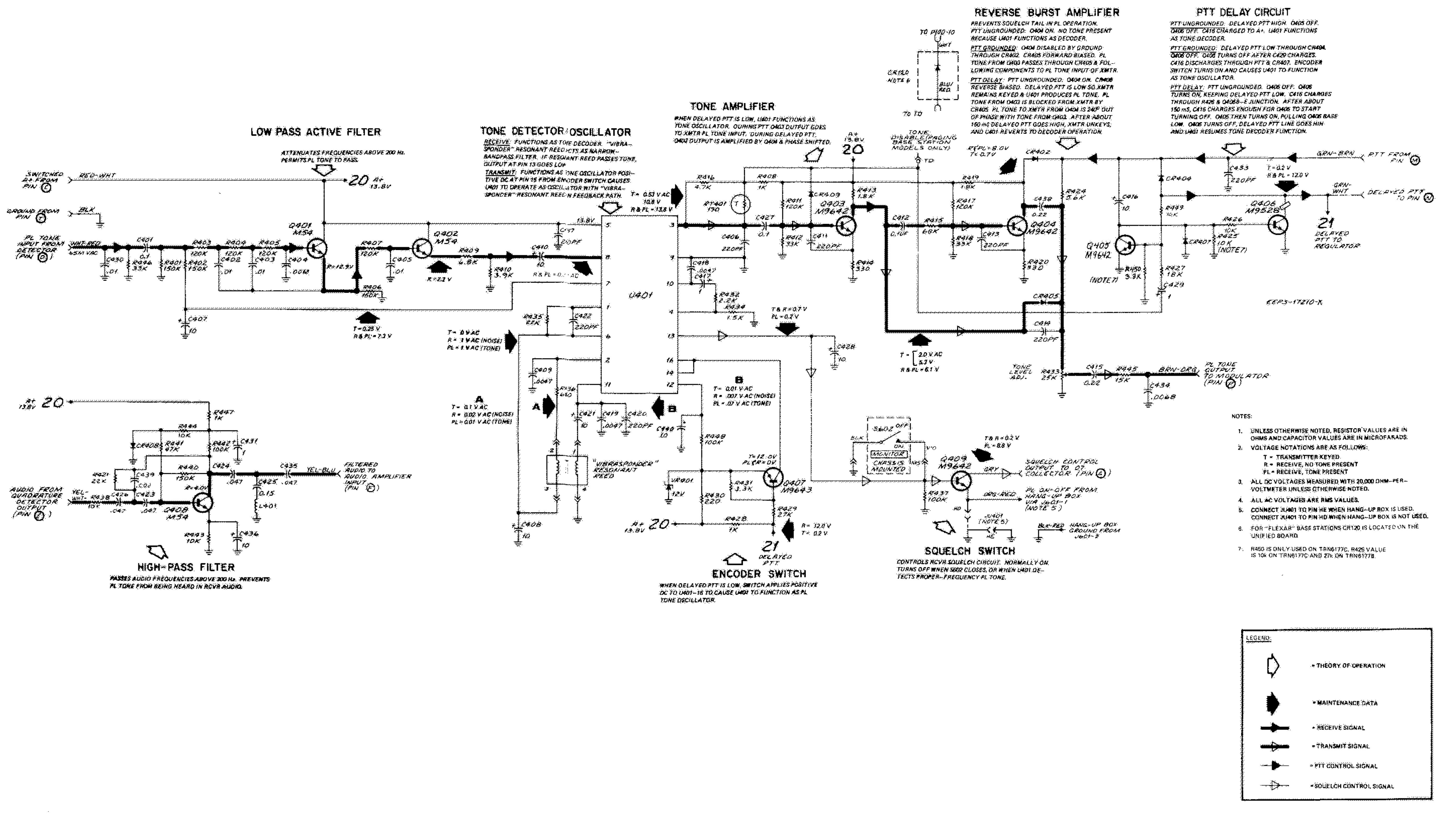
PARTS LIST

TRN6177B/C "Private-Line" Encoder/Decoder PL-3340-J

		CAPACITOR, fixed: uF ±10%; 100 V; unless otherwise stated
C401, 412, 427	21-82372C01	0.1 +80-20%; 25 V
C402, 403, 405 430	21-82428B59	.01 +80-20%; 200 V
C404	21-82428B23	.0012
C406, 411, 413 414, 420, 422, 433, 437	21-83596E10	220 pF ±20%; 500 V
C407, 408, 410 416, 421, 428, 436	23-84665F01	10 +100-0%; 25 V
C409, 418, 419	21-82428B09	.0047
C415	8-82096J20	0.22; 250 V
C417, 429, 431	23-84665F04	1 +150-0%; 50 V
C423, 424, 426 435	8-84496D04	.047 ±20%; 100 V
C425	8-82905G31	0.15; 50 V
C434	8-83813H01	.0068
C438	8-82096J20	0.22; 250 V
C439	21-82428B28	.002
C440	23-84665F04	1.0 +150-0%; 50 V
		DIODE: (SEE NOTE)
CR401		NOT USED
CR402, 405, 407, 408, 409	48-83654H01	silicon
CR404	48-82178A06	germanium
		COIL:
L401	25-82498H02	6 H
		TRANSISTOR: (SEE NOTE)
Q401, 402, 408	48-134667	NPN; type M54
Q403 thru 405 409	48-869642	NPN; type M9642
Q406	48-869528	NPN; type M9528
Q407	48-869643	PNP; type M9643
		RESISTOR, fixed: ±10%; 1/4 W; unless otherwise stated
R401, 402, 406 440	6-124D02	150k
R403, 404, 405 407, 411, 417	6-124A99	120k ±5%
R408, 428, 447	6-124C49	1k
R409	6-124C69	6.8k
R410	6-124C63	3.9k
R412, 418, 446	6-124C85	33k
R413, 419	6-124C55	1.8k
R414, 420	6-124C37	330
R415	6-124C93	68k
R416	6-124C65	4.7k
R421, 435	6-124C87	22k
R424	6-124C67	5.6k
R425	6-124A73 6-124C832	10k ±5% (TRN6177C) 27k (TRN6177B)
R426, 438, 443 444	6-124C73	10k
R427	6-124C79	18k
R429	6-124C83	27k
R430	6-124C33	220
R431	6-124C61	3.3k
R432	6-124C57	2.2k
R433	18-84944C02	variable; 25k
R434	6-124C53	1.5k
R436	6-124C45	680
R437, 442, 448	6-124C97	100k
R441	6-124C89	47k
R445	6-124C77	15k
R449	6-124C73	10k
R450	6-124A61	3.3k ±5% (TRN6177C only)
		THERMISTOR:
RT401	6-82990E18	190 ohms
		INTEGRATED CIRCUIT: (SEE NOTE)
U401	51-84267A04	type 67A04
		DIODE: (SEE NOTE)
VR401	48-82256C25	Zener type; 12 V
NON-REFERENCED ITEMS		
	KLN6209A	"VIBRASPONDER", resonant reed
	42-84116B02	SOCKET, "Vibrasponder"
	39-10184A10	CONTACT, push-pin; male
	39-10184A24	CONTACT, push-pin; female; 9 req'd.
	29-84706E06	PIN, female; molex



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



TONE "PRIVATE-LINE" ENCODER/DECODER

MODEL TRN6177C

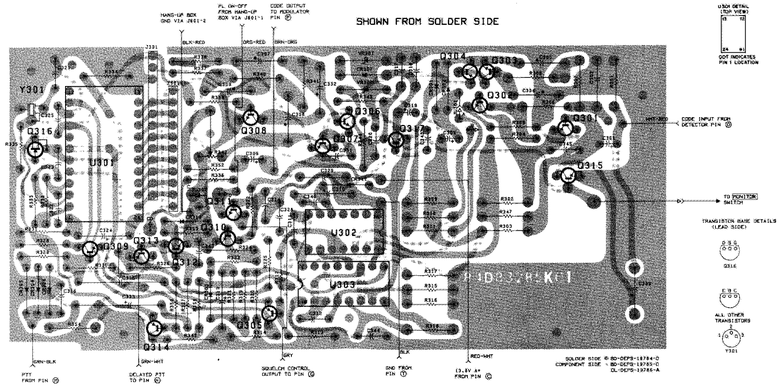
FUNCTION

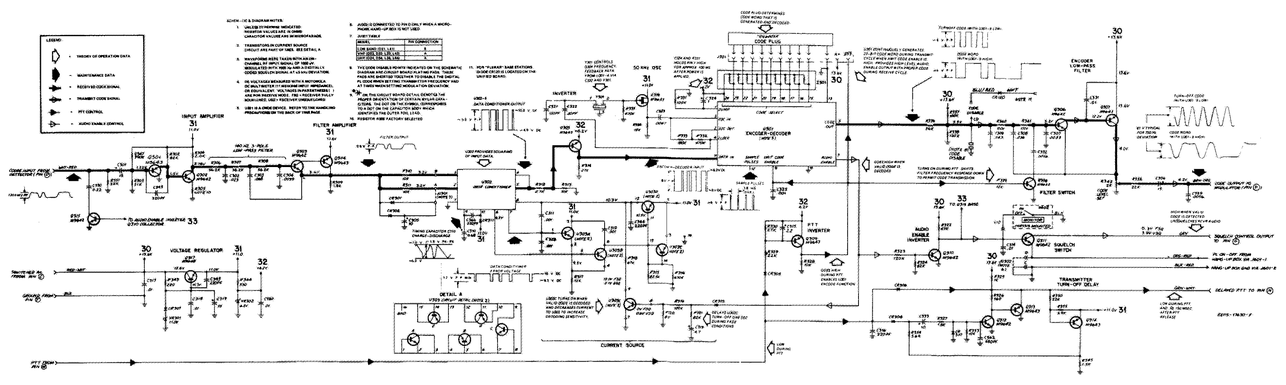
Encodes and decodes sub-audible "Private-Line" tones. Encoder modulates transmitter and delays transmitter turn-off 150 mS to allow transmission of turn-off reverse tone burst. Decoder detects received tone and unsquelches receiver when proper tone is received.

TONE "PRIVATE-LINE" ENCODER & DECODER

"DIGITAL PRIVATE-LINE" ENCODER/DECODER

MODEL TRN6207A





FUNCTION

Encodes and decodes "Digital Private-Line" codes. Encoder modulates transmitter and delays transmitter turn-off 150 mS to allow transmission of turn-off code. Decoder detects received tone and unsquelches receiver when proper code is received.

PARTS LIST AND MAINTENANCE INFORMATION IS SHOWN ON THE BACK OF THIS DIAGRAM

68P81030E07-F
(Sheet 1 of 2)
10/25/78-UP

"DIGITAL PRIVATE-LINE" ENCODER/DECODER

PARTS LIST

TRN6207A "Digital Private-Line" Encoder-Decoder PL-3560-G

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		CAPACITOR, fixed: uF ±5%; 50 V; unless otherwise stated
C301, 306, 319	23-84665F02	15 +100-0%; 35 V
C302	8-82905G39	.023
C303	8-83813H23	.068
C304	8-83813H19	.0039
C305	23-84665F01	10 +100-0%; 35V
C307	8-83813H27	.0033
C308	8-83813H24	.036
C309	8-83813H14	.043
C310	23-82783B48	0.68; 35 V
C311, 312, 328	21-82187B20	.001 ±10%; 100 V
C313	23-84762H07	4.7 ±20%; 10 V
C314, 317, 318, 320, 331	21-82428B59	.01 +80-20%; 200 V
C315	23-82783B16	2.2 ±10%; 25 V
C316, 344, 345	21-83596E10	220 pF ±10%; 500 V
C321	21-83798B01	100 pF; 200 V
C322	21-840849	20 pF; 500 V
C323	21-82428B09	.0047 ±10%; 100 V
C324	23-82783B08	1 ±20%; 35 V
C325	21-82187B20	.001 ±10%; 100 V
C329, 332	8-83813H26	.0056
C330	8-82905G32	0.22 ±10%; 50 V
C333	23D82783B27	10 uF
C342	21-83596E17	680 pF ±10%; 500 V
C343, 346	21D82877B24	220 pF
		DIODE: (SEE NOTE)
CR301, 302	48-84616A01	hot carrier
CR303, 304, 305, 307, 310, 311	48-83654H01	silicon
CR306	48C82178A06	germanium
		SOCKET:
J301	9-82071K01	female; 12 contact
		TRANSISTOR: (SEE NOTE)
Q301, 304, 305, 307, 309, 313, 314	48-869643	PNP; type M9643
Q302, 303, 306, 308, 310, 311, 312, 315	48-869642	NPN; type M9642
Q316	48-869653	field-effect; type M9653
Q317	48-869648	NPN; type M9648
		RESISTOR, fixed: ±5%; 1/4 W; unless otherwise stated
R302	6-124A95	82k
R303, 336	6-124A90	51k
R304, 327	6-124A56	2.0k
R305		(factory selected)
R306, 307, 308	6-13755D64	56.2k ±1%
R309	6-124A55	1.8k
R310, 311,	6-124A73	10k
R312	6-124C59	2.7k ±10%
R313, 328, 353	6-124C73	10k ±10%
R314	6-124C83	27k ±10%
R316, 332, 335	6-124B14	470k
R317, 339	6-124A75	12k
R318	6-124A89	47k
R319, 323, 338	6-124A99	120k
R320, 321, 324	6-124C95	82k ±10%
R322	6-124C89	47k ±10%
R325	6-124C49	1k ±10%
R326	6-124C43	560 ±10%
R329	6-124A81	22k
R330	6-124A83	27k
R331	6-124C97	100k ±10%
R333	6-124B04	180k
R334	6-124A77	15k
R336	6-124A91	56k
R337, 340, 341	6-124A97	100k
R342	18-84944C01	var; 2k
R343	6-124C33	220 ±10%
R344	6-124C37	330 ±10%
R345	6-124A53	1.5k
R347	6-124B12	390k
R350, 351, 352	6-124C81	22k ±10%
R354	6-124A67	5.6k
R355	6-124A63	3.9k
R315	6S13755D80	82.5k
		INTEGRATED CIRCUIT: (SEE NOTE)
U301	51-84267A82	type M6782
U302	51-84320A55	type NE565
U303	51-84320A79	type CA3096AE
Z301	51-82142K02	NETWORK: resistive
Y301	48-82003K01	CRYSTAL: (SEE NOTE II) resonator: 50.00000 kHz
VR301	48-82256C34	VOLTAGE REGULATOR: Zener type: 11.0 V
VR302	48-83696E07	Zener type: 6.2 V

NOTES:

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

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

HANDLING PRECAUTIONS FOR CMOS INTEGRATED CIRCUITS

Many of the integrated circuit devices used in communications equipment are of the CMOS (Complementary Metal Oxide Semiconductor) type. Because of their high open circuit impedance, CMOS ICs are vulnerable to damage from static charges. Care must be taken in handling, shipping, and servicing them and the assemblies in which they are used.

Even though protection devices are provided in CMOS IC inputs, the protection is effective only against overvoltage in the hundreds of volts range such as are encountered in an operating system. In a system, circuit elements distribute static charges and load the CMOS circuits, decreasing the chance of damage. However, CMOS circuits can be damaged by improper handling of the modules even in a system.

To avoid damage to circuits, observe the following handling, shipping, and servicing precautions:

(1) Prior to and while servicing a circuit module, particularly after moving within the service area, momentarily touch both hands to a bare metal earth grounded surface. This will discharge any static charge which may have accumulated on the person doing the servicing.

(2) Whenever possible avoid touching any electrically conductive parts of the circuit module with your hands.

(3) Normally, circuit modules can be inserted or removed with power applied to the unit. However, check the INSTALLATION and MAINTENANCE sections of the manual as well as the module schematic diagram to insure there are no objections to this practice.

(4) When servicing a circuit module, avoid carpeted areas, dry environments, and certain types of clothing (silk, nylon, etc.) because they contribute to static buildup.

(5) All electrically powered test equipment should be grounded. Apply the ground lead from the test equipment to the circuit module before connecting the test probe. Similarly, disconnect the test probe prior to removing the ground lead.

(6) If a circuit module is removed from the system, it is desirable to lay it on a conductive surface (such as a sheet of aluminum foil) which is connected to ground through a resistance of approximately 100k.

WARNING

If the aluminum foil is connected directly to ground, be cautious of possible electrical shock from contacting the foil at the same time as other electrical circuits.

(7) When soldering, be sure the soldering iron is grounded.

(8) Prior to connecting jumpers, replacing circuit components, or touching CMOS pins (if this becomes necessary in the replacement of an integrated circuit device), be sure to discharge any static buildup as described in procedure 1. Since voltage differences can exist across the human body, it is recommended that only one hand be used if it is necessary to touch pins on the CMOS device and associated board wiring.

(9) When replacing a CMOS integrated circuit device, leave the device in its metal rail container or conductive foam until it is to be inserted into the printed circuit module.

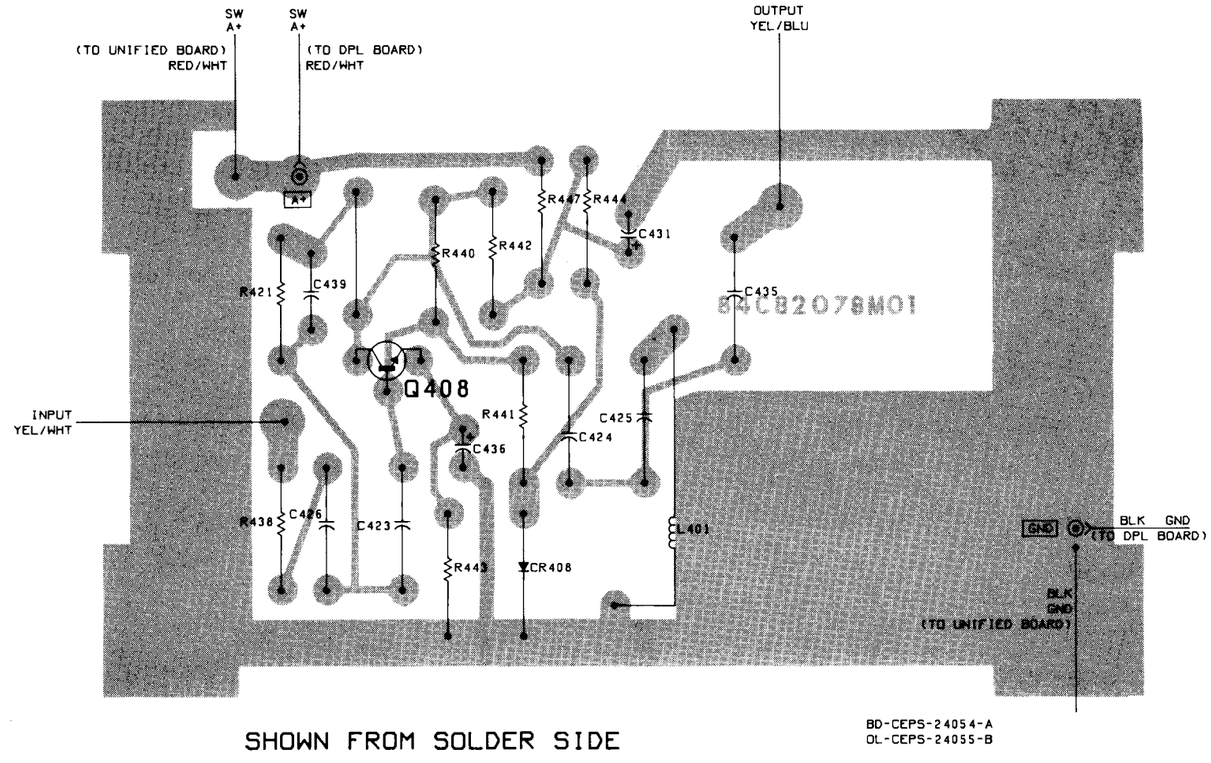
(10) All low impedance test equipment (such as pulse generators, etc.) should be connected to CMOS device inputs after power is applied to the CMOS circuitry. Similarly, such low impedance equipment should be disconnected before power is turned off.

(11) Replacement modules shipped separately from the factory will be packaged in a conductive material. Any modules being transported from one area to another should be wrapped in a similar material (aluminum foil may be used). NEVER USE NONCONDUCTIVE MATERIAL for packaging these modules.

EPS-18293-O

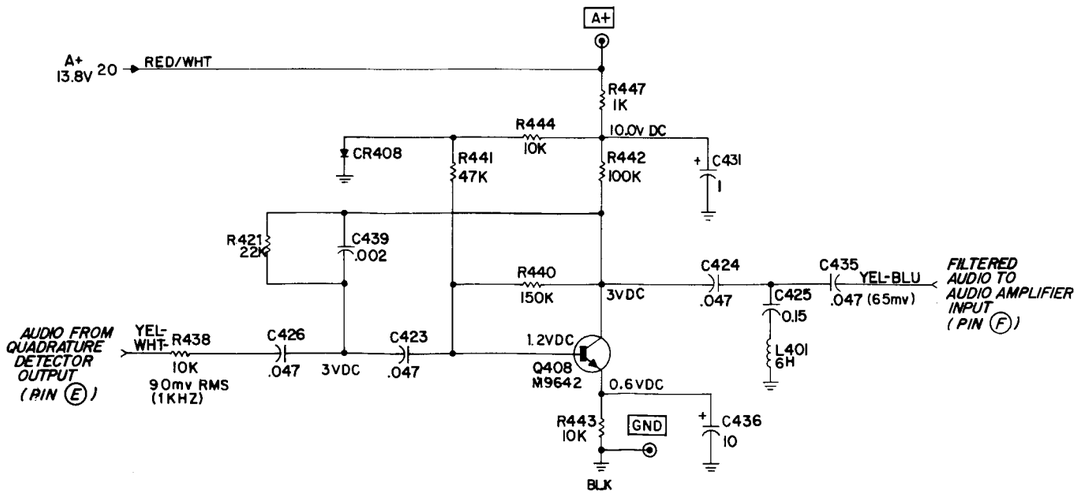
"DIGITAL PRIVATE-LINE" HIGH PASS FILTER

MODEL TRN8472A



SHOWN FROM SOLDER SIDE

BD-CEPS-24054-A
DL-CEPS-24055-B



HIGH-PASS FILTER

PASSES AUDIO FREQUENCIES ABOVE 300 Hz. PREVENTS PL/DPL TONE FROM BEING HEARD IN RCVR AUDIO

CEPS-24056-A

FUNCTION

Passes audio frequencies above 300 Hz. Attenuates coded squelch tones to prevent them from being heard in the receive audio.

PARTS LIST

TRN8472A High Pass Filter — PL-5761-A

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		CAPACITORS, fixed: uF:
C423, 424	8-84496D04	.047
C425	8-82905G31	0.15
C426	8-84496D04	.047
C431	23-84665F04	1
C435	8-84496D04	.047
C436	23-84665F01	10
C439	21-82428B28	.002
		DIODE: (SEE NOTE)
CR408	48-83654H01	silicon
		COIL:
L401	25-82498H02	6 H
		TRANSISTOR: (SEE NOTE)
Q408	48-869642	type M9642 NPN
		RESISTORS, fixed: 1/4 W ±5%:
R421	6-124A81	22k
R438	6-124A73	10k
R440	6-124B02	150k
R441	6-124A89	47k
R442	6-124A97	100k
R443, 444	6-124A73	10k
R447	6-124A49	1k

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

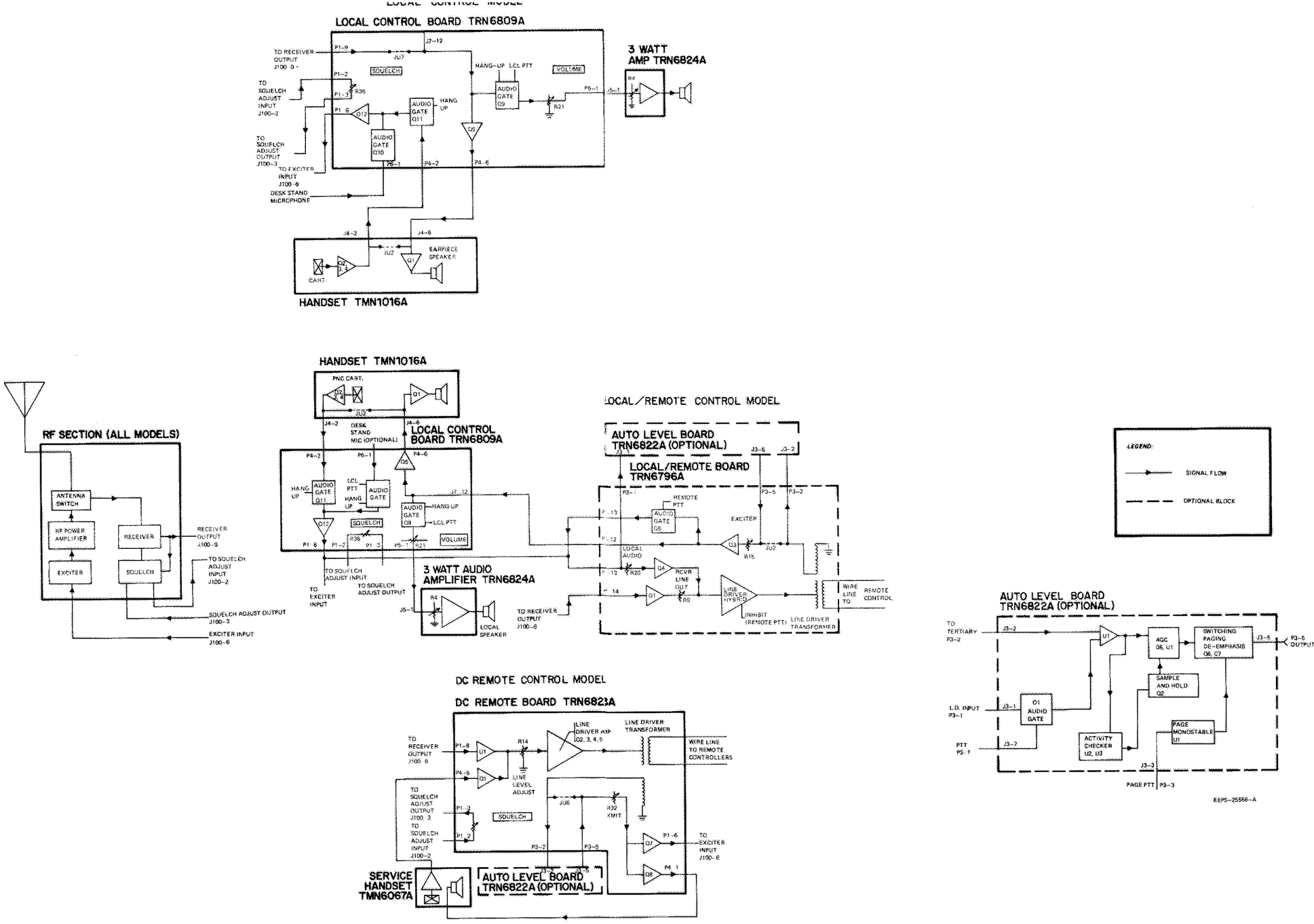
68P81038E31-A
7/6/78-UP

FLEXAR CONTROL

FUNCTION

FLEXAR radios can employ local (front panel) and/or remote control. Control capabilities are determined by the radio model and optional features. Refer to the model and options charts for information on the control features of a particular model.

A functional block diagram is provided to show how local, local/remote or dc remote control operate with or without the automatic line level adjust option.



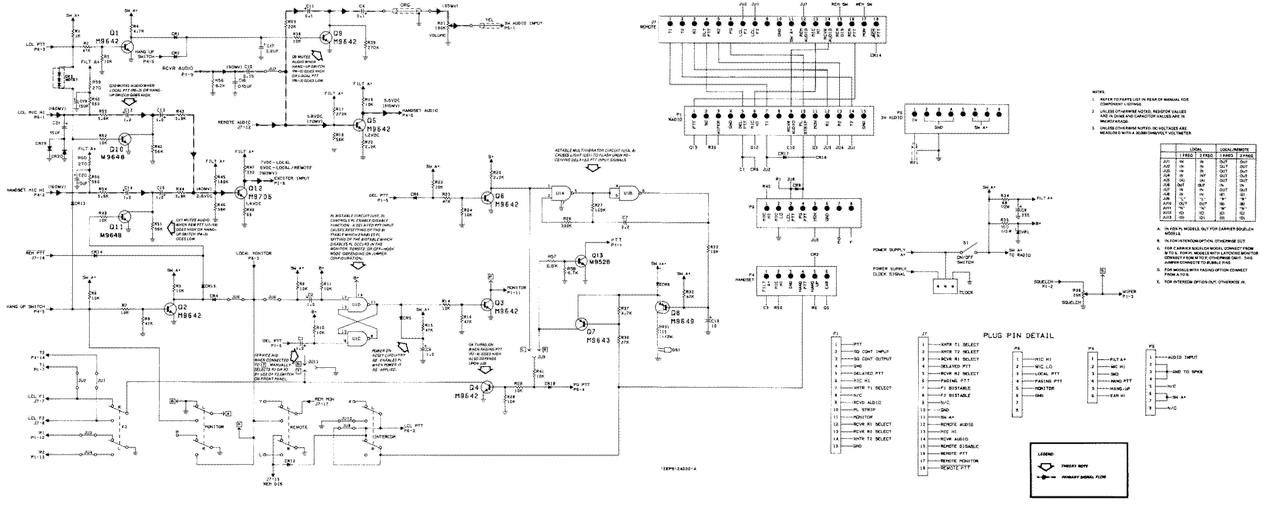
68P81037E59-A
1/6/78-UP

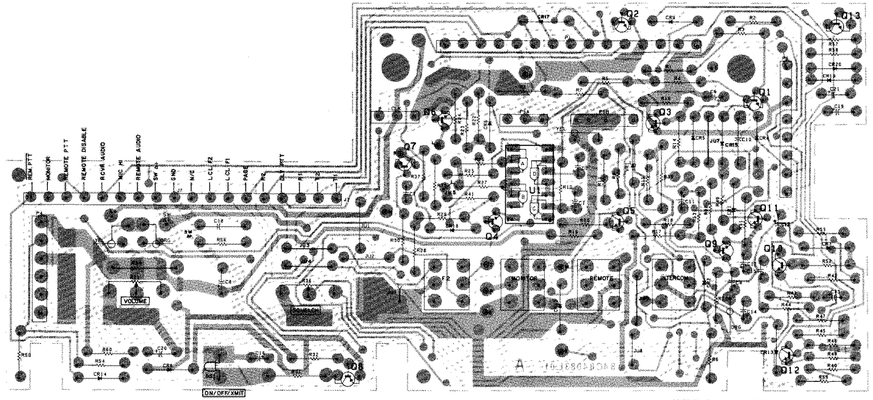
LOCAL CONTROL BOARD

MODEL TRN6809A

FUNCTION

Provides local control operation of the radio.





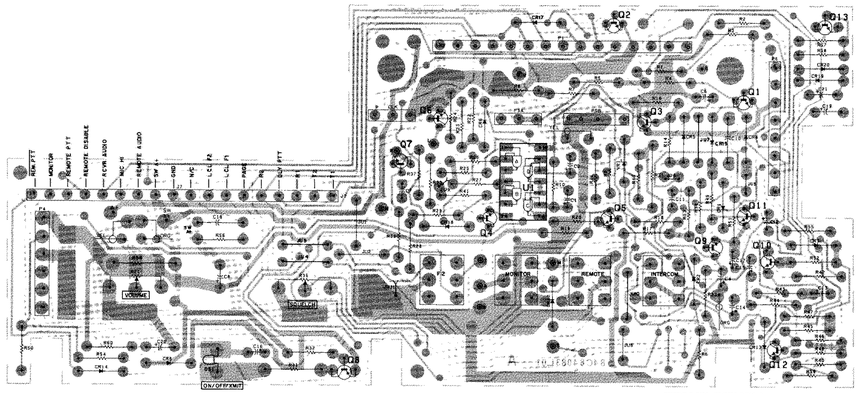
SHOWN FROM COMPONENT SIDE

LOCAL CONTROL BOARD

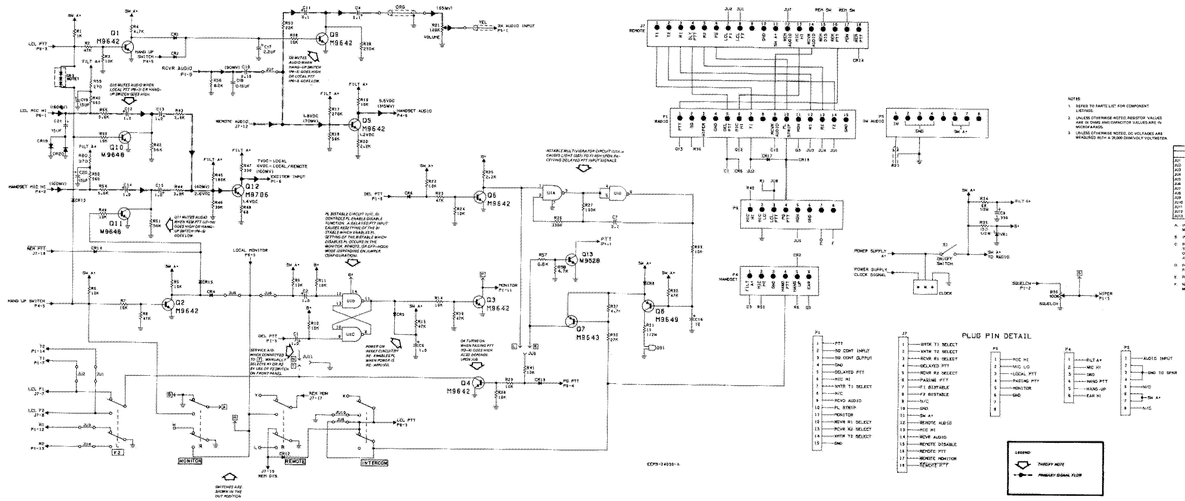
MODEL TRN6809A

FUNCTION

Provides local control operation of the radio.



SHOWN FROM COMPONENT SIDE



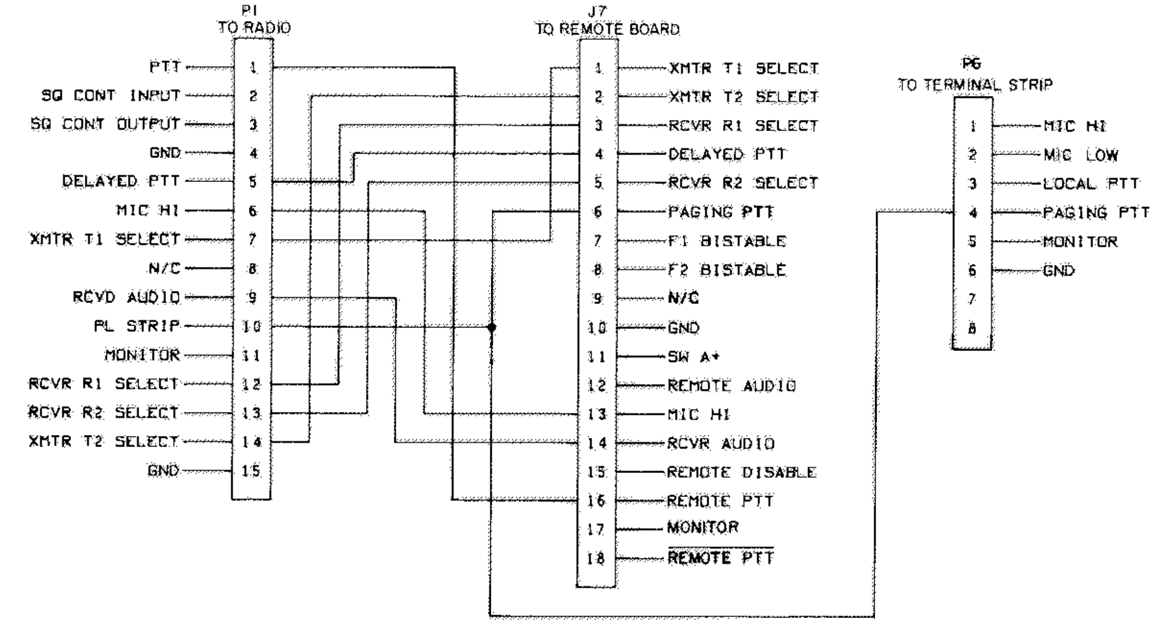
PARTS LIST SHOWN ON BACK

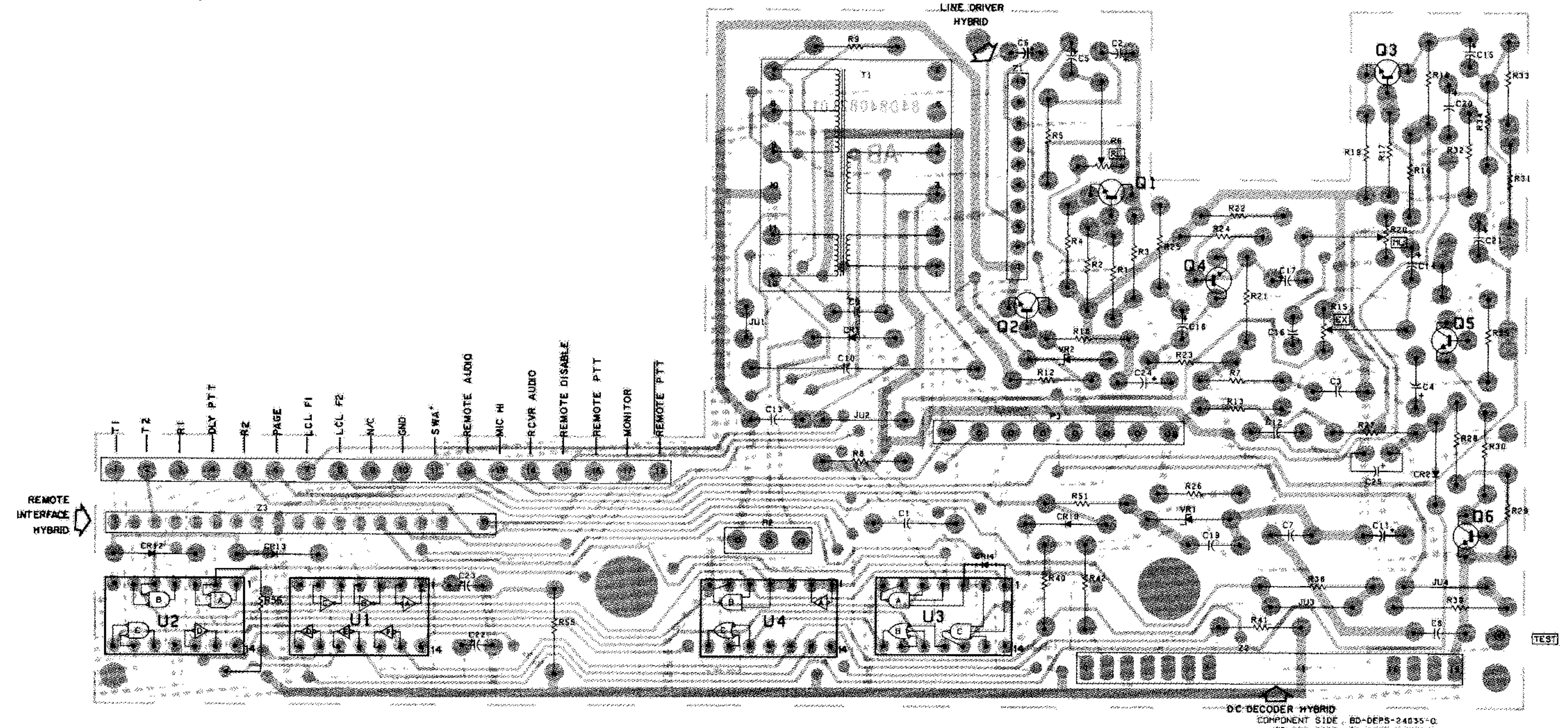
PARTS LIST

TRN6809A Local Control Board PL-5769-B

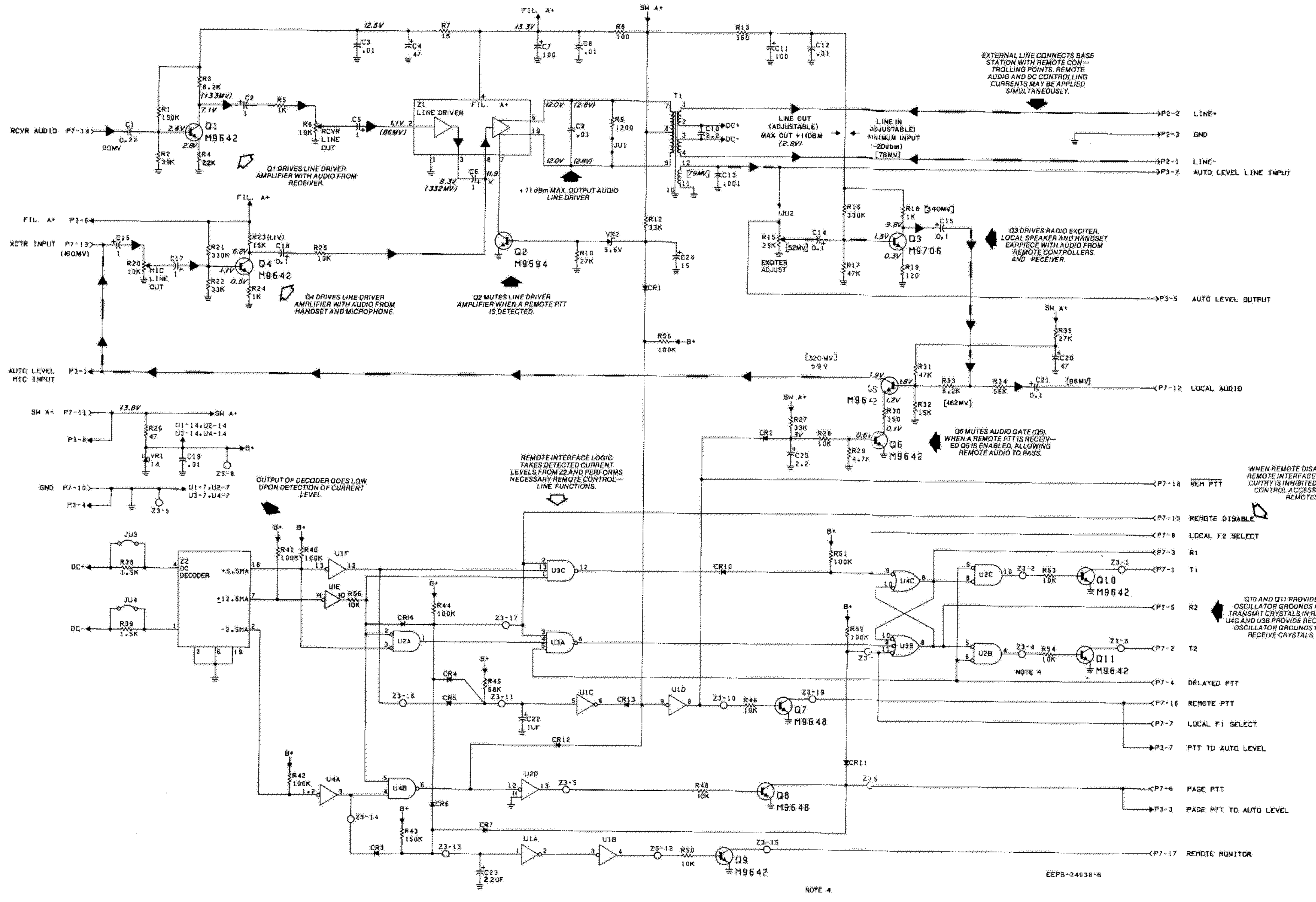
REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		CAPACITORS, fixed: uF ±20%; 35 V: unless otherwise stated
C1, 2	23-84665F04	1.0
C4	Z3-84538G03	0.1
C6	23-84665F04	1.0
C7	Z3-84908L01	2.2; 50 V
C8	23-84665F15	330 -10+150%; 25 V
C10	8-83293B18	.15 10%; 50 V
C11	23-84538G03	0.1
C12 thru 15	23-84538G01	1.0
C16	Z3-84665F01	10 -10+100%; 25 V
C17	23-84538G08	2.2 -20 V
C18	8-82905G34	.15 -5%; 50 V
C19, Z0, Z1	Z3-84538G04	15 -20 V
		DIODES: (SEE NOTE)
CR1,2,4,5,6,8	48-83654H01	silicon
CR12 thru 15, 17, 18	48-83654H01	silicon
CR19, 20, 21	48-83654H01	silicon
CR3	48-83329G04	3 Pellet diode
		LAMP, subminiature:
DS1	65-83376K01	.08 amps, 14 V
		CONNECTORS, receptacle:
J7	-	consists of: 9-83795F10 CONNECTOR, female 9 contact; 2 used
		CONNECTOR, plug:
P1	28-83441F16	male, 15 contact; red
P4	28-83441F07	male, 6 contact; wht
P5	-	consists of: Z8-83496F28 CONNECTOR, male 3 contact; 28-83496F17 CONNECTOR, male, 4 contact
P6	28-83441F03	male, 8 contact; grn
		TRANSISTORS: (SEE NOTE)
Q1 thru 6	48-869642	NPN; type M9642
Q7	48-869643	PNP; type M9643
Q8	48-869649	PNP; type M9649
Q9	48-869642	NPN; type M9642
Q10, 11	48-869648	NPN; type M9648
Q12	48-869706	NPN; Darlington M9706
Q13	48-869528	NPN; type M9528
		RESISTOR, fixed: ±10%; 1/4 W: unless otherwise stated
R1	6-124C49	1k
R2	6-124C89	47k
R3	6-124C73	10k
R4	6-124C65	4.7k
R5, 6, 7	6-124C73	10k
R8	6-124C89	47k
R9, 10, 11	6-124C73	10k
R14	6-124C73	10k
R15, 16	6-124C89	47k
R17	6-124D08	270k
R18	6-124C91	56k
R19	6-124C73	10k
R20	6-124C57	2.2k
R21	18-83288K01	variable; 100k ±20%; includes S1
R22	6-124C73	10k
R23	6-124C89	47k
R24	6-124C73	10k
R25	6-124C57	2.2k
R26	6-124B10	330k ±5%
R27	6-124C97	100k
R28, 29	6-124A73	10k
R30	6-124C83	27k
R31	6-125C05	15; 1/2 W
R32	6-124C89	47k
R33	6-124C73	10k
R34	6-125C21	68; 1/2 W
R35	6-125C29	150; 1/2 W
R36	18-83287K01	variable; 100k ±20%
R37	6-124C65	4.7k
R38	6-124C73	10k
R39	6-124D08	270k
R40	6-124C43	560
R41	6-124C73	10k
R42	6-124C97	56k
R43, 44	6-124C63	3.9k
R45	6-124D04	180k
R46	6-124C89	39k
R47	6-124C37	330
R48	6-124CZ1	68
R49	6-124C73	10k
R50	6-124C43	560
R51	6-124C91	56k
R52	6-124C73	10k
R53	6-124C81	22k
R54, 55	6-124C67	5.6k
R56	6-124A71	8.2k 5%
R57	6-124C69	6.8k
R58	6-124C65	4.7k
R59, 60	6-124C35	270
		SWITCH, pushbutton:
S2 thru 5	40-84979B15	dpdt
		INTEGRATED CIRCUITS: (SEE NOTE)
U1	51-82764K01	type 64K01
		VOLTAGE REGULATOR: (SEE NOTE)
VR1	48-82256C10	Zener; 14 V
	MECHANICAL PARTS	
	1-80797B64	CIRCUIT BOARD, eyeletted
		includes:
	39-10184A10	CONTACT, plug; 9 used
	1-80797B65	BRACKET, potentiometer
		includes:
		Ref. items R21, R36
	7-83289L01	BRACKET, mounting
	1-80771B49	LEAD AND CONTACT
		includes:
	39-10184A24	CONTACT, chain form; 2 used
	3-139776	SCREW, tapping; 5-20 x 3/8" 2 used
	9-84151B03	RECEPTACLE, contact; 2 used
	9-84151B05	RECEPTACLE, contact
	14-84360C01	INSULATOR, switch; 4 used
	14-84590B06	INSULATOR, connector (J8)
	15-10183B22	HOUSING, connector; 2 contact (J200)
	28-83441F18	CONNECTOR, male; 3 contact
	29-83167C01	TERMINAL, strain relief; 2 used
	29-84150L01	TERMINAL, plug; 2 used
	37-82603D60	SLEEVE, blank; 4 used
	39-10184A24	CONTACT, chain form
	42-10217A02	STRAP, tie
	42-84284B01	RETAINER

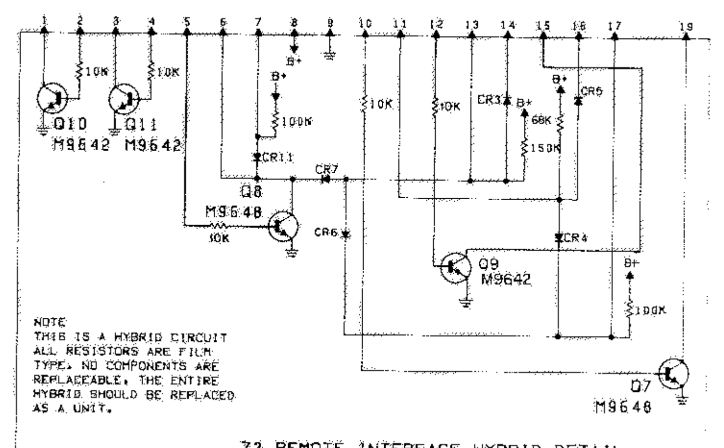
LOCAL AND LOCAL/REMOTE INTERCABLING DETAIL



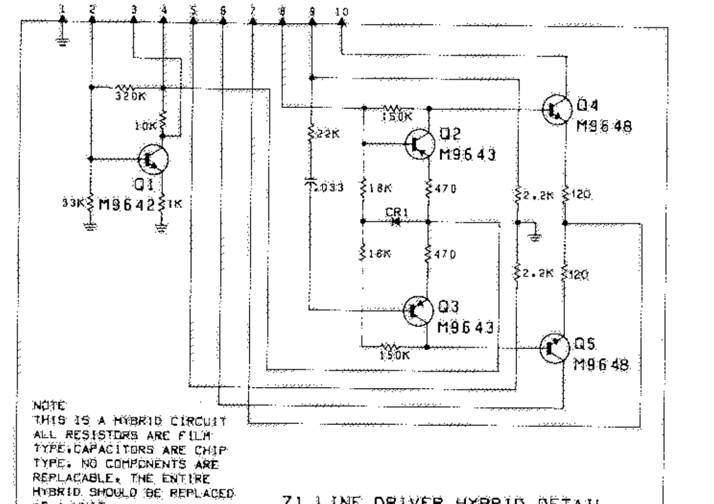


SHOWN FROM COMPONENT SIDE

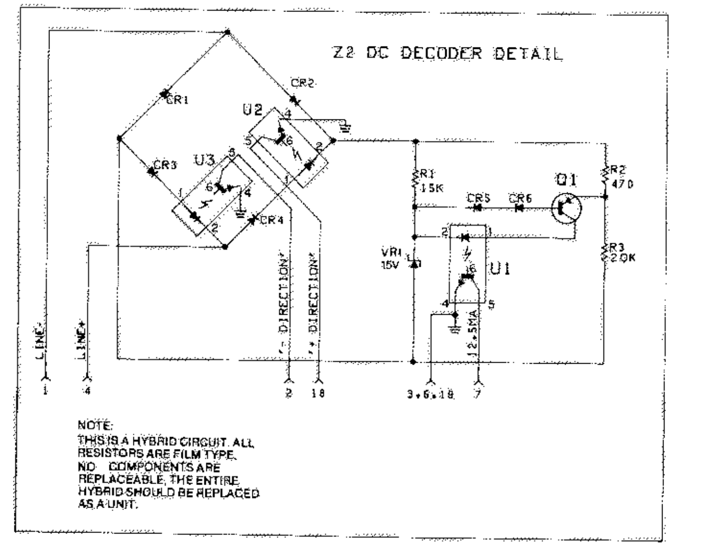




Z3 REMOTE INTERFACE HYBRID DETAIL



Z1 LINE DRIVER HYBRID DETAIL



LOCAL/REMOTE CONTROL BOARD

MODEL TRN6796A

FUNCTION

Provides remote control interface to operate radio when the REMOTE switch is depressed. Provides audio interface for remote controlling points.

JUMPER TABLE

JU1 - NORMALLY IN, OUT FOR LINE BRIDGING.
JU2 - NORMALLY IN, OUT WHEN AUTO LEVEL OPTION IS USED.
JU3, JU4 - NORMALLY OUT, - USED FOR SPECIAL APPLICATIONS.

NOTES:

1. ALL RESISTORS ARE IN OHMS, CAPACITORS ARE IN UF, UNLESS OTHERWISE STATED.
2. ALL DC VOLTAGES ARE MEASURED WITH A 20K/VOLTMETER.
3. ALL AC VOLTAGES ARE RMS, MEASURED WITH A HIGH IMPEDANCE METER. A 600-OHM LOAD IS ATTACHED ACROSS THE LINE.

   [ ] = MINIMUM LINE INPUT, -20 dBm
   ( ) = MAXIMUM LINE OUTPUT, +11 dBm

4. RECEIVER AUDIO
   TRANSMIT AUDIO
   MAINTENANCE NOTE
   CIRCUIT THEORY
   Z3-XX Z3 CONNECTION

PARTS LIST SHOWN ON BACK

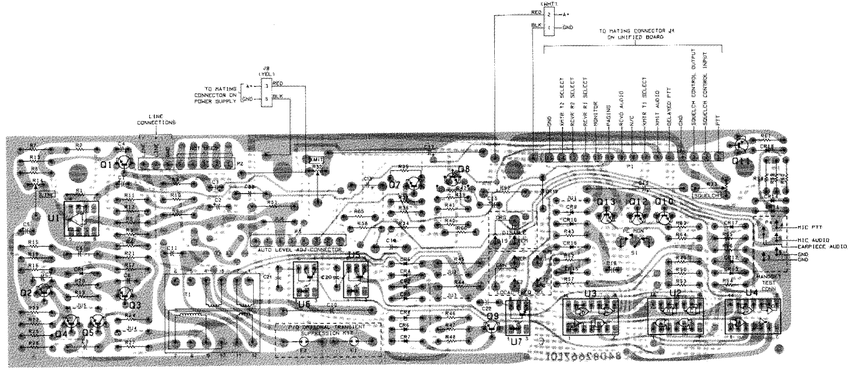
68P81037E83-B
7/6/78-UP

PARTS LIST

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
TRN6796A Local/Remote Board		PL-5755-B
		CAPACITOR, fixed: uF:
C1	8-82905G32	.22 ±10%; 50 V
C2	23-84538G01	1.0 +150-0%; 50 V
C3	21-82428B40	.01 -40+60%; 250 V
C4	23-84538G06	47 ±20%; 20 V
C5, 6	23-84665F04	1.0 +150-0%; 50 V
C7	23-84665F03	100 +100-0%; 25 V
C8	21-82428B40	.01 -40+60%; 250 V
C9	21-82428B40	.01 -40+60%; 250 V
C10	8-82096J15	2.2 ±10%; 250 V
C11	23-84665F03	100 +100-0%; 25 V
C12	21-82428B40	.01 -40+60%; 250 V
C13	21-82187B29	.001 ±10%; 100 V
C14, 15	23-84538G03	0.1 ±20%; 35 V
C16, 17	23-84665F04	1.0 +150-0%; 50 V
C18	23-84538G03	0.1 ±20%; 35 V
C19	21-82428B40	.01 +60-40%; 250 V
C20	23-84538G06	47 +150-0%; 50 V
C21	23-84538G03	0.1 ±20%; 35 V
C22	23-84665F04	1.0 +105-0%; 50 V
C23	23-84538G08	2.2 ±20%; 20 V
C24	23-84538G04	15 ±20%; 20 V
C25	23-84538G08	2.2 ±20%; 20 V
		DIODES: (SEE NOTE)
CR1, 2	46-83654H01	silicon
CR10	46-83654H01	silicon
CR12, 13, 14	46-83654H01	silicon
		SPARK GAP:
E1, 2	80-83029H01	230 V dc; ±15% (optional)
		RESISTORS, fixed: 1/4 W ±10%;
R1	6-124D02	150k
R2	6-124C87	39k
R3	6-124C71	8.2k
R4	6-124C57	2.2k, 10%
R5	6-124C49	1k
R6	18-84944C03	10k variable
R7	6-124C79	1k
R8	6-124C25	100
R9	6-124C51	1200
R10	6-124C83	27k
R12	6-124C85	33k
R13	6-124C43	560
R15	18-84494C02	25k variable
R16	6-124D10	330k
R17	6-124C89	47k
R18	6-124C79	1k
R19	6-124C27	120
R20	18-84944C03	10k variable
R21	6-124D10	330k
R22	6-124C85	33k
R23	6-124C77	15k
R24	6-124C79	1k
R25	6-124C73	10k
R26	6-124C17	47
R27	6-124C85	33k
R28	6-124C73	10k
R29	6-124C65	4.7k
R30	6-124C29	150
R31	6-124C89	47k
R32	6-124C77	15k
R33	6-124C71	8.2k
R34	6-124C91	56k
R35	6-124C83	27k
R38, 39	6-125C53	1.5k 1/2 W
R40, 41, 42	6-124C97	100k
R51	6-124C97	100k
R55	6-124C97	100k
R56	6-124C73	10k
		TRANSISTORS: (SEE NOTE)
Q1	48-869642	type M9642 NPN
Q2	48-869594	type M9594 NPN
Q3	48-869706	type M9706 NPN
Q4, 5, 6	48-869642	type M9642 NPN
		INTEGRATED CIRCUITS: (SEE NOTE)
U1	51-82764K16	type 74C14
U2	51-82764K02	type 74C02
U3	51-82764K05	type 74C10
U4	51-82764K01	type 74C00

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		DIODES, Zener (See Note)
VR1	48-82256C14	15.0 V 400 mW
VR2	48-82256C12	5.6 V 400 mW
		HYBRID CIRCUITS: (SEE BELOW)
Z1	0180796B46	Line Driver
Z2	0180796B45	DC Decoder
Z3	0180705D27	Remote Interface
		These hybrid circuits should be replaced if any part is defective.
T1	25-83036L01	TRANSFORMER, line driver
P2	28-83441F18	CONNECTOR, 3-pin male, Wht
P3	28-83496F01	CONNECTOR, 8-pin male, Wht
P7	15-84928L02	CONNECTOR, 18-pin male, Wht

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

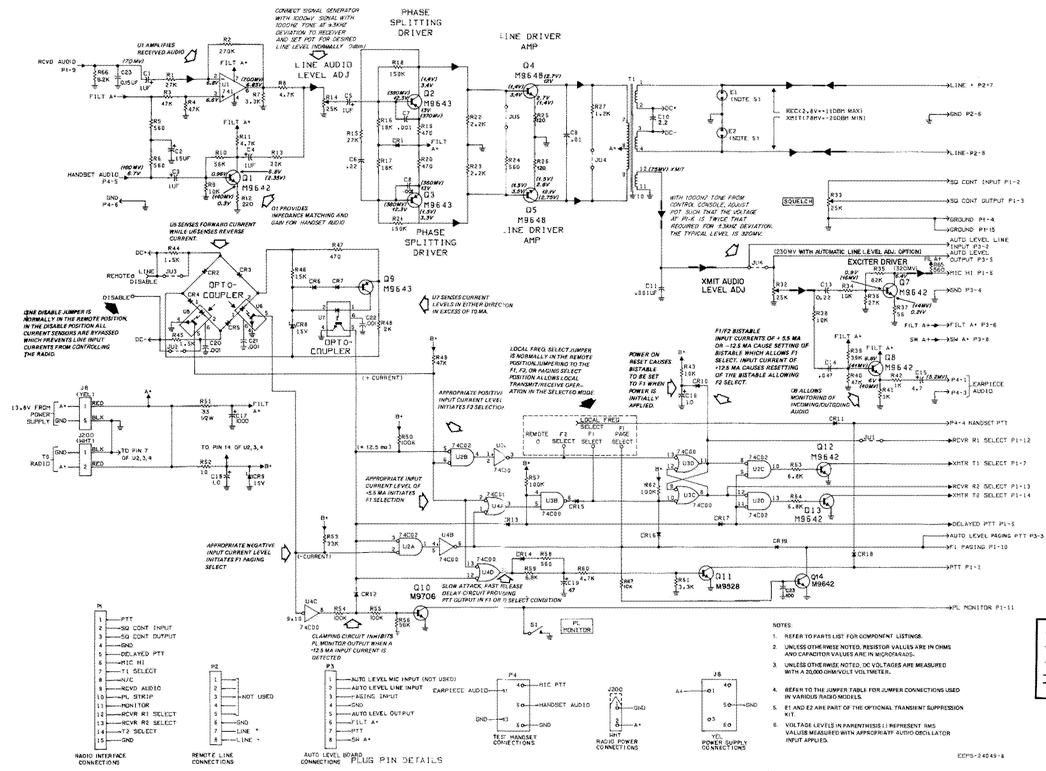


SHOWN FROM COMPONENT SIDE

TRANSISTOR LEAD DETAILS

G1 TO G13

COMPONENT SIDE = 00-DCPS-24048-A
SOLDER SIDE = 02-DCPS-24047-A
02-DCPS-24048-A



DC REMOTE CONTROL BOARD

MODEL TRN6823A

FUNCTION

Provides remote control interface for radio operation.

PARTS LIST SHOWN ON BACK

68P81037E87-B
7/6/78-UP

DC REMOTE

PARTS LIST

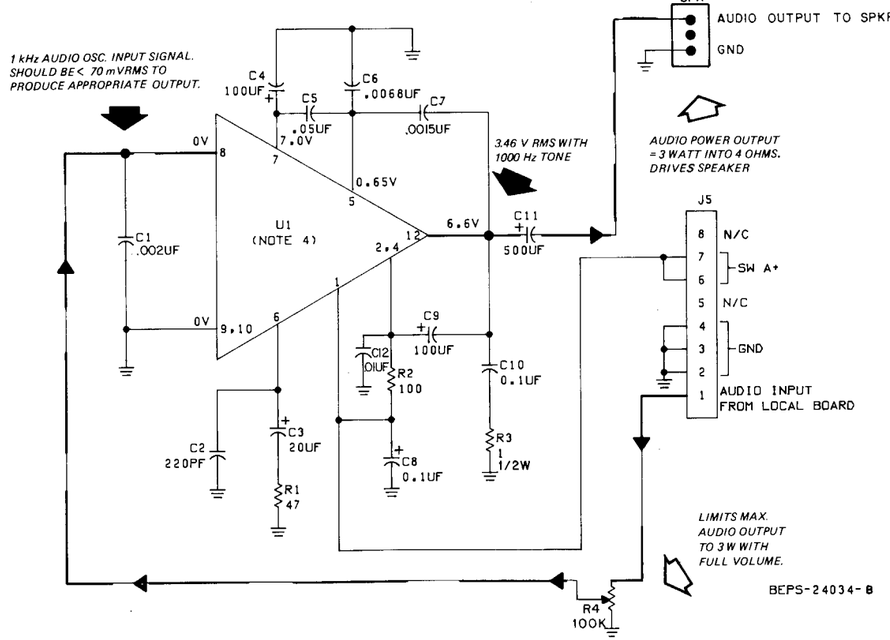
TRN6823A DC Remote Board — PL-5765-B

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		CAPACITOR, fixed:
C1	23-84665F04	1 uF +150-0%; 50 V
C2	23-84538G04	15 uF +20%; 20 V
C3, 4, 5	23-84665F04	1 uF +150-0%; 50 V
C6	8-82905G11	0.22 uF ±10%; 50 V
C7, 8	21-82187B29	.001 uF ±10%; 100 V
C9	8-82905G01	.01 uF ±10%; 50 V
C10	8-82096J15	2.2 uF ±10%; 250 V
C11	21-82187B29	.001 uF ±10%; 100 V
C13	8-82905G11	0.22 uF ±10%; 50 V
C14	8-82905G03	.047 uF ±10%; 50 V
C15	23-84538G02	4.7 uF ±20%; 20 V
C16	23-84665F04	1 uF +150-0%; 50 V
C17	23-83210A24	1000 uF ±20; 20 V
C18	23-84665F04	1 uF +150-0%; 50 V
C19	23-82783B37	47 uF ± 20%; 25 V
C20, 21, 22	21-82187B29	.001 ±10%; 100 V
C23	23-82783B04	100 uF ±20%; 25 V
C33	8-82905G34	0.15 uF ±5%; 50 V
		DIODE: (SEE NOTE)
CR1 thru 7	48-83654H01	silicon
CR8, 9	48-82256C14	silicon
CR10 thru 19	48-83654H01	silicon
		SPARK GAP:
E1, 2	80-83029H01	230 V dc ±15% (Optional)
		CONNECTOR, plug:
P1	28-83441F16	male; 15 contact
P2	28-83441F18	male; 3 contact
P3	28-83496F01	male; 8 contact
		TRANSISTOR: (SEE NOTE)
C1	48-869642	NPN; type M9642
C2, 3	48-869643	PNP; type M9643
C4, 5	48-869648	NPN; type M9648
C7, 8	48-869642	NPN; type M9642
C9	48-869643	PNP; type M9643
Q10	48-869706	NPN; type M9706
Q11	48-869528	NPN; type M9528
Q12, 13	48-869642	NPN; type M9642
		RESISTOR, fixed ±10%; 1/4 W; unless otherwise stated
R1	6-124A83	27k ±5%
R2	6-124A08	270k ±5%
R3, 4	6-124C89	47k
R5, 6	6-124C43	560
R7	6-124C61	3.3k
R8	6-124C65	4.7k
R9	6-124C73	10k
R10	6-124C91	56k
R11	6-124C65	4.7k
R12	6-124C33	220
R13	6-124C81	22k
R14	18-84944C02	variable; 25k ±20%; 1/8 W
R15	6-124C83	27k
R16, 17	6-124C79	18k
R18	6-124D02	150k
R19, 20	6-124C41	470
R21	6-124D02	150k
R22, 23	6-124C57	2.2k
R24	6-124C43	560
R25, 26	6-124A27	120 ±5%
R27	6-124C51	1.2k
R32, 33	18-84944C02	variable, 25k ±20%; 1/8 W
R34	6-124C73	10k
R35	6-124C95	82k
R36	6-124C83	27k
R37	6-124C19	56
R38	6-124C73	10k
R39	6-124C87	39k
R40	6-124C89	47k
R41, 42	6-124C49	1k
R43	6-124C73	10k
R44, 45	6-125C53	1.5k; 1/2 W
R46	6-124A77	15k 5%
R47	6-124A41	470 5%
R48	6-124A56	2.0k 5%
R49	6-124C89	47k
R50	6-124C97	100k
R51	6-125C13	33 1/2 W
R52	6-124C01	10; 1/2 W
R53	6-124C85	33k
R54, 55	6-124C97	100k
R56	6-124C91	56k
R57	6-124C97	100k
R58	6-124C43	560
R59	6-124C69	6.8k
R60	6-124C65	4.7k
R61	6-124C61	3.3k
R62	6-124C97	100k
R63, 64	6-124C69	6.8k
R66	6-124A71	8.2k
R67	6-124C73	10k
		SWITCH:
S1	40-83468E01	spst
		TRANSFORMER:
T1	25-83036L01	pri: pin 1 and 2, 25 ohms dc res. 3 and 4 25 ohms dc res. sec: 11 and 390 ohms dc res. 7 and 250 ohms dc res.
		INTEGRATED CIRCUIT: (SEE NOTE)
U1	51-84320A13	type 741
U2	51-82764K02	type 74C02
U3, 4	51-82764K01	type 74C00
U5, 6, 7	51-84320A65	type 20A65
		MECHANICAL PARTS
	39-10114A24	TERMINAL, pin female; 2 used
	15-10193B22	CONNECTOR, plug (WHT)
	9-84151B01	LUG, 2 used
	3-139776	SCREW, machine; 4 used
	14-84590B06	INSULATOR CONNECTOR (YEL)

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

PARTS LIST

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
TRN6824A 3 Watt Audio Board		PL-5766-O
		CAPACITOR, fixed:
C1	21-82428B28	.002 40%; 200 V
C2	21-83596E10	220 pF ±20%; 200 V
C3	23-84669A03	20 uF +100-0%; 25 V
C4	23-84669A19	100 uF +150-10%; 30 V
C5	21-82372C04	.05 uF +80-20%; 25 V
C6	8-84496D08	.0068 uF ±10%; 400 V
C7	21-82187B18	.0015 uF ±10%; 100 V
C8	23-84538G03	0.1 uF ±20%; 35 V
C9	23-84669A19	100 uF +150-10%; 30 V
C10	23-84538G03	0.1 uF ±20%; 35 V
C11	23-83210A19	500 uF +100-0%; 25 V
C12	21-82428B59	.01 uF -20+80%; 200 V
		CONNECTOR, plug:
P5	9-83795F01	female; 8 contact
	28-83496F28	Connector, male; 3 contact
		RESISTOR, fixed:
R1	6-124A17	47 ±5%; 1/4 W
R2	6-124A25	100 +5%; 1/4 W
R3	6-125B70	1 ±5%; 1/2 W
R4	18-84944C11	100k ±20%; 1/4 W (Variable)
		INTEGRATED CIRCUIT BOARD
U1	51-84320A77	type 20A77



NOTES:

1. REFER TO PARTS LIST FOR COMPONENT LISTINGS.
2. UNLESS OTHERWISE NOTED, RESISTOR VALUES ARE IN OHMS AND CAPACITOR VALUES ARE IN PICOFARADS.
3. UNLESS OTHERWISE NOTED, DC VOLTAGES ARE MEASURED WITH A 20,000 OHM/VOLT VOLTMETER.
4. U1 VOLTAGES MEASURED WITH VOLUME CONTROL FULLY CLOCKWISE (MAXIMUM VOLTAGE)

LEGEND

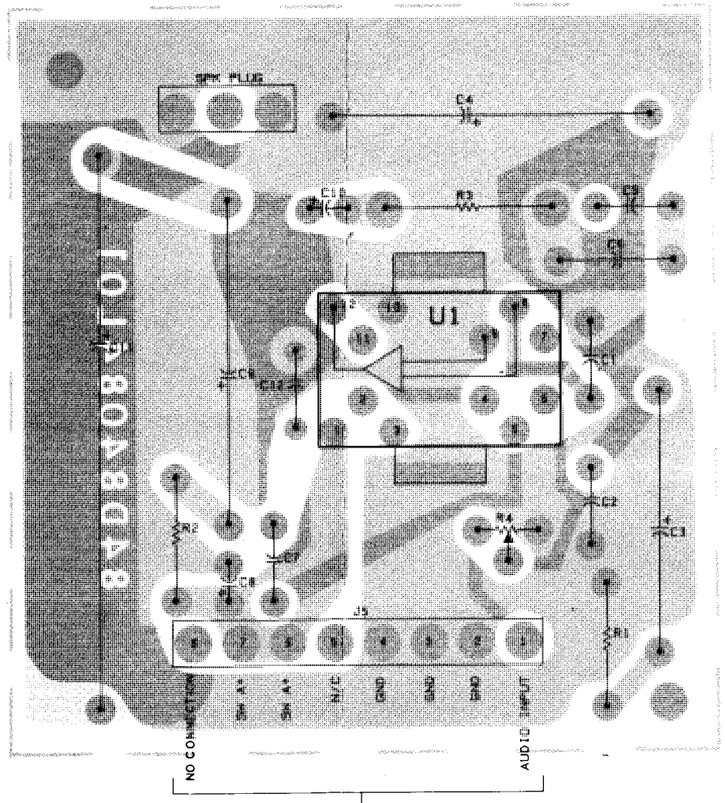
- THEORY OF OPERATION DATA
- MAINTENANCE DATA
- PRIMARY AUDIO SIGNAL FLOW

3 WATT AUDIO BOARD

MODEL TRN6824A

FUNCTION

Provides audio amplification for the local speaker.



COMPONENT SIDE BD-CEPS-24031-O
SOLDER SIDE BD-CEPS-24032-O
OL-CEPS-24033-O

SHOWN FROM COMPONENT SIDE

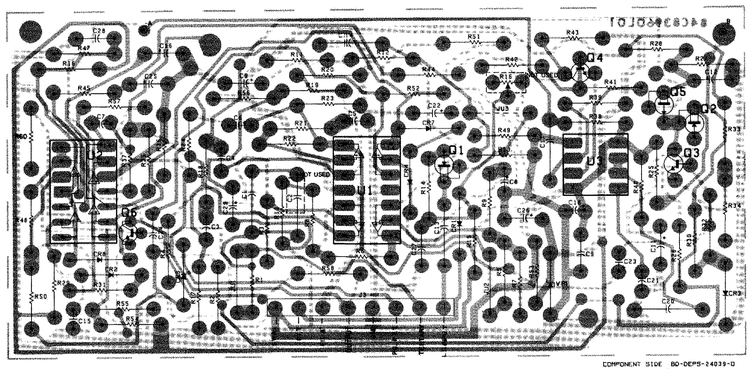
68P81037E84-B
7/6/78-UP

PARTS LIST

TRN6822A Auto Level Adjust PL-5767-B

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		CAPACITOR: fixed: uF ±20%; 35 V; unless otherwise stated
C1	8-82905G04	.068 10%; 50 V
C3, 4	23-84538G03	0.1
C5, 6	23-84338G01	1.0
C7	23-84538G03	0.1
C8	23-84538G01	1.0
C9	23-84538G06	47
C11	23-84538G06	47
C12	23-84538G04	15
C13	8-82096J08	.022 ±10%; 250 V
C14	8-82096J01	.047 ±10%; 250 V
C15	23-84538G01	1.0
C17	23-84538G04	15
C18	23-84538G01	1.0
C19	21-83596E01	.001 ±10%; 500 V
C20	21-863294	2100 1%; 500 V
C21	23-84538G03	0.1
C22	23-84538G04	15
C23	23-84538G03	0.1
C24	21-832501	.01 +60-40%; 250 V
C25	23-84538D02	4.7
C26	23-84538G04	15
C27	21-832501	.01 +60-40%; 250 V
C28	23-84538G03	0.1
		DIODE: (SEE NOTE)
CR1-6	48-83654H01	silicon
CR8	48-84616A01	silicon, hot carrier
		CONNECTOR, plug:
P1	28-83496F01	male, 8 contact
		TRANSISTOR (SEE NOTE)
Q1, 2	48-869652	field-effect type M9652
Q3	48-869594	NPN; type M9594
Q4	48-869642	NPN; type M9642
Q5	48-869660	field-effect type M9660
Q6	48-869642	NPN; type M9642
		RESISTOR, fixed: ±5%; 1/4 W; unless otherwise stated
R1	6-124A81	22k
R2	6-124A73	10k
R3, 4	6-124A73	10k
R5	6-124B06	220k
R6	6-124A73	10k
R7	6-124A97	100k
R8, 9	6-124A73	10k
R10	6-124A97	100k
R11	6-124A79	18k
R12	6-124A81	22k
R13	6-124A87	39k
R14	6-124A97	100k
R15	6-124A73	10k
R16		variable 2.2k
R17	6-124A61	3.3k
R18	6-124A89	47k
R19	6-124A87	39k
R20	6-124A95	82k
R21	6-124A65	4.7k
R22	6-124B02	150k
R23	6-124A61	3.3k
R24	6-124A73	10k
R25	6-124A77	15k
R26	6-124A97	100k
R27, 28	6-124A59	2.7k
R29, 30	6-124A73	10k
R31	6-124A61	3.3k
R33	6-10621C28	2.21k 1%
R34	6-10621B06	121 1%
R35	6-124A65	4.7k
R36	6-124B14	470k
R37	6-124A49	1k
R38	6-124A61	3.3k
R39	6-124A55	1.8k
R40	6-10621D64	56.2k 1%
R41, 42	6-124A73	10k
R43	6-124A67	5.6k
R44	6-124A41	470
R45	6-124A73	10k
R46	6-124A95	82k
R47	6-124A87	39k
R48	6-124A65	4.7k
R49	6-124B10	330k
R50	6-124A73	10k
R51	6-124A97	100k
R52	6-124A83	27k
R53	6-124A39	390
R54	6-124A73	10k
R55	6-124A81	22k
R56	6-124A92	68k
R57	6-124B22	1 meg
R58	6-124A69	6.8k
R59, 60	6-124A73	10k
		INTEGRATED CIRCUIT: (SEE NOTE)
U1	51-84320A80	type LM324
U2	51-84621K11	type MC3302
U3	51-84320A35	type 555
		VOLTAGE REGULATOR:
VR1	48-82256G38	Zener; 9.5 V

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

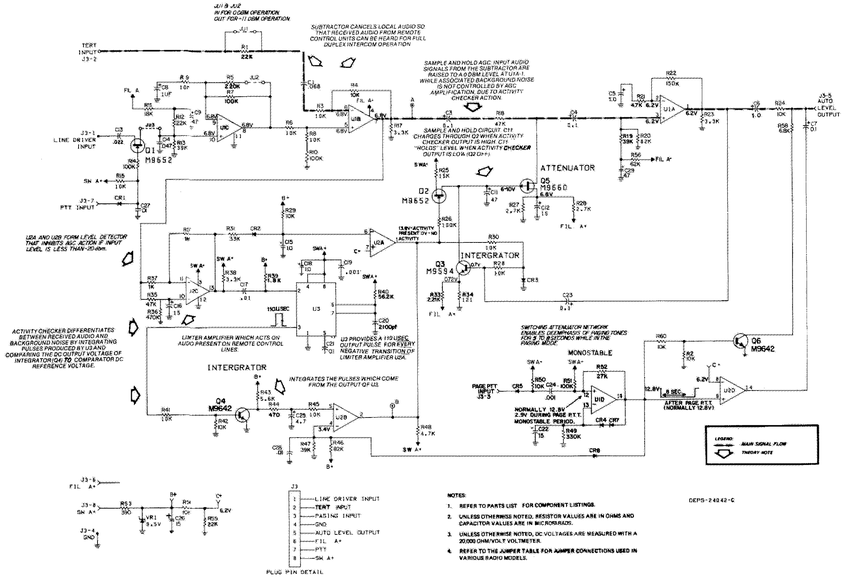


COMPONENT SIDE 80-DEPS-24039-O
SOLDER SIDE 80-DEPS-24040-O
GL-DEPS-24041-A

SHOWN FROM COMPONENT SIDE

AUTO LEVEL BOARD

MODEL TRN6822A



NOTES:
1. REFER TO PARTS LIST FOR COMPONENT LISTINGS.
2. UNLESS OTHERWISE NOTED, RESISTOR VALUES ARE IN OHMS AND CAPACITOR VALUES ARE IN MICROFARADS.
3. UNLESS OTHERWISE NOTED, DC VOLTAGES ARE MEASURED WITH A 20,000 OHM/VOLT VOLTMETER.
4. REFER TO THE JUMPER TABLE FOR JUMPER CONNECTIONS USED IN VARIOUS RADIO MODELS.

FUNCTION

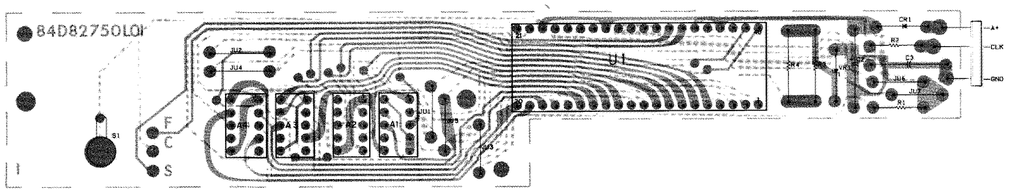
Provides constant audio output level for varying audio input levels from remote units. Gives full duplex intercom capability over transmission lines that present considerable path loss.

68P81037E89-B
10/25/78-UP

DIGITAL CLOCK
MODEL TRN6798A

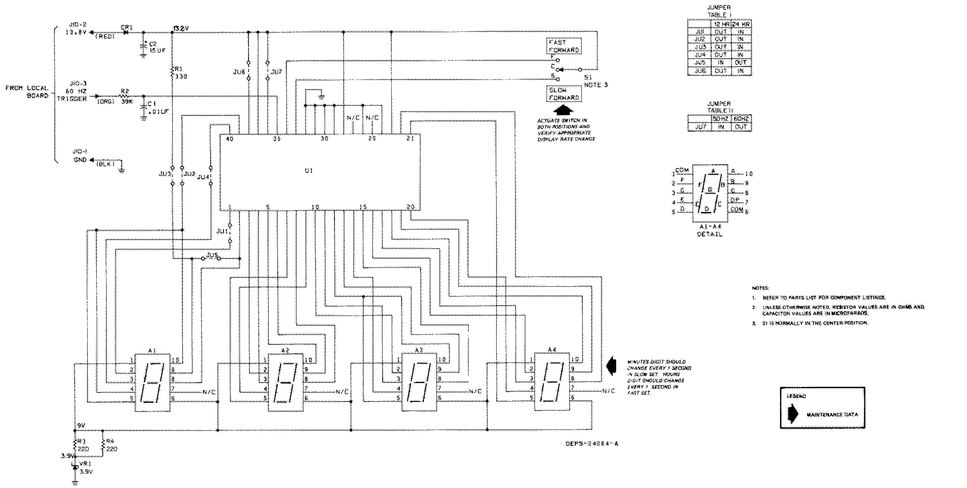
PARTS LIST

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
TRN6798A Digital Clock		PL-5764-A
		CAPACITOR, fixed:
C1	8-867617	.01 uF +60-40%; 100 V
C2	23-865136	15 uF; 25 VDC
		DIODE: (SEE NOTE)
CR1	48-83654H01	silicon
		LIGHT EMITTING DIODE:
A1 thru 4	48-82771L01	red lens
		RESISTOR, fixed:
R1	6-124C37	330 ±10%; 1/4 W
R2	6-124C87	39k ±10%; 1/4 W
R3, 4	6-125A33	220 ±5%; 1/2 W
		SWITCH, toggle:
S1	40-83402K02	spdt
		INTEGRATED CIRCUIT:
U1	51-84865G10	type 65G10
		VOLTAGE REGULATOR:
VR1	48-82256C46	Zener, 3.9 V
	MECHANICAL PARTS	
	3-139776	SCREW, tapping; 5-20 x 3/8"; 2 used
	29-83167C01	STRAIN RELIEF, 3 used
	42-10217A02	STRIP, tie; 2 used
	29-83497F01	TERMINAL; 3 used
	15-83498F28	HOUSING, connector



SHOWN FROM SOLDER SIDE

COMPONENT SIDE = 8D-DEPS-24062-A
SOLDER SIDE = 8D-DEPS-24061-D
GL-DEPS-24063-D



DIGITAL CLOCK

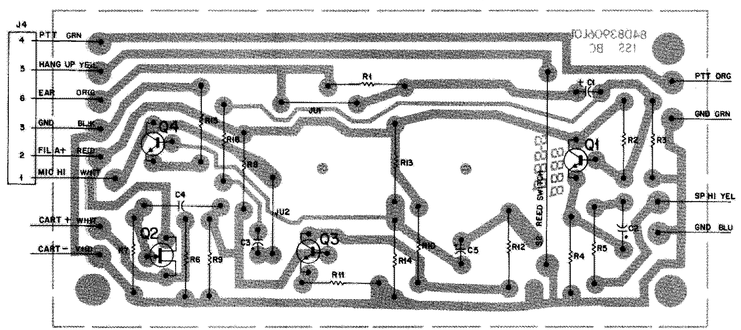
68P81037E88-A
7/6/78-UP

HANDSET
MODEL TMN1016A

PARTS LIST

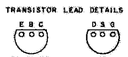
REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
TMN1016A Handset		PL-5762-B
		CAPACITOR, fixed:
C1	23-84538G01	1 uF ±20%; 35 V
C2	23-84538G05	10 uF ±20%; 15 V
C4	8-82905G02	.022 uF ±10%; 50 V
C5	23-84538G01	1 uF ±20%; 35 V
		SPEAKER:
LS1	50-82225L01	8 ohms; 1.57 dia.
		CARTRIDGE, microphone:
MK1	59-84640E01	ceramic
		TRANSISTOR: (SEE NOTE)
Q1	48-869706	NPN; type M9706
Q2	48-869652	field-effect type M9652
Q3	48-869642	NPN; type M9642
Q4	48-869594	NPN; type M9594
		RESISTOR, fixed; ±5%; 1/4 W; unless otherwise stated
R1	6-124A87	39k
R2	6-124A99	120k
R3	6-124A87	39k
R4	6-124A39	390
R5	6-124A27	120
R6	6-124B22	1 meg
R7	6-124A61	3.3k
R8	6-124B10	330k
R9	6-124A85	33k
R10	6-124A75	12k
R11	6-124A49	1k
R12	6-124A83	27k
R13	6-124A08	270k
R14	6-124A88	43k
R15	6-124A25	100
		SWITCH:
S1	40-82712L01	spst
S2	40-84200B07	spst; reed
MECHANICAL PART		
	01-80797B71	CABLE
	42-82325L01	CLIP, speaker
	75-82111M01	INSUL., foam

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



SHOWN FROM COMPONENT SIDE

TRANSISTOR LEAD DETAILS

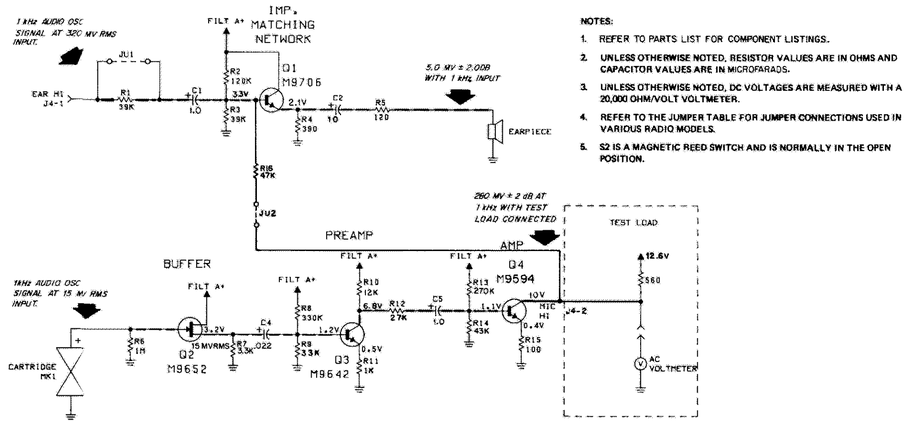


COMPONENT SIDE 8D-CEPS-24043-O
OL-CEPS-24044-O

JUMPER TABLE

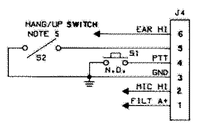
JUMPER	POSITION
JU1	NORMALLY OUT
JU2	NORMALLY IN

JU1 USED FOR 10DB INCREASE IN EARPIECE LEVEL. (NORMALLY OUT)
JU2 USED FOR SIDETONE MIXING. (NORMALLY IN)



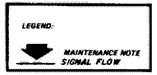
NOTES:

1. REFER TO PARTS LIST FOR COMPONENT LISTINGS.
2. UNLESS OTHERWISE NOTED, RESISTOR VALUES ARE IN OHMS AND CAPACITOR VALUES ARE IN MICROFARADS.
3. UNLESS OTHERWISE NOTED, DC VOLTAGES ARE MEASURED WITH A 20,000 OHM/VOLT VOLTMETER.
4. REFER TO THE JUMPER TABLE FOR JUMPER CONNECTIONS USED IN VARIOUS RADIO MODELS.
5. S2 IS A MAGNETIC REED SWITCH AND IS NORMALLY IN THE OPEN POSITION.



TMN1016A HANDSET MODEL COMPLEMENT

MODEL	DESCRIPTION
TRN6815A	PRE-AMP CIRCUIT BOARD
TRN6814A	HARDWARE KIT



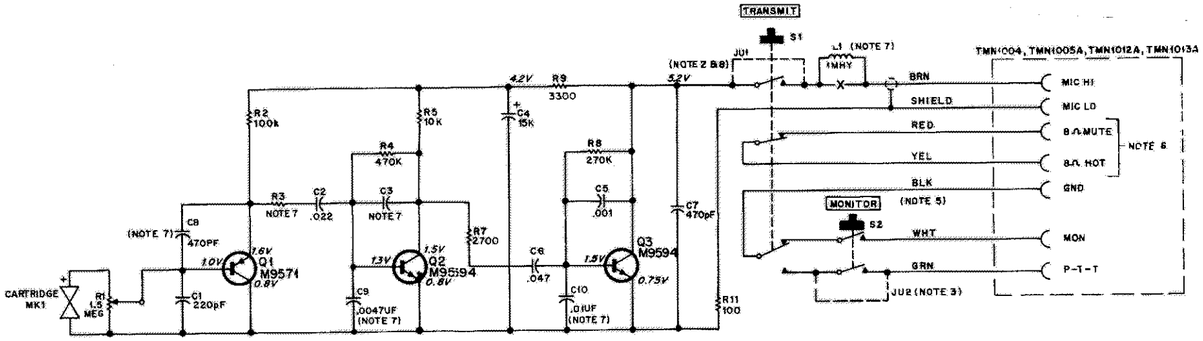
CEPS-24045-B

FUNCTION

Provides microphone audio amplification and provides earpiece audio for convenient handset operation.

DESK MICROPHONES

MODELS TMN1004A, TMN1005A, TMN1012A, TMN1013A, TMN1014A AND TMN1015A



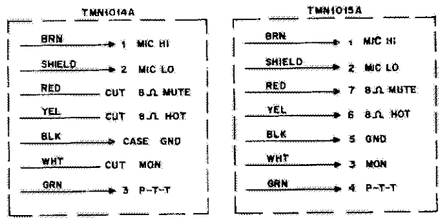
NOTES:

1. UNLESS OTHERWISE STATED: ALL CAPACITOR VALUES ARE IN MICROFARADS.
2. REMOVE JU1 FOR PARALLEL MIC OPERATION. FOR TMN1012A & TMN1013A, CUT JU1 IF INTERCOM KIT IS USED.
3. REMOVE JU2 TO MONITOR BEFORE TRANSMIT.
4. ALL DC VOLTAGE READINGS ARE IN RESPECT TO THE MIC LO LEAD.
5. MONITOR SWITCH S2 IS PRESENT IN MODELS TMN1005A, TMN1013A AND TMN1015A ONLY.
6. ON LHB AND MHB SERIES "MOTRAC" LOCAL CONTROL BASE STATIONS WITH TLN1184B MONITOR INTERCOM, 8 MUTE CONNECTS TO TB1–3 (3 MUTE) AND 6 NOT CONNECTS TO TB1–6 (3 AUDIO LO) AND JUMPER TB1–6 TO GROUND.
7. THE FOLLOWING COMPONENT VALUES ARE MODEL–SENSITIVE:

REF. SYM.	TMN1004A AND TMN1005A	TMN1012A, TMN1013A TMN1014A, TMN1015A
R3	15k–1/4–10%	22k–1/4–5%
C9	.001	560 pF ±10%
C8	NOT USED	470 pF ±10%
C9	NOT USED	.0047 ±10%
C10	NOT USED	.01 ± 20%
L1	NOT USED	1 mHy

8. REMOVE JU1 FOR ANY CONSOLE WITH INTERCOM SINGLE–TONE OR ALERT–TONE APPLICATIONS.

CEPS-9460 - K



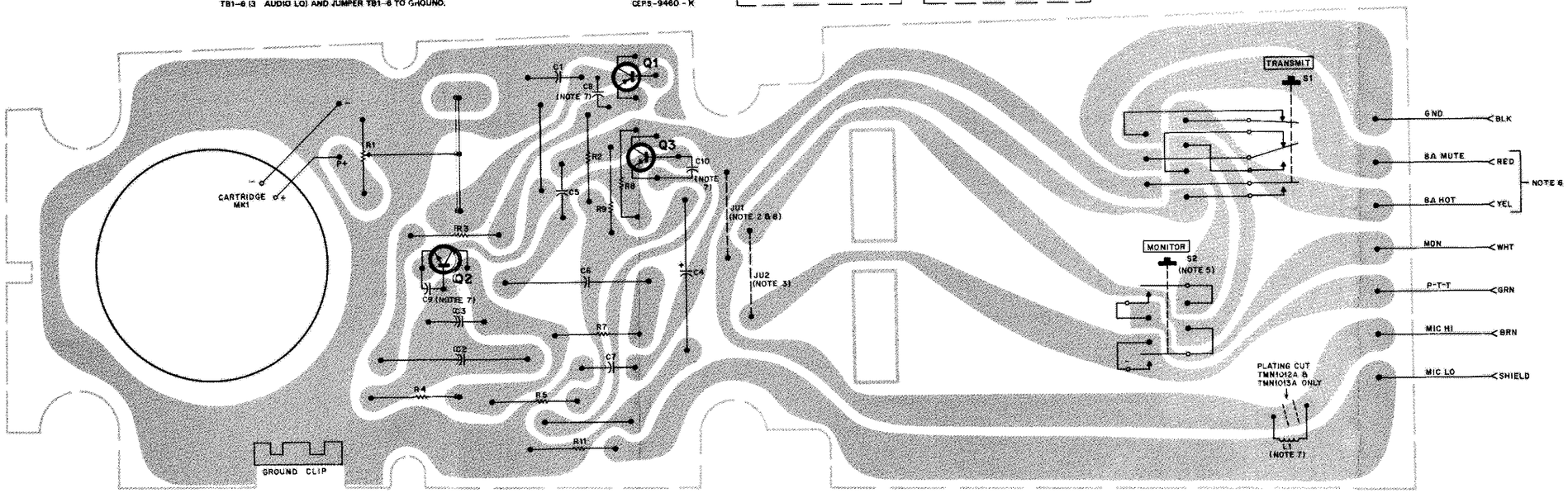
MODEL TABLE

MODEL	SUFFIX	SUB-MODEL	SUFFIX	DESCRIPTION
TMN1004A	2	TLN4[illegible]5A	2	CIRCUIT BOARD
		THN61[illegible]A		HOUSING AND HARDWARE KIT
TMN1005A	2	TLN4[illegible]5A	2	CIRCUIT BOARD
		THN61[illegible]5A		HOUSING AND HARDWARE KIT
TMN1012A		TRN63[illegible]6A		CIRCUIT BOARD
		THN61[illegible]4A		HOUSING AND HARDWARE KIT
TMN1013A		TRN63[illegible]6A		CIRCUIT BOARD
		THN61[illegible]5A		HOUSING AND HARDWARE KIT
TMN1014A		TRN63[illegible]6A		CIRCUIT BOARD
		TRN62[illegible]5A		HOUSING AND HARDWARE KIT
TMN1015A		TRN63[illegible]6A		CIRCUIT BOARD
		THN62[illegible]0A		HOUSING AND HARDWARE KIT

EPS-20626-O

APPLICATIONS

The desk microphones provide a desk surface self- supporting stand to mount the PTT and PL monitor switches and to support the dynamic cartioid microphone element at mouth level. The TMN1005A, TMN1013A and TMN1015A are used in "Private- Line" squelch systems and provides both PTT and monitor switches; the TMN1004A, TMN1012A and TMN1014A are used carrier squelch systems and uses only the PTT switch.



SHOWN FROM COMPONENT SIDE

TRANSISTOR DETAIL

DL-DEPS-9462-E

DESK MICROPHONE

CONNECTIONS

Lead Color	Function
Brown	Microphone High
Shield	Microphone Low
Green	PTT
White	Monitor
Black	Ground
Yellow*	Speaker Audio Hot
Red*	Speaker Audio Mute

*Use only when transmit monitor is desired at parallel-connected dispatch points when microphone is transmitting.

JUMPERS

Jumper JU1 is removed when parallel microphones or other local equipment are connected at the same microphone input. (For TMN1012A and TMN1013A, cut JU1 to systems without intercom.)

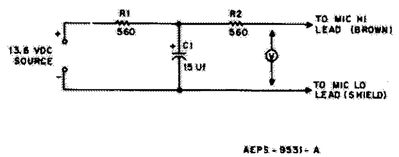
Jumper JU2 (Models TMN1005A and TMN1013A only) is removed when it is necessary to prevent an operator from transmitting without first monitoring a channel to verify it is clear. With JU2 removed, both the MONITOR and TRANSMIT switches must be activated before transmitting.

MAINTENANCE

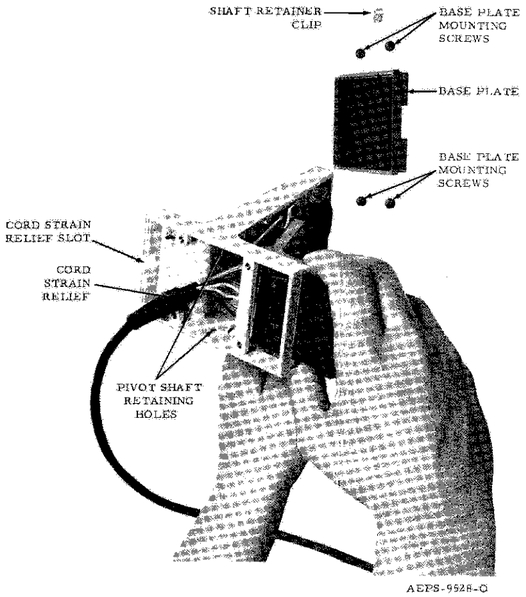
NOTE

Potentiometer R1 is factory set and field adjustment is not required.

The microphone can be tested either while connected to its associated equipment or to the test setup as shown below. Basic testing consists of checking resistances and dc voltages against the schematic diagram. Dynamic testing can be accomplished by speaking into the microphone and using an oscilloscope or ac voltmeter to monitor the amplification (gain) of the various stages. However, since a known dynamic input signal for field testing is not practicable, gain measurements are to be used only as indications of proper stage functioning. For that reason, no ac voltages are provided on the schematic.



AEPS-9531-A



AEPS-9528-O

PARTS LIST

TRN6396A Mic Circuit Board PL-3933-B

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		CAPACITOR, fixed: uf ±10%:
C1	21-82187B08	220 pF; 500 V
C2	8-82987E11	.022; 80 V
C3	21D82187B06	560 pF ±10%; 500 V
C4	23-84762H09	15; ±20%; 20 V
C5	21-82187B44	.001; 100 V
C6	8-82987E02	.047; 200 V
C7	21-82187B45	470 pF; 500 V
C8	21-82213E17	470 pF; 100 V
C9	21-82213E07	.0047 ; 100 V
C10	21-82213E12	.01 ±20%; 100 V
		COIL:
L1	24-82549D03	choke; 1 mHy
		CARTRIDGE, microphone:
MK1	59-84640E01	miniature
		TRANSISTOR: (SEE NOTE)
Q1	48-869571	PNP; type M9571
Q2, 3	48-869594	NPN; type M9594
		RESISTOR, fixed: ±10%; 1/4 W; unless stated
R1	18-83083G34	variable; 1.5 meg; 30%
R2	6-129226	100k
R3	6S124A81	22k ±5%
R4	6-124B14	470k ±5%
R5	6-129668	10k ±5%
R7	6-129707	2.7k ±5%
R8	6-131858	270k ±5%
R9	6-129231	3.3k
R11	6-129753	100
		NON-REFERENCED ITEMS
	5-84371E01	GROMMET, cartridge
	42-84724E01	CLIP, grounding

TLN4925A Mic Circuit Board PL-1884-D

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		CAPACITOR, fixed: uF ±10%
C1	21-82187B08	220 pF; 500 V
C2	8-82987E11	.022; 80 V
C3	21-82187B44	.001; 100 V
C4	23-84762H09	15; ±20%; 20 V
C5	21-82187B44	.001; 100 V
C6	8-82987E02	.047; 200 V
C7	21-82187B45	470 pF; 500 V
		CARTRIDGE, microphone:
MK1	59-84640E01	miniature
		TRANSISTOR: (SEE NOTE)
Q1	48-869571	PNP; type M9571
Q2, 3	48-869594	NPN; type M9594
		RESISTOR, fixed: ±10%; 1/4 W; unl. stated
R1	18-83083G34	variable; 1.5 meg ±30%
R2	6-129226	100k
R3	6-127805	15k
R4	6-124B14	470k ±5%
R5	6-129668	10k ±5%
R7	6-129707	2.7k ±5%
R8	6-131858	270k ±5%
R9	6-129231	3.3k
R11	6-129753	100
		NON-REFERENCED ITEMS
	5-84371E01	GROMMET, cartridge
	42-84724E01	CLIP, grounding

THN6154A, THN6155A, THN6279A & THN6280A Mike Housing & Hardware Kit PL-1885-D

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
S1, 2	40-84711E02	SWITCH, leaf: 2 section, multiple nonlocking contacts (THN6154A, THN6279A)
	40-84711E01	2 section, multiple nonlocking contacts (THN6155A, THN6280A)
		NON-REFEFERENCED ITEMS
	3-136676	SCREW, switch mtg. 4-40 x 1/4 pnl hex
	1-80736B05	CABLE ASSEMBLY includes: 29-847854 LUG, slotted tongue; 7 req'd.
	1-80788B86	CABLE ASSEMBLY for TMN1015A includes: 29-82336A02 connector pins; 7 req'd.
	1-80788B85	CABLE ASSEMBLY for TMN1014A includes: 28-16370 4 plug connector
	15-84186E01	COVER, front
	15-84188E01	COVER, rear
	15-84191E01	HOUSING
	26-84720E01	FOIL, grounding, front cover
	26-84721E01	FOIL, grounding, rear cover
	38-84184E02	BUTTON, left hand (THN6154A, THN6279A)
	38-84184E01	BUTTON, left hand (THN6155A, THN6280A)
	38-84192E01	BUTTON, right hand
	42-84725E01	CLIP, retainer
	47-84193E01	SHAFT
	47-84194E01	SHAFT EXTENSION
	47-84723E01	SHAFT COUPLING (THN6154A, THN6279A)
	22-82591C05	PIN, roll (THN6154A THN6279A)
	64-84183E01	PLATE, base
	75-84722E01	PAD, base plate
	3-138809	BASE PLATE SCREW 4-40 x 5/16 phl bn hx bk ox
	3-138810	FRONT COVER SCREW 4-40 x 5/8 phl bn hx bk ox
	4-10058B10	WASHER ("TEFLON")

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

REVISIONS

PEPS-9463-M

BOARD AND SUFFIX NO.	REF. SYMBOL	CHANGE	LOCATION
TLN4924A TLN4925A TMN1004A-1 (TLN4924A-1)	R6	REMOVED (WAS 6-131524, 100 ±5%; 1/4 W) WAS CONNECTED IN SERIES WITH EMITTER OF Q2	Q2 EMITTER
TMN1005A-1 (TLN4925A-1)	R10	REMOVED (WAS 6-124A01, 10 ±5%; 1/4 W) WAS CONNECTED IN SERIES WITH EMITTER OF Q3.	Q3 EMITTER
TMN1004A-2 (TLN4924A-2) TMN1005A-2 (TLN4925A-2)	R4	FROM 6-124B06, 220k TO 6-124B14, 470k	Q2 COLLECTOR
	R7	FROM 6-127804, 4.7k TO 6-129707, 2.7k	
TLN4924A-2		REPLACED WITH MODEL TLN4925A-2	
TMN1012A TMN1013A TMN1014A TMN1015A		MODELS ADDED	
		NOTES ADDED	
TRN6396A	C8	FROM 21-82187B07 470 pF ±10%; 500 V TO 21-82213E17 470 pF ±10%; 100 V	PARTS LIST
	C9	FROM 21-82428B09 .0047 uF ±10%; 100 V TO 21-82213E07 .0047 uF ±10%; 100 V	
	C10	FROM 21-83250I .01 uF +60-40%; 250 V TO 21-82213E12 .01 uF ±20%; 100 V	

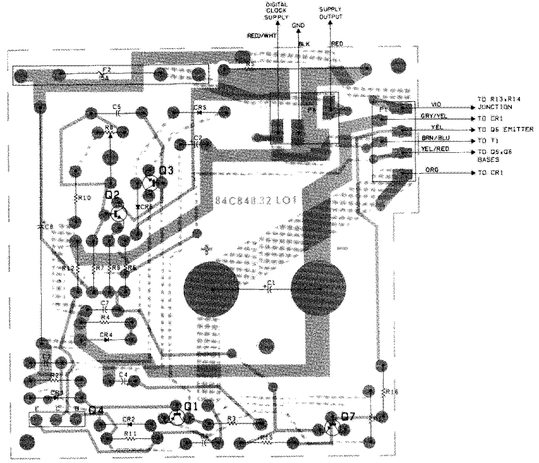
POWER SUPPLY

MODEL TPN1155A

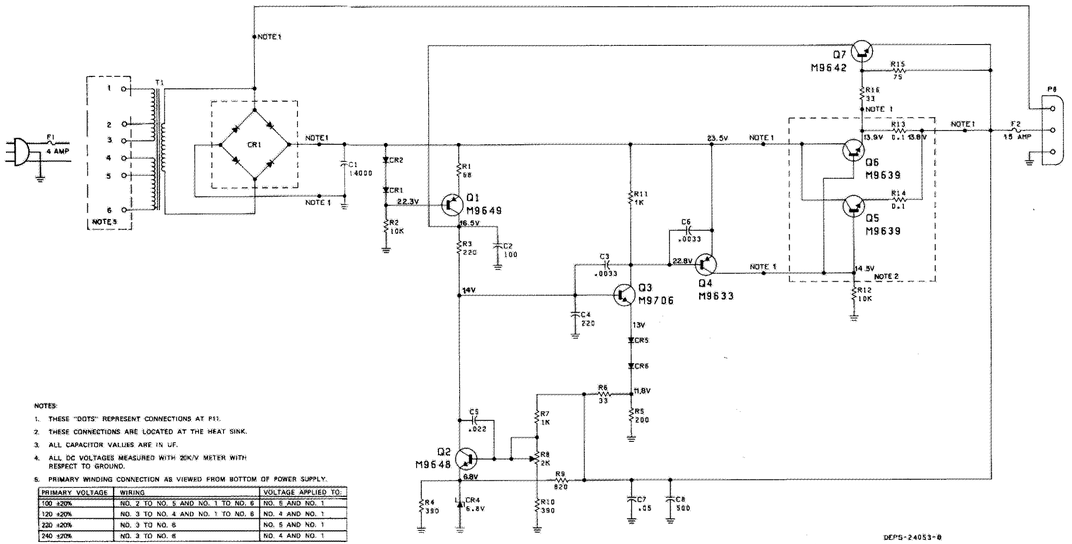
PARTS LIST

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
TPN1155A Power Supply		PL-5751-C
		CAPACITOR, fixed: uF:
C1	23-82464C12	14,000 -10+75%; 40 V
C2	23-84665F05	100; 25 V
C3	21-82428B10	.0033 ±10; 100 V
C4	23-84665F06	220; 25 V
C5	8-82305C02	.022; 50 V
C6	21-82428B10	.0033 ±10%; 100 V
C7	21-82372C04	.05; 25 V
C8	23-83210A19	500; 20 V
		DIODE: (SEE NOTE)
CR1	48-84751H06	silicon bridge
CR2, 3	48-83654H01	silicon
CR4	48-83696K01	Zener, 6.8 V
CR5, 6	48-83654H01	silicon
		FUSE:
F1	65-61688	4 amp; 250 V (100/120 models)
	or65-20404	3 amp; 250 V (220/240 models)
F2	65-4165	15 amps; 32 V
		TRANSISTORS: (SEE NOTE)
Q1	48-869649	PNP; type M9649
Q2	48-869648	NPN; type M9648
Q3	48-869706	NPN; type M9706
Q4	48-869633	PNP; type M9633
Q5, 6	48-869639	NPN; type M9639
Q7	48-869642	NPN; type M9642
		RESISTORS, fixed: ±10%; 1/4 W; unless otherwise stated
R1	6-124C21	68
R2	6-124C73	10k
R3	6-124C33	220
R4	6-124C39	390
R5	17-82177B08	200; 5 W
R6	6-124A13	33 ±5%
R7	6-124C49	1k
R8	18-84944C01	var. 2k
R9	6-124C47	820
R10	6-124C39	390
R11	6-124C49	1k
R12	6-124C73	10k
R13, 14	17-82177B50	.1; 7 W
R15	6-124A22	75 ±5%
R16	6-124A13	33 ±5%
		TRANSFORMER, power:
T1	25-84932L01	pri. #1 = 6.2 ohms pri. #2 = 5.7 ohms sec. = .075 ohms
	MECHANICAL PARTS	
	1-80707D40	LINE CORD AND PLUG,includes: 30-83211C09 - 6 ft. line cord 29-10134A91-terminal (2 used)
	1-80797B62	CABLE TO HEATSINK,includes: 9-84151B03-receptacle (6 used) 14-84849L01-insulator 29-10134A91-terminal lug
	1-80797B67	CHASSIS
	15-84927L01	RECEPTACLE, transistor
	42-10122A12	FUSE CLIPS (2 used)
	29-84547B04	CONTACT PINS (9 used)
	3-135106	SCREW 6-32 x 15/16 (4 used)
	3-10903A07	SCREW M3 x 0.5 x 6 (4 used)
	3-10904A12	SCREW M3 x 0.5 x 16
	3-83436L01	SCREW M3 x 0.5 x 35 (2 used)
	7-84926L01	BRACKET
	9-865564	RECEPTACLE, fuse
	9-82337H01	SOCKET, transistor (2 used)
	14-85743?	INSULATOR, transistor (2 used)
	26-84843L01	HEAT SINK
	29-5248	LUG
	31-131751	TERMINAL STRIP
	42-10128A18	"O" RING (2 used)
	2-11913	NUT (4 used)
	3-139776	SCREW 5-20 x 3/8 (4 used)
	14-84268A01	INSULATOR, transistor
	22-10133A17	PIN, rolled (2 used)
	42-84929L01	RETAINING STRAP
	29-10134A91	TERMINAL LUG, (2 used,in 220/240 V models only)

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



SHOWN FROM SOLDER SIDE



NOTES:

1. THESE "DOTS" REPRESENT CONNECTIONS AT P11.
2. THESE CONNECTIONS ARE LOCATED AT THE HEAT SINK.
3. ALL CAPACITOR VALUES ARE IN UF.
4. ALL DC VOLTAGES MEASURED WITH 20K/V METER WITH RESPECT TO GROUND.
5. PRIMARY WINDING CONNECTION AS VIEWED FROM BOTTOM OF POWER SUPPLY.

PRIMARY VOLTAGE	WIRING	VOLTAGE APPLIED TO:
100 ±20%	NO. 2 TO NO. 5 AND NO. 1 TO NO. 6	NO. 5 AND NO. 1
120 ±20%	NO. 3 TO NO. 4 AND NO. 1 TO NO. 6	NO. 4 AND NO. 1
220 ±20%	NO. 3 TO NO. 6	NO. 5 AND NO. 1
240 ±20%	NO. 3 TO NO. 6	NO. 4 AND NO. 1

NOTE: PIN 1 IS ON THE RIGHT HAND SIDE.

FUNCTION

Provides operating power for the base station.

POWER SUPPLY

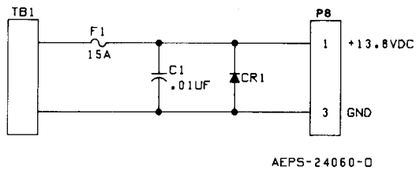
68P81037E91-C
10/25/78-UP

12 V DC POWER SUPPLY

MODEL TPN6105A

FUNCTION

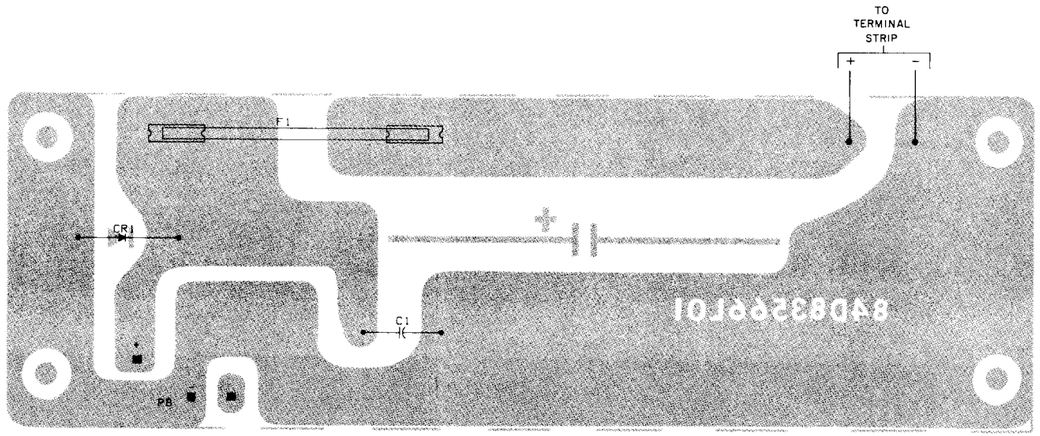
Allows base station to be operated from a 12 V dc source.



AEPS-24060-O

PARTS LIST

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
TPN6105A 12 Volt Power Supply		PL-5763-A
C1	21-83596E19	CAPACITOR, fixed: .01 uF +80-20%; 3 kV
CR	48-82525G13	DIODE: (SEE NOTE) silicon
F1	65-4165	FUSE: 15 amp; 32 V
TB1	31-898013	TERMINAL STRIP: 2 screw terminal
	MECHANICAL PARTS	
	42-10122A12	CLIP, fuse; 2 used
	42-10217A02	TY-WRAP
	42-84284B01	RETAINER; 8 used
	3-10904A05	SCREW, M3 x .5 x 10; 4 used
	3-139776	SCREW, machine; 4 used
	4-7555	WASHER; 4 used
	15-83584L01	SHROUD, back cover
	29-84547B04	CONTACT, pin; 3 used



BD-CEPS-24058-O
OL-CEPS-24059-A

SHOWN FROM COMPONENT SIDE

END OF DOCUMENT

68P81037E92-B
7/6/78-UP