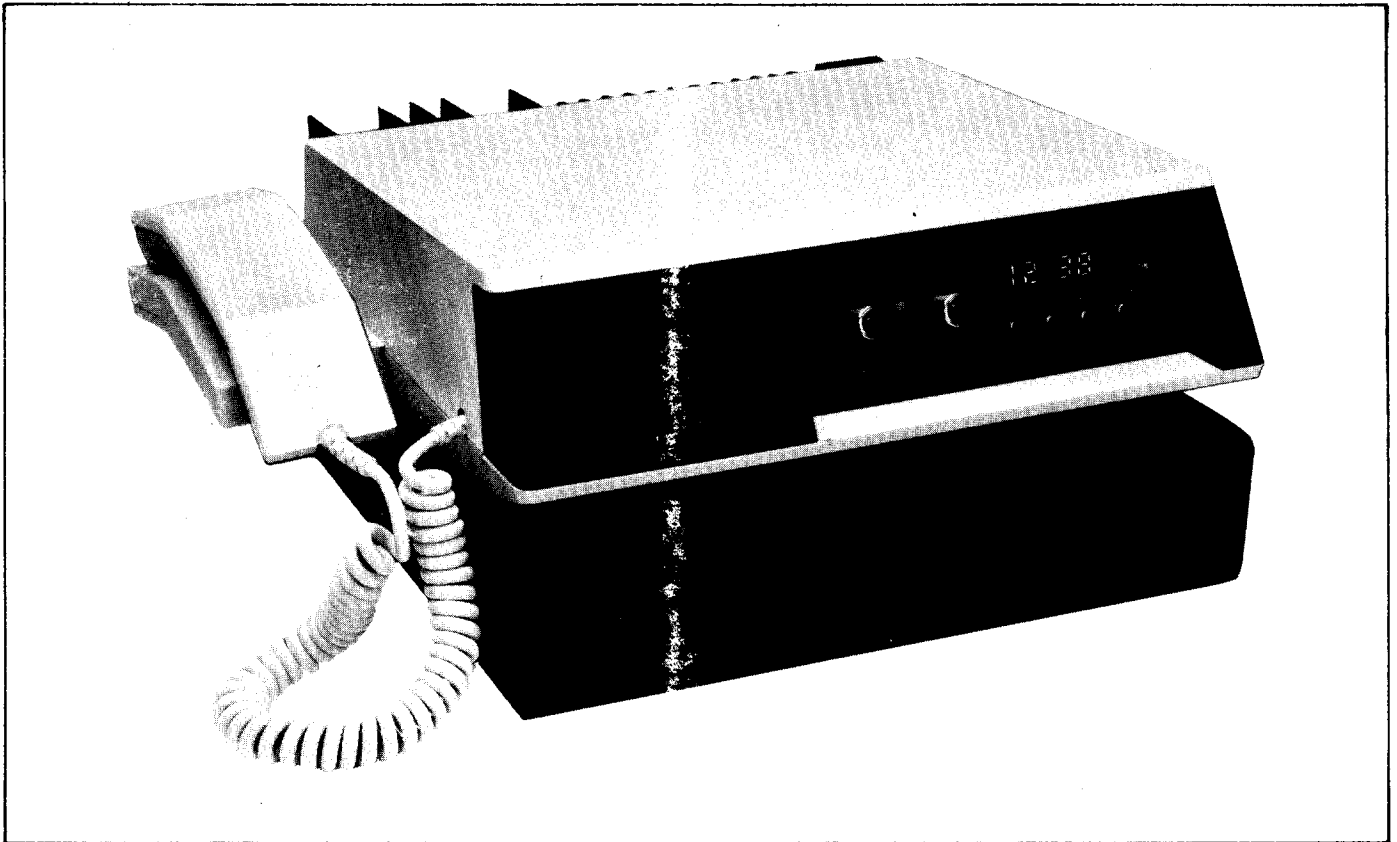




# FLEXAR

## Base/Repeater Station

\* , D, %\$( ) 9%\$!6



**MUST BE USED WITH**  
**FLEXAR Base Station Instruction Manual 68P81035E55**

THIS MANUAL HAS BEEN  
DISCONTINUED

**Instruction Manual**

68P81045E10-B



**CONTENTS**

<i>Section</i>	<i>Number</i>
Specifications . . . . .	Pages iii, iv
FCC Designations . . . . .	Page iv
Options Chart without Duplexer/Circulator . . . . .	Page v
Options Chart with Duplexer/Circulator . . . . .	Page vi
Foreword . . . . .	Pages vii, viii
General Safety Information . . . . .	EPS-28750

**STATION DATA**

<b>DESCRIPTION . . . . .</b>	<b>68P81046E06</b>
Manual Usage . . . . .	Page 1
Equipment Description . . . . .	Page 1
<b>OPERATION . . . . .</b>	<b>68P81045E79</b>
Operation . . . . .	Page 1
Control Functions . . . . .	Page 2
<b>INSTALLATION AND LINE LEVEL ADJUSTMENTS . . . . .</b>	<b>68P81045E97</b>
Preoperational Instructions . . . . .	Page 1
Servicing . . . . .	Page 2
Preoperational Adjustments . . . . .	Page 4
Line Level Setting . . . . .	Page 4
Recommended Test Equipment . . . . .	Page 7
Station Escutcheons, Housing and Hardware Kits . . . . .	Page 7
Metering Adapter Cable Diagram and Parts Lists; Escutcheon and Housing Hardware Kits Parts Lists . . . . .	PEPS-30262
<b>FLEXAR BASE/REPEATER CONTROL . . . . .</b>	<b>68P81045E78</b>
Introduction . . . . .	Page 1
Functional Description . . . . .	Page 1
Repeater Control Board Operation . . . . .	Page 1
Local Control . . . . .	Page 4
Local/Remote Control . . . . .	Page 7
DC Remote Control . . . . .	Page 10
Auto Level . . . . .	Page 11
FLEXAR Base/Repeater Station Cabling & Hardware Kits Parts Lists . . . . .	Page 13
FLEXAR Base/Repeater Station Local & Local/Remote Control Functional Interconnect Diagram . . . . .	Pages 14, 15
FLEXAR Base/Repeater Station DC Remote Control Functional Interconnect Diagram . . . . .	Pages 16, 17

## STATION EQUIPMENT

<b>FILTER BOARD &amp; CONTROL CABLE (TRN8817A)</b> .....	68P81046E11
<b>EXPLODED MECHANICAL VIEW (L357A &amp; L358A SERIES)</b> .....	68P81046E07
<b>REPEATER CONTROL BOARD (TRN8815A)</b> .....	68P81046E08
<b>COMMUNITY REPEATER TONE <i>PRIVATE-LINE</i> ENCODER/DECODER BOARD (TRN4745A)</b> .....	68P81110E55

## TRANSMITTER & RECEIVER

<b>UHF TRANSMITTER &amp; RECEIVER</b> .....	68P81045E98
Introduction .....	Page 1
Metering .....	Page 1
Transmitter Alignment .....	Page 1
Receiver Alignment .....	Page 6
Repeater Alignment .....	Page 9
Duplexer Alignment .....	Page 11
<b>UHF RECEIVER &amp; EXCITER UNIFIED CHASSIS</b> .....	68P81045E99

## FIELD MODIFICATION

<b>FIELD MODIFICATION KIT</b> .....	68P81046E04
General .....	Page 1
Model Application Chart for Field Modification Kits .....	Page 1
Model Complement Chart Field Modification Kits .....	Page 2
Installation .....	Page 3
Field Modification Hardware Kit .....	Page 8
<b>TRN6796B LOCAL/REMOTE CONTROL BOARD INSTRUCTION SECTION</b> .....	68P81045E64
<b>TRN4435A DC REMOTE CONTROL BOARD INSTRUCTION SECTION</b> .....	68P81046E66



## UHF FLEXAR BASE/REPEATER SPECIFICATIONS

### GENERAL

Frequency Range	450-470 MHz
Frequency Separation	5 MHz
Dimensions	6.75" H x 13.1" W X 14.75" D (171mm x 333mm x 375mm)
Weight	30 lbs. (13.8 kgs)
Temperature Range	-30°C to +60°C
Humidity	90-95% relative humidity @50°C
Duty Cycle	Intermittent

### TRANSMITTER

RF Power Output (Note 2)	30 Watts (Factory Installed Options) 30, 15 Watts (Field Modification Kits)
Spurious & Harmonic Emissions (Note 3)	70 dB below carrier
Output Impedance	50 ohms
Frequency Stability	± 0.0002%
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%
Time-Out Time	3 min. (field selectable to 1.5 min.)

### RECEIVER

Selectivity-EIA Sinad	-85 dB
Intermodulation-EIA Sinad	-80 dB
EIA Modulation Acceptance	7 kHz
Sensitivity (Note 2)	0.40 uV or less for 20 dB quieting 0.30 uV or less for EIA Sinad
Frequency Stability	± 0.0005%; -30°C to +60°C (+ 25°C reference)
Spurious and Image Rejection (Note 2)	Greater than 85 dB
Squelch Threshold Sensitivity (Note 2)	Less than 0.2 uV
Audio Output	Line: + 11 dBm with less than 3% distortion, 1 remote console load; + 5 dBm, 2 to 6 remote console loads. Speaker: 3 watts with less than 5% distortion.
Audio Response	Line: + 1, -3 dB from 6 dB/octave de-emphasis (300-3000 Hz) Speaker: + 2, -8 dB from 6 dB/octave de-emphasis (300-3000 Hz)
Hum and Noise (Unsquelled)	Speaker: -50 dB from full rated output Line: -45 dB from full rated output

### REPEATER

Squelch Access Sensitivity (Note 2)	0.40 uV (field adjustable)
Drop-Out Delay	2 sec. (field selectable to 4 sec.)
Time-Out Time	3 min. (field selectable to 1.5 min.)

### CIRCULATOR/DUPLEXER (Optional)

Frequency Range	450-470 MHz
Frequency Separation	5 MHz
Transmit Path Loss/Rx-Tx Isolation	3 dB/65 dB
Receive Path Loss/Tx-Rx Isolation	2.1 dB/65 dB
Antenna to Transmitter Isolation	20 dB
Extension Cable, RF Path Loss	0.5 dB

## SPECIFICATIONS (Cont'd.)

### POWER SUPPLY

AC Requirements	100, 120, 220, 240 V ac $\pm$ 20%, 50/60 Hz
DC Output	13.8 V dc nominal
Current Drain (Nominal)	15/30 W Models
100 V AC	3.6A
120 V AC	3.6A
220 V AC	1.6A
240 V AC	1.5A

#### NOTES:

1. Specifications subject to change without notice.
2. This specification is reduced in base/repeater stations with circulator/duplexer option. See circulator/duplexer specifications for amount of loss.
3. Per EIA specification RS-152B, paragraph 4.

#### FCC Designations

Transmitter	CC432C, 64C, 65C, 66C
Receiver	RC417T

**OPTIONS CHART**  
**FOR**  
**UHF "FLEXAR"**  
**BASE/REPEATER STATIONS**  
**WITHOUT**  
**DUPLEXER/CIRCULATOR**  
**30-WATT RF POWER**

**CODE:**

- = INDICATES ONE ITEM ADDED
- 4 = INDICATES NUMBER ADDED

OPTION	DESCRIPTION	TYPE OF SQUELCH
L358AA	LOCAL CONTROL REPEATER W/MONITOR & REMOTE	CARRIER
L358AB	LOCAL CONTROL REPEATER W/MONITOR, REMOTE & CLOCK	CARRIER
L358AC	LOCAL CONTROL REPEATER W/MONITOR, REMOTE & INTERCOM	CARRIER
L358AD	LOCAL CONTROL REPEATER W/MONITOR, REMOTE, INTERCOM, & CLOCK	CARRIER
L358AE	REMOTE CONTROL REPEATER	"PRIVATE-LINE"
L358AF	LOCAL CONTROL REPEATER W/MONITOR & REMOTE	"PRIVATE-LINE"
L358AG	LOCAL CONTROL REPEATER W/MONITOR, REMOTE & CLOCK	"PRIVATE-LINE"
L358AH	LOCAL CONTROL REPEATER W/MONITOR, REMOTE, & INTERCOM	"PRIVATE-LINE"
L358AJ	LOCAL CONTROL REPEATER W/MONITOR, REMOTE, INTERCOM & CLOCK	"PRIVATE-LINE"
L358AK	REMOTE CONTROL REPEATER	"PRIVATE-LINE"
L358AL	LOCAL CONTROL REPEATER W/MONITOR & REMOTE	"DIGITAL PRIVATE-LINE"
L358AM	LOCAL CONTROL REPEATER W/MONITOR, REMOTE AND CLOCK	"DIGITAL PRIVATE-LINE"
L358AN	LOCAL CONTROL REPEATER W/MONITOR, REMOTE, CLOCK AND INTERCOM	"DIGITAL PRIVATE-LINE"
L358AP	LOCAL CONTROL REPEATER W/MONITOR, REMOTE, INTERCOM & CLOCK	"DIGITAL PRIVATE-LINE"
L358AQ	REMOTE CONTROL REPEATER	"DIGITAL PRIVATE-LINE"
L360AA	LOCAL CONTROL COMMUNITY REPEATER W/MONITOR & REMOTE	"PRIVATE-LINE"
L360AB	LOCAL CONTROL COMMUNITY REPEATER W/MONITOR, REMOTE AND CLOCK	"PRIVATE-LINE"
L360AC	LOCAL CONTROL COMMUNITY REPEATER, REMOTE & INTERCOM	"PRIVATE-LINE"
L360AD	LOCAL CONTROL COMMUNITY REPEATER W/MONITOR, REMOTE, INTERCOM & CLOCK	"PRIVATE-LINE"
L360AE	REMOTE CONTROL COMMUNITY REPEATER	"PRIVATE-LINE"

ITEM	DESCRIPTION
TKN8035A	REPEATER INTERCONNECT CABLE
TRN4301A	ESCUTCHEON FOR REPEATER W/MONITOR & REMOTE
TRN4302A	ESCUTCHEON FOR REPEATER W/ MONITOR, REMOTE & CLOCK
TRN4303A	ESCUTCHEON FOR REPEATER W/ MONITOR, REMOTE & INTERCOM
TRN4304A	ESCUTCHEON FOR REPEATER W/ MONITOR, REMOTE, INTERCOM & CLOCK
TRN8811A	NON-DUPLEXER HARDWARE KIT
TRN8815A	REPEATER CONTROL BOARD
TRN8817A	FILTER BOARD AND CONTROL CABLE
KLN6209A	"VIBRASPONDER" RESONANT REED
TRN6005A	CODE PLUG
TRN8833A	tone "PRIVATE-LINE" ENCODER/DECODER
TRN6207A	"DIGITAL PRIVATE-LINE" ENCODER/DECODER
TUE1603AB	UNIFIED CHASSIS (RCVR ONLY); 1-FREQ.
TUE1613AB	UNIFIED CHASSIS (XMTR ONLY) 1-FREQ.; 30-WATT
TKN8192A	RECEIVER CABLE
TRN4745A	COMMUNITY REPEATER TONE "PRIVATE-LINE" ENCODER/DECODER BOARD
TRN4319A	COMMUNITY REPEATER HARDWARE KIT

**OPTIONS CHART  
FOR  
UHF "FLEXAR"  
BASE/REPEATER STATIONS  
WITH  
DUPLEXER/CIRCULATOR  
15-WATT RF POWER**

OPTION	DESCRIPTION	TYPE OF SQUELCH
L357AA	LOCAL CONTROL REPEATER W/DUPLEXER-CIRCULATOR W/MONITOR & REMOTE	CARRIER
L357AB	LOCAL CONTROL REPEATER W/DUPLEXER-CIRCULATOR W/MONITOR, REMOTE & CLOCK	CARRIER
L357AC	LOCAL CONTROL REPEATER W/DUPLEXER-CIRCULATOR W/MONITOR, REMOTE & INTERCOM	CARRIER
L357AD	LOCAL CONTROL REPEATER W/DUPLEXER-CIRCULATOR W/MONITOR, REMOTE, INTERCOM & CLOCK	CARRIER
L357AE	REMOTE CONTROL REPEATER W/DUPLEXER-CIRCULATOR	CARRIER
L357AF	LOCAL CONTROL REPEATER W/DUPLEXER-CIRCULATOR W/MONITOR & REMOTE	"PRIVATE-LINE"
L357AG	LOCAL CONTROL REPEATER W/DUPLEXER-CIRCULATOR W/MONITOR, REMOTE & CLOCK	"PRIVATE-LINE"
L357AH	LOCAL CONTROL REPEATER W/DUPLEXER-CIRCULATOR W/MONITOR, REMOTE & INTERCOM	"PRIVATE-LINE"
L357AJ	LOCAL CONTROL REPEATER W/DUPLEXER-CIRCULATOR W/MONITOR, REMOTE, INTERCOM & CLOCK	"PRIVATE-LINE"
L357AK	REMOTE CONTROL REPEATER W/DUPLEXER-CIRCULATOR	"PRIVATE-LINE"
L357AL	LOCAL CONTROL REPEATER W/DUPLEXER-CIRCULATOR W/MONITOR & REMOTE	"DIGITAL PRIVATE-LINE"
L357AM	LOCAL CONTROL REPEATER W/DUPLEXER-CIRCULATOR W/MONITOR, REMOTE & CLOCK	"DIGITAL PRIVATE-LINE"
L357AN	LOCAL CONTROL REPEATER W/DUPLEXER-CIRCULATOR W/MONITOR, REMOTE & INTERCOM	"DIGITAL PRIVATE-LINE"
L357AP	LOCAL CONTROL REPEATER W/DUPLEXER-CIRCULATOR W/MONITOR, REMOTE, INTERCOM & CLOCK	"DIGITAL PRIVATE-LINE"
L357AQ	REMOTE CONTROL REPEATER W/DUPLEXER-CIRCULATOR	"DIGITAL PRIVATE-LINE"
L359AA	LOCAL CONTROL COMMUNITY REPEATER W/MONITOR & REMOTE	"PRIVATE-LINE"
L359AB	LOCAL CONTROL COMMUNITY REPEATER W/MONITOR & REMOTE & CLOCK	"PRIVATE-LINE"
L359AC	LOCAL CONTROL COMMUNITY REPEATER W/MONITOR & REMOTE & INTERCOM	"PRIVATE-LINE"
L359AD	LOCAL CONTROL COMMUNITY REPEATER W/MONITOR, REMOTE, INTERCOM, & CLOCK	"PRIVATE-LINE"
L359AE	REMOTE CONTROL COMMUNITY REPEATER	"PRIVATE-LINE"

**CODE:**

- = INDICATES ONE ITEM ADDED
- 4 = INDICATES NUMBER ADDED

ITEM	DESCRIPTION
TKN8035A	REPEATER INTERCONNECT CABLE
TKN8112A	RF CABLE; 18-INCH
TLE4193A	CIRCULATOR (450-470 MHz)
TRN4301A	ESCUTCHEON FOR REPEATER W/MONITOR & REMOTE
TRN4302A	ESCUTCHEON FOR REPEATER W/MONITOR, REMOTE & CLOCK
TRN4303A	ESCUTCHEON FOR REPEATER W/MONITOR, REMOTE & INTERCOM
TRN4304A	ESCUTCHEON FOR REPEATER W/MONITOR, REMOTE AND CLOCK
TRN8810A	DUPLEXER HARDWARE KIT
TRN8815A	REPEATER CONTROL BOARD
TRN8817A	FILTER BOARD AND CONTROL CABLE
KLN6209A	"VIBRASPONDER" RESONANT REED
TRN6005A	CODE PLUG
TRN8833A	-tone "PRIVATE-LINE" ENCODER/DECODER
TUE6207A	"DIGITAL PRIVATE-LINE" ENCODER/DECODER
TUE1603AB	UNIFIED CHASSIS (RCVR ONLY); 1-FREQ.
TUE1613AB	UNIFIED CHASSIS (XMTR ONLY); 1-FREQ.; 30-WATT
TKN8191A	DUPLEXER CABLE
TRN4745A	COMMUNITY REPEATER TONE "PRIVATE-LINE" ENCODER/DECODER BOARD
TRN4319A	COMMUNITY REPEATER HARDWARE

### TAB 1. STATION DATA

DESCRIPTION .....	68P81046E06
OPERATION .....	68P81045E79
INSTALLATION AND LINE LEVEL ADJUSTMENTS .....	68P81045E97
FLEXAR BASE/REPEATER CONTROL .....	68P81045E78

### TAB 2. STATION EQUIPMENT

EXPLODED MECHANICAL VIEW (L357A & L358A SERIES) .....	68P81046E07
REPEATER CONTROL BOARD (TRN8815A) .....	68P81046E08
FILTER BOARD & CONTROL CABLE (TRN8817A) .....	68P81046E11
COMMUNITY REPEATER TONE <i>PRIVATE-LINE</i> ENCODER/DECODER BOARD (TRN4745A) .....	68P81110E55

### TAB 3. TRANSMITTER & RECEIVER

UHF TRANSMITTER & RECEIVER .....	68P81045E98
----------------------------------	-------------

### TAB 4. FIELD MODIFICATION

FIELD MODIFICATION KIT .....	68P81046E04
------------------------------	-------------





**1. MANUAL USAGE**

This manual is intended to be used with and as a supplement to the FLEXAR Instruction Manual 68P81035E55. This manual contains information concerning base/repeater station operation, installation and line level adjustments, control, UHF transmitter and receiver, field modification, and applicable schematics, circuit board details and parts lists.

**2. EQUIPMENT DESCRIPTION**

The FLEXAR Base/Repeater Station is based on current FLEXAR technology and utilizes a separate transmitter and receiver rf chassis for duplex repeater and simplex base station operation. The base/repeater station is available as a factory installed option to standard FLEXAR models and also as field installed modification kits. Refer to the attached option charts for information concerning a specific application.

**NOTE**

The FLEXAR Base/Repeater Station is rated for intermittent duty application only. It is not designed for multi-station site operation.

The station is comprised of two housing assemblies: a base station with a transmit only rf chassis replacing the original transmitter/receiver unit, and a separate repeater housing with a receive only rf chassis, and repeater control logic (and duplexer/circulator units on stations with duplexer option). The two housings are interconnected with an 18" filtered control cable (and an 18" coaxial cable on duplexer stations). This configuration allows integral positioning with the base station housing and provides the isolation required for repeater operation.

All stations include 2 PPM transmit frequency stability circuitry for compliance with FCC regulations. Field Modification Kits also provide 2 PPM circuitry. Receiver frequency stability remains at 5 PPM.

Station options with duplexer include a transmitter isolator (circulator with built in 50-ohm load) with integral harmonic filter. The duplexer used is a compact reject type, which permits considerable savings in size, weight and cost.

**NOTE**

A reject (notch) type duplexer is different than the bandpass type duplexer typically used in site type stations, in that the reject type requires a critical alignment.

Since the FLEXAR Base/Repeater Station is not designed for multi-station site operation, a reject duplexer is ideal for desk top repeater operation. The circulator/harmonic filter is not only required for isolation, but also is necessary for stable transmitter power amplifier operation.

The transmitter rf output is cabled to the repeater housing, where the circulator and duplexer are located. The circulator provides 20 dB transmitter IM protection (UHF frequencies) and assures proper loading of the transmitter into the reactive duplexer load. Insertion losses with the duplexer/circulator option are 3 dB in the transmit path and 2.1 dB in the receive path. The circulator also contains a multi-section low pass filter for attenuation of circulator produced harmonics.

**NOTE**

The control cable is filtered to further reduce the possibility of interference which will degrade the performance of the station.

The control cabling attaches to the base station metering connector (J601) and a system metering connector (J801) is provided on the repeater housing.

The cabling is 18" standard with optional (L151A Series) 10' extension cabling available, as follows:

- TKN8110A Control Cable 10' Extension Kit
- TKN8111A RF Cable 10' Extension Kit

DESCRIPTION

The control cable plugs into the existing 18'' filtered control cable, and the rf cable replaces the existing 18'' rf cable.

The extension cabling is available as a factory installed option or as a field installed modification. The

cabling permits wall mounting or remote placement of the repeater housing in space sensitive installations. Four mounting holes are provided in the repeater housing (however, mounting hardware is not provided).

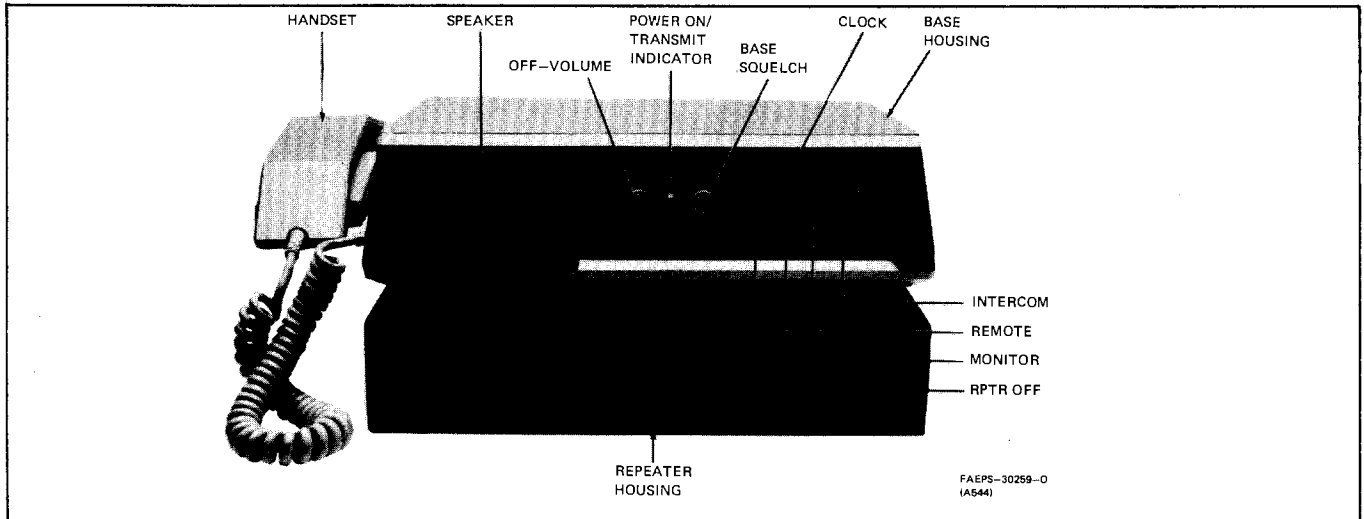


Figure 1. FLEXAR Base/Repeater Station

**1. OPERATION**

**1.1 GENERAL**

Become familiar with your particular station and any optional accessories included with it. Study the function of each control on your equipment before operating the station. DC remote control models have no front panel controls; refer to Installation and Line Level Adjustments instruction section.

Make sure the handset is on hook before starting operation. The handset contains a magnetically operated switch and must be on hook to unmute the speaker.

**NOTE**

Before transmitting, allow a 20 minute warm-up time for crystal heater stabilization.

Before messages can be received, after turn-on, allow a 10 second delay for station initialization.

**1.2 TURN-ON**

Step 1. Turn OFF-VOLUME control clockwise to turn station on. The Power On/Transmit indicator should light.

Step 2. Depress RPTR OFF button then momentarily depress the PTT button to select mode in local/remote or dc remote models.

Step 3. Depress MONITOR button (coded squelch radio models only).

Step 4. Turn SQUELCH control fully counterclockwise.

Step 5. Adjust OFF-VOLUME control for desired listening level.

Step 6. Turn SQUELCH control clockwise until background noise is eliminated. For a coded squelch model, momentarily depress the TRANSMIT (PTT) button on the handset to switch the station from the monitor mode to the coded squelch mode.

OPERATION

Step 7. To switch the station from the base mode to the repeater mode, set the RPTR OFF button to the out position, then momentarily depress the PTT button on Local/Remote or DC Remote models.

### 1.3 TO ANSWER A CALL

Step 1. Lift handset off hook. Speaker is muted and received audio is heard in handset earpiece until handset is replaced on hook.

Step 2. Depress the TRANSMIT (PTT) button on handset to talk. The Power On/Transmit indicator should flash during transmission.

Step 3. Release TRANSMIT button to listen.

Step 4. When call is complete, hang up handset.

#### NOTE

A local or remote call may be made whether or not the RPTR OFF button is depressed since a local or remote transmission has priority over a repeated transmission.

### 1.4 TO MAKE A CALL

Step 1. Depress MONITOR button to check that channel is clear.

Step 2. Lift handset off hook.

Step 3. Depress TRANSMIT (PTT) button to talk. Note that Power On/Transmit indicator flashes.

Step 4. State station call sign (FCC requirement) and message.

Step 5. Release TRANSMIT (PTT) button to listen.

Step 6. When call is complete, hang up handset.

### 1.5 INTERCOM OPERATION

#### 1.5.1 With Handset

Lift handset off hook and talk, *DO NOT* depress PTT button.

#### 1.5.2 With Optional Desk Microphone

Depress INTERCOM button and talk into the microphone. *Release* the INTERCOM button to listen. *DO NOT depress the PTT button* while operating the intercom.

## 2. CONTROL FUNCTIONS

### 2.1 FRONT PANEL

- **OFF-VOLUME** — Turns station on and off and adjusts speaker volume.
- **Power On/Transmit Indicator** — Steady light indicates station is on, flashing light indicates transmitter is keyed.
- **BASE SQUELCH** — Operational only when station is in base mode (RPTR OFF button depressed). Allows operator to set base receiver squelch so that only signals above that squelch level are heard. Weaker signals and background noise are eliminated.
- **RPTR OFF** — Selects base mode when depressed; selects repeater mode when out. Depress PTT momentarily after selection on Local/Remote or DC Remote models.
- **MONITOR** — Unsquels receiver to monitor channel before transmitting.
- **REMOTE** — Inhibits remote control with button out; enables remote control with button in. Intercom operation is not affected by this switch.
- **INTERCOM** — (optional, used only with desk microphone option) — Enables communications between the station (using desk microphone) and remote control positions without keying the transmitter.

### 2.2 HANDSET

- **PTT BUTTON** — Keys transmitter for local operation.

### 2.3 DESK MICROPHONE (OPTIONAL)

- **TRANSMIT** — Keys transmitter for local operation.
- **MONITOR** — Unsquels receiver to monitor channel before transmitting.

### 2.4 DIGITAL CLOCK (OPTIONAL)

- **CLOCK TEST SWITCH** — Up position for rapid advance, down position for slow advance.
- **CLOCK DISPLAY** — Displays time in a 12-hour (100 at 1 P.M.) or 24-hour (1300 at 1 P.M.) format. AC power interruption is indicated by a continuously displayed 1200 (12-hour format) or displayed 0000 with blinking lead zero (24-hour format). Use Clock Set switch to reset clock.

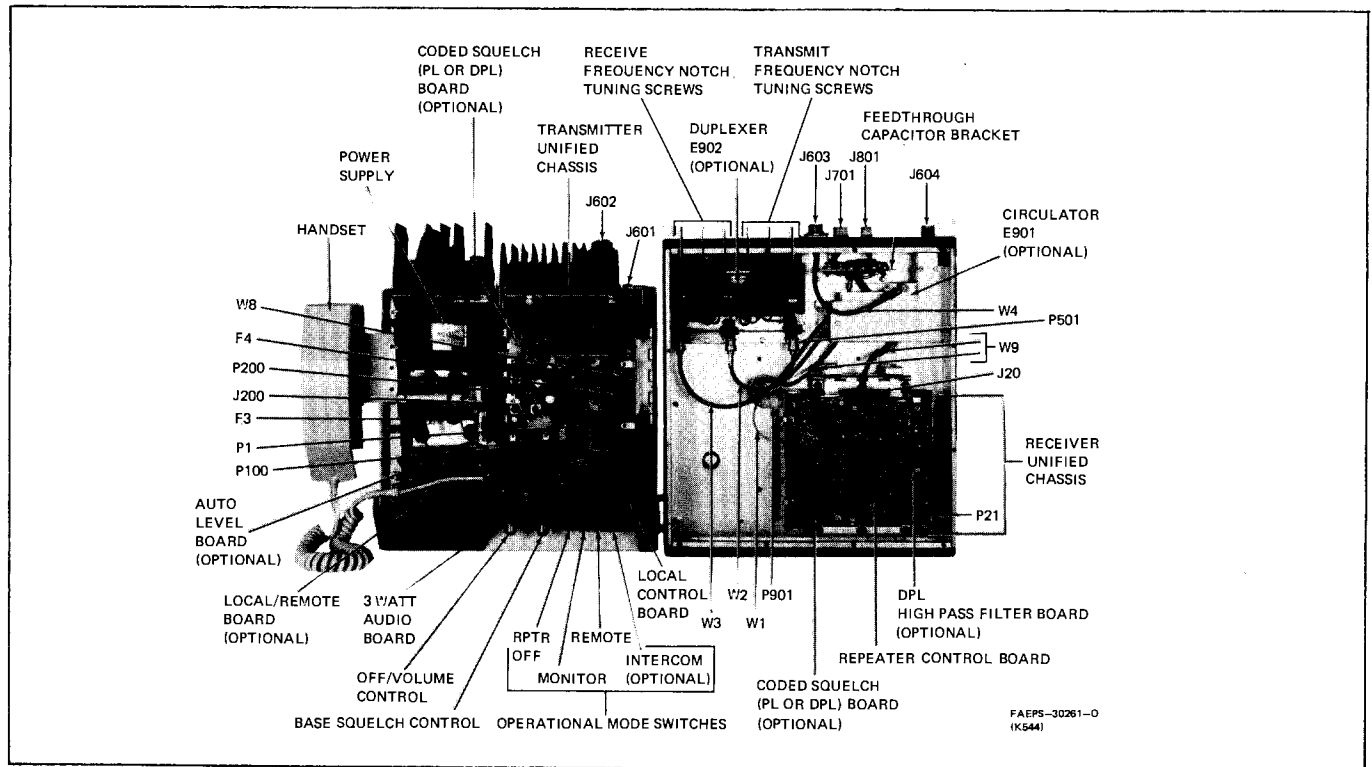


Figure 1. FLEXAR Radio Set Rear Detail

## 1. PREOPERATIONAL INSTRUCTIONS

When unpacking the station from its shipping carton, refer to the option charts at the front of this manual. If any item is missing, contact your Motorola representative immediately.

After unpacking and verifying that all items are present, interconnect the base station housing and the repeater housing as follows:

1. Connect P701 of W7 to J701 (labeled CONTROL) on the repeater housing.

2. On non-duplexer stations, the transmit antenna will be connected to transmitter rf output connector J602 (on the base station housing), and the receive antenna will be connected to UHF input connector J603 (labeled INPUT) on the repeater housing.
3. On duplexer stations, connect the TKN8112A 18' RF Cable (identified W12) between J602 and J603. The antenna will be connected to antenna output connector J604 (labeled OUTPUT) on the repeater housing.

### NOTE

System metering jack connector J801 (labeled METER) is located on the repeater housing.

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 license. No license is required to install, check out, or operate the radio.

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.

The radio should be tested with all cables and accessories supplied 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. When planning the installation, keep the antenna cable run as short as possible and connect it to the antenna jack (J602 and J603 in radios without a circulator/duplexer or J604 in radios with a circulator/duplexer) on the rear of the station.

The power source for the station is normally 120 V ac, but other ac voltages are available. If the station is to be powered via 120 V ac, provide a grounded 3-wire convenience outlet within reach of the station ac line cord.

If the station is to be powered by an ac voltage other than 120 V ac, refer to the primary winding connection chart shown in the TPN1176A Power Supply Instruction Section 68P81045E98. In addition to the information presented there, external connection to the source of ac power must be made in accordance with local electrical code. For example, a 220 V ac external connection may require that the 3-prong ac plug be removed from the line cord, and a direct, hard-wired connection be made to the 220 V ac source, with a second fuse installed in the second hot lead, AND a separate earth ground be supplied to the station.

The screw terminals located on the bottom of the station (on TB-2) are used for DC remote control connections, paging, and optional microphone connections. Refer to Figure 1, Table 1 and Table 2 for connections.

*Table 1. Optional Microphone Connections*

Figure 1 Reference	TMN1005B Microphone Connection
MIC HI	Brown
MIC LOW	Brown Lead Shield
PTT	Green
MON	White
GND	Black

Note: JU1 is always installed (in microphone) when the TMN1005B Microphone is used.

*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.

### CAUTION

For protection against lightning induced transients, install Model RRX4021 Telephone Line Transient Suppressor Kit (or equivalent) across control lines which are located in close proximity to power lines (indoors) or are run outdoors.

The RRX4021 Telephone Line Transient Suppressor Kit provides protection for the station from high voltage transients or lightning induced surges. The phone line suppressor consists of a three-element gas tube that provides very high resistance (approximately 10<sup>9</sup> ohms) across the audio control line surge conditions, the gas tube will operate to instantaneously discharge the overvoltage surge to ground. After the surge is dissipated, the service will be restored to normal through the self-restoring feature of the gas tube.

The telephone line transient suppressor should be located as near as is practical to the best available ground, distance not to exceed 50 feet from the grounding medium. Attach the protector to wooden surfaces using wood screws that penetrate the holding surface at least 3/4 inch (1-1/2" #10 screws in most cases are sufficient). Use 1/4 inch nylon anchors in masonry and 3/8 inch hollow wall fasteners on hollow surfaces. Use an 8 AWG ground wire (not to exceed 50 feet in length) or follow local electrical codes, as applicable, to ground the protector ground terminal. Run the ground wire in cable clamps or station wire nails. Never run the ground wire in drive rings or metal pipes unless the pipes are electrically connected to the ground wire at both ends of the pipe.

Connect the ring and tip leads to the two outside terminals of the protector, and from there to the station LN+ and LN- terminals on TB-2. All the wiring to the protector is fed through the wire entrance grommet on the bottom of the unit. The wire entrance grommet is designed such that when the wires are pushed through, a moisture barrier is provided.

## 2. SERVICING

### 2.1 BASE HOUSING REMOVAL

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

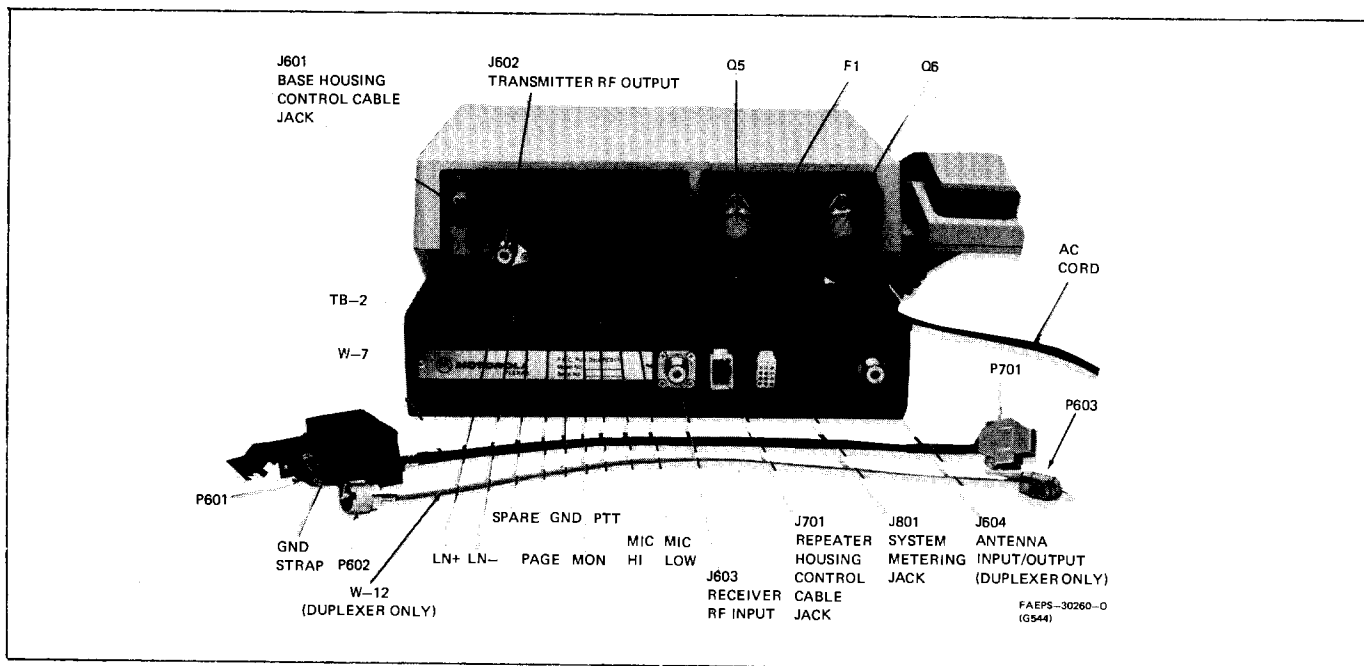


Figure 2. Circuit Board Location

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

panel must be removed. The boards are then removed by unscrewing the captive screws that secure the boards to the housing. (Board locations are shown in Figure 2.)

### 2.1.1 Transmitter RF Section Removal

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

### 2.1.2 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 power supply heatsink. The heatsink folds out for servicing.

### 2.1.3 Circuit Board Removal

To facilitate the removal of circuit boards, the transmitter should be folded out and the power supply removed. When removing the local board, the volume and squelch knobs located on the base station front

### 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.

## 2.2 REPEATER HOUSING COVER REMOVAL

Step 1. Turn the housing over, exposing the bottom cover.

Step 2. Remove the twelve screws fastening the cover to the repeater housing.

### 2.2.1 Receiver RF Section Removal

The receiver rf section folds outward on a hinge for ease of servicing. It can be folded outward by removing the three screws which secure the receiver chassis to the repeater housing.

### 2.2.2 Circulator/Duplexer

The circulator & duplexer are not field repairable. If defective, replace with new unit(s). To align duplexer, remove mounting screws disconnect from station and adjust as described in the alignment instruction section.

## 2.3 SERVICING PROCEDURE

When servicing local or local/remote model receiver and transmitter sections, move JU11 (on the local control board) from pin N (normal) to pin T (test). When servicing dc remote control models, the radio must be momentarily keyed to select repeater setup or knock-down. Also, before keying, the jumper labeled LIN DIS (line disable) should be repositioned to the DIS (disable) pin. Actual setup/knockdown selection is accomplished by repositioning the REM (remote) jumper to the desired frequency pin, before keying.

### NOTE

For repeater applications:  
Pin F1 corresponds to setup;  
Pin F2 corresponds to knockdown;  
Pin F1 PG corresponds to page.

### 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.

To properly key dc remote control models when servicing either the receiver or transmitter sections, use a TMN6067A Service Handset. If a service handset is not available, momentarily ground P4-4, on the dc remote control board, to key the radio.

### NOTE

Keying of the radio with a portable test set or a TEK-5 metering panel, will not switch locally selected repeater setup or knockdown.

## 3. PREOPERATIONAL CHECK OUT

Insure that all external equipment (remote control units, paging units, etc.), if used, is properly connected and functioning correctly. The following general tests may be used to verify proper operation of the FLEXAR base station:

1. Power Output Measurement
2. Transmitter Frequency Measurement
3. Transmitter Deviation Measurement
4. 20 dB Receiver Quieting Measurement (with RPTR OFF button depressed)
5. VSWR Measurement (if greater than 3:1, check the antenna installation)
6. Base squelch operation (PL and DPL encode/decode operation)
7. Repeater setup/knockdown operation
8. Base PTT operation
9. Time-Out Timer circuit operation
10. Repeater squelch setting
11. Repeater deviation setting.

### NOTE

Before transmitting, allow 20-minute warm-up time for crystal heater stabilization.

Before messages can be received, after turn-on, allow a 10 second delay for station initialization.

Refer to the receiver and transmitter alignment procedures for the general test procedures. For "Private-Line" or "Digital Private-Line" models check operation, where applicable, with and without coded squelch.

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. 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 switch, located on the front panel of the FLEXAR station, must be depressed to enable remote control operation.

### 4.1 REMOTE CONTROL DC CURRENT LEVEL SETTING.

FLEXAR Local/Remote and DC Remote Control Base/Repeater stations use the detection of various levels and directions of remote control currents to activate the various remote control functions.

Any remote controller that is used to provide proper control of the FLEXAR Base/Repeater Station must have 2-frequency (F1/F2) capability, where the F1 selection current (+ 5.5 mA) corresponds with repeater setup and the F2 selection current (+ 12.5 mA) corresponds with repeater knockdown. Table 4 illustrates the dc line currents employed.

Table 4. DC Line Currents

Function	Current and Direction Level
PL Monitor	-2.5 mA
Key & Repeater Setup	+ 5.5 mA
Key & Repeater Knockdown	+ 12.5 mA
Page & Repeater Setup	-12.5 mA

Proper system operation may require the modification of any 1-frequency SERIES-80 Desk Top Controller to a 2-frequency unit in order to control the



base/repeater station. If required, a F1/F2 Switch Kit is available for field installation. Also, the TRN8809A Repeater Button Accessory Kit, is then required to change the button legend to read RPTR OFF instead of F2. This latter kit is also required to modify an existing 2-frequency SERIES-80 Desk Top Controller.

#### NOTE

When modifying an existing SERIES-80 Desk Top Controller, have a replacement escutcheon of the proper color and with the correct holes and slots available before removing the existing escutcheon.

Use of the remote controller in the base/repeater system will override locally setup base/repeater operational modes. This means that if local operation has setup repeater mode, the use of the remote F2 current will knockdown the repeater. Also, if local operation has knocked-down the repeater mode, the use of the remote F1 current will setup the repeater. Finally, if local operation has knocked-down the repeater mode, the use of the F1 PAGE current will setup the repeater. See Table 4.

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 (REM) position to allow remote control.

## 4.2 LEVEL SETTING FOR LOCAL/REMOTE MODELS

### IMPORTANT

In models with a circulator/duplexer, disconnect the TKN8112A Housing RF Interconnect Cable from Transmitter RF Output jack (J602) on the base station housing, and disconnect the Receiver RF Input Cable (W1) plug (P501) from the Duplexer Rx Input Jack. Reconnect cables after completing line level settings.

#### 4.2.1 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  $\pm 3$  kHz deviation to receiver rf input cable (W1) plug (P501).

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 receiver line level control labeled RL (R6) 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 transmitter rf output jack (J602).

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

Step 8. Ground the pin labeled TEST on the local/remote board. This step keys the transmitter.

Step 9. Adjust the exciter level control labeled EX (R15) on the local/remote board for a level 3 dB above the modulation sensitivity level ( $\pm 3$  kHz deviation).

#### NOTE

Modulation sensitivity level plus 3 dB is 3 dB above the level required for  $\pm 3$  kHz deviation. If a deviation monitor is not available, 225 mV at P100-6 will approximate the level required. Local or remote audio is set 3 dB above the modulation sensitivity level and repeated audio is set 6 dB above the modulation sensitivity level to allow both types of transmission to be received at approximately the same loudness level.

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/repeater 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 the incoming level from the control point is -10 dBm, due to path loss, the receiver output level should be also set -10 dBm at the base station.

#### 4.2.2 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  $\pm 3$  kHz deviation to receiver rf input cable (W1) plug (P501).

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 receiver line level control labeled RL (R6) 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 transmitter rf output jack (J602).

Step 8. Connect a 1 kHz audio oscillator across the LN+ and LN- terminals and adjust for 0 dBm. Ground the base of Q4 on the auto level board.

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

Step 10. Adjust the exciter level control labeled EX (R15) on the local/remote board for a level 3 dB above the modulation sensitivity level ( $\pm 3$  kHz deviation).

#### NOTE

Modulation sensitivity level plus 3 dB is 3 dB above the level required for  $\pm 3$  kHz deviation. If a deviation monitor is not available, 225 mV at P100-6 will approximate the level required. Local or remote audio is set 3 dB above the modulation sensitivity level and repeated audio is set 6 dB above the modulation sensitivity level to allow both types of transmission to be received at approximately the same loudness level.

Step 11. Remove the grounds connected in Step 8 and 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. Connect an audio oscillator (160 mV at 1 kHz) to P100-6 and an ac voltmeter to the pin labeled "A" on the TRN6822A Auto Level Board. Adjust microphone level control ML (R20) on the 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  $0 \pm 2$  dB; if JU1 and JU2 are out, the reading should be  $+11 \pm 2$  dB.

### 4.3 LEVEL SETTING FOR DC REMOTE CONTROL MODELS

#### IMPORTANT

In models with a circulator/duplexer, disconnect the TKN8112A Housing RF Interconnect Cable from Transmitter RF Output Jack (J602) on the base station housing, and disconnect the Receiver RF Input Cable (W1) plug (P501) from the Duplexer Rx Input Jack. Reconnect cables after completing line level settings.

#### 4.3.1 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  $\pm 3$  kHz deviation to receiver rf input cable (W1) plug (P501).

Step 3. Slide PL MON switch S1 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 receiver line level control LINE R14 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 transmitter rf output jack (J602).

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 exciter level control XMIT R32 on the dc remote board for a level 3 dB above the modulation sensitivity level ( $\pm 3$  kHz deviation).

#### NOTE

Modulation sensitivity level plus 3 dB is 3 dB above the level required for  $\pm 3$  kHz deviation. If a deviation monitor is not available, 225 mV at P100-6 will approximate the level required. Local or remote audio is set 3 dB above the modulation sensitivity level and repeated audio is set 6 dB above the modulation sensitivity level to allow both types of transmission to be received at approximately the same loudness level.

Step 10. Release handset PTT.

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

#### 4.3.2 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  $\pm 3$  kHz deviation to receiver rf input cable (W1) plug (P501).

Step 4. Slide PL MON switch S1 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 receiver line level control LINE R14 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 transmitter rf output jack (J602).

Step 8. Connect a 1 kHz audio oscillator across the LN+ and LN- terminals and adjust for 0 dBm. Ground the base of Q4 on the auto level board.

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

Step 10. Adjust exciter level control XMIT R32 on the dc remote board for a level 3 dB above the modulation sensitivity level ( $\pm 3$  kHz deviation).

##### NOTE

Modulation sensitivity level plus 3 dB is 3 dB above the level required for  $\pm 3$  kHz deviation. If a deviation monitor is not available, 225 mV at P100-6 will approximate the level required. Local or remote audio is set 3 dB above the modulation sensitivity level and repeated audio is set 6 dB above the modulation sensitivity level to allow both types of transmission to be received at approximately the same loudness level.

Step 11. Release handset PTT.

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

## 5. RECOMMENDED TEST EQUIPMENT

The test equipment recommended for FLEXAR Base/Repeater radio servicing is listed in Table 5. Use of the SKN6029A/30A Adapter Cables with a TEK-5 Meter Panel or S1056-59 Portable Test Set is given on metering adapter cable diagram PEPS-30262.

## 6. STATION ESCUTCHEONS, HOUSING AND HARDWARE KITS

The parts listed for these various kits are given on Metering Adapter Cable Diagram PEPS-30262.

Table 5. Recommended 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, S1340	Measurement range: 100 uV - 3 V from 1 MHz-900 MHz Inputs: 50 ohms and high impedance
Digital Multimeter	DC Voltage reading requiring high accuracy	Motorola R1001	Measurement range: 0-1000 V dc Accuracy: $\pm 0.1\%$ of reading + 1 digit + 15 to 35°C
Oscilloscope	Waveform Observation	Motorola R1004; dual trace; 15 MHz	Vertical sensitivity: 10 mV - 10 V/division Horizontal time base: 1 usec. - 1 sec/division

Table 5. (Cont'd.) Recommended Test Equipment for FLEXAR Radio Servicing

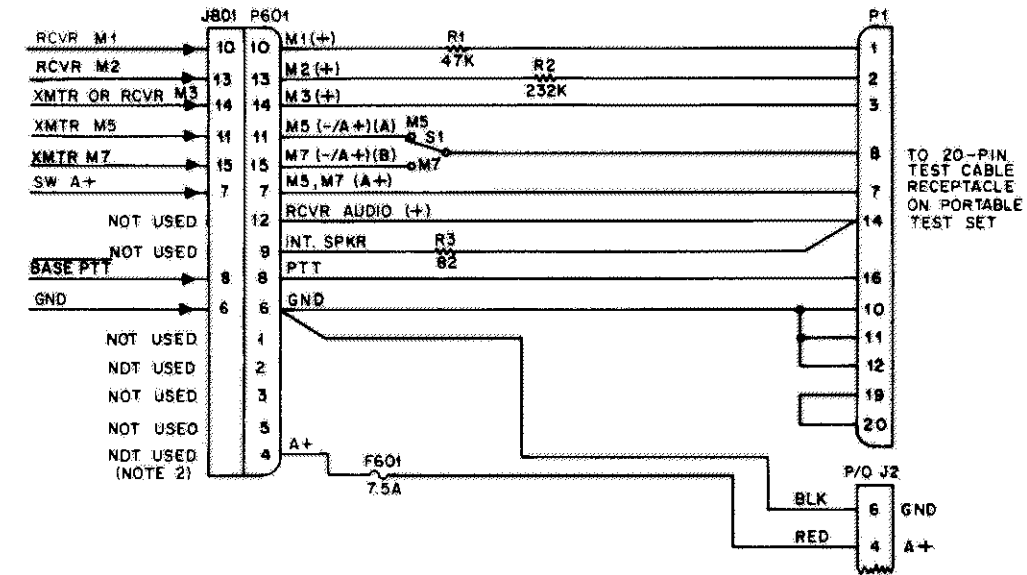
General Type	Application	Recommended Model	Min. Specifications
RF Wattmeter	Transmitter Output Power Measurements	Motorola S1350 with appropriate element and T1013 RF Dummy Load	Measurement range: 0-30 Watts
Frequency Meter	Transmitter Frequency Measurement	Motorola R1200 Series Service Monitor, S1343 Series, or S1344 Series.	Measurement range: 450-470 MHz Frequency resolution: 10 Hz
Deviation Meter	Transmitter Modulation Deviation Measurement	Motorola S1344 (450-470 MHz)	Measurement range: 0-5 kHz deviation Frequency Range: 450-470 MHz
RF Signal Generator	Receiver Alignment and Troubleshooting	Motorola S1329 or S1342	Frequency Range (450-470 MHz) Output Level: 0.1 uV-100.000 uV. Must be capable of at least $\pm 3$ 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 SLN6221	Frequency Range: 50 Hz-200 Hz Output Level: 0-500 mV
DPL Test Set**	"Digital Private-Line" Encoder-Decoder Troubleshooting	Motorola SLN6413	
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 S1056-59 Portable Test Set, TEK5B or C Metering Panel with TEK40 Conversion kit, or TEK5E Metering Panel.	
10.7 MHz Signal Source	Adjustment of Receive Frequency		1 mV Output Accuracy $\pm 10$ Hz
Tuning Tool Kit	Receiver and Transmitter Alignment	Motorola TRN6210A	
Stepped Attenuator	Duplexer Alignment	Narda 4705-99	0-99 dB Dynamic Range
Fixed Attenuator	Duplexer Alignment	Narda 771	6 dB Pad

\*Required for Tone-Coded "Private-Line" Models only.

\*\*Required for "Digital Private-Line" Models only

HOW TO USE MODELS S1056-59 PORTABLE TEST SET WITH SKN6030A METERING ADAPTER CABLE

METERING POINT	TEST SET METER SELECTOR SWITCH POSITION	RCVR XMTR ACCESSORIES SWITCH POSITION	METER OFF-REV SWITCH POSITION	REMARKS
1	1	RCVR	REV	
2	2	RCVR	REV	
3	3	XMTR OR RCVR	REV	
5	7	XMTR	OFF	S1 IN POSITION M6 (A)
7 (NOTE 1)	7	XMTR	OFF	S1 IN POSITION M7 (B)



TO 20-PIN TEST CABLE RECEPTACLE ON PORTABLE TEST SET



MATES WITH METERING JACK J601 ON REAR OF CHASSIS. SHOWN FROM WIRE SIDE

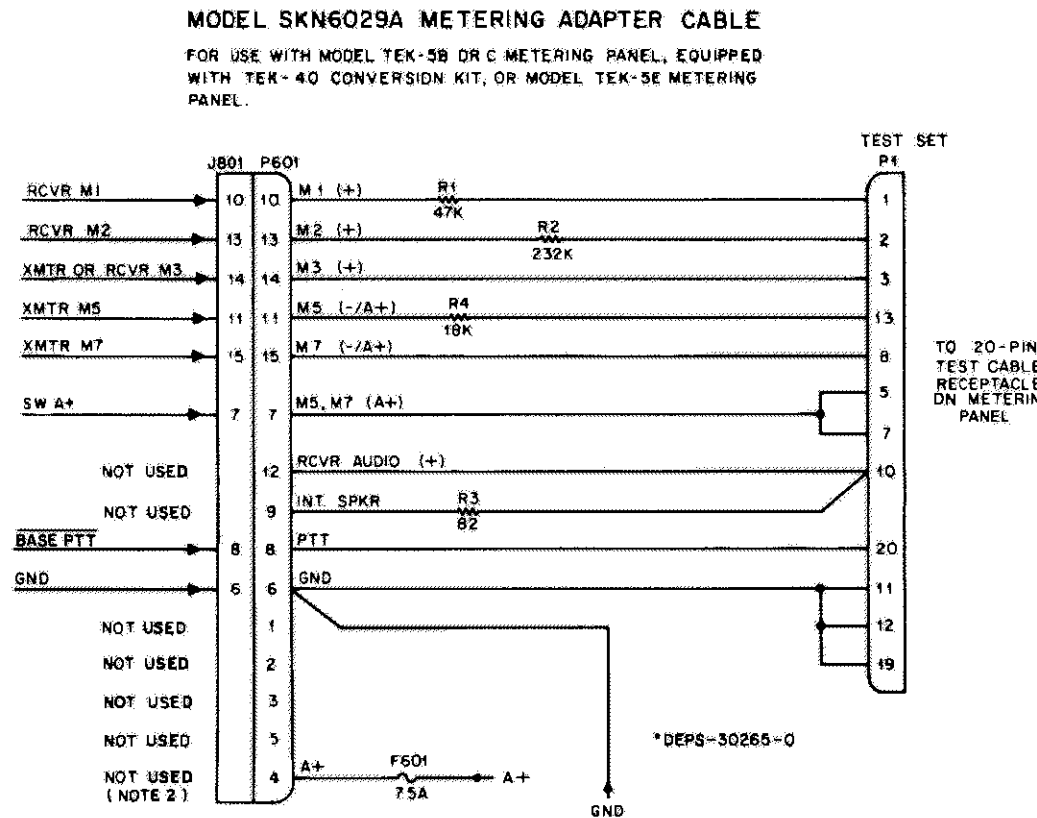
HOW TO USE TEK-5 METERING PANEL WITH SKN6029A ADAPTER CABLE

- NOTES:
1. SET TEK-5 SELECTOR SWITCH TO POSITION C.
  2. SET TEK-5 XMTR-REC SWITCH TO REC POSITION FOR M1, M2, AND M3. SET XMTR-REC SWITCH TO XMTR FOR M3, M5 AND M7.

- NOTES:
1. A+ SUPPLIED TO STATION VIA STATION POWER SUPPLY (7PN1176 A).



FRONT VIEW



TO 20-PIN TEST CABLE RECEPTACLE ON METERING PANEL

\*DEPS-30265-0

parts list

TRN6810A Repeater Housing & Hardware Kit (Duplexer) PL-6979-B

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
non-referenced items		
1-80795B62		COVER, oven
2-132616		NUT, hex; 6-32 x 1/4 x 3/32 x 1/8"; 7 used
2-836540		NUT, speed; 10-18; 2 used
3-122080		SCREW, machine; 6-32 x 1/4"; 4 used
3-124444		SCREW, machine; 6-32 x 1"
3-136848		SCREW, tapping; 10-16 x 1/2"; 2 used
3-134188		SCREW, tapping; 4-40 x 1/4"; 18 used
3-134184		SCREW, tapping; 4-40 x 5/16"; 4 used
3-134212		SCREW, tapping; 6-32 x 1/4"; 5 used
3-135506		SCREW, tapping; 6-32 x 5/16"; 2 used
3-135575		SCREW, tapping; 6-32 x 3/8"
3-136138		WASHER, flat; #6; 4 used
4-138499		BRACKET, mounting; circulator
7-83781M01		BRACKET, filter board
9-84181L01		SOCKET, 2-contact; 4 used (RPTX CTL BD JUMPERS)
15-83778M01		HOUSING, repeater
15-83779M01		COVER, repeater housing
33-84053M01		NAMEPLATE
41-84044M01		SPRING, catch; 2 used
42-82588L01		CLIP, holddown
54-84391M01		LABEL
64-83782M01		PLATE
75-10608A11		BUMPER, rubber; 8 used
75-82230B14		PAD, rubber; 2 used
75-82200H01		PAD, rubber

TRN6811A Repeater Housing & Hardware Kit (Non-Duplexer) PL-6882-B

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
non-referenced items		
1-80795B62		COVER, oven
2-132616		NUT, hex; 6-32 x 1/4 x 3/32 x 1/8"; 3 used
3-122080		SCREW, machine; 6-32 x 1/4"
3-134188		SCREW, tapping; 4-40 x 1/4"; 18 used
3-134184		SCREW, tapping; 4-40 x 5/16"; 4 used
3-134212		SCREW, tapping; 4-40 x 5/16"; 6 used
3-135506		SCREW, tapping; 6-32 x 1/4"; 5 used
3-135575		SCREW, tapping; 6-32 x 5/16"; 2 used
3-136138		WASHER, flat; #6; 4 used
4-138499		BRACKET, filter board
7-83781M01		SOCKET, 2-contact; 4 used (RPTX CTL BD JUMPERS)
9-84181L01		HOUSING, repeater
15-83778M01		COVER, repeater housing
33-84053M01		NAMEPLATE
38-83784M01		PLUG, button
41-84044M01		SPRING, catch; 2 used
42-82143C01		CLAMP, cable
42-82588L01		CLIP, holddown
54-84391M01		LABEL
75-10608A11		BUMPER, rubber; 8 used
75-82230B14		PAD, rubber; 2 used
75-82200H01		PAD, rubber

TRN4301A ESCUTCHEON, Rptr., Monitor, Remote  
 TRN4302A ESCUTCHEON, Rptr., Monitor, Remote, Clock  
 TRN4303A ESCUTCHEON, Rptr., Monitor, Remote, Intercom  
 TRN4304A ESCUTCHEON, Rptr., Monitor, Remote, Intercom, Clock  
 TRN6799A ESCUTCHEON, DC Remote

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
13-83280L34		ESCUTCHEON (TRN4301A)
13-83280L36		ESCUTCHEON (TRN4302A)
13-83280L35		ESCUTCHEON (TRN4303A)
13-83280L37		ESCUTCHEON (TRN4304A)
13-83280L33		ESCUTCHEON (TRN6799A)
36-83281L01		KNOB; 2 used (TRN4301A thru 04A)
38-83282L02		PUSHBUTTON; 3 used (TRN4301A, 02A); 4 used (TRN4303A, 04A)
43-83291L01		WINDOW, clock (TRN4302A, 04A)

TKN8192A Duplexer Cable PL-7244-O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
J603	9-82442E01	connector, receptacle; coaxial, chassis mtg.; UHF type
W4	9-84886E02	cable assembly, duplexer; includes J603, and: CONNECTOR, receptacle, right angle; BNC type
	15-483599	HOOD, connector
	30-84173E01	CABLE, coaxial; 7" used

TRN6810B Housing & Hardware Kit (Local Control) PL-5760-B  
 TRN6813B Housing & Hardware Kit (DC Remote Control) PL-5760-D

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
non-referenced parts		
E1, 2	80-83029H01	spark, gap; 230 V dc ± 15%
F3	85-4185	fuse; 15A; 32 V
Z2	1-80798B95	hybrid circuits; temperature regulator assembly; 5 PPM
non-referenced items		
	*1-80707D03	ASSEMBLY, speaker includes: HOUSING, connector, 3-pin, WHT
	15-83498F28	TERMINAL; 2 used
	29-83499F01	STRAP, tie; 3 used
	42-10217A02	SPEAKER, 4-ohms, 3-watt
	50-83981L01	ASSEMBLY, lead & contact includes: RECEPTACLE, contact; 4 used
	*1-80708D02	ASSEMBLY, terminal strip cable includes: HOUSING, connector, 8-pin, GRN
	15-83498F03	SPRING, catch; 2 used
	15-83498F28	HOUSING, connector, 3-pin, WHT
	29-83353L01	CLIPS, terminal strip; 9 used
	29-83499F01	TERMINAL; 9 used
	31-83292L01	STRIP, terminal
	42-10217A02	STRAP, tie; 18 used
	1-84204L01	BASE & PANEL
	*3-138138	SCREW, tapping; 6-32 x 3/8"; 2 used
	*3-139773	SCREW, tapping; 5-20 x 1/2"; 3 used
	3-139773	SCREW, tapping; 5-20 x 3/8"; 6 used (TRN6810B, TRN6813B); 4 used
	3-82729M01	SCREW, machine, special metric; 4 used
	4-7683	LOCKWASHER, internal, #4; 4 used
	*5-83903L01	GROMMET; 4 used
	15-83277L01	COVER, top
	15-83823L01	SHROUD
	33-83051K02	NAMEPLATE
	*35-84057L01	GRILLE CLOTH
	42-10217A02	STRAP, tie; 4 used (TRN6810B), 2 used (TRN6813B)
	42-82143C01	CLAMP, cable
	42-82143C03	CLIP, cable
	54-84565K01	LABEL
	75-10606A11	BUMPER, rubber, WHT; 4 used

note: \*Not used in TRN6813B.

SKN6029A Metering Adapter Cable PL-6811-C

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
F601	65-86099	fuse, cartridge; 7.5 amp, 32 V
P1	9-855266	connector, plug; female, 20-contact assembly, includes: housing, receptacle; 15-pin with ears terminal, male; 11 used
P601	15-80315A39	connector, receptacle; 15-pin with ears terminal, male; 11 used
R1	6-124A89	resistor, fixed; 47k ± 5%; 1/4 W
R2	6-10621E24	232k ± 1%; 1/8 W
R3	6-124C23	82 ± 10%; 1/4 W
R4	6-124A79	16k ± 5%; 1/4 W
non-referenced parts		
	1-82779C01	ASSEMBLY fuseholder, includes: BODY
	14-86882A01	CAP
	14-82883A01	SPRING
	41-82885A01	CLIP; 2 used
	42-82884A01	NUT, 4-40 x 3/16"; 2 used
	2-9627	SCREW, machine, 4-40 x 7/16"; 2 used
	3-114831	SCREW, tapping, 4-24 x 1/4"; 2 used
	3-138943	LOCKWASHER, internal, #4; 2 used
	4-7683	LOCKWASHER, internal, #4; 2 used
	29-82607B03	LUG; 2 used
	42-80313A05	STRAIN RELIEF; 2 used
	42-84066A80	TIE WRAP; 2 used

TKN8192A Receiver Cable PL-7245-O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
J501	9-82221K01	connector, receptacle; BNC type
J603	9-855269	connector, receptacle; coaxial, chassis mtg.; UHF type
W5	15-483599	cable assembly, receiver; includes J501, J603, and: HOOD, connector
	30-84173E01	CABLE, coaxial; 7" used

SKN6030A Metering Adapter Cable PL-6812-O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
F601	65-86099	fuse, cartridge; 7.5 amp, 32 V
J2	15-80315A39	connector, receptacle; housing, receptacle, 15-pin with ears terminal, female; 2 used
P1	15-84821B10	connector, plug; assembly, includes: housing, end cover, right hand end cover, left hand end cover, 10-contacts
P601	15-80315A40	connector, receptacle; assembly, includes: housing, plug; 15-pin with ears terminal, male; 11 used (stamped Nos. Start #1)
	29-84706E03	connector, female, 10-contacts (stamped Nos. Start #3)
R1	6-124A89	resistor, fixed; 47k ± 5%; 1/4 W
R2	6-10621E24	232k ± 1%; 1/8 W
R3	6-124C23	82 ± 10%; 1/4 W
S1	40-82148F01	switch; SPDT

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
non-referenced parts		
	1-82779C01	FUSEHOLDER ASSEMBLY, includes: BODY
	14-82883A01	CAP
	41-82885A01	SPRING
	42-82884A01	CLIP; 2 used
	2-9627	NUT, 4-40 x 3/16"; 2 used
	3-114831	SCREW, machine, 4-40 x 7/16"; 2 used
	3-138943	SCREW, tapping, 4-24 x 1/4"; 6 used
	4-7683	LOCKWASHER, internal, #4; 2 used
	42-80313A05	STRAIN RELIEF; 2 used
	42-83345E01	CABLE CLAMP
	42-84066A80	TIE WRAP; 2 used

note: Field replacement of component parts of this unit is not recommended. For replacement, order the entire unit. Specify part number and frequency range required.

Metering Adapter Cable Diagram and Parts Lists  
 Motorola No. PEPS-30262-D  
 7/21-82-PH1

INSTALLATION AND LINE LEVEL ADJUSTMENTS



## 1. INTRODUCTION

FLEXAR base/repeater stations can employ local (front panel), DC Remote, or Local/Remote control in addition to normal repeater rf control. Control capabilities are determined by the station model and optional features. Refer to the option charts at the front of this manual for information on the control features of a particular model.

Functional interconnect diagrams are provided in this section of the manual to illustrate Local, DC Remote, or Local/Remote control operation and interconnection with the various base/repeater optional features.

## 2. FUNCTIONAL DESCRIPTION

### 2.1 REPEATER CONTROL BOARD OPERATION

The heart of the FLEXAR Base/Repeater station is the Repeater Control Board (RCB). The board is located in the repeater housing, fastened to the receiver rf section. It operates in conjunction with the base station control board(s) which are located in the base station housing along with the transmitter rf section. The RCB provides proper operation of the FLEXAR Base/Repeater station.

The RCB employs the following circuits:

- Transmit PTT
- Dropout Delay
- Time-Out Timer
- Knockdown
- Audio
- Monitor
- Squelch Setting
- PL Indicate Delay.

#### 2.1.1 Transmit PTT

A low Transmit PTT output signal at J20-3 causes the FLEXAR Base/Repeater station to transmit,

by initiating a PTT cycle in the transmitter rf section. A low Transmitt PTT signal results from either a low Base PTT input signal at J20-6 or a repeater PTT signal generated internally on the RCB.

#### 2.1.1.1 Base PTT

The Base PTT signal is generated during normal base station operation and routed to P1-1 in the base station housing. From there, the signal reaches the RCB via J601-5, P701-5, feedthru capacitor bracket (FCB)-5, and P20-6.

The low Base PTT signal simultaneously disables the Carrier Indicate input, via CR5, and provides a low Receiver Disable signal at P21-1. The Carrier Indicate input is disabled to prevent a potential time-out timer lockup. The low Receiver Disable signal mutes the receiver via Mute switch Q14 in the receiver rf section.

The low Base PTT signal is also applied to U5F, the output of which performs three functions. First, transmission gate U2D is unmuted. This allows Base Exciter Audio to pass through the RCB to the Exciter Audio output J20-8. Second, the output of U5F provides a low Transmit PTT signal at J20-3, via U4D, U4A, and Q6. Third, the Time-Out Timer is started via U4B and U3A.

Exciter audio is applied to the exciter of the transmitter rf section via FCB-4, J701-4, P601-4, and P100-6. The low Transmit PTT output signal is applied to the transmitter rf section via FCB-8, J701-8, P601-8, and a GRN wire to point 36 on the unified board. Transmission will last until the Time-Out Timer times out (1-1/2 or 3 minutes) or until the Base PTT input signal becomes high.

#### 2.1.1.2 Repeater PTT

A repeater PTT signal is available only when the FLEXAR Base/Repeater station is operating in the repeater mode. The repeater PTT signal is generated internally on the RCB. In carrier squelch models, it is

generated as a result of a high Carrier Indicate input signal. In PL or DPL coded squelch models, it is generated as a result of both a high Carrier Indicate input signal and a high PL Indicate input signal.

The operation of the repeater PTT bistable (U3B & U3D) generates the repeater PTT signal. The bistable is controlled by the Carrier Indicate input at P21-10 and the PL Indicate input at pin K. The Carrier Indicate input signal comes from pin G on the receiver unified board through a BRN-YEL wire to point 59 on the unified board and J21-10. The PL Indicate input signal comes from the receiver coded squelch board (PL or DPL) via a GRY wire connected to pin K on the RCB. On the RCB, jumpers 1 through 5, U3C, and U5E direct and control the application of these signals to the bistable set and reset inputs.

For carrier squelch stations: JU2, JU3, and JU5 are installed while JU1 and JU4 are deleted and no PL Indicate input signal exists. When no carrier is being received, the Carrier Indicate input signal voltage is less than 4.7 V dc. When a carrier is being received, the Carrier Indicate input signal voltage is approximately 8.8 V dc.

The Carrier Indicate input signal is applied from P21-10 to U2B-5. When no carrier is being received, U2B-7 is low. This low is applied via JU2 to U5C. It is inverted by U5C and causes U4C-10 to be low. Since JU3 is installed, both inputs of U3C are low, which results in a high at U3C-10. This high is presented to U3B-5 and to inverter U5E. The output of U5E is routed to U3D-13 via JU5. This resets the repeater bistable (U3B & U3D). Therefore, no repeater PTT signal is internally generated and no Transmit PTT output signal exists.

When a carrier is being received, U2B-7 is high. This high is applied via JU2 to U5C. It is inverted by U5C and causes U4C-10 to be high. Since JU3 is installed, both inputs of U3C are high, which results in a low at U3C-10. This low is presented to U3B-5 and U5E. The output of U5E is applied through JU5 to U3D-13. This sets the repeater bistable.

#### NOTE

When the carrier is removed, the repeater bistable is reset (the Carrier Indicate signal becomes low).

The high from U3B-4 turns Q3 on, via CR7. This provides a low Audio Enable output signal at P21-11. The high from U3B-4 is also presented to U4B-6. The input to U4B-5 is low, since no Base PTT input signal exists. Without a Base PTT, U5F-13 is pulled high through R30 & R45. The resulting high is inverted by U5F and simultaneously presented to U6D-12 and to U4B-5. The low at U6D-12 mutes the Base Exciter Audio input path. The result of the low at U4B-5 and the high at U4B-6 is a low at U4B-4. This low is applied to U1-11, enabling clock input U1-10. The outputs

of U1 (U1-1 and U1-2) are low until clock input U1-10 receives sufficient pulses from U3A to force them high. (This occurs when the Time-Out Timer times out.)

The low from U3D-11 turns Q2 off, which causes a high to be presented at U2D-12. This high causes U2D to output a high at U2D-14. This high output is presented to U4D-13. U4D, as a result, outputs a low at U4D-11. This low is applied to U4A-2 and combined with the existing low from U1-2 or -3 applied to U4A-1, to produce a high at U4A-3. The high from U4A-3 is simultaneously applied to U3A-1 and to Q6. The high at U3A-1 causes it to oscillate at about 25 Hz, starting the Time-Out Timer. The high applied to Q6 turns it on, and it applies a switched ground output signal at Transmit PTT output J20-3. Therefore, a repeater PTT signal is internally generated and a Transmit PTT output signal exists.

Exciter audio is applied to the exciter of the transmitter rf section via FCB-4, J701-4, P601-4, and P100-6. The low Transmit PTT signal is applied to the transmitter rf section from J20-3 via FCB-8, J701-8, P601-8, and a GRN wire to point 36 on the transmitter unified board. Transmission lasts until the Time-Out Timer times out (1-1/2 or 3 minutes) or until the Transmit PTT signal becomes high.

#### 2.1.1.3 AND Squelch or AND-THEN-PL Squelch

There are two modes of Repeater PTT Bistable U3B & U3D operation used with coded squelch stations. First, AND squelch, in which both a predetermined level of carrier squelch AND a valid PL code are required for station key-up. Second, AND-THEN-PL squelch, in which initially both a predetermined level of carrier squelch AND a valid PL code are required for station key-up, THEN only a valid PL code is required to maintain key-up.

With AND squelch operation, JU1 and JU5 are installed and JU2, JU3, and JU4 are deleted. At station turn-on, the repeater PTT bistable is reset via the power-on delay circuit of CR1, C4, R3 and R10. The Carrier Indicate input signal is applied from P21-10 to U2B-5. When a carrier is detected, Carrier Indicate P21-10 goes high and, as a result, U2B-7 goes high. The high is applied through JU1 to U3C-9, but the repeater PTT bistable remains reset (JU3 is out). When a valid PL code is detected, PL Indicate pin K goes high. This high is applied through inverter U5C and gate U4C to U3C-8. With both inputs of U3C high, U3C-10 outputs a low. This low is simultaneously presented to U3B-5 and (inverted by U5E) via JU5 to U3D-13 as a high. Thus, the repeater PTT bistable is set. Therefore, a repeater PTT signal is internally generated and a Transmit PTT output signal exists. When quieting (Carrier Indicate) is lost or when PL Indicate goes low, then the repeater PTT bistable will reset.

With AND-THEN-PL operation, JU1 and JU4 are installed and JU2, JU3, and JU5 are deleted.



As with AND operation, both Carrier Indicate and PL Indicate signals must be present to set the repeater PTT bistable. If quieting (Carrier Indicate) is lost due to signal fade, the repeater PTT bistable remains set until the Time-Out Timer times out. At that time the Transmit PTT signal goes high, but the station remains in the unscquelched mode until PL Indicate goes low. The repeater PTT bistable is only reset when PL Indicate goes low. As a result, repeater access is maintained even if a temporary loss of signal strength occurs.

### 2.1.2 Dropout Delay

This circuit is incorporated to smooth conversation transitions from mobile to mobile and momentarily maintain the station PTT during deep signal fade conditions. When the repeater PTT bistable is set, Q2 is turned off and C9 is rapidly charged to about 12 V through R21 and CR10. The voltage level across C9 determines whether or not a Transmit PTT signal is generated. When Q2 is turned on by the resetting of the repeater PTT bistable, C9 slowly discharges through R22/R23 and Q2. The slow discharge maintains the Transmit PTT signal for approximately 2 seconds (4 seconds if R22 is deleted) after the repeater PTT bistable is reset.

### 2.1.3 Time-Out Timer

This circuit is incorporated to prevent users against accidental repeater lockup for long periods of time. The Time-Out Timer circuit limits the key-up time of the station by limiting the existence of a Transmit PTT signal to either 1-1/2 minutes (JU7 only installed) or 3 minutes (JU6 only installed). The circuit consists of a 14-bit counter (U1) and an astable multivibrator (U3A). When the repeater PTT bistable is set or when the Base PTT signal becomes low, U1 is enabled and U4A-3 goes high. The high signal from U4A-3 starts the oscillator and turns Q6 on. U1 starts counting and the Transmit PTT output signal goes low. The output of the oscillator drives the clock input of U1 at approximately 25 Hz. After 2048 counts, U1-1 goes high, which disables the clock and forces the Transmit PTT signal high (4096 counts for U1-2). Also, Q4 is turned on to drain the charge on C9, thus preventing a momentary key-up when the time-out timer is reset. If the repeater PTT bistable is reset or the Base PTT signal becomes high, U4B-4 also becomes high and forces the outputs of U1 low.

#### NOTE

Actual station time-out is indicated when the Power On/Transmit indicator stops flashing.

### 2.1.4 Knockdown

This signal is applied to the RCB via P20-4. When the signal is high, repeater operation is enabled. When the signal is low, repeater operation is disabled.

With a high signal at P20-4, transmission gate U6C is opened. This permits squelch sensitivity to be determined by SQLCH POT R33 on the RCB. When a repeater PTT signal is internally generated, which results in a low Transmit PTT signal, the received audio is re-transmitted (repeated).

A low signal at P20-4 is applied to inverter inputs U5A-1 and U5D-9. The high from U5D-8 opens transmission gates U6A and U6B. This permits squelch sensitivity to be determined by the base squelch control on the base station front panel. The high from U5A-2 turns Q4 on, which in turn clamps U2D-12 low. This prevents the internal generation of a repeater PTT signal (and thus a low Transmit PTT signal). Received audio is heard at the base station, but not re-transmitted (repeated).

### 2.1.5 Audio

Receiver audio enters the RCB at P21-9. A portion of the audio is fed to U2C-9 through AUD POT R7. The remainder of the received audio passes through buffer stage Q1 and is routed to the base station housing, via Base Receiver Audio output J20-1, for either local or remote listening. AUD POT R7 allows adjustment of the gain of U2C to provide the level required to drive the transmitter exciter for proper deviation. Receiver audio is applied to the transmitter exciter via Exciter Audio output J20-8.

Base Exciter Audio enters the RCB at J20-5. It is routed through transmission gate U6D directly to U2C. U6D will mute the base exciter audio path when Base PTT is high and unmute it when Base PTT is low. Here AUD POT R7 has no affect on the gain of U2C because base exciter audio is already adjusted to provide the level required to drive the transmitter exciter for proper deviation.

### 2.1.6 Monitor

This signal enters the RCB at J20-2. It must be low to enable the function. When low, it is inverted by U5B and satisfies one input (CR4) of a diode AND gate consisting of CR3 & CR4. If a carrier is not being received, Carrier Indicate input P21-10 will be low. The low is applied to U2B-5. This causes U2B-7 to be held low, keeping CR3 conducting. Since CR3 is conducting, Q3 is held turned off. Q3 then holds Audio Enable output P21-11 high.

If a carrier is being received, Carrier Indicate input P21-10 will be high. The high is applied to U2B-5. This causes U2B-7 to be held high, reverse biasing CR3. This satisfies the other input (CR3) of the diode AND gate. Q3 is turned on and outputs a low Audio Enable signal at P21-11. This signal enables audio and allows monitoring of channel traffic.



### 2.1.7 Squelch Setting

Detector noise from the receiver detector (U10) enters the RCB at Squelch Control Input P21-2 and is applied to U2A-2. U2A-1 outputs the detector noise. It is then directed by the squelch setting circuitry through the RCB to Squelch Control Output P21-3. From there, the noise signal leaves the RCB, for the receiver squelch circuit in the receiver rf section.

There are two ways of setting squelch sensitivity in the base/repeater station. The first is with the base squelch control. The second is with the squelch control on the RCB. The two ways are independent of each other. The choice between the two ways is controlled by the Knockdown signal directing the detector noise into one of two paths through the RCB.

When the repeater is setup, a high Knockdown signal opens transmission gate U6C, which allows detector noise from U2A-1 to pass through SQLCH POT R33, which sets the squelch sensitivity.

When the repeater is knocked-down, a low Knockdown signal opens transmission gates U6A and U6B, which allows detector noise from U2A-1 to pass through Q5. Q5 is a FET acting as a variable resistor. In local or local/remote models, Q5 is controlled by the front panel base SQUELCH control R36. In dc remote models, Q5 is controlled by base SQUELCH control R33. Either R36 or R33 then sets the squelch sensitivity.

The receiver squelch circuit provides an output voltage (identified as the Carrier Indicate signal) inversely proportional to the amount of receiver noise on the receive channel. The amount of noise input can be varied as follows.

First, if an on-channel rf signal is received, it will quiet the existing on-channel noise. This reduces the noise input to the receiver squelch circuit.

Second, the amount of noise input can be varied by selecting only a portion (reference level) of the detector output with a potentiometer or potentiometer-like device.

Third, the combination of setting a noise reference level input with a potentiometer (or potentiometer-like device) and the application of a rf signal will quiet the existing noise. If the potentiometer setting allowed a lot of existing noise to be selected, it will require a higher level of rf signal to cause the receiver squelch circuit to switch to 8.8 V, than if the potentiometer setting allowed only a little noise to be selected.

Within the receiver squelch circuit, the noise signal is routed through a pre-emphasis network. The resulting signal (noise) is then amplified and converted

into a variable dc voltage proportional to the input signal level. This signal is then fed through a transistorized switch to pin G on the receiver unified board. From pin G, the signal is fed through a BRN-YEL jumper to pin 59 on the unified board, and then to the RCB, via Carrier Indicate J21-10.

The range of Carrier Indicate output signal, which keeps the receiver squelched, is 0.4 to 4.0 V. This range of voltage is adjusted by the squelch controls. When the noise level drops (carrier detected) below the adjusted circuit threshold, the Carrier Indicate level goes to 8.8 V.

### 2.1.8 PL Indicate Delay

Upon initial FLEXAR Base/Repeater station power up, any signal appearing at U4C-9 will not propagate to U4C-10 for approximately 10 seconds. This is to prevent false repeater key-up of the station. The RC network of R3 & C4 function to clamp U4C-8 high for this period of time. As a result, the repeater cannot be accessed for 10 seconds.

#### NOTE

Before transmitting, allow a 20 minute warmup time, for crystal heater stabilization.

Before messages can be received, after turn-on, allow a 10 second delay for station initialization.

## 2.2 LOCAL CONTROL

When the handset, on a local control base station, is on-hook, the local speaker audio path is unmuted, the handset mic audio path is muted (earpiece audio is never muted), and the optional desk microphone audio path is muted.

Taking the handset off-hook, unmutes the handset mic audio path and mutes the local speaker audio path. The optional desk microphone audio path remains muted.

Depressing the optional desk microphone PTT, with handset on-hook, mutes the local speaker audio path and unmutes the optional desk microphone audio path.

Disconnecting the handset from the station will unmute the handset mic audio path, mute the local speaker audio path, and mute the optional desk microphone audio path, disabling the station. To prevent this, the TRN8417A Jumper Plug Kit must be installed in P4, providing a permanent ground of P4-5. Refer to the Local and Local/Remote Functional Interconnect Diagram and Local Control board (LCB) Schematic Diagram.

## 2.2.1 Base Exciter Audio

The base exciter audio input comes from either the handset or the optional desk microphone. Handset Hang-up switch S2 prevents simultaneous use of these audio inputs, via mute switches Q9, Q10 and Q11. Handset Hang-up switch S2 is a normally open magnetic reed switch. It is located in the handset and actuated by means of a permanent magnet located in the cradle assembly. When the handset is on-hook, S2 is closed and ground is present at J4-5. When the handset is off-hook, S2 is open.

### 2.2.1.1 Handset Audio

Handset audio enters the LCB via P4-2.

#### **NOTE**

A side tone can be routed to the handset earpiece if JU2 is installed.

When the handset is taken off-hook, S2 opens and the ground at P4-5 is removed. As a result, switched A+ (SW A+) passes through CR13 to Q10, enabling it. Q10 then mutes the optional desk microphone audio path. SW A+ also passes through CR2 to Q9, enabling it. Q9 then mutes the local speaker audio path. Finally, SW A+ enables Q2, which removes SW A+ from CR15, disabling Q11. The handset audio path is then unmuted, and audio passes through the LCB to the repeater control board (RCB) in the repeater housing (via P1-6, J601-3, P701-3, FCB-3, and P20-5). The audio is gated and amplified on the RCB and exits the RCB as exciter audio at J20-8. From there, the audio is applied to the exciter in the transmitter rf section (via FCB-4, J701-4, P601-4, and P100-6). In PL stations, receiver PL is disabled by the off-hook signal, via CR4, JU5, U1C & D and Q3. Channel monitoring is automatically available, at the handset earpiece with the handset off-hook.

### 2.2.1.2 Desk Microphone Audio

Desk microphone audio enters the LCB via P6-1 from the MIC HI screw terminal on TB-2. When the optional desk microphone is used, the handset is left on-hook, S2 is closed and ground is present at P4-5. As a result, SW A+ is removed from Q2, disabling it. SW A+ then passes through CR15 to Q11, enabling it. Q11 then mutes the handset audio path. The ground at P4-5 also reverse biases CR2 and CR13. With CR13 reverse biased, SW A+ enables Q10, via CR3, and the desk microphone audio path is muted.

The local speaker audio path is unmuted by disabling Q9. This is accomplished by reverse biasing both CR2 (as previously described) and CR1. CR1 is reverse biased by enabling Q1 with the same SW A+ that enabled Q10. These conditions allow automatic channel monitoring at the local speaker.

The desk microphone audio path is unmuted by ANDING the on-hook ground which disabled Q10 with a local PTT signal (ground at P6-3). The PTT signal also disables Q1, which allows SW A+ to enable Q9, which then mutes the local speaker. Audio passes through the LCB to P1-6 and is applied, through P100-6, to the exciter section of the transmitter rf section just as for handset audio.

## 2.2.2 Receiver Audio

Receiver audio comes from the receiver rf section and is applied to the RCB, via J21-9, to be processed. The processed audio exits the RCB as receiver audio to the LCB, via J20-1, and as exciter audio, via J20-8. Exciter audio is routed to the transmitter rf section, as previously described, but is not transmitted.

#### **NOTE**

A low Transmit PTT signal must also be present at the transmitter rf section for transmission to occur.

Receiver audio to the LCB is routed via FCB-1, J701-1, P601-1, and enters the LCB via P1-9 and is routed through JU7 to the handset earpiece, via Q5 and P4-6. Receiver audio is also routed to the local speaker, via VOLUME control R21 and P5-1. Q9 mutes the local speaker audio path only if the handset is taken off-hook or there is a PTT signal.

## 2.2.3 Control Circuitry

#### **NOTE**

In a Local Control station configuration, neither REMOTE (S4) nor INTERCOM (S5) functions are compatible with station operation.

### 2.2.3.1 Monitor

The monitor function, which unscelches the receiver, occurs when MONITOR switch S3 is depressed. S3 is a momentary type which supplies a ground when actuated. This function allows manual monitoring of channel traffic. The monitor function may be either a latching or a non-latching type.

Latching monitor unscelches the receiver and keeps it unscelched until either the station is keyed, or turned OFF and then back ON. In the former case, U1C & D will be reset by a delayed PTT signal from P1-5. In the latter case, the power reset circuit (CR5, R15 and C6) will reset U1C & D. Non-latching monitor unscelches the receiver only so long as S3 is held depressed. Carrier squelch stations do not make use of a monitor function, as channel traffic is monitored by manual adjustment of SQUELCH control R36.

Latching monitor, in PL squelch stations, is accomplished by omitting JU12 and installing both JU5 and JU6. Then, the ground from S3 is applied to P1-11, via JU6, U1C & D, and Q3. The switched ground from Q3 is applied to the RCB Monitor input P20-2 via J601-2, P701-2, and FCB-2. This input satisfies one input of the diode AND gate CR3 & CR4, via U5B. If there is a carrier to be monitored, the receiver squelch circuit outputs a switched high at pin G, via Q83. This high is applied to the RCB Carrier Indicate input P21-10. This input satisfies the other input of the diode AND gate CR3 & CR4, via U2B. The output of the diode AND gate turns Q3 ON (via diode OR gate CR5, 6, & 8 and CR7), which results in a switched ground at Audio Enable output P21-11 on the RCB. The switched ground unmutes Q18 in the receiver allowing receiver audio to be applied to the RCB, via J21-9, thus allowing monitoring of channel traffic. The station stays in the monitor mode until either it is keyed or tuned off and then back on.

Non-latching monitor, in PL squelch stations, is accomplished by installing JU12 from S3 to P1-11 (from pin M to pin P). This bypasses U1C & D. Also, JU5 is installed and JU6 is omitted. Then, the ground from S3 is routed as described for latching monitor, except that the station stays in the monitor mode only so long as S3 is held depressed.

PL squelch stations with a handset (either latching or non-latching monitor) disable receiver PL whenever the handset is taken off-hook, until the station is keyed or turned off and then back on. This is accomplished by removing the hangup switch (S2) ground from the base of Q2, enabling it. Q2 provides a switched ground, via JU5, to the RCB either via JU6, U1C & D, and Q3 (latching), or via JU12 from pin M to P (non-latching).

#### NOTE

Handset receiver PL disable, via Q2 switching, is defeated in stations with paging option. This is accomplished by connecting pin A to pin B, with JU13, on S3.

#### 2.2.3.2 Base PTT

The Base PTT signal is a switched ground initiated by either the handset, at P4-4, or by the optional desk microphone, at P6-3. Local PTT is routed via JU8 to Q7 and Handset PTT is routed directly to Q7. Either PTT signal enables Q7, which in turn enables Q13, placing a switched ground at Base PTT P1-1. Either PTT signal is also routed to Q1, via JU8 and P6-3, to disable Q1, which enables Q9, muting the local speaker audio path. The switched ground at P1-1 initiates the Time-Out Timer and Transmit PTT circuits on the RCB, via J601-5, P701-5, FCB-5, and P20-6. These circuits initiate a PTT cycle in the transmitter, via J20-3, FCB-8, J701-8, P601-8 and a GRN wire to point 36 on the transmitter section Unified Board. Also, the low

Base PTT signal at P20-6 of the RCB unmutes U6D, via U5F, allowing Base Exciter Audio to pass to the exciter.

#### NOTE

Base PTT disables the receiver giving local operation priority over a repeated transmission.

The PTT cycle in the transmitter results in a delayed PTT signal that is fed to the LCB via P100-5 to P1-5. The delayed PTT signal is routed to U1C & D, through C1; and Q6 through CR6. The switched ground presented to U1C & D resets the PL bistable, and in PL squelch stations, returns the receiver to PL operation.

The switched ground routed to Q6 disables it, causing B+ to be presented to Q4 (through JU9 connected to pin L) enabling it; and as a logic high to U1A & B starting the PTT astable multivibrator. The enabled Q4 presents a switched ground to RPTR OFF switch S2. This switched ground enables the switch selected setup or knockdown via JU4 and P1-13. The output of U1A & B alternately increases and decreases the conduction of Q8, which flashes ON/OFF/TRANSMIT lamp DS1, indicating transmission.

#### NOTE

Base PTT can be actuated while the repeater is setup or knocked-down.

#### 2.2.3.3 Page PTT

Paging encoders are connected, with a TKN6065A Interconnect Cable, to TB-2. The PTT signal is then originated in the encoder and applied to the PTT screw terminal on TB-2. From TB-2, it is routed to P6-3 and, thereafter, exactly as a local PTT signal is routed in the station. When paging, an additional switched ground is applied to the PAGE screw terminal on TB-2.

From the PAGE screw terminal on TB-2, Page PTT enters the LCB at P6-4, and is routed: directly to P1-10, and through CR17 to P1-7, and through CR18 to Q4.

The Page PTT signal at P1-10 (in PL squelch stations) is routed through the transmitter rf section via P100-10, CR120 and a BLU-RED wire, to the Transmit PL Inhibit input of the PL board. A ground at this input removes the PL coding signal from the transmitted carrier. In carrier squelch stations, the Page PTT signal at P1-10 has no effect.

The optional desk microphone audio path is unmuted (Q10 disabled) by the local PTT signal at P6-3. Paging tones are then sent from the encoder, through the LCB, through the RCB, to the transmitter, as previously described for handset audio. A voice message, from the optional desk microphone, may follow the paging tones.

### 2.2.3.4 Repeater Setup/Knockdown

Repeater setup/knockdown selection, with a local control station configuration, is accomplished by RPTR OFF switch S2. Jumper JU4 only is installed. S2 directly selects setup or knockdown, via JU4, P1-13, J601-9, P701-9, FCB-9, P20-4, and the RCB.

- When S2 is out, the repeater is setup.
- When S2 is depressed, the repeater is knocked-down.

## 2.3 LOCAL/REMOTE CONTROL

Refer to the Local and Local/Remote Functional Interconnect Diagram, the Local/Remote Control Board (LRB) Schematic Diagram, and the previous Local Control Functional Description.

The LRB provides an interface between a dc remote control point and the base station by performing remote audio and dc control signal processing. Local operation of a local/remote control station is as described for local control operation except jumpers JU1 through JU4 and JU7 are omitted, and JU9 is connected to pin R, on the Local Control Board (LCB). This means that repeater setup/knockdown selection is accomplished with the LRB; that received audio is routed through the LCB to the LRB and back through the LRB to the LCB (as remote audio) before application to either the handset earpiece or local speaker; and that Q4 is enabled by hand PTT or desk microphone PTT rather than delayed PTT.

The LRB provides the base station with line audio, local audio, and processed dc control signals. The processed dc control signals will setup the repeater and key the transmitter; or, knockdown the repeater and key the transmitter; or, initiate the monitor function; or, key the transmitter without PL coding for paging.

---

#### CAUTION

Latching monitor is required for proper remote operation of PL squelch stations.

---

The LRB provides the remote control point with received audio, local audio and intercom capability.

### 2.3.1 BASE PTT Signal

The BASE PTT signal originates at either the remote control point or the handset or optional desk microphone during local operation of the base station. Local operation has priority over the station. This is accomplished by means of CR12, on REMOTE switch S4.

### 2.3.1.1 Remote Audio

Remote audio and control signals from a 600 ohm line, enter the station on the LN+ and LN- terminals of TB-2. The audio and control signals are routed to the LRB, by internal cabling, and are applied to line driver transformer T1, through P2-2 and 3. Just prior to the remote audio, a dc control signal enters the LRB through P2-2 and 3. Among other functions (described later), it causes a Remote PTT and a Remote PTT signal to exist in the LRB. The Remote PTT signal (a logic high) comes from U1D and performs three functions. It reverse biases CR2; enables Q7; and is routed to the LCB by P7-18.

Reverse biasing CR2 allows Q6 to be enabled by SW A+. Q6 unmutes Q5, which allows remote audio to pass. Remote audio is picked off of T1 by the tertiary winding, and is routed through EXCITER ADJUST control R15 and Q3. After leaving Q3, remote audio is routed to two destinations. The first is by P7-13, the LCB, and the handset audio path as previously described, to the exciter. The second is as remote audio to the LCB, by P7-12, where it is applied to the handset and local speaker audio paths. Remote audio will be heard in the local speaker unless it is muted by Q9, with either a local PTT or an off-hook signal.

Enabling Q7, with the Remote PTT signal, provides a Base PTT signal (a switched ground) directly to P1-1 via P7-16 and the LCB. This signal is routed to and actuates RCB circuits as previously described.

#### NOTE

Base PTT disables the receiver giving local and remote operation priority over a repeated transmission.

The Remote PTT signal is applied to the LCB by P7-18. It enables Q11, through CR14, muting the handset audio path.

The Remote PTT signal (as a logic low from U1C) is routed to Q2 on the LRB, muting Line Driver Hybrid Z1. This prevents the remote audio that is being transmitted (via P7-13) from being sent to the remote control point, via MIC LINE OUT control R20 and Q4.

### 2.3.1.2 Base Exciter Audio

Base exciter audio is transmitted as described for local control operation, except that it is also routed to the LRB, via J7-13, to be placed on the remote line by R20, Q4, and Z1. Z1 is only muted with a Remote PTT. Audio derived from the tertiary winding of T1 is fed back to the LCB, and only drives the handset earpiece. The local speaker audio path is muted by the local PTT signal, via Q9.

### 2.3.2 Base Receiver Audio

Receiver audio enters the RCB at P21-9. The audio is processed and routed to the LCB (by J20-1, FCB-1, J701-1, P601-1, and J1-9). Since JU7 is omitted on the LCB, receiver audio is routed directly to the LRB, by J7-14. Receiver audio is then placed on the remote line by Q1, RCVR LINE OUT control R6, Z1 and T1. From the tertiary winding of T1, receiver audio is routed back to the LCB for local speaker and handset earpiece audio, using the same path described previously for remote audio.

#### NOTE

Q5 is muted by Q6, since no Remote PTT signal exists during reception.

### 2.3.3 Control Circuitry

Remote control of the station is accomplished by the detection and processing of dc control currents, sent from the remote control point on the line, by Decoder Hybrid Z2 on the LRB. Z2 detects current direction on the line (positive or negative) and current magnitude ( $\pm 12.5$  mA).

Any remote controller that is used to provide proper control of the FLEXAR Base/Repeater Station must have 2-frequency (F1/F2) capability, where the F1 selection current ( $+ 5.5$  mA) corresponds with repeater setup and the F2 selection current ( $+ 12.5$  mA) corresponds with repeater knockdown. The dc control signals and functions are as follows:

- $+ 5.5$  mA  $\pm 20\%$  — Key & Repeater Setup
- $+ 12.5$  mA  $\pm 20\%$  — Key & Repeater Knockdown
- $- 2.5$  mA  $\pm 20\%$  — PL Monitor
- $-12.5$  mA  $\pm 20\%$  — Page & Repeater Setup

Use of a remote controller in the base/repeater system will override locally setup base/repeater operational modes. This means that if local operation has setup repeater mode, the use of the remote F2 current will knockdown the repeater. Also, if local operation has knocked-down the repeater mode, the use of the remote F1 current will setup the repeater. Finally, if local operation has knocked-down the repeater, the use of the F1 PAGE current will setup the repeater.

The dc control signals enter the station via the same path as remote audio. However, they are routed directly to Z2 after reaching T1 on the LRB. C10 prevents dc saturation of T1 and maintains ac continuity for audio.

#### 2.3.3.1 Key & Repeater Setup

When Z2 has a  $+ 5.5$  mA input, it provides a logic low output at Z2-18 and a logic high output at Z2-2 & 7. Only the low at Z2-18 activates the remaining

logic circuitry. Setup/Knockdown Bistable U3B & U4C is activated, through U3C and CR10, and directly provides a high to Knockdown P7-5. Remote PTT P7-16 receives a switched ground from Z2-18, through CR5, U1C, CR13, U1D and Q7.

#### NOTE

C22, R45 combination provides approximately 60 ms delay at U1C.

The switched ground at P7-16 is routed by the LCB and P1-1, as previously described for Base PTT. Q6 and Q5 are enabled, through CR5, U1C, CR13, U1D and CR2, to allow remote audio to pass through the LRB to the transmitter exciter. Z1 is disabled, through CR5, U1C, CR13, CR1, VR2 and Q2, in order to block retransmission of remote audio on the line.

The PTT cycle in the transmitter provides a switched ground to the repeater setup/knockdown select logic, through P100-5, P1-5, the LCB and P7-4. The switched ground at P7-4 disables U3A, preventing additional selection, and enables the delayed PTT logic U2B and U2C. The repeater is setup and the transmitter is keyed.

#### 2.3.3.2 Key & Repeater Knockdown

When Z2 has a  $+ 12.5$  mA input, it provides a low at Z2-18 & 7. Also, it provides a logic high at Z2-2. Only the lows at Z2-18 & 7 activate the remaining logic circuitry. U3B & U4C is activated, as described for key & repeater setup, except that Knockdown P7-5 receives a switched ground due to the logic action. The PTT cycle for the transmitter, Z1 disable, and Q6 & Q5 enable functions are as described for key & repeater setup.

#### 2.3.3.3 PL Monitor

When Z2 has a  $-2.5$  mA input, it provides a low at Z2-2, and a high to Z2-18 & 7. Only the low at Z2-2 activates the remaining logic circuitry. A switched ground is provided at Remote Monitor P7-17, through U4A, CR3, U1A, U1B and Q9. From P7-17, the switched ground is routed to REMOTE switch S4, through the LCB.

In PL models, with non-latching monitor, if S4 is depressed (remote enabled) the switched ground from S4 is applied to the monitor input of the PL board. The monitor function is activated only so long as the  $-2.5$  mA signal comes from the remote control point.

---

#### CAUTION

This is a non-latching PL monitor function, and is not recommended for local/remote control station operation.

---

In PL models, with latching monitor, if S4 is depressed, the switched ground from S4 will be applied to the PL bistable through JU6, which enables Q3. The

switched ground from Q3 is applied to the RCB Monitor input, activating its circuitry as previously described for the local control monitor function.

#### 2.3.3.4 Page & Repeater Setup

When Z2 has a -12.5 mA input, it provides a logic low at Z2-2 & 7. Also, it provides a high at Z2-18. Only the lows at Z2-2 & 7 activate U4A and U1E, respectively. U4B ANDs the resulting outputs and applies a switched ground to remote PTT P7-16 (through CR12, U1D and Q7); to page PTT P7-6 (through U2D and Q8); and to Z1, disabling it (through CR12, CR1, VR2 and Q2). The switched ground from Q8 is used to disable remote monitor P1-17 (through CR7), and to U3B & U4C (through CR11). U3B & U4C provide a high at Knockdown P7-5, through logic action, which causes the repeater to be setup.

The switched ground at remote PTT P7-16 initiates a PTT cycle which results in a switched ground at delayed PTT P7-4. The switched ground at page PTT P7-6 is directly applied to P100-10 of the transmitter rf section. In PL stations, as in local control, this signal is applied to the transmit PL inhibit input of the PL board and prevents the PL encoder from modulating the transmitted carrier. Paging tones are then sent from the encoder at the remote control point to the transmitter rf section for transmission. A voice message may follow the paging tones.

#### 2.3.3.5 Remote Disable

When REMOTE switch S4 is depressed, all remote functions are enabled as previously described. When S4 is out, all control access to the station, from the remote control point, is disabled. This is accomplished by opening the remote monitor path and placing a ground at remote disable P7-15. The ground disables: remote setup/knockdown selection (through U3A and U3C); page PTT (through CR14, U4B, U2D and Q8); remote PTT (through CR4, U1C, CR13, U1D and Q7); and Q6 & Q5 (through CR4, U1C, CR13 and U1D). The ground also ensures remote monitor disable, through CR6, U1A, U1B and Q9.

#### 2.3.3.6 Local Setup/Knockdown Selection

A switched ground arrives at S5, on the LCB, from handset PTT P4-4 or local PTT P6-3. From S5, the switched ground is routed to remote disable P7-15, via CR12. The switched ground at P7-15 disables all control access to the station from the remote control point, as previously described.

The PTT signal is routed to P100-1, initiating a PTT cycle. On the LCB, Q4 is enabled via JU9 (connected to pin R) which presents a switched ground to RPTR OFF switch S2.

S2 manually selects setup or knockdown, and passes the switched ground to P7-7 or P7-8. The switched ground at P7-7 or P7-8 selects setup or knockdown, respectively, via bistable U3B & U4C.

#### NOTE

Locally selected setup or knockdown will continue to be selected upon release of the local PTT unless reselected remotely, due to bistable U3B & U4C action.

To assure local selection of setup or knockdown, REMOTE switch S4 should be out (remote access disabled).

#### 2.3.3.7 Intercom

Both simplex and duplex intercom is possible with a local/remote control configured station. In either case, JU8 is omitted and JU10 is installed on INTERCOM switch S5 (a momentary type). S4 is out, to assure that all remote control access to the station is disabled.

---

#### CAUTION

If S4 is depressed, the remote intercom response will be transmitted, due to the use of remote PTT when responding.

---

Simplex intercom functions as follows. When S5 is depressed, it places a ground at P6-3. This ground mutes the local speaker audio path and provides a remote disable signal to the LRB. S5 also opens the local PTT path, to assure that a local PTT signal will not key the station. The ground at P6-3 is ANDed with the handset on-hook ground at P4-5. As a result, Q10 is disabled, and the desk microphone audio path is unmuted. Since no PTT cycle has been initiated, the audio reaching the exciter in the transmitter rf section has no effect. Instead, simplex intercom audio is routed to the remote control point through Q12, P1-6 (electrically identical with J7-13) and the LCB. Local intercom audio enters the LRB at P7-13 and is sent to the remote control point through R20, Q4, Z1, and T1.

---

#### CAUTION

Do NOT use Local PTT for simplex intercom. Use S5.

---

During simplex intercom operation, S5 must be released to hear the remote intercom audio response. Since S4 is out, Remote PTT will not key the station, and the response will be heard on the local speaker.

Duplex intercom works in a similar manner, except that the handset is used at the base station, instead of the desk microphone; S5 is NOT used; and S4 is out.

When the handset is taken off-hook, S2 causes Q10 to mute the desk microphone audio path, Q9 to mute the local speaker audio path, and Q11 to unmute the handset audio path. Handset intercom audio follows the same path as desk microphone intercom audio and is

routed through the station to the remote control point as in simplex intercom.

**NOTE**

A handset PTT signal is NOT used for duplex intercom at the station. The operator simply ensures S4 is out, takes the handset off-hook, and speaks into the handset microphone. S5 is NOT used.

Remote intercom audio response is heard in the handset earpiece and is routed from the remote control point as in simplex intercom.

## 2.4 DC REMOTE CONTROL

Refer to the DC Remote Functional Interconnect Diagram and the DC Remote Control Board (DCB) Schematic Diagram.

The DCB provides an interface between a remote control point and the base station by performing remote audio and dc control signal processing. The DCB provides the base station and remote control point with exactly the same functions, in the same manner, as the LRB.

The difference between a local/remote control and a dc remote control configured station is that (except for servicing) no local operation is possible with a dc remote control configured station. Minor differences exist in the actual circuitry of the DCB, but the action of the various circuits is the same as the remote control portion of the local/remote station.

### 2.4.1 Base Exciter Audio

The base exciter audio input originates at either the remote control point or the service handset.

#### 2.4.1.1 Remote Audio

Remote audio is routed from the remote control point in the same manner as in the LRB. However, in this case, the base exciter audio level is adjusted by XMIT AUDIO LEVEL ADJ control R32 and a secondary audio path, through Q8, is available to drive the service handset earpiece via P4-1.

#### 2.4.1.2 Service Handset Audio

If the service handset is connected to P4, handset audio enters the DCB at P4-5, and is routed to the remote control point through Q1, LINE AUDIO LEVEL ADJ control R14, line drivers Q2-Q5 and transformer T1. The audio is also routed to the exciter through the tertiary winding of T1, R32 and Q7 and to the handset earpiece (as a "side-tone") through Q8.

**NOTE**

R14 can be used to vary the line level 31 dB (from -20 to +11 dBm).

### 2.4.2 Receiver Audio

Receiver audio enters the DCB at P1-9, and is routed to the remote control point via U1, R14, Q2-Q5 and T1. From T1, receiver audio is sent through the tertiary winding of T1, R32 and Q7. Thereafter, it follows the same path as previously described for local handset audio.

**NOTE**

In the receive mode, audio at the exciter section is not used.

Receiver audio is also available, through Q8, to drive the service handset earpiece via P4-1.

### 2.4.3 Control Circuitry

Remote control of the dc remote station is accomplished in the same manner, with exactly the same signals, as the local/remote station. The levels and directions of the dc control signal currents are identical. Also, the controlled station functions are identical.

### 2.4.4 Service Aid

As a service aid, local operation of a dc remote station is made possible by LINE DISABLE jumper (ORG wire); LOCAL REPEATER SETUP/KNOCK-DOWN SELECT JUMPER (GRN wire); and PL MONITOR switch S1.

For local audio transmission and/or reception, the TMN6067A Service Handset is required. The LINE DISABLE jumper is normally connected to the REM pin. When connected to the DIS pin, all control access to the station from the remote control point is disabled. The local repeater setup/knockdown select jumper is normally connected to the REM pin. When connected to the F1, F2, or F1 PG pin AND J4-4 momentarily grounded (which keys the station via CR18) then the jumpered function will be locally selected.

---

**IMPORTANT**

For repeater applications only: Pin F1 corresponds to setup; pin F2 corresponds to knockdown; pin F1 PG corresponds to page.

---

**NOTE**

CR19 ensures a switched ground at P1-10 when a local frequency select of Page is made.

The PL MONITOR switch, in conjunction with the service handset, allows normal transmission and reception using the locally selected functions. The handset PTT signal keys the station. Duplex intercom with the remote control point is available as soon as the handset is plugged into J4.

### NOTE

To prevent remote keying of the station when using intercom, LINE DISABLE jumper must be connected to the DIS pin.

## 2.5 AUTO LEVEL

Refer to the functional interconnect diagrams and the Auto Level Board Schematic Diagram.

The Auto Level board (ALB) provides three functions. It automatically compensates for varying line levels due to the length or the condition of the line. It enhances duplex intercom operation (for local/remote control stations only) and finally, it replaces the de-emphasis removed from the paging tone transmission by the auto level function.

In stations with auto level, a constant audio input to the exciter can be maintained, with as much as a 20 dB level variation on the line, without affecting transmitted audio performance. In stations without auto level, a line variation greater than 6 dB will affect transmitted audio performance.

Duplex intercom (available only if a handset is used) in local/remote control stations with auto level, is enhanced because the station (local) audio is electronically subtracted from the composite audio signal (local plus remote audio) before presentation to the handset earpiece. This ensures that only remote audio will be heard at the earpiece. If desired, local sidetone can also be heard via JU2 in the handset. In dc remote control stations, duplex intercom (available only with a service handset) enhancement consists only of maintaining a constant remote line level during intercom operation. This assures reception of remote audio with the non-amplified service handset earpiece.

Paging tones are transmitted with a flat frequency response from a paging station. In stations without auto level, this mode of transmission is accomplished by the paging encoder. The paging tone output of the encoder is de-emphasized (by the encoder) so that the normal pre-emphasis of the exciter results in a flat frequency response. In stations with auto level, the paging encoder pre-emphasis is defeated by the normal operation of the level compensating circuits. Therefore, an additional de-emphasis circuit is added at the output of the ALB. This circuit, which is enabled by paging PTT, de-emphasizes the ALB output for approximately 8 seconds (the paging tone window). This results in a paging tone transmission that has a flat frequency response and a compensated audio level.

### 2.5.1 Auto Level Circuitry

Audio from the remote control point enters either the LRB or the DCB as described previously. After passing through T1, remote audio is directed from the tertiary winding of T1 to P3-2, the auto level line input, by removing JU2 (LRB) or JU6 (DCB).

Remote audio from P3-2 is routed through U1B to the sample and hold circuitry and the activity checker circuitry.

### NOTE

U1B acts as a buffer amplifier at this time.

The auto level circuitry consists of a sample and hold circuit and an activity checker circuit.

#### 2.5.1.1 Sample and Hold Circuitry

The sample and hold circuitry consists of U1A, a constant gain output stage; Q5, a variable voltage attenuator stage; Q3, an AGC output sampling integrator stage; and Q2, an activity detection switch.

AGC stage Q3 functions when activity switch Q2 is enabled by the high output of U2A (or U2B) (high = activity; low = no activity) applied simultaneously to Q2 and Q3. When Q2 is ON, Q3 varies the bias of Q5, so that the output of U1A remains constant (approximately 700 mV rms). Thus, when activity is detected, the AGC stage is enabled and maintains a constant audio output level at auto level output J3-5. Audio from J3-5 is routed to the exciter as previously described for the LRB and DCB.

### NOTE

When no-activity is detected, Q2 and Q3 are OFF, holding the gain of U1A fixed at the level at which activity was last detected.

#### 2.5.1.2 Activity Checker Circuitry

The activity checker circuitry consists of U2C, a limiter amplifier stage; U3, a zero-crossing detector stage; U2A, the lower frequency cutoff stage; Q4, an integrator stage; and U2B, the upper frequency cutoff stage.

Audio from the output of U1B is examined for level (by U2C) and frequency (by U3, U2A, Q4 and U2B). U2C acts as a zero-crossing level detector for audio above -20 dBm (referenced to the line). Audio below this level is sensed as no-activity. Thus, the output of U2A is driven low. When activity above -20 dBm is sensed, the output of U2C is a square wave corresponding to the frequency of the audio input. This output is applied to U2A causing it to be driven high and is also applied to U3, causing it to produce a 110 usec. pulse for each negative transition of U2C. The pulses are integrated by Q4, R43, R44 and C25 and applied to U2B. As the audio input frequency increases, the input voltage to U2B becomes less positive. Eventually, the output of U2B goes low, turning Q2 and Q3 OFF. The upper frequency cutoff point, determined by U2B, is approximately 1100 Hz.

U2A acts in a similar manner to determine the lower frequency cutoff point of approximately 200 Hz. Therefore, if the audio input is 200-1100 Hz and has a level above -20 dBm, activity is detected and the AGC functions.



**NOTE**

The 200-1100 Hz range contains the maximum voice energy.

2.5.2 Intercom Enhancement Circuitry

When using intercom, no PTT signal is present at PTT input J3-7 of the ALB. Thus, Q1 is enabled, passing local audio from line driver input J3-1 through U1C to U1B.

**NOTE**

U1B now functions as a common mode rejection amplifier — a subtractor.

Audio applied to J3-2 consists of both local and remote audio. Therefore, local audio is subtracted (minimum 10 dB reduction), and only remote audio becomes "auto leveled". This ensures proper reception of remote audio, via the handset, when using the intercom function.

**NOTE**

Intercom enhancement, in this manner, is only available with local/remote control stations. In dc remote control stations, all audio is "auto leveled."

2.5.3 Paging De-emphasis Circuitry

When a paging PTT signal is fed into page PTT input J3-3, the output of monostable UID goes low for approximately 8 seconds. This low disables Q6, removing the fixed output voltage divider R24 and R28 from the audio path. Also, U2D is enabled, inserting the frequency sensitive voltage divider R24 and C7 into the audio path. This voltage division replaces the de-emphasis removed from the paging encoder tone output by the auto level circuitry. After 8 seconds, the ALB de-emphasis circuit is disabled, so as not to affect the voice message that may follow the paging tone transmission.

# parts list

TLE4193A Circulator PL-6978-O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
E901	1-80722D57	<b>circulator: (see note)</b> 450-470 MHz
J604	28-84884E02	<b>connector, plug:</b> coaxial, chassis mtg., UHF type
W2	1-80722D54 28-84967D01 30-83278B01	<b>cable assembly:</b> includes J604 and: CONNECTOR, plug; BNC CABLE, coaxial; 14.5" used
W3	1-80722D55 28-84967D01 30-84173E01 43-84232F01	<b>includes:</b> CONNECTOR, plug; BNC CABLE, coaxial; 11.5" used BUSHING, coaxial termination
<b>non-referenced items</b>		
	1-80722D56	HOUSING, circulator
	1-84984E01	ANTENNA HOUSING
	3-134169	SCREW, tapping; 4-40 x 1/4"; 6 used
	15-84601E03	COVER
	26-84163G02	SHIELD, antenna connector
	21-868487	CAPACITOR, fixed; 1.5 pF ± 0.25 pF; 500 V
	21-82355B62	CAPACITOR, fixed; 1 pF ± 0.25 pF; 500 V

TKN8112A Cable Assembly, RF (18") PL-6976-O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
P602, B03	28-84579F04	<b>connector, plug:</b> single contact; UHF type
W12	1-80722D24 30-84173E01	<b>cable assembly:</b> includes P602, P603, and: CABLE, coaxial; 18" used

**note:** Field replacement of component parts of this unit is not recommended. For replacement, order the entire unit. Specify part number and frequency range required.

TKN8111A Cable Assembly Extension RF (10 Ft.) PL-6975-O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
	1-80722D23	CABLE ASSEMBLY includes:
	28-82021G01	CONNECTOR, plug; coaxial; 2 used
	30-82345	CABLE, coaxial; 132" used

TKN8110A Cable Assembly, Extension Control (10 Ft.) PL-6974-A

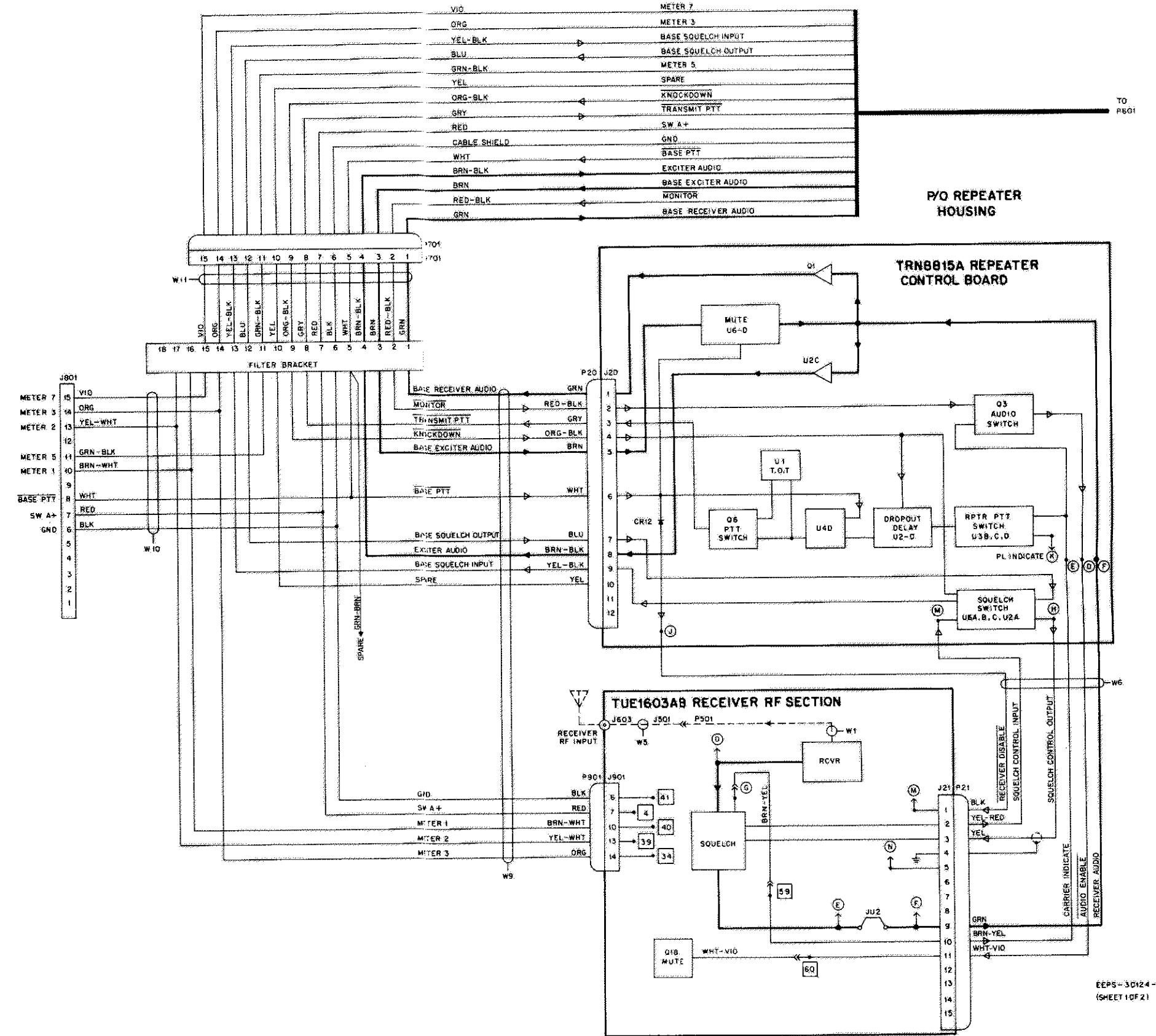
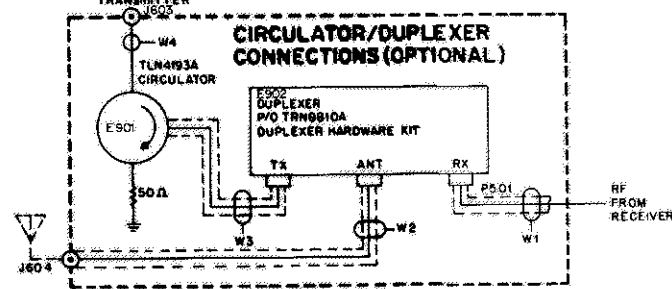
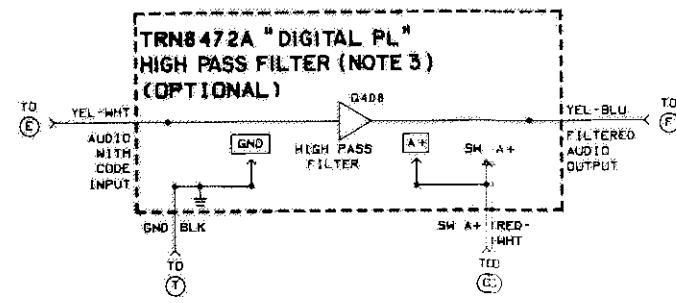
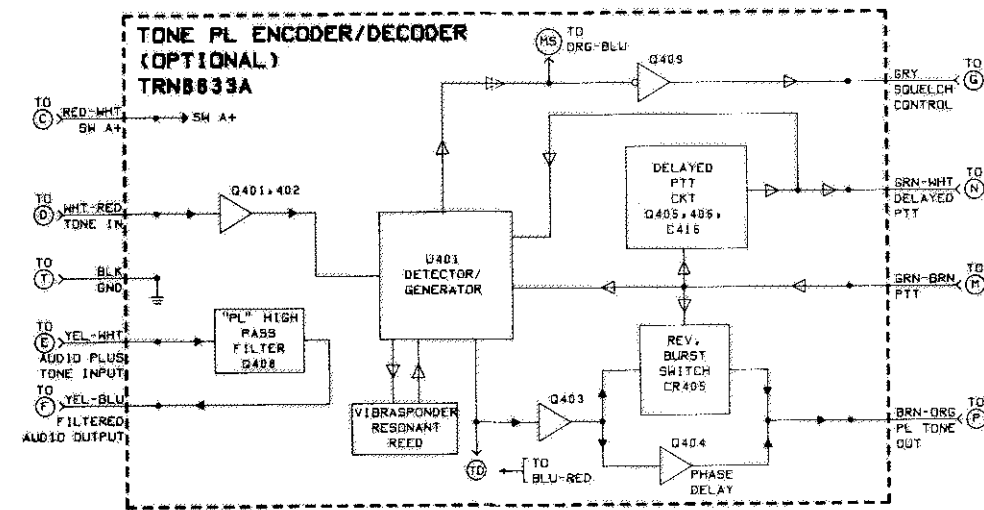
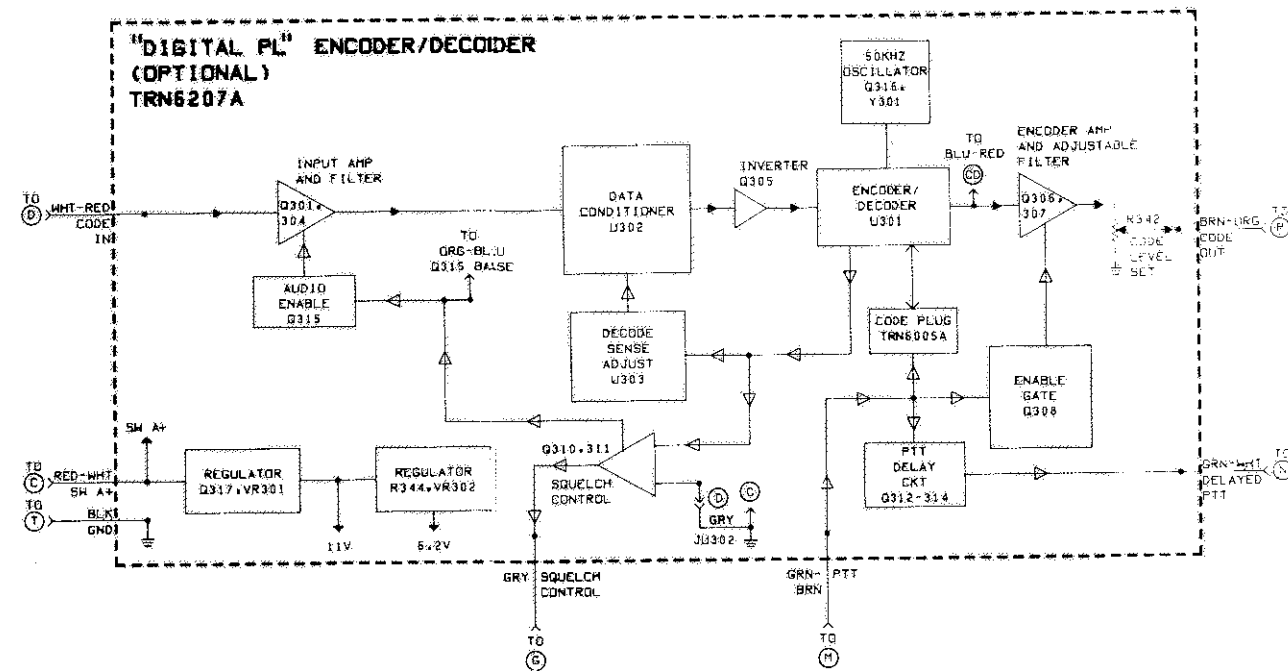
REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
	1-80722D22	CABLE ASSEMBLY includes:
	2-9627	NUT, hex; 4-40 x 3/16" x 3/32"; 4 used
	3-1930	SCREW, machine; 4-40 x 3/8"; 4 used
	15-83292K01	HOUSING, connector, receptacle; 15-contact
	30-84794M01	CABLE, 14-conductor; 10" used
	29-84706E06	CONTACT, receptacle; 15 used
	15-83293K02	HOUSING, connector; plug; 15-contact
	29-84706E05	CONTACT, pin; 15 used
	37-82603D01	SLEEVE, number 1; 2 used
	42-83885M01	RETAINER, cable; 2 used

TKN8035A Cable Assembly, RPTR Interconnect PL-6973-O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
J701	15-83293K02 28-84706E05	<b>connector:</b> includes: HOUSING, connector; 15-contact CONTACT, pin; 15 used
J801	15-83292K01 29-84706E06	<b>includes:</b> HOUSING, connector; 15-contact CONTACT, receptacle; 8 used
P20	15-84301K15 39-84300K01	<b>includes:</b> HOUSING, connector; 12-contact CONTACT, receptacle; 10 used
P901	15-83293K01 28-84706E05	<b>includes:</b> HOUSING, connector; 15-contact CONTACT, pin; 5 used
W9	1-80722D19 28-84302K01 42-10217A02	<b>cable assembly:</b> includes P20, P901, and: PLUG, key STRAP, tie; 0.091" x 3.62"; 5 used
W10	1-80722D59 42-10217A02	includes J801 and: STRAP, tie; 0.091" x 3.62"
W11	1-80722D60 42-10217A02 76-84069B02	includes J701 and: STRAP, tie; 0.091" x 3.62" FERRITE BEAD
<b>non-referenced items</b>		
	14-84045M01	INSULATOR; 1.4" x 2.9" x 0.015"
	42-10217A02	STRAP, tie; 0.091" x 3.62"; 2 used
	1-80722D18	BRACKET ASSEMBLY, feedthru capacitor includes: WASHER, shoulder; 18 used
	4-83755H01	CAPACITOR, feedthru; 1000 uF + 100.0%; 500 V; 18 used
	21-861219	
	7-83783M01	BRACKET, mtg.

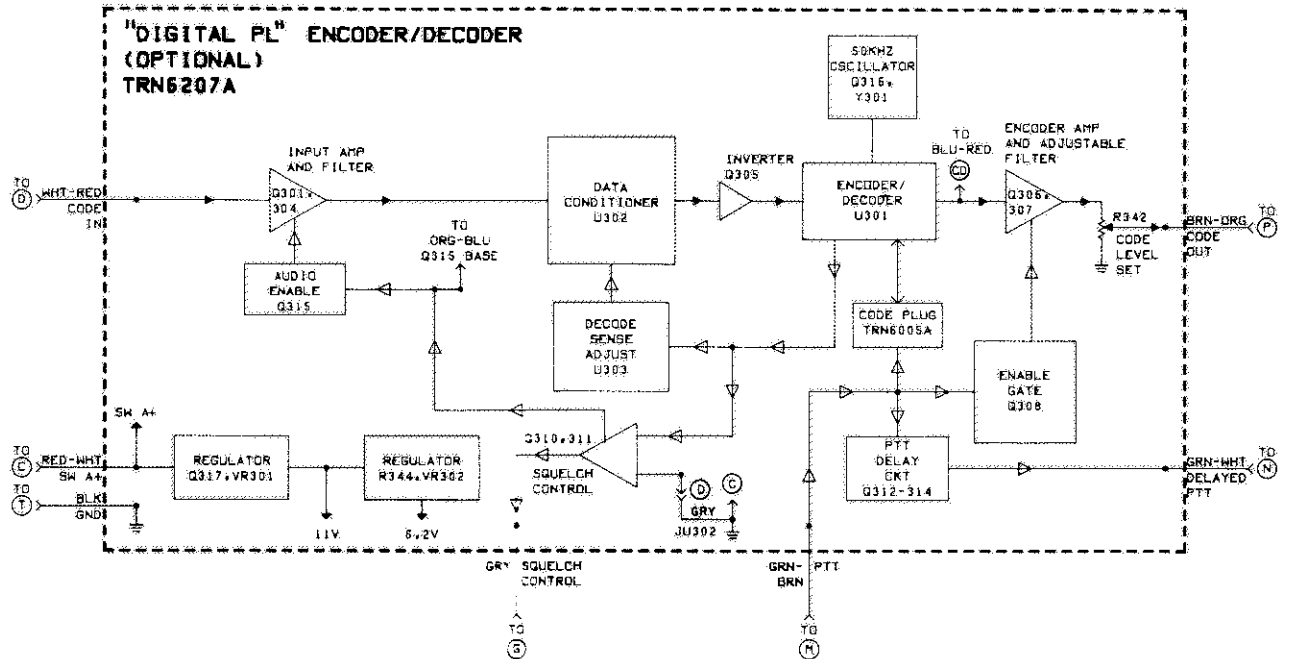
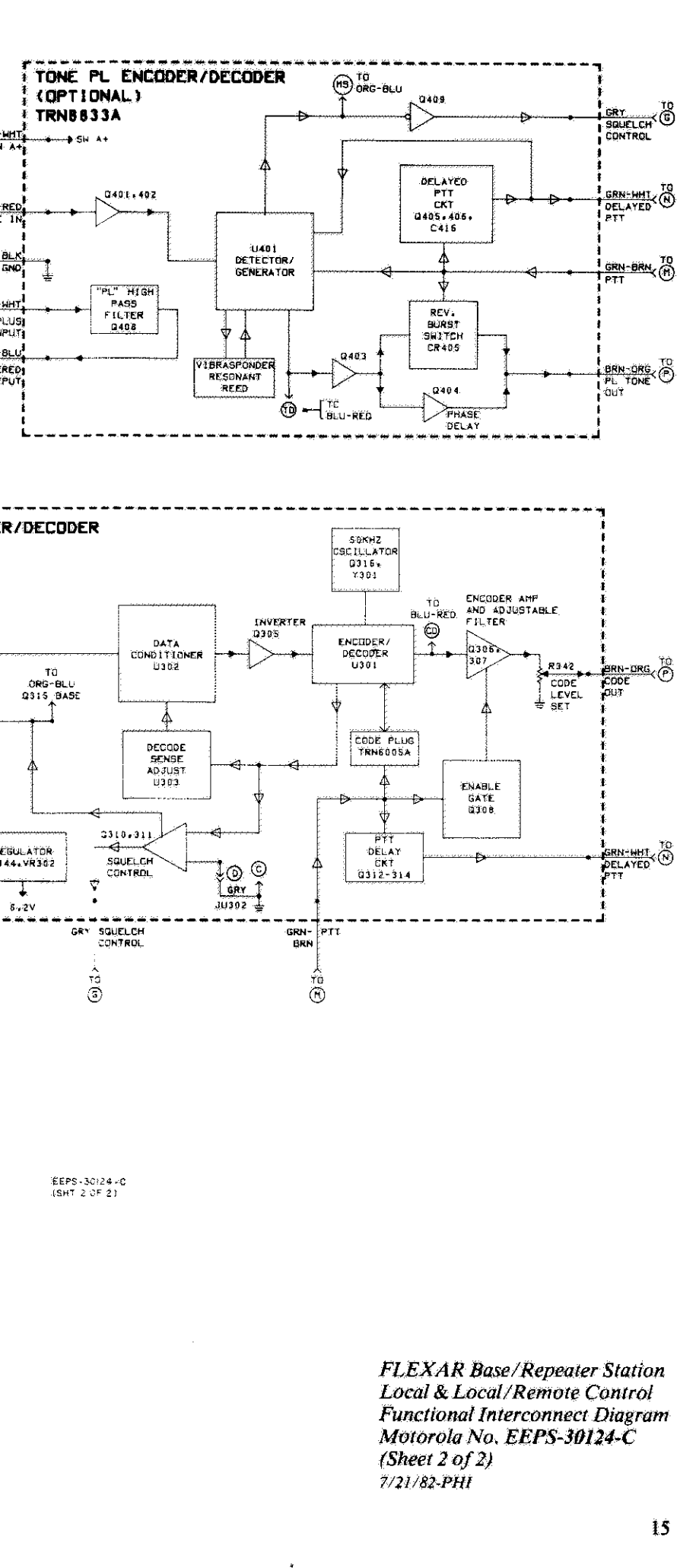
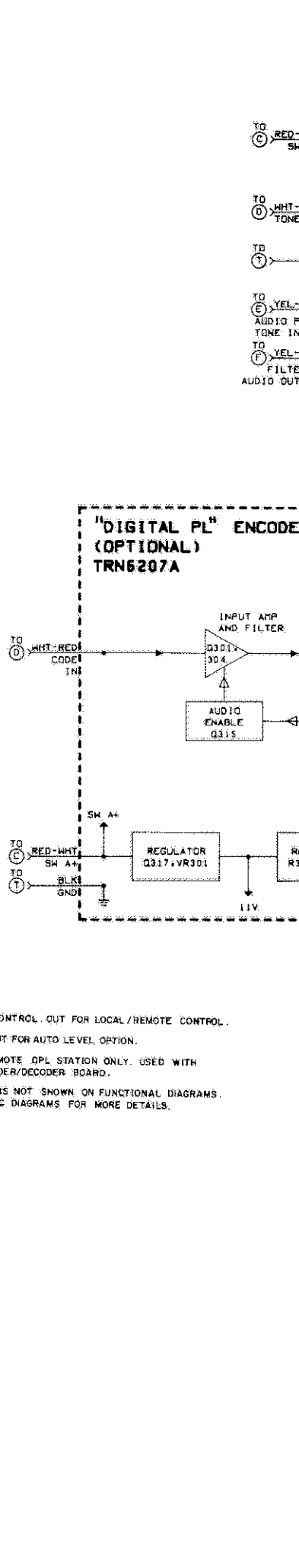
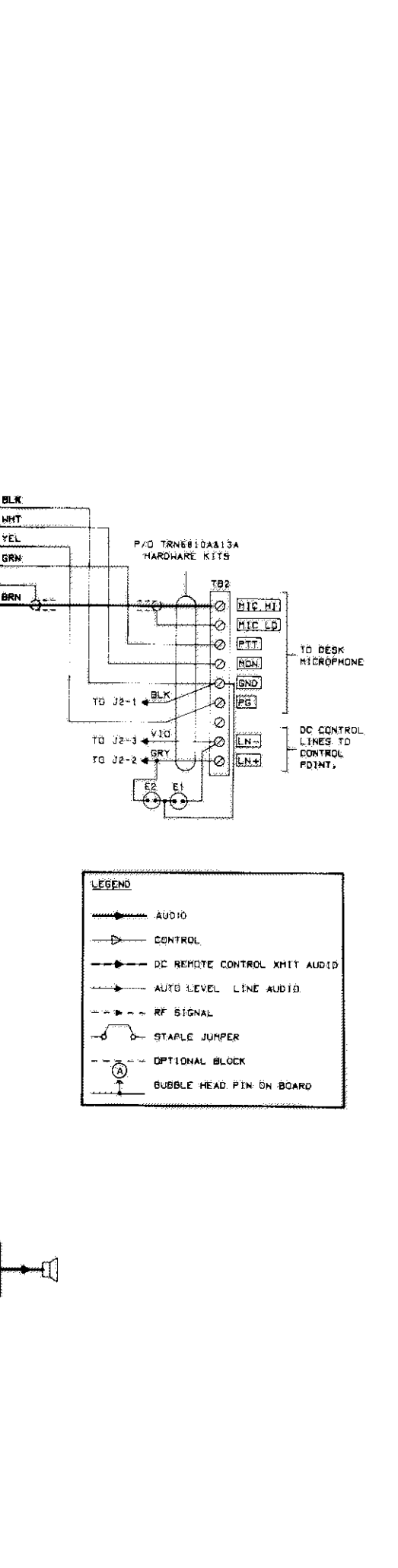
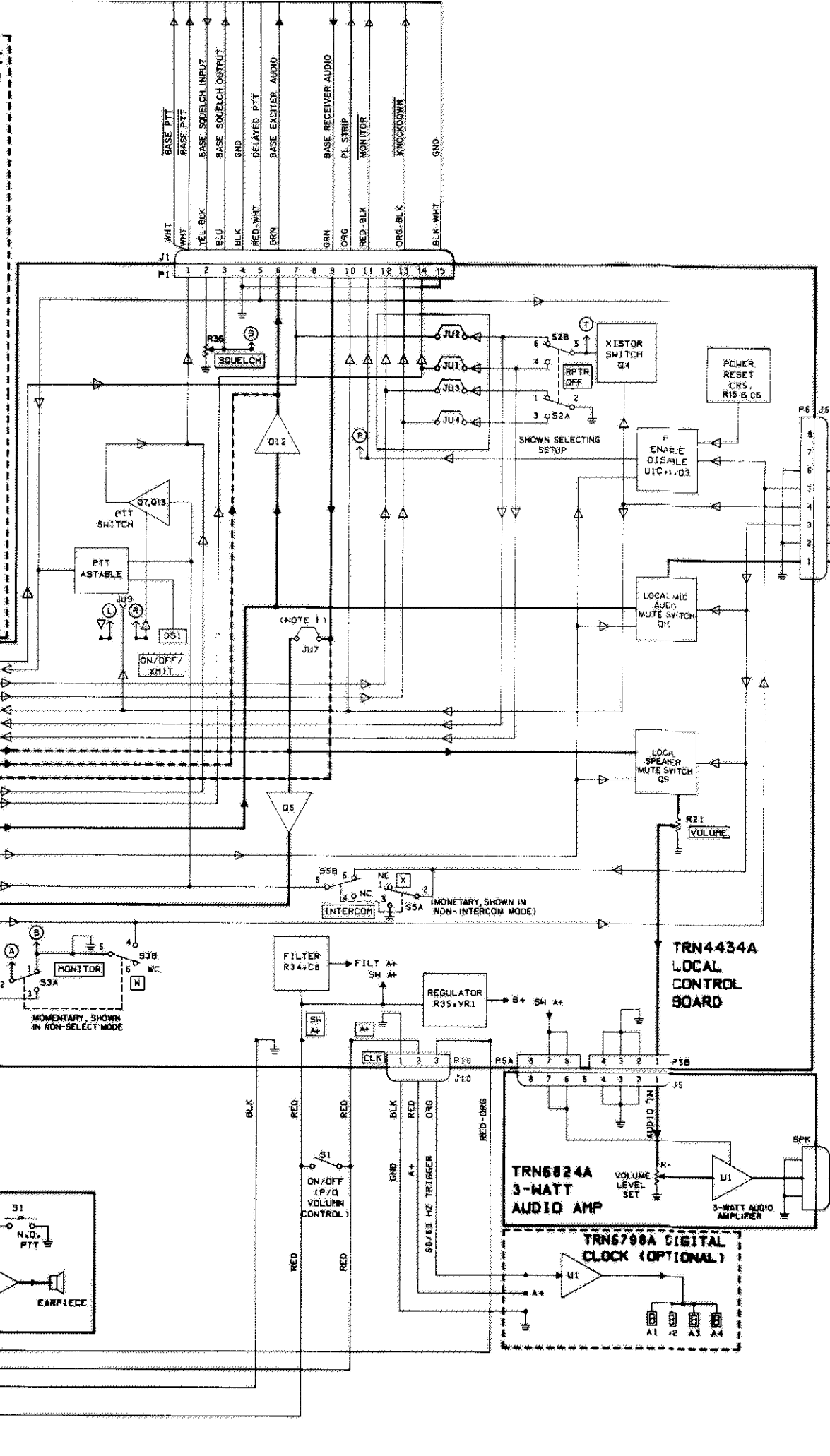
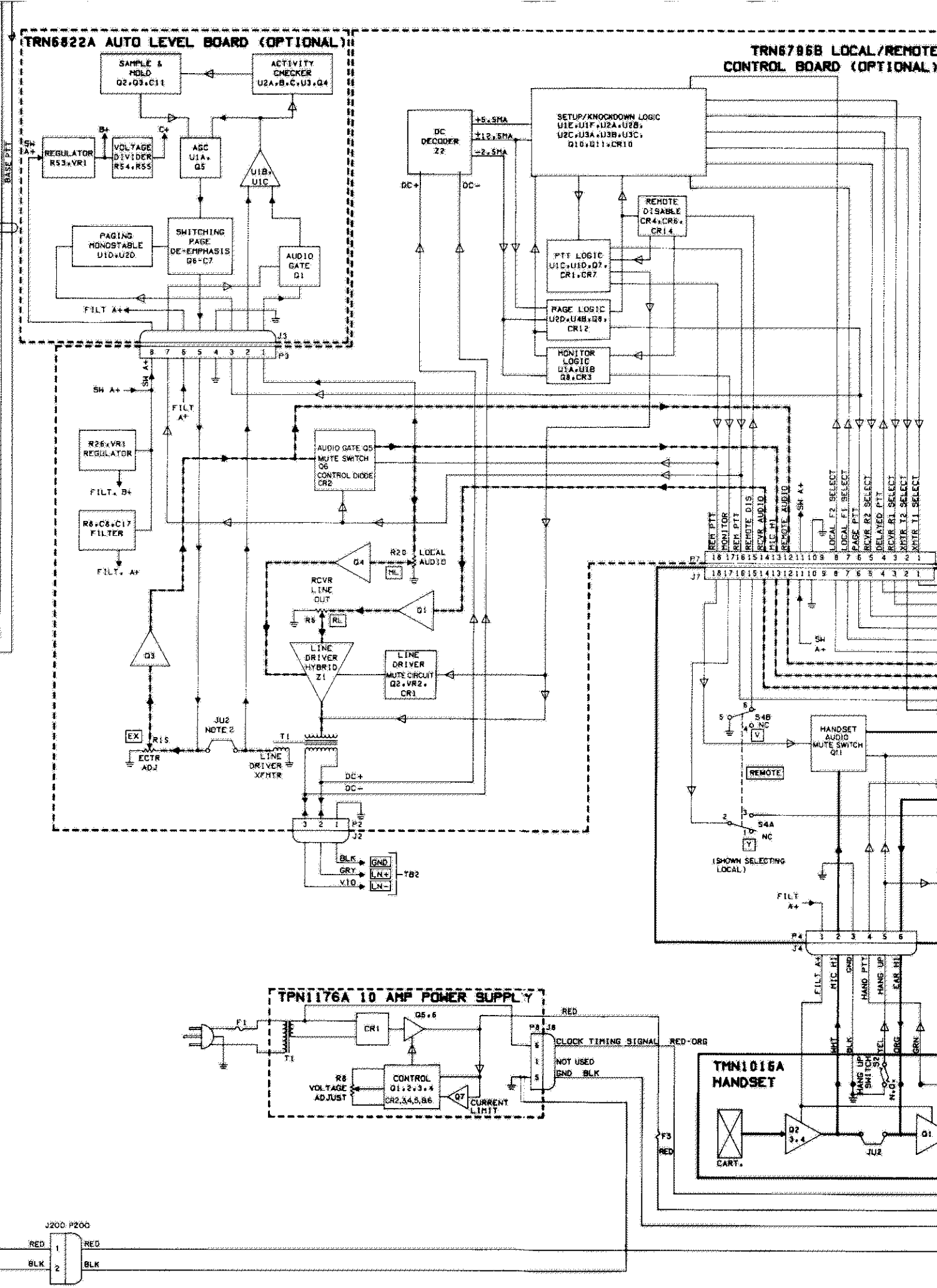
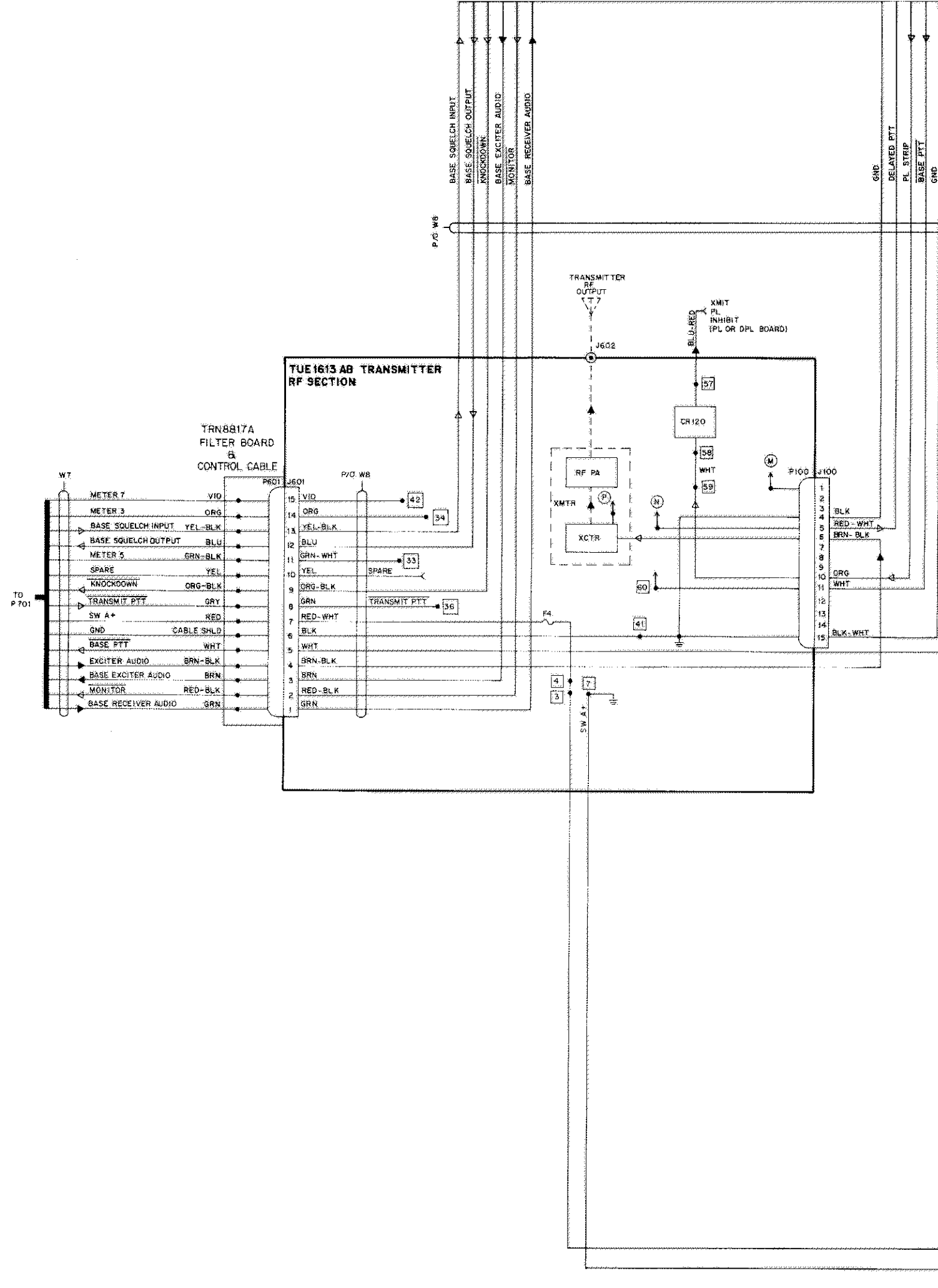
*FLEXAR Base/Repeater Station  
Cabling & Hardware Kits Parts Lists  
Motorola No. PEPS-30454-A  
5/20/81-UP*

BASE REPEATER CONTROL

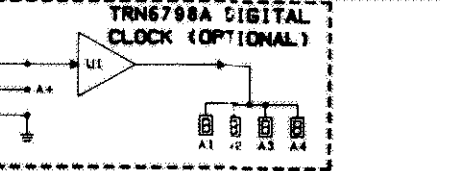
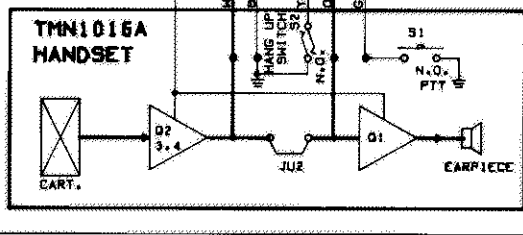
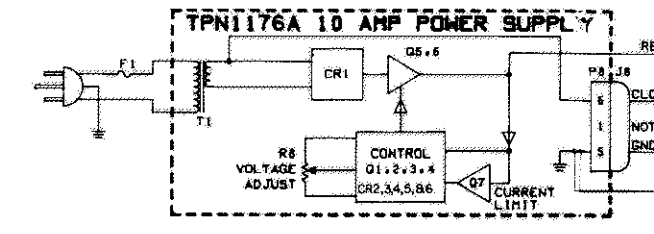
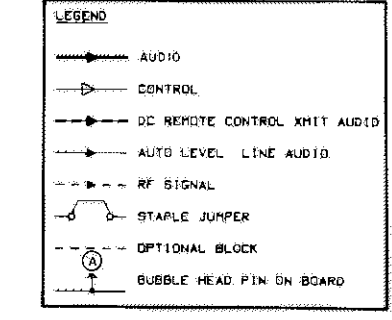


FLEXAR Base/Repeater Station  
Local & Local/Remote Control  
Functional Interconnect Diagram  
Motorola No. EEPS-30124-C  
(Sheet 1 of 2)

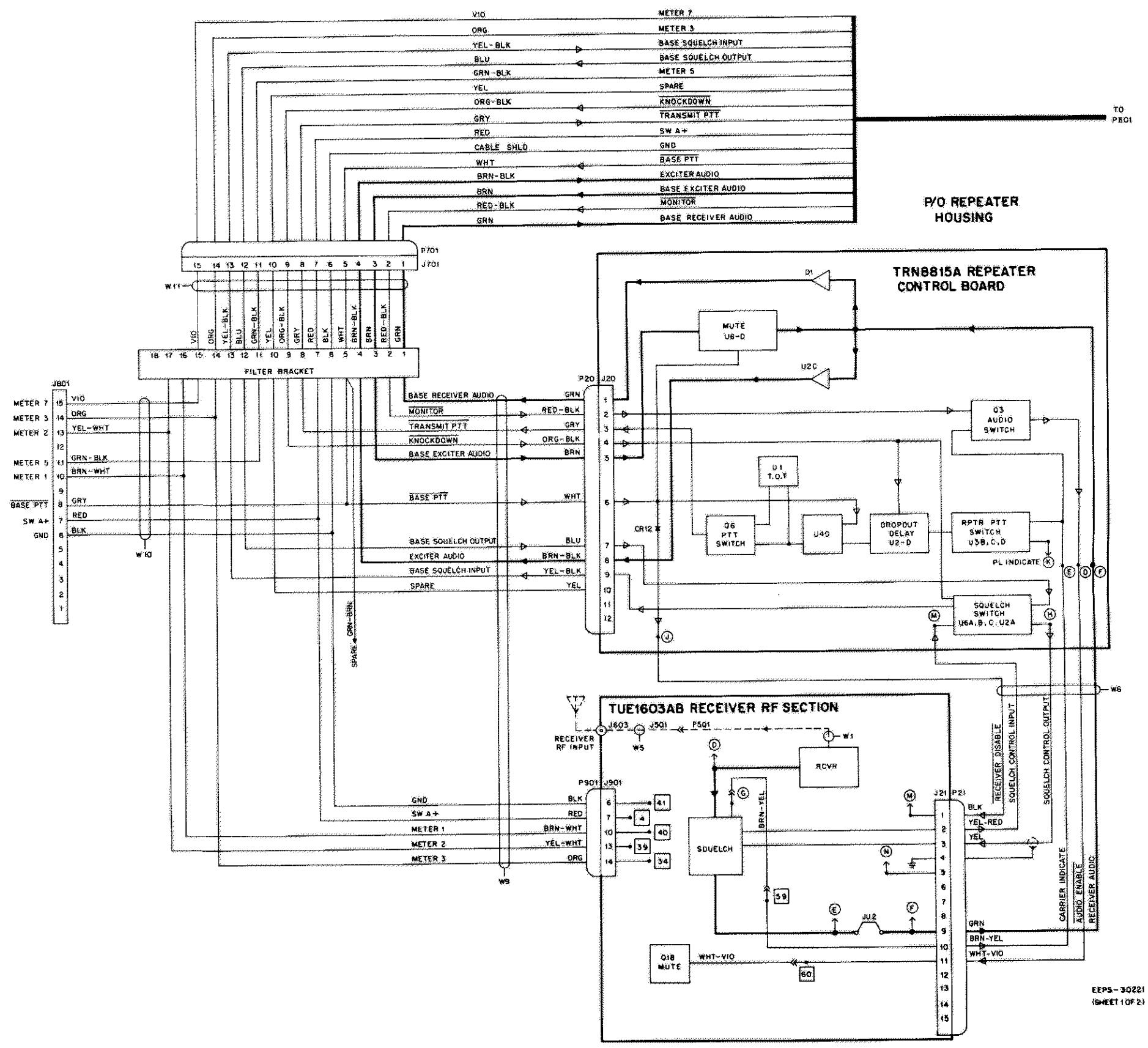
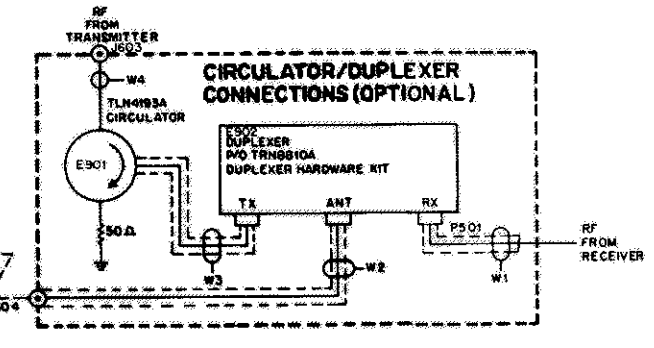
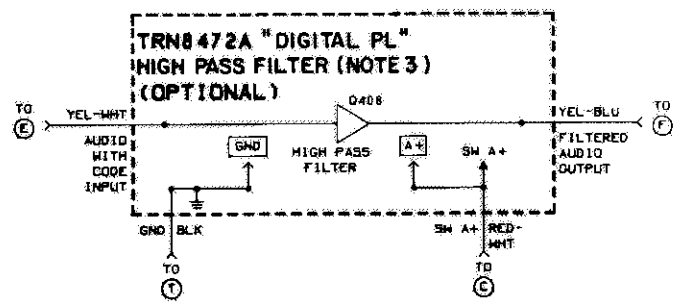
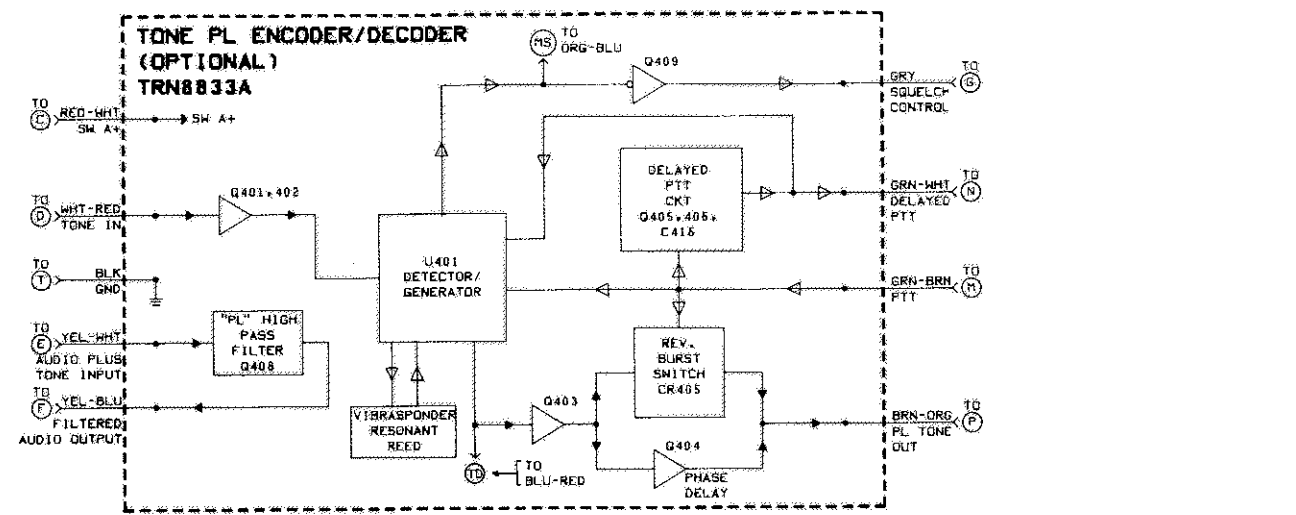
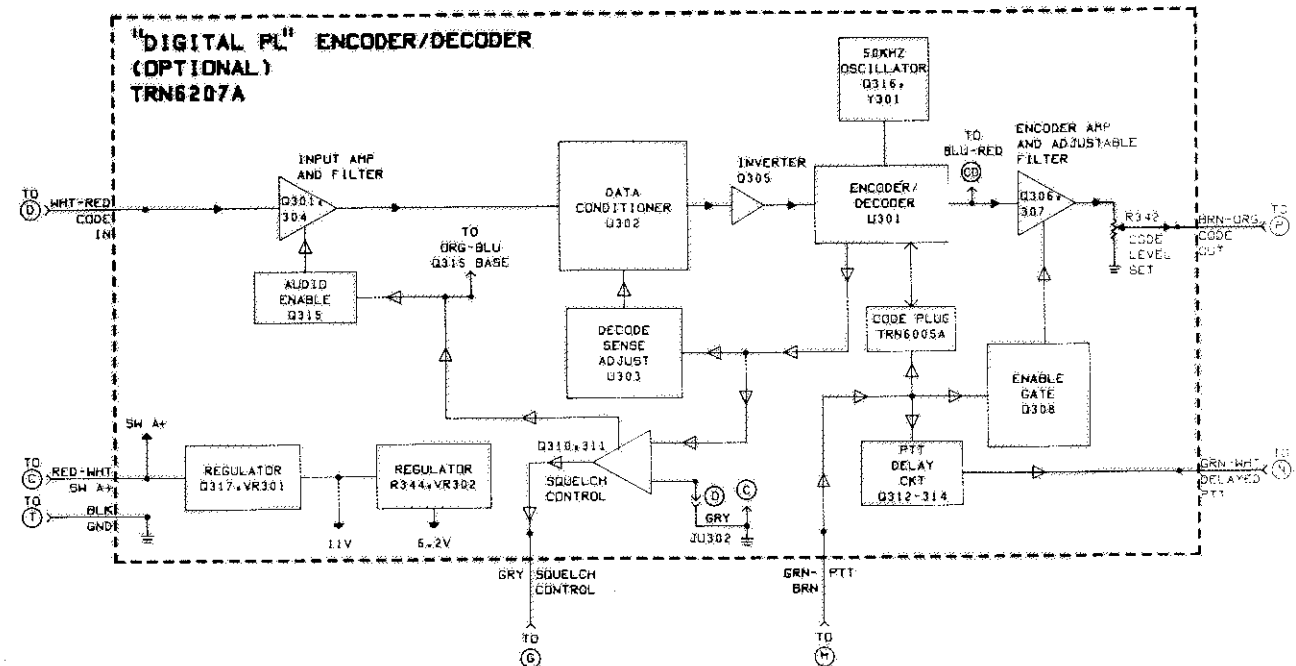
7/21/82-PHI



- NOTES:
1. JUT IN FOR LOCAL CONTROL. OUT FOR LOCAL/REMOTE CONTROL.
  2. J02 NORMALLY IN. OUT FOR AUTO LEVEL OPTION.
  3. LOCAL OR LOCAL/REMOTE OPL STATION ONLY. USED WITH TRN 6207A DPL ENCODER/DECODER BOARD.
  4. MOST BOARD JUMPERS NOT SHOWN ON FUNCTIONAL DIAGRAMS. REFER TO SCHEMATIC DIAGRAMS FOR MORE DETAILS.



FLEXAR Base/Repeater Station  
Local & Local/Remote Control  
Functional Interconnect Diagram  
Motorola No. EEPS-30124-C  
(Sheet 2 of 2)  
7/21/82-PH1

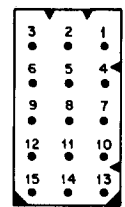
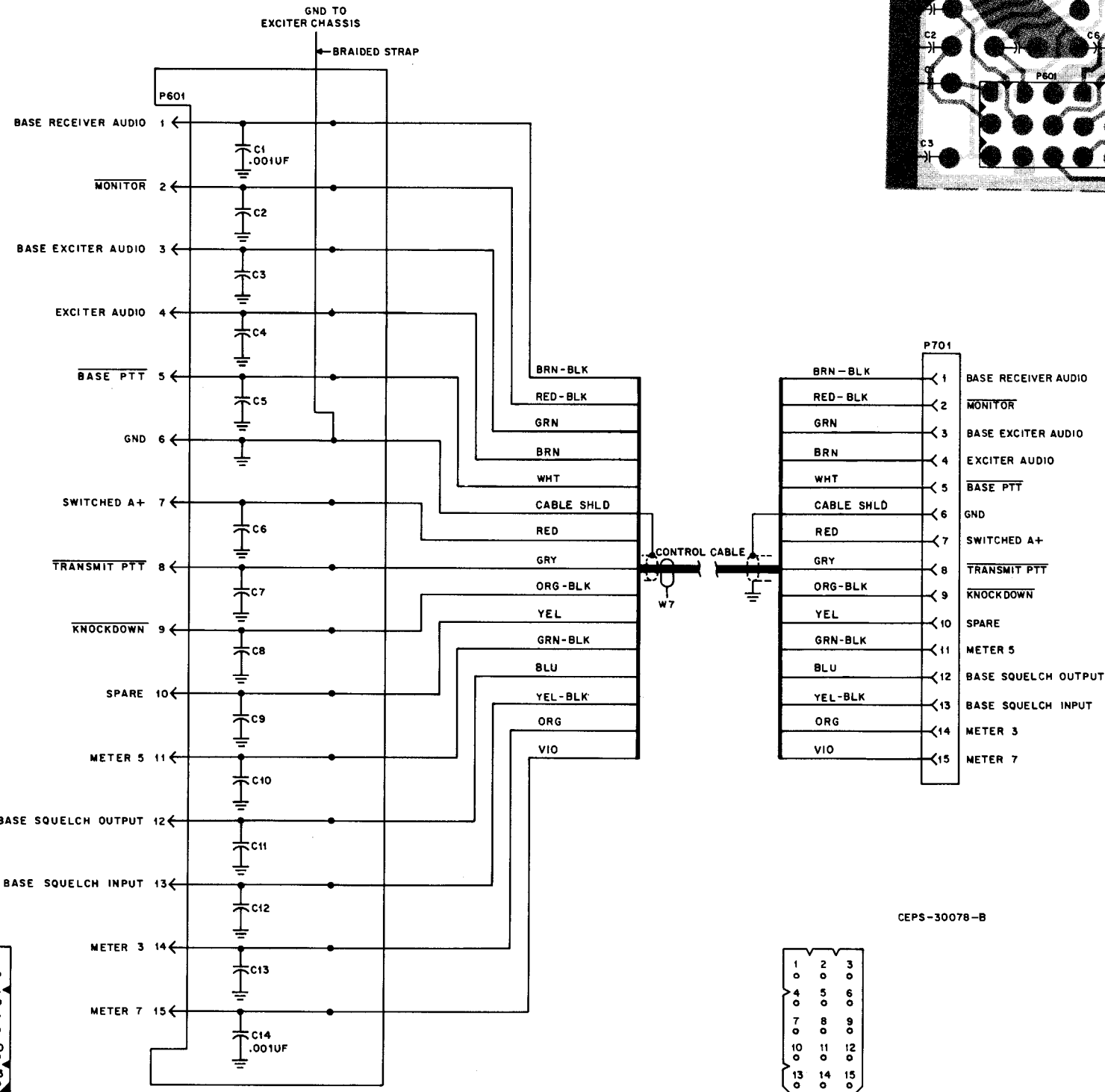
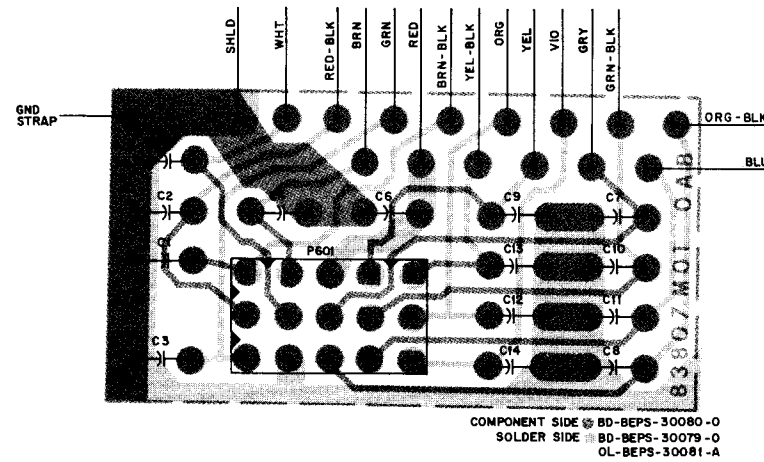


FLEXAR Base/Repeater Station  
 DC Remote Control  
 Functional Interconnect Diagram  
 Motorola No. EEPS-30221-C  
 (Sheet 1 of 2)  
 7/21/82-PH1

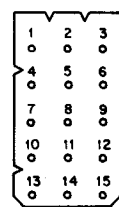


# FILTER BOARD & CONTROL CABLE

MODEL TRN8817A



P601 DETAIL  
SHOWN FROM PIN SIDE



P701 DETAIL  
SHOWN FROM PIN SIDE

NOTE: ALL CAPACITORS ARE .001UF.

## FUNCTION

Provides filtered control line and audio interconnections between the base station housing and the repeater housing.

## parts list

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
C1 thru 14	21-83596E13	capacitor, fixed: .001 uF ± 10%; 500 V
P601	15-83293K01 39-83788M01	connector, plug: includes: HOUSING, connector; 15-contact CONTACT, pin; 15 used
P701	15-83292K01 29-84706E06	connector, receptacle: includes: HOUSING, connector; 15-contact CONTACT, receptacle; 15 used
W7	1-80722D21 2-9627 3-1930 29-83167C01 30-84794M01 37-82603D01 42-801273 42-83885M01	cable assembly: includes C1 thru C14, P601, P701, and: NUT, hex: 4-40 x 3/16 x 3/32"; 2 used SCREW, machine: 4-40 x 3/8"; 2 used TERMINAL, strain relief; 13 used CABLE, 14-conductor; 18" long SLEEVE, number "1"; 2 used CLAMP, wire with S-hook RETAINER, cable
non-referenced item		
	29-84078B01	LUG, flanged spade

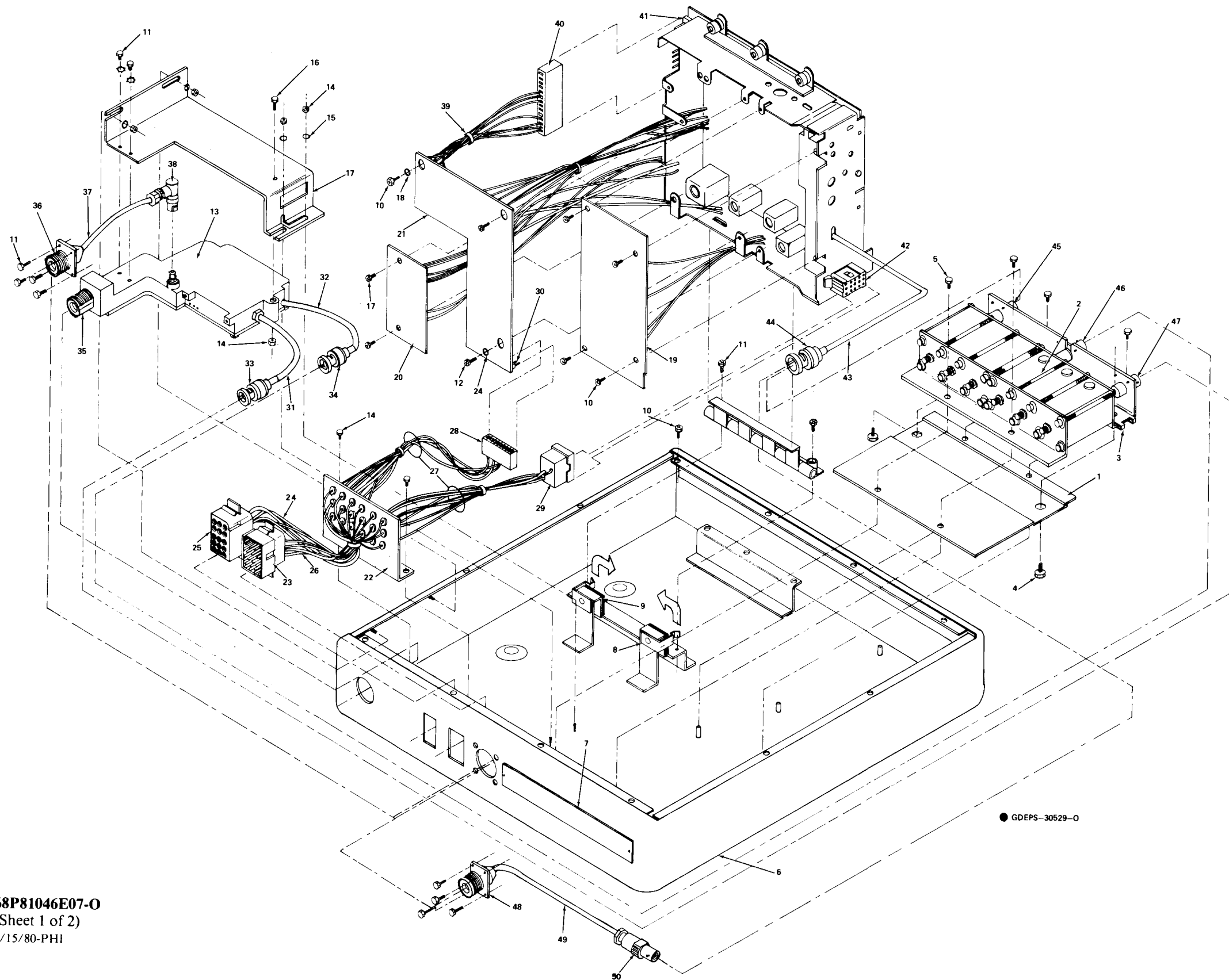
FILTER BOARD & CONTROL CABLE



# EXPLODED MECHANICAL VIEW

OPTION L357A & L358A SERIES

## REPEATER HOUSING



### parts list

Repeater Housing Exploded Mechanical View

PL-7004-O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
1	64-83782M01	DUPLEXER MOUNTING PLATE
2	1-83861M01	DUPLEXER (E902)
3	2-836540	NUT, speed; 10-16
4	3-131834	SCREW, tapping; 10-16 x 3/8"
5	3-122080	SCREW, machine; 6-32 x 1/4"
6	15-83778M01	HOUSING, repeater
7	33-84053M01	NAMEPLATE, w/serial no.
8	41-84044M01	SPRING, retainer clip
9	75-82230B14	PAD, rubber
10	3-134168	SCREW, tapping; 4-40 x 1/4"
11	3-134212	SCREW, tapping; 4-40 x 5/16"
12	3-135506	SCREW, tapping; 6-32 x 1/4"
13	1-80722D57	CIRCULATOR (E901)
14	2-132616	NUT, hex; 6-32 x 1/4" x 3/32" x 1/8"
15	4-138499	WASHER, flat; #6
16	3-124444	SCREW, machine; 6-32 x 1"
17	7-83781M01	BRACKET, mounting; circulator
18	4-114057	WASHER, flat; #4
19		CODED SQUELCH BOARD (PL or DPL)
20		DPL HIGH PASS FILTER BOARD (DPL only)
21		REPEATER CONTROL BOARD
22		FEEDTHROUGH CAPACITOR BRACKET
23		J701
24		W10
25		J801
26		W11
27		W9
28		P20
29		P901
30		J20
31		W3
32		W2
33		Tx INPUT PLUG (to Duplexer)
34		ANT OUTPUT PLUG (from Duplexer)
35		J604 (Antenna Input/Output-Circulator/Duplexer Only)
36		J603 (RF Input) — Circulator/Duplexer Only
37		W4 (Circulator/Duplexer Only)
38		RF INPUT PLUG (Circulator/Duplexer Only)
39		W6
40		P21
41		J21
42		J901
43		W1
44		P501 (Rx Input Plug)
45		Rx INPUT JACK — J501
46		ANT OUTPUT JACK (to Circulator)
47		Tx INPUT JACK (to Circulator)
48		J603 (RF Input) — Non-Circulator/Duplexer
49		W5 — Non-Circulator/Duplexer
50		J501 — Non-Circulator/Duplexer

● GDEPS-30529-0

68P81046E07-O

(Sheet 1 of 2)

7/15/80-PHI



# EXPLODED MECHANICAL VIEW

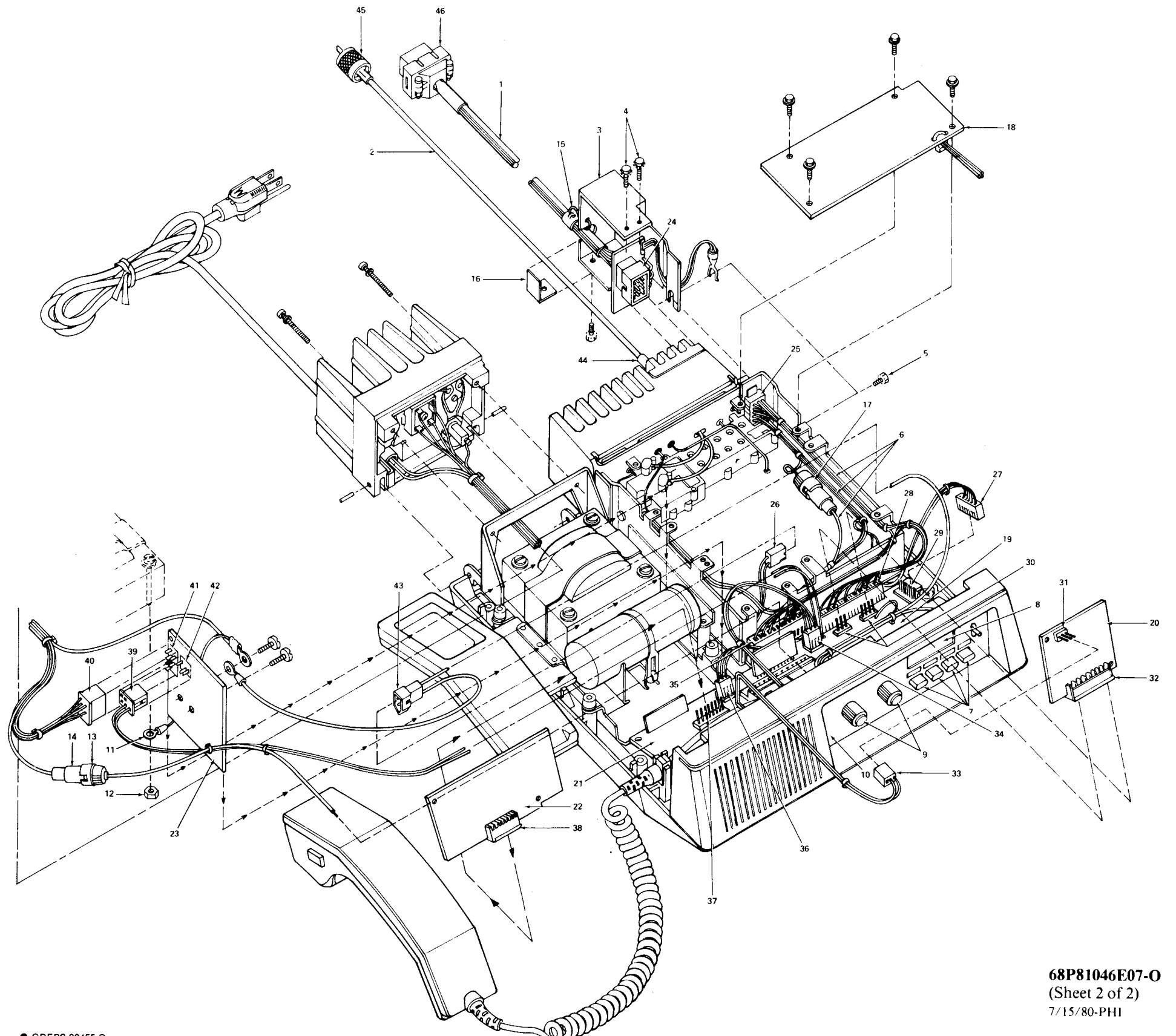
OPTION L357A & L358A SERIES

## BASE HOUSING

### parts list

Base Station Housing Exploded Mechanical View PL-7001-O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
1		FILTER BOARD & CONTROL CABLE (W7)
2		RF 18" CABLE ASSEMBLY (W12)
3	7-83787M01	FILTER BRACKET
4	3-135506	SCREW, tapping; 6-32 x 1/4"
5	3-136138	SCREW, tapping; 6-32 x 3/8"
6	1-80722D51	RADIO INTERCONNECT CABLE (W8)
7	38-83282L02	PUSHBUTTON
8	43-83291L01	CLOCK WINDOW INSERT
9	36-83281L01	CONTROL KNOB
10	13-83280L34	ESCUTCHEON, RPTR, Monitor, Remote.
	or 13-83280L35	ESCUTCHEON, RPTR, Monitor, Remote.
		Intercom
	or 13-83280L36	ESCUTCHEON, RPTR, Monitor, Remote.
		Clock
	or 13-83280L37	ESCUTCHEON, RPTR, Monitor, Remote.
		Intercom, Clock
	or 13-83280L33	DC REMOTE
11	1-80728D28	HEATSINK WIRE & LUG (W100)
12	2-119913	NUT, hex; 11/16"
13	1-80728D25	HEAT SINK HOT WIRE & LUG
14	1-80728D27	DC REMOTE CONTROL WIRE & F3 FUSE
		HOLDER
	or 1-80728D30	LOCAL CONTROL WIRE & F3 FUSE
		HOLDER
15	42-801273	CABLE CLAMP W/S-HOOK STRAIN RELIEF
16	7-84043M01	15 W PA ADAPTER COVER BRACKET
17	65-834464	FUSE, p/o W8 (F4)
18		CODED SQUELCH BOARD (PL or DPL)
19		LOCAL CONTROL BOARD
20		3 WATT AUDIO BOARD
21		LOCAL/REMOTE CONTROL BOARD
22		AUTO LEVEL BOARD
23		POWER SUPPLY REGULATOR BOARD
24		P601
25		J601
26		J200
27		J6
28		J1
29		P6
30		P5
31		SPK PLG
32		J5
33		SPK JACK
34		CLK PLG
35		J100
36		J2
37		P3
38		J3
39		J8
40		J11
41		P11
42		P8
43		P200
44		P603
45		P604
46		P701



FLEXAR BASE/REPEATER STATION



# parts list

TRN8815A Repeater Control Board

PL-6980-A

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		<b>capacitor, fixed: <math>\mu\text{F} \pm 20\%</math>; 35 V;</b> unless otherwise stated:
C1	23-84538G03	0.1
C2	8-82905G31	$0.15 \pm 10\%$ ; 50 V
C3	23-84538G03	0.1
C4, 5	23-84538G10	10; 20 V
C6	23-84538G01	1
C7	23-84665F03	100 + 100-10%; 25 V
C8	23-84538G01	1
C9	23-84665F01	10 + 100-10%; 25 V
C10, 11	8-84496D04	.047; 100 V
C12	23-84538G01	1
C13	8-84496D04	.047; 100 V
C14	8-82905G31	$0.15 \pm 10\%$ ; 50 V
C15	23-84538G01	1
C16	23-84665F04	1 + 150-10%; 50 V
		<b>diode: (see note)</b> silicon
CR1 thru 15	48-83654HD1	
		<b>connector, plug:</b> 12-contact includes: HOUSING, connector: 15-contact CONTACT, terminal: 7 used
J20	28-84299K15	
P21	15-83498F17 29-83499F01	
		<b>transistor: (see note)</b> NPN Darlington; type M9706 NPN; type M9642 FET N-channel; type M9653 NPN; type M9642
Q1	48-869706	
Q2 thru 4	48-869642	
Q5	48-869653	
Q6	48-869642	
		<b>resistor, fixed; k ohms <math>\pm 10\%</math>; 1/4 W;</b> unless otherwise stated:
R1	6-124A71	$8.2 \pm 5\%$
R2	6-124C73	10
R3	6-124B18	$680 \pm 5\%$
R4	6-124C47	820 ohms
R5	6-124B06	$220 \pm 5\%$
R6	6-124A83	$27 \pm 5\%$
R7	18-84944C05	variable; $250 \pm 20\%$
R8, 9	6-124C97	100
R10	6-124C25	100 ohms
R11	6-124B06	$220 \pm 5\%$
R12	6-124C09	22 ohms
R13	6-124C59	2.7
R14, 15	6-124D12	390
R16	6-124C89	47
R17	6-124C61	3.3
R18	6-124C89	47
R19	6-124C73	10
R20	6-124C89	47
R21	6-124C73	10
R22, 23	6-124B12	$390 \pm 5\%$
R24	6-124C73	10
R25	6-124C97	100
R26	6-124C73	10
R27	6-124C97	100
R28	6-124C45	680 ohms
R29	6-124A65	$33 \pm 5\%$
R30	6-124C89	47
R31	6-124A70	$18 \pm 5\%$
R32	6-124C58	2.7
R33	18-84944C07	variable; $100 \pm 20\%$
R34	6-124A97	$100 \pm 5\%$
R35A	6-185B12	$390k \pm 5\%$ ; 1/8 W
R35B	6-185B14	$470k \pm 5\%$ ; 1/8 W
R36	6-124A49	$1 \pm 5\%$
R37	6-124C29	150 ohms
R38	6-124A55	$1.8 \pm 5\%$
R39	6-124A66	$5.1 \pm 5\%$
R40	6-124C71	8.2
R41	6-124A73	$10 \pm 5\%$
R42	6-124C25	100 ohms
R43 thru 45	6-124C73	10
		<b>integrated circuit: (see note)</b> 14-bit binary counter quad operational amplifier quad 2-input NAND-Schmitt trigger quad 2-input NOR gate hex inverter quad transmission gate
U1	51-82884L42	
U2	51-83629M08	
U3	51-82884L66	
U4	51-82884L04	
U5	51-82884L03	
U6	51-82884L14	
		<b>voltage regulator: (see note)</b> Zener, 4.7 V Zener, 8.2 V
VR1	48-82256C03	
VR2	48-82256C16	
		<b>cable assembly:</b> includes P21 and: TERMINAL, strain relief; 8 used; CONTACT, receptacle; 3 used; STRAP, tie: .091 x 3.62"; 3 used
WB	1-80722D14 29-83167C01 39-10184A24 42-10217A02	
<b>non-referenced items</b>		
	28-84528K03	CONNECTOR, 14-contact (jumper block)
	1-80722D15	CIRCUIT BOARD ASSEMBLY includes:
	39-10184A10	CONTACT, terminal; 4 used

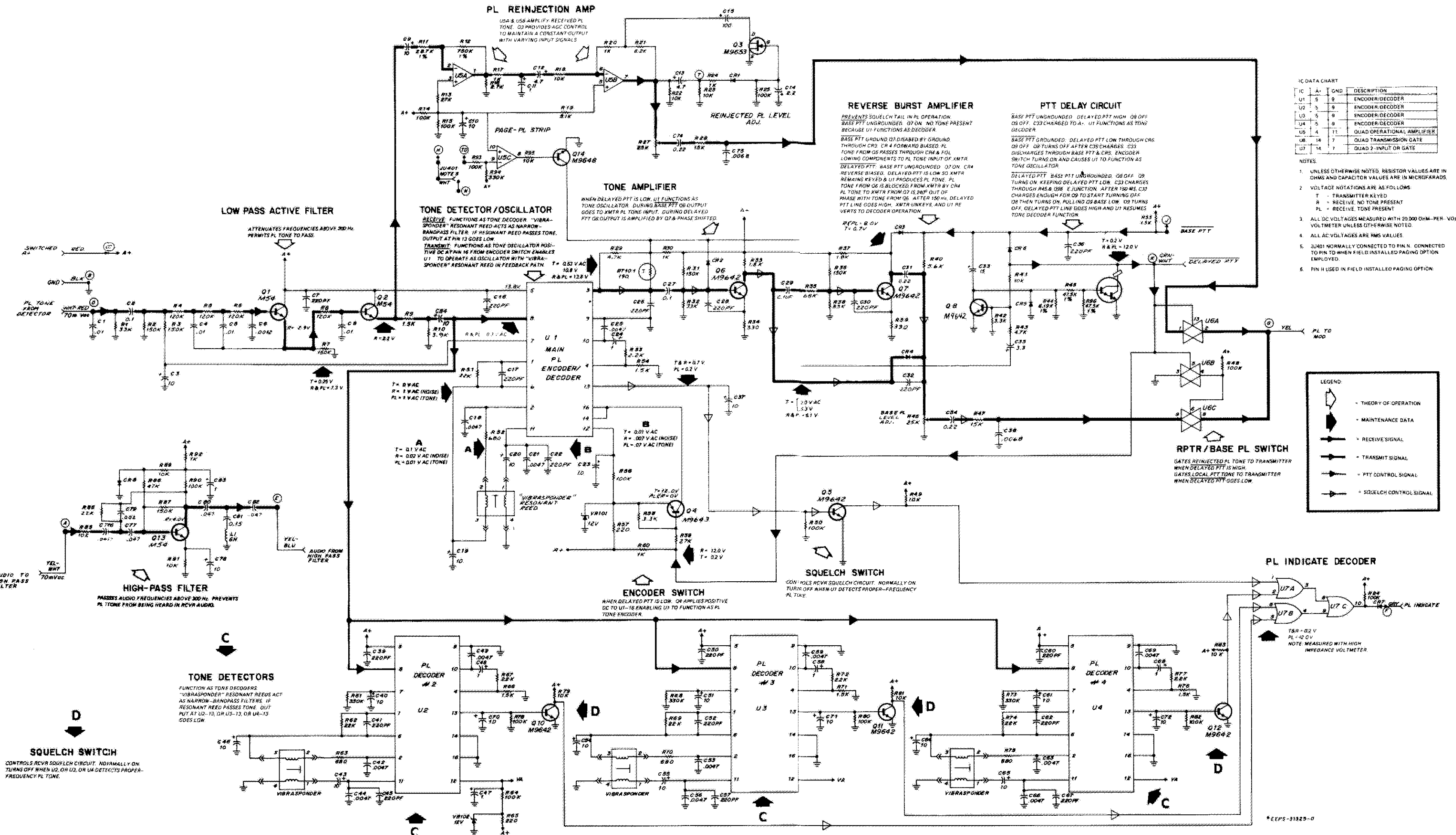
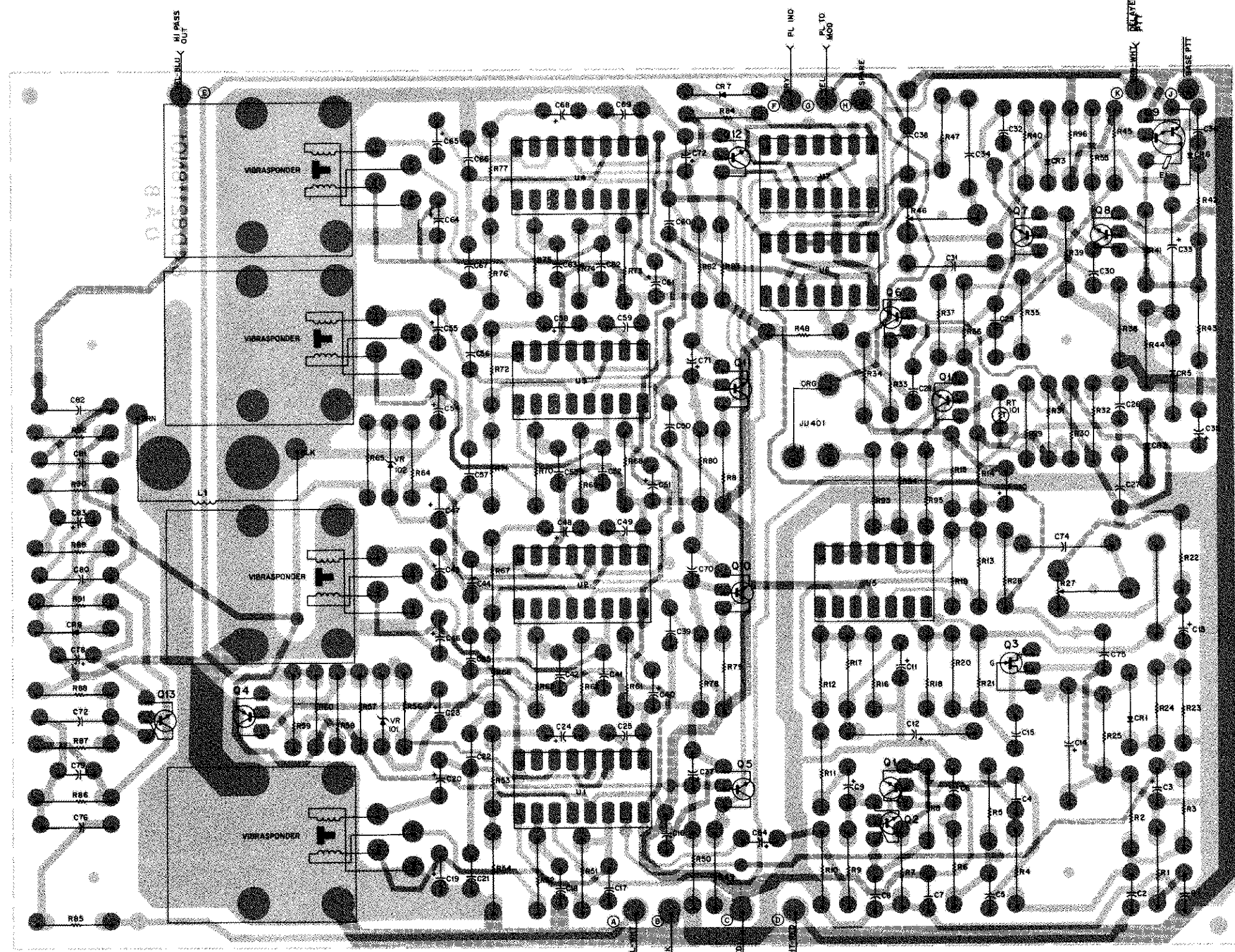
# revisions

CHASSIS AND SUFFIX NO.	REF. SYMBOL	CHANGE	LOCATION
TRN8815A	R35	FROM 6-124B06 $220 \pm 5\%$ ; 1/4 W	TIME-OUT TIMER CIRCUIT
	R35A	ADD 6-185B12 $390k \pm 5\%$ ; 1/8 W	
	R35B	ADD 6-185B14 $470k \pm 5\%$ ; 1/8 W	

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



# COMMUNITY REPEATER TONE PRIVATE-LINE ENCODER/DECODER BOARD MODEL TRN4745A



BLOCK DIAGRAM AND PARTS LIST  
SHOWN ON OTHER SIDE

68P81110E55-A  
2/20/81-PHI

COMMUNITY REPEATER TONE PL ENCODER/DECODER

# parts list

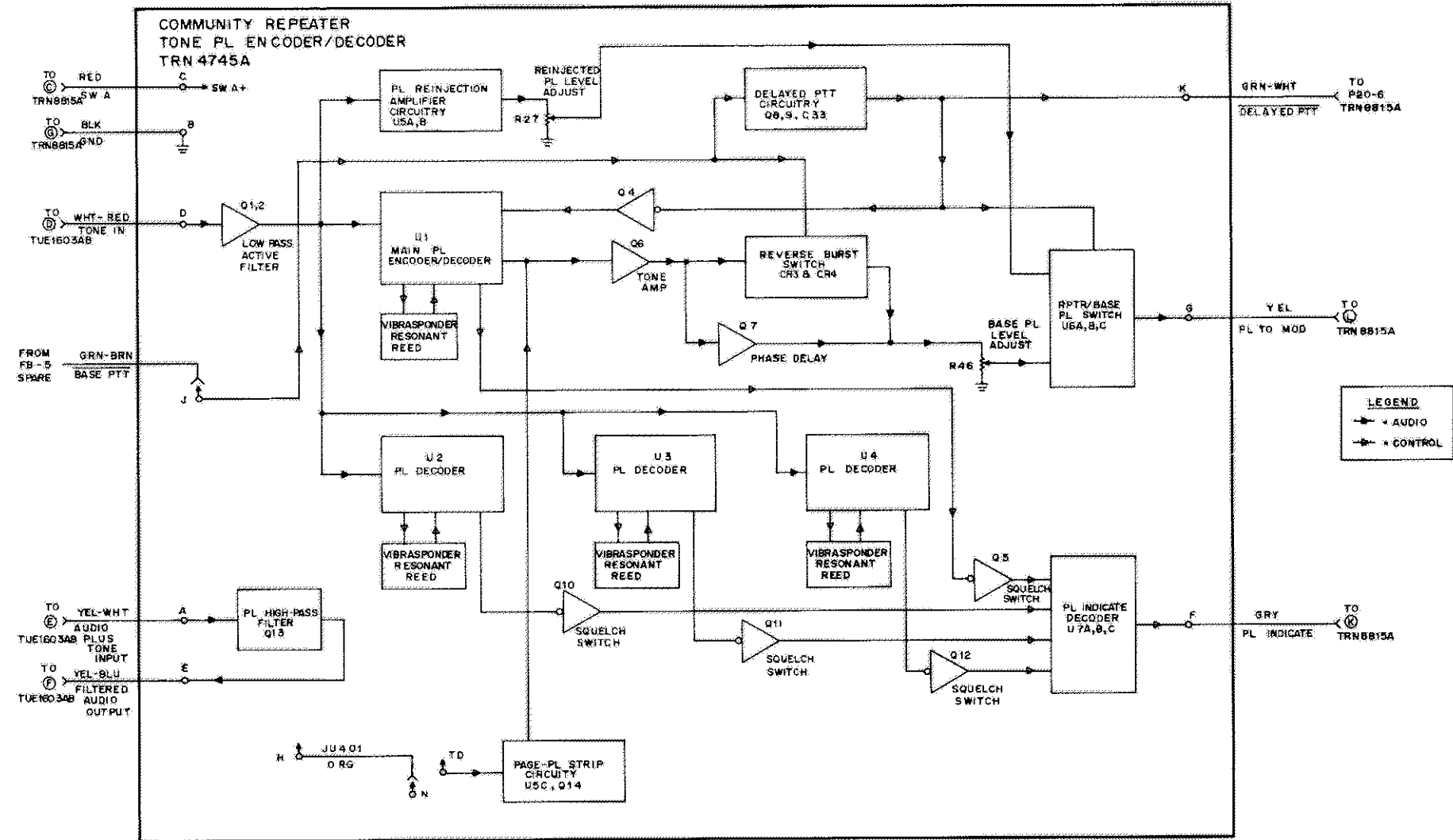
TRN4745A Encoder/Decoder Board PL-7199-O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
C1	8-11017A08	capacitor, fixed: uF ± 10%; 100 V; unless otherwise stated:
C2	8-11017B17	.01 ± 5%; 50 V
C3	23-84665F01	10 ± 100-10%; 25 V
C4, 5	8-11017A09	.01 ± 5%; 50 V
C6	21-82428B23	.00122
C7	21-11015B05	220 mF
C8	8-11017A08	.01 ± 5%; 50 V
C9, 10	23-84665F01	10 ± 100-10%; 25 V
C11	23-84538G01	1.0 ± 20%; 35 V
C12	23-865137	4.7 ± 20%; 25 V
C13	23-84538G02	4.7 ± 20%; 20 V
C14	23-82783B17	2.2 ± 20%; 20 V
C15	23-84665F03	100; 25 V
C16, 17	21-11015B05	220 mF
C18	21-82428B09	.0047
C19, 20	23-84665F01	10 ± 100-10%; 25 V
C21	21-82428B09	.0047
C22	21-11015B05	220 mF
C23, 24	23-84538G01	1.0 ± 20%; 35 V
C25	21-82428B09	.0047
C26	21-11015B05	220 mF
C27	21-82372C01	0.1 ± 80-20%; 25 V
C28	21-11015B05	220 mF
C29	21-82372C01	0.1 ± 80-20%; 25 V
C30	21-11015B05	220 mF
C31	8-83293B02	0.22; 50 V
C32	21-11015B05	220 mF
C33	23-82783B13	15 ± 5%; 25 V
C34	8-83293B02	0.22; 50 V
C35	23-84538G23	15 ± 20%; 20 V
C36	21-11015B05	220 mF
C37	23-84665F01	10 ± 100-10%;
C38	8-83813H01	.0068; 50 V
C39	21-11015B05	220 mF
C40	23-84665F01	10 ± 100-10%; 25 V
C41	21-11015B05	220 mF
C42	21-82428B09	.0047
C43	23-84665F01	10 ± 100-10%; 25 V
C44	21-82428B09	.0047
C45	21-11015B05	220 mF
C46	23-84665F01	10 ± 100-10%; 25 V
C47, 48	23-84538G01	1.0 ± 20%; 35 V
C49	21-82428B09	.0047
C50	21-11015B05	220 mF
C51	23-84665F01	10 ± 100-10%; 25 V
C52	21-11015B05	220 mF
C53	21-82428B09	.0047
C54, 55	23-84665F01	10 ± 100-10%; 25 V
C56	21-82428B09	.0047
C57	21-11015B05	220 mF
C58	23-84538G01	1.0 ± 20%; 35 V
C59	21-82428B09	.0047
C60	21-11015B05	220 mF
C61	23-84665F01	10 ± 100-10%; 25 V
C62	21-11015B05	220 mF
C63	21-82428B09	.0047
C64, 65	23-84665F01	10 ± 100-10%; 25 V
C66	21-82428B09	.0047
C67	21-11015B05	220 mF
C68	23-84538G01	1.0 ± 20%; 35 V
C69	21-82428B09	.0047
C70, 71, 72	23-84665F01	10 ± 100-10%
C73		NOT USED
C74	8-83293B02	0.22; 50 V
C75	8-11017B07	.0068; 50 V
C76, 77	8-82096J04	.047 ± 10%; 250 V
C78	23-84538G05	10 ± 20%; 15 V
C79	21-82428B28	.002; 200 V
C80	8-82096J04	.047; 250 V
C81	8-82096G31	0.15; 50 V
C82	8-82096J04	.047; 250 V
C83	23-84538G01	1.0 ± 20%; 35 V
C84	23-84665F01	10 ± 100-10%; 25 V
CR1	48-82178A06	diode: (see note)
CR2 thru 5	48-83654H01	germanium
CR6	48-82178A06	silicon
CR7, 8	48-83654H01	germanium
		silicon
E1	76-83960B07	core: ferrite bead
L1	25-82498H02	coil: 6H
Q1, 2	48-134667	transistor: (see note)
Q3	48-869653	NPN; type M54
Q4	48-869643	N-channel FET; type M9653
Q5 thru 8	48-869642	PNP; type M9643
		NPN; type M9642

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
Q9	48-868706	NPN, darlington; type M9706
Q10, 11, 12	48-869642	NPN; type M9642
Q13	48-134667	NPN; type M54
Q14	48-869648	NPN; type M9648
		resistor, fixed: ± 5%; 1/4 W; unless otherwise stated:
R1	6-11009C85	33k
R2, 3	6-11009C02	150k
R4, 5, 6	6-11009C99	120k
R7	6-11009D02	150k
R8	6-11009C99	120k
R9	6-11009C53	1.5k
R10	6-11009C83	3.9k
R11	6-10821D36	26.7k ± 1%; 1/8 W
R12	6-10821E73	750k ± 1%; 1/8 W
R13	6-11009C83	27k
R14, 15	6-11009C77	100k
R16	6-11009C69	2.7k
R17	6-11009C49	1k
R18	6-11009C73	10k
R19	6-11009C66	5.1k
R20	6-11009C49	1k
R21	6-11009C71	8.2k
R22, 23	6-11009C73	10k
R24	6-11009C49	1k
R25	6-11009C97	100k
R26		NOT USED
R27	18-84944C02	var. 25k
R28	6-11009C77	15k
R29	6-11009C85	4.7k
R30	6-11009C49	1k
R31	6-11009D02	150k
R32	6-11009C85	33k
R33	6-11009C55	1.8k
R34	6-11009C37	330
R35	6-11009C93	68k
R36	6-11009D02	150k
R37	6-11009C55	1.8k
R38	6-11009C85	33k
R39	6-11009C37	330
R40	6-11009C67	5.6k
R41	6-11009C79	18k
R42	6-11009C81	3.3k
R43	6-11009C85	4.7k
R44	6-10821C71	6.19k ± 1%; 1/8 W
R45	6-10821D57	47.5k ± 1%; 1/8 W
R46	18-84944C02	var. 25k
R47	6-11009C77	15k
R48	6-11009C97	100k
R49	6-11009C73	10k
R50	6-11009C97	100k
R51	6-11009C81	22k
R52	6-11009C45	680
R53	6-11009C57	2.2k
R54, 55	6-11009C53	1.5k
R56	6-11009C97	100k
R57	6-11009C33	220
R58	6-11009C81	3.3k
R59	6-11009C83	27k
R60	6-11009C49	1k
R61	6-11009D10	330k
R62	6-11009C81	22k
R63	6-11009C45	680
R64	6-11009C97	100k
R65	6-11009C33	220
R66	6-11009C53	1.5k
R67	6-11009C57	2.2k
R68	6-11009D10	330k
R69	6-11009C81	22k
R70	6-11009C45	680
R71	6-11009C53	1.5k
R72	6-11009C57	2.2k
R73	6-11009D10	330k
R74	6-11009C81	22k
R75	6-11009C45	680
R76	6-11009C53	1.5k
R77	6-11009C57	2.2k
R78	6-11009C97	100k
R79	6-11009C73	10k
R80	6-11009C97	100k
R81	6-11009C73	10k
R82	6-11009C97	100k
R83	6-11009C73	10k
R84	6-11009C97	100k
R85	6-11009C73	10k
R86	6-11009C81	22k
R87	6-11009D02	150k
R88	6-11009C89	47k
R89	6-11009C73	10k
R90	6-11009C97	100k
R91	6-11009C73	10k
R92	6-11009C49	1k
R93	6-11009C97	100k
R94	6-11009D10	330k
R95	6-11009C73	10k
R96	6-10821D57	47.5k ± 1%; 1/8 W
RT101	8-82990E18	thermistor: 190 ohms @ 25 °C

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
U1 thru 4	51-80074C02	integrated circuit: (see mte)
U5	51-83829M08	Decoder/Encoder
U6	51-82884L14	Quad Op Amp
U7	51-84371K94	Quad Analog Switch
		Quad 2-input "OR" Gate
		voltage regulator: (see mte)
VR101, 102	48-82256C25	Zener, 12 V
		mechanical parts
	9-84910C01	socket, Vibrasponder; 4 lead
	38-10184A10	CONTACT, male; 4 usec
	38-10184A24	CONTACT, female; 10 usec
	29-83167C01	STRAIN RELIEF; 11 user

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



\*DEPS-31329-D



**1. INTRODUCTION**

This section of the manual contains the schematics, circuit board details, parts lists and alignment instructions for the transmitter and receiver section of the FLEXAR Base/Repeater Station. The alignment instructions are broken into four major alignment procedures; transmitter, receiver and duplexer (if used). For a complete alignment of the station, perform all the alignment procedures in sequence given below. When performing a touch-up or check, perform only the particular procedure required.

1. Transmitter Alignment consisting of the following:

- Exciter/PA alignment
- Oscillator frequency adjustment
- "IDC" adjustment.

2. Receiver Alignment consisting of the following:

- Receiver alignment
- 20 dB quieting sensitivity measurement.

3. Repeater Alignment consisting of the following:

- Repeater setup/knockdown functional operation
- Base PTT functional operation
- Time-Out Timer functional operation
- Repeater squelch sensitivity measurement
- Repeater deviation measurement
- Repeater deviation adjustment
- Repeater squelch sensitivity adjustment.

4. Duplexer Alignment consisting of the following:

- Duplexer functional operation
- Receive frequency notch adjustment
- Transmit frequency notch adjustment.

**2. METERING**

Metering during transmitter or receiver alignment is performed with either a TEK-5 Metering Panel, a S1056-59 Portable Test Set, or a VOM with 20,000 ohms/volt sensitivity (50 uA meter movement).

**NOTE**

The accuracy of the alignment is dependent upon the accuracy of the test instruments used. Therefore, it is extremely important that any test instruments used are properly CALIBRATED.

If a TEK-5 Metering Panel or a S1056-59 Portable Test Set is available, connect the metering panel or test set to metering jack J801, using the appropriate metering adapter cable. The metering adapter cables and directions for their use are shown on diagram PEPS-30262. Typical meter readings are listed for each major alignment procedure.

**3. TRANSMITTER ALIGNMENT**

3.1 GENERAL 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" of 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. Key transmitter for each step in the alignment procedure and dekey after each alignment step is completed. Avoid keying an unaligned transmitter for prolonged periods.
4. Multi-frequency transmitters should be aligned on lowest operating frequency.

UHF TRANSMITTER & RECEIVER

Table 1. Typical Transmitter Meter Reading, Using TEK-5 Metering Panel or S1056-59 Portable Test Set

Meter	Measurement	Typical Readings	Remarks
M3	Buffer Amplifier Input	8 uA, Min.	—
M5	Exciter Amplifier Collector Current	25 uA (40 uA, Max.)	—
M7	PA Current	13.5 uA (17.5 uA Max.)	Multiply M7 reading by 0.336 to obtain PA current in amperes.

Table 2. Typical Transmitter Meter Readings Using 20,000 Ohms/Volt VOM

Measurement	VOM Lead Connections		VOM Scale	Typical Reading
	+	-		
Buffer Amplifier Input	J801-14	Chassis Ground	50 uA, DC	8 uA, Min.
Exciter Amplifier Collector Current	J801-7	J801-11	100 mA, DC	17 mA, (100 mA, Max.)
PA Current	J801-7	J801-15	500 mA, DC	230 mA, (300 mA, Max.)

5. Transmitter frequency calculations:

$$f_c = 27f_{osc};$$

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

6. Before proceeding with any alignment procedure, verify that the power supply provides 13.8 V dc at the transmitter rf unit power connector J200.
7. Check that R801 and R809 are as follows:
  - R801 = 0.1 ohm, and R809 = 0.1 ohm
8. Tables 1 and 2 list typical transmitter meter readings.
9. On models with circulator/duplexer, disconnect the 18" rf cable (W12) from J602 to align transmitter.

**NOTE**

Transmitter deviation is adjusted for 4.5 kHz to assure that maximum deviation (5 kHz) is not exceeded under any operating or environmental conditions.

3.2 EXCITER/PA ALIGNMENT

Perform the Exciter/PA Alignment procedure as given in Table 3. Figure 1 illustrates the transmitter and power amplifier adjustment locations. The graph of Figure 2 gives the number of turns necessary to preset tuning coils L112 thru L115 and L118. Throughout the

alignment procedure a resonant antenna, or a UHF rated wattmeter, with a nonreactive, 50-ohm dummy load capable of dissipating at least 30 watts, is connected to the transmitter rf output connector J602.

3.3 OSCILLATOR FREQUENCY ADJUSTMENT

**IMPORTANT**

Oscillator(s) must be set on frequency AFTER exciter/PA has been alignment and BEFORE modulation deviation is set.

**NOTE**

The transmit frequency of this radio should only be adjusted at ambient room temperature (82°F) or (28°C). Because of temperature and voltage variations between factory and field locations, the frequency measured may not correspond to the assigned frequency.

Perform the oscillator frequency adjustment as given in Table 4.

3.4 "IDC" ADJUSTMENT

**IMPORTANT**

Oscillator(s) frequency adjustment must be made BEFORE setting the "IDC" controls.

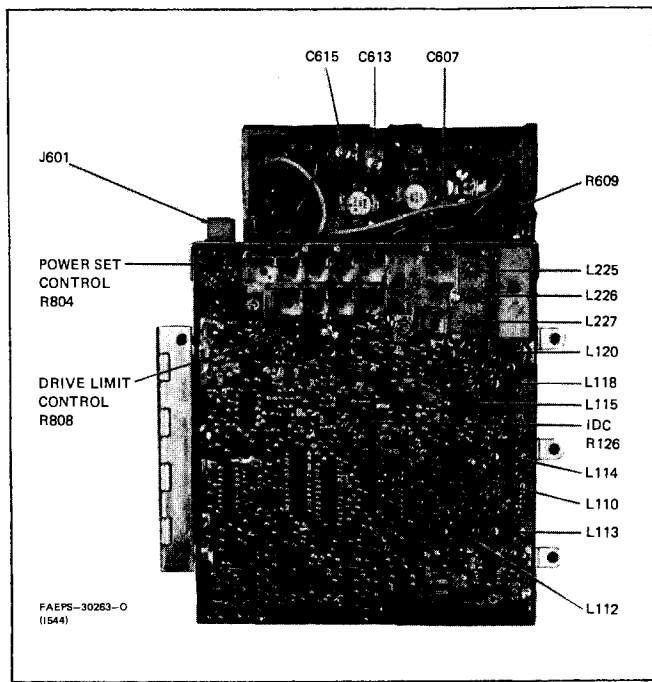


Figure 1. Transmitter Adjustment Locations & UHF FLEXAR Power Amplifier

**NOTE**

The transmitter may be keyed by pressing the key button on the test set, local microphone, or handset. To ensure no extraneous modulation, via the handset or local microphone, ground both P4-2 and the MIC HI screw terminal on TB-2.

**IMPORTANT**

**“DIGITAL PRIVATE-LINE”  
DEVIATION MEASUREMENT**

To obtain accurate measurement of transmitter deviation in radios equipped with “Digital Private-Line” (DPL) binary-coded squelch, the frequency response of the deviation measuring equipment must extend to below 1 Hz (essentially dc). 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 (p/o DPL board) and key the transmitter.

Perform the “IDC” adjustment procedure as given in Table 5.

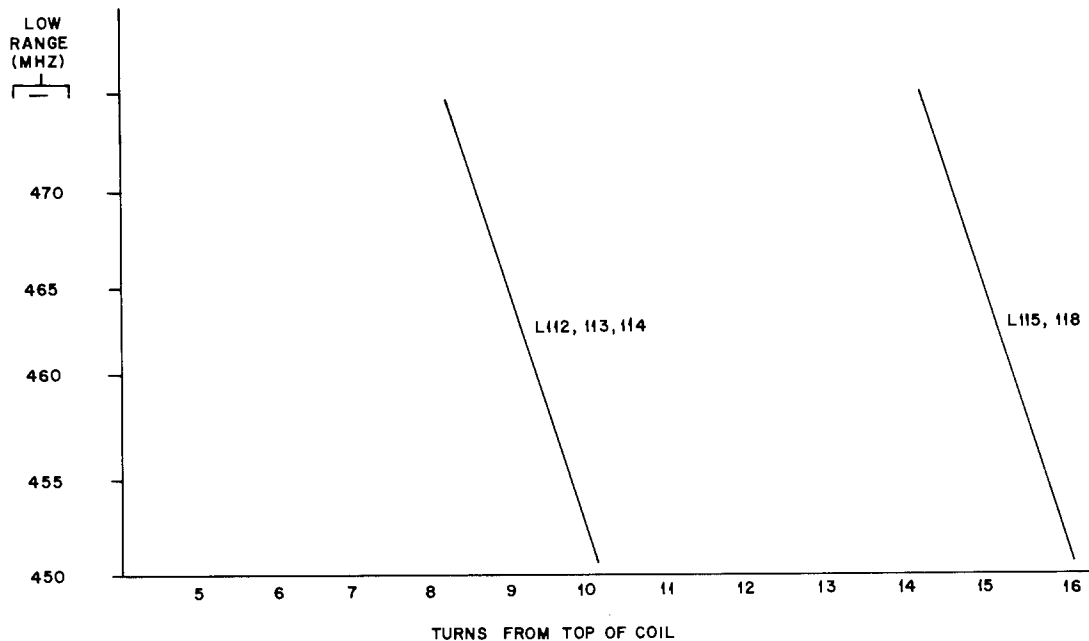


Figure 2. Tuning Coils L112 thru L115 & L118 Preset Graph



Table 3. Exciter/PA Alignment Procedure

Step	Adjust	Metering Indicator	Procedure
1. Set-Up	L110	—	Set 7-turns from circuit board. <b>CAUTION</b> Low or no M3 reading obtained if L110 not properly pre-set.
	L112 thru L115 & L118	—	Set per Figure 2.
	L120	—	Set 7-turns from top of coil form.
	L225 thru L227	—	First, set flush with tension nuts. Then, set 6-turns above tension nuts.
	R804 (Power Set)	—	Set fully CCW (from solder side) — Maximum Output Power.
	R808 (Drive Limit)	—	Set fully CCW (from solder side) — Minimum Drive Limit.
	C613 C615	— —	Set 1 turn CCW from full CW (tight). Set 3 turns CCW from full CW (tight).
2. Oscillator Output	L112, then L113	M3	Peak.
3. Buffer Output	L114	M3	Dip if no M5 reading
		M5	Peak if M5 has a reading.
4. First Tripler Output	L115 then L118	M5	Peak.
5. Second Tripler Output	L120	Wattmeter	Peak if wattmeter has reading.
		M5	Peak if no wattmeter reading.
6. Predriver Output	C607	Wattmeter	Peak. If no wattmeter reading, go to Step 7.
7. Second Tripler Output Filter	L225, 226, 227	Wattmeter	Peak. (If no wattmeter reading, turn C607 1/4 Turn CW and repeat Step 7)
8. Predriver and Final Output	C607, 613, 615	Wattmeter	Peak.
<i>Repeat all adjustments made to this point.</i>			
9. Predriver Output	C607	Wattmeter	Adjust for 20 watts output.
10. Second Tripler Output	L225, 226, 227	Wattmeter	Peak each coil, keep wattmeter reading between 20 and 25 watts with C607.
11. Oscillator Output	L112	Wattmeter	Adjust for 15 watts output.
	L113	Wattmeter	Adjust for 15 watts output if not obtainable by tuning L112 alone.
12. Second Tripler Output	L120	Wattmeter	Peak. If wattmeter reading is greater than 20 watts, repeat Steps 10 and 11.
13. Repeat Step 9.			
14. Oscillator Output	L112 then L113	M3	Peak.
15. Predriver Output	C607	Wattmeter	Peak.
16. Power Output	R804 (Power Set) (See Note)	Wattmeter	Adjust for 33 watts.
17. Final Output	C613, C615	Wattmeter	Peak.
18. Thermal Shutback	R609	Wattmeter	Disconnect WHT-BLU jumper from pin A in PA. Adjust for 16 watts. Reconnect jumper to pin A.
19. DC Power Supply	R8	Voltmeter	Adjust for 13.8 volts at J200.
20. Conclusion	—	—	Close PA housing and tightly fasten heatsink to chassis with captivated screw.
			<b>CAUTION</b> Be careful not to pinch wires between heatsink and chassis. Recheck output power. If necessary, repeat Step 16.
Variable Power Models	R804 (Power Set) (See Note)	Wattmeter	Adjust for desired power output: 15-30 W.
PA Alignment Test	—	M7	Reading must be less than or equal to 17 uA for any power level. If reading is greater than specified, an efficiency problem exists in PA. Refer to schematic diagram for troubleshooting information.
This completes the exciter/PA alignment procedure.			

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

Table 4. Oscillator Frequency Adjustment Procedure

Step	Adjust	Procedure
1. Set-Up	Frequency Meter or Counter	Set controls as necessary to measure transmitter frequency of radio being adjusted.
	—	For tone PL radios, remove "Vibrasponder" resonant reed from socket on tone PL encoder/decoder board.
	—	For DPL radios, short together the "code disable" plating pads on DPL encoder/decoder board.
	—	For 2 PPM stability models, allow 20 minute warm-up time for crystal heaters.
2. Key XMTR	—	Key <b>WITHOUT</b> modulation.
3. Modulator	L110	Adjust for frequency $\pm 30$ Hz.
4. Conclusion	—	1. Un-Key XMTR.
		2. Disconnect all test instruments.
		3. For tone PL radios, insert reed into socket on tone PL board.
		4. For DPL radios, remove short from "code disable" plating pads on DPL board.
		5. On models with circulator/duplexer, reconnect W12 to J602.
This completes the oscillator frequency adjustment procedure.		

**NOTE:** Oscillator(s) must be set on frequency **AFTER** exciter/PA has been aligned and **BEFORE** modulation deviation is set.

Table 5. "IDC" Adjustment Procedure

Step	Adjust	Procedure
1. Set-Up	Deviation Meter	Set controls as necessary to measure transmitter deviation of radio being adjusted.
	—	For tone PL radios, remove "Vibrasponder" resonant reed from socket on tone PL encoder/decoder board.
	—	For DPL radios, short together the "code disable" plating pads on DPL encoder/decoder board.
	Audio Signal Generator	1. Connect high side to J1-6, through a 1 uF electrolytic capacitor (+ end toward radio). 2. Connect low side to J1-4, or chassis ground.
	AC Voltmeter	Connect across audio signal generator output.
	Audio Signal Generator Output	Adjust to provide 0.8 V rms at 1 kHz.
2. Key XMTR	—	Key with <b>KEY</b> button on test set.
3. "IDC"	R126	Adjust for ± 4.5 kHz deviation.
4. Modulation Sensitivity Test	Audio Signal Generator Output	Reduce output for ± 3 kHz deviation.
	AC Voltmeter	Audio signal generator output level should equal 160 mV rms ± 3 dB.
<i>(Steps 5 &amp; 6 are for tone PL radios ONLY.)</i>		
5. Tone Deviation	—	Insert reed into socket tone PL board.
	Audio Signal Generator	Disconnect from J1.
	—	Key XMTR with <b>KEY</b> button on test set.
	R433: TONE LEVEL Control	Adjust for ± 750 Hz tone deviation.
6. Overall Deviation Adjustment & Test	Audio Signal Generator	Connect to J1, as described in Step 1.
	—	Repeat Steps 2 thru 4.
	—	Deviation must not exceed ± 4.5 kHz, including PL tone.
<i>(Steps 7 &amp; 8 are for DPL radios ONLY.)</i>		
7. Code Deviation	—	Remove short from "code disable" plating pads on DPL board.
	Audio Signal Generator	Disconnect from J1.
	—	Key XMTR with <b>KEY</b> button on test set.
	R342: CODE LEVEL Control	Adjust for ± 750 Hz code deviation.
8. Overall Deviation Adjustment & Test	Audio Signal Generator	Connect to J1, as described in Step 1.
	—	Repeat Steps 2 thru 4.
	—	Deviation must not exceed ± 4.5 kHz, including DPL code.
9. Conclusion	—	1. Un-Key XMTR. 2. Disconnect all test instruments.
	This completes the "IDC" adjustment procedure.	

NOTES: 1. Oscillator(s) frequency adjustment must be made **BEFORE** setting the "IDC" controls.  
2. Earlier versions are adjusted for ± 4.3 kHz deviation. Check deviation label on transmitter chassis for amount of deviation required for proper adjustment

#### 4. RECEIVER ALIGNMENT

##### 4.1 GENERAL NOTES

- On "Digital Private-Line" and "Private-Line" models, disable the DPL or PL decoder by depressing the front panel MONITOR pushbutton.
- 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).
- Unnecessary tuning adjustments should be avoided. Usually, the receiver will require only a "touch-up" alignment. Complete receiver alignment is necessary in the following case:
  - After changing the receiver operating frequency.

- After replacing a component in a frequency-sensitive network.

##### 4. Receiver frequency calculations:

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

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

- Before proceeding with any alignment procedure, verify that the power supply provides 13.8 V dc at the transmitter rf power connector J200.
- Tables 6 and 7 list typical receiver meter readings.

##### 4.2 RECEIVER ALIGNMENT

Perform the Receiver Alignment procedure as given in Table 8. Figure 3 illustrates the receiver adjustment locations.

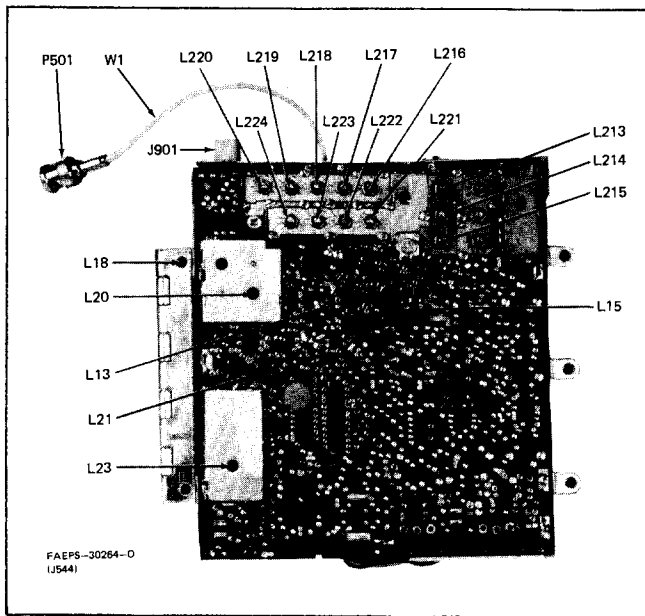


Figure 3. Receiver Adjustment Locations

#### 4.3 BASE 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 station front panel.

3. Disable (knockdown) repeater operation by depressing the RPTR OFF button on station front panel.
4. Turn the base SQUELCH control fully counterclockwise.
5. Turn the station on and adjust the VOLUME control until a reading of 2 volts is obtained on the ac voltmeter.
6. Connect an rf signal generator to the receiver rf connector P501. Set the signal generator to the carrier frequency, and set the generator output level control to minimum.
7. Slowly increase the output level of the rf signal generator until the ac voltmeter reads 0.2 volts.

#### NOTE

For stations with the optional auto level board, the signal generator output should be increased RAPIDLY. If not, the AGC action may produce erroneous results.

8. Note the signal generator output signal level. This signal level is the 20 dB quieting sensitivity of the receiver.

Table 6. Typical Receiver Meter Readings With TEK-5 Metering Panel or S1056-59 Portable Test Set

Meter	Measurement	Typical Reading
M1	I-F Amplifier Signal Level	8-14 uA (No Signal) 50 uA (40 uV input)
M2	Quadrature Detector Output	22 ± 1 uA
M3	Injection Oscillator Output	3-28 uA

Table 7. Receiver Meter Readings with 20,000 Ohms/Volt VOM

Measurement	VOM Lead Connections		VOM Scale	Typical Readings
	+	-		
I-F Amplifier Signal Level	J801-10	Chassis Ground	2.5 V, DC	0.25-0.5 V (No Signal) 1.75 V (40 uV input)
Quadrature Detector Output	J801-13	Chassis Ground	10 V, DC	5.5 V (using DVM) (5.2 ± 0.2 V using VOM)
Injection Oscillator Output	J801-14	Chassis Ground	50 uA, DC	15-25 uA

Table 8. 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.

Step	Adjust	Metering Indicator	Procedure
1. Set-Up	RPTR OFF Switch	—	Set to "in" position. (Momentarily press PTT on Local/Remote or DC Remote models.)
	BASE SQUELCH Control	—	Set fully CCW (counterclockwise).
	MONITOR Switch	—	Set to "in" position.
	OFF-VOLUME Control	—	Adjust for comfortable level. (Service Handset required for DC Remote models.)
	L221 thru L224	—	First, set flush with tension nuts. Then set 9-turns CCW.
	L213 thru L220	—	First, set flush with tension nuts. Then set 7-turns CCW.
	L13, L15	—	Turn CCW, set flush with main circuit board (from solder side).
2. Quadrature Detector Coil	L18, L20, L21 & L23	—	Turn CCW, set flush with main circuit board (from solder side).
	—	—	"Spray" 10.7 MHz @ 1 mV near Q12 (Note 1).
3. Injection Oscillator Input	L23	DVM	Adjust for 5.50 V dc (Note 2).
	L13	M3	Adjust for peak.
4. Injection Oscillator Output	L15	M3	Adjust for maximum reading.
5. Injection Filter	L221	M3	Adjust for peak.
	L222	M3	Adjust for dip.
	L223	M3	Adjust for peak.
	L224	M3	Adjust for dip.
6. Mixer Input Filter (Note 3)	RF Signal Generator	RF Frequency Counter	Inject assigned receive frequency, without modulation @ 10 mV, into antenna jack P501.
	L220 thru L216	M1	Adjust, in order shown, for peak. Adjust signal generator input level to keep M1 in 25-35 uA range. Then repeat.
7. RF Preselector (Note 3)	RF Signal Generator	RF Frequency Counter	Inject assigned receive frequency, without modulation, into P501.
	L213 thru L215	M1	Adjust for peak. Adjust signal generator input level to keep M1 in 25-35 uA range.
8. I-F Tuning (Note 3)	RF Signal Generator	RF Frequency Counter	Inject assigned receive frequency, without modulation, into P501.
	L18, L20, L21	M1	Adjust, in order shown, for peak. Adjust signal generator input level to keep M1 in 25-35 uA range. If two peaks are present, choose peak nearest top of coil form (away from circuit board).
	L21	—	Set 1/2 turn CCW.
9. Injection Touch-Up	RF Signal Generator	RF Frequency Counter	Inject assigned receive frequency, without modulation, into P501.
	Signal Generator Output Level Control	M1	Adjust for 30 uA reading.
	L15	M1	Adjust CW for 20 uA reading.
	L224 thru L221	M1	Adjust, in order shown, for peak. Then repeat.
	L15	M3	Adjust for peak.
10. Fine Frequency Adjustment (Note 1 & 3)	RF Signal Generator	RF Frequency Counter	Inject assigned receive frequency, without modulation, into P501.
	—	—	"Spray" 10.7 MHz @ 1 mV near Q12.
	L13	Station Speaker	Adjust for audio zero beat. Allow 20-minute warmup. Then repeat.
11. Final Touch-Up (Note 3)	L216 thru L220	—	Set 1/2 turn CCW.
	RF Signal Generator	RF Frequency Counter	Inject assigned receive frequency, without modulation, into P501.
	L220 thru L215	M1	Adjust, in order shown, for maximum reading. Adjust signal generator input level to keep M1 in 20-30 uA range.



Table 8. Receiver Alignment Procedure (Cont'd.)

Step	Adjust	Metering Indicator	Procedure
<i>(Step 12 for models with circulator/duplexer only.)</i>			
12. RF Preselector Final Touch-Up	W1		Attach P501 to Duplexer.
	RF Signal Generator	RF Frequency Counter	Inject assigned receive frequency, without modulation, into J604.
	L213 (only)	M1	Adjust for peak. Adjust signal generator input level to keep M1 in 25-35 $\mu$ A range.
<b>CAUTION</b> Do NOT touch-up duplexer tuning.			
13. Conclusion	—	—	Perform receiver sensitivity measurement. — 20 dBq = 0.40 $\mu$ V or less without duplexer/circulator. — 20 dBq = 0.51 $\mu$ V or less with duplexer/circulator. Disconnect all test instruments.
This completes the receiver alignment procedure.			

**NOTES:**

1. With a wire connected to a 1 mV, 10.7 MHz signal source, "spray" the signal near Q12 (by holding the wire close to Q12), but do not allow the wire to make physical contact with any part of the i-f amplifier.
2. The best method of adjustment to use when adjusting the Quadrature Detector Coil (L23) is to use a DVM (Digital Voltmeter) connected from J601-13 (+ lead) to chassis ground (-lead), **with portable test set, metering panel or VOM disconnected from station.** Use M2 indication **only** if M2 is calibrated.
3. To set signal generator to receive frequency, use the zero beat method. This method requires "spraying" 10.7 MHz near Q12 (as in Note 1), with the simultaneous adjustment of the signal generator frequency control while listening for the zero beat signal. For fine frequency adjustments, use an RF frequency counter to set RF signal generator to assigned frequency. Then, adjust L13 (F1) or L12 (F2) for audio zero beat.

**5. REPEATER ALIGNMENT**

**5.1 GENERAL NOTES**

1. Perform the following functional tests and measurements to verify proper repeater operation.
2. Perform the following adjustments **ONLY** if required for proper repeater operation.

**5.2 REPEATER SETUP/KNOCKDOWN FUNCTIONAL OPERATION**

Step 1. Connect a UHF rated wattmeter, with a nonreactive 50-ohm dummy load capable of dissipating at least 30 watts, to the transmitter rf output connector J602.

Step 2. Enable (setup) repeater operation by setting the RPTR OFF button to the out position.

Step 3. Connect an rf signal generator to the receiver rf input connector P501.

**NOTE**

On models with circulator/duplexer, disconnect all cables between circulator and duplexer to prevent damage to test equipment.

Step 4. Turn the station on.

Step 5. Set the rf signal generator to the carrier frequency (also modulate carrier with proper PL code in the case of a coded squelch station).

Step 6. Set the output level of the rf signal generator to 1000  $\mu$ V. The transmitter should key and the wattmeter indicate a power output.

Step 7. To examine the drop-out delay functional operation, turn the signal generator off. The transmitter should remain keyed for approximately 2 seconds (4 seconds if R22 on the RCB is deleted). Turn the signal generator on. The station should rekey.

Step 8. Disable (knockdown) repeater operation by depressing the RPTR OFF button. (Momentarily push PTT on local/remote or dc remote models to select mode.) The transmitter should dekey and the wattmeter indicate no power output.

**5.3 BASE PTT FUNCTIONAL OPERATION**

Step 1. Connect a UHF rated wattmeter, with a nonreactive 50-ohm dummy load capable of dissipating at least 30 watts, to the transmitter rf output connector J602.

Step 2. Connect an rf signal generator to the receiver rf input connector P501.

Step 3. Turn the station on.

Step 4. Key the station with either the handset, or the desk microphone or from any remote control point(s). The transmitter should key (wattmeter indicating power output).

Step 5. Dekey the station.

Step 6. Set the rf signal generator to the carrier frequency and modulate it with 1000 Hz with  $\pm 3$  kHz deviation (also modulate carrier with proper PL code in the case of a coded squelch station). The transmitter should key (wattmeter indicating power output) and audio should be present locally and at any remote operating point(s).

Step 7. Key the station with either the handset, or the desk microphone or from any remote control point(s). The transmitter should remain keyed (wattmeter indicating power output), but audio should be muted locally and at any remote operating points.

Step 8. Dekey the station and audio should again be present locally and at any remote operating point(s).

#### 5.4 TIME-OUT TIMER FUNCTIONAL OPERATION

Step 1. Connect a UHF rated wattmeter, with a nonreactive 50-ohm dummy load capable of dissipating at least 30 watts, to the transmitter rf output connector J602.

Step 2. Turn the station on.

Step 3. Key and hold the station keyed with either the handset, or the desk microphone or from any remote control point(s). The transmitter should key (wattmeter indicating power output).

Step 4. The transmitter should remain keyed for approximately 3 minutes and then automatically dekey if JU6 is deleted and JU7 is installed. If JU6 is installed and JU7 is deleted, the transmitter will remain keyed for approximately 1 - 1/2 minutes, and then dekey.

Step 5. Dekey and then immediately rekey the station with either the handset, or the desk microphone or from any remote control point(s). The transmitter should key (wattmeter indicating power output).

#### 5.5 REPEATER SQUELCH SENSITIVITY MEASUREMENT

Step 1. Connect an ac voltmeter across the speaker; on dc remote models, connect to P4 on dc remote board.

Step 2. On PL models, disable PL by depressing the MONITOR button on station front panel.

Step 3. Disable (knockdown) repeater operation by depressing the RPTR OFF button on station front panel.

Step 4. Turn the base SQUELCH control fully counterclockwise.

Step 5. Turn the station on and adjust the VOLUME control until a reading of 2 volts is obtained on the ac voltmeter.

Step 6. Enable (setup) repeater operation by setting the RPTR OFF button to the out position on the station front panel. (Momentarily push PTT on local/remote or dc remote models to select mode.)

Step 7. Connect an rf signal generator to the receiver rf input connector P501.

Step 8. Set the rf signal generator to the carrier frequency, and set the generator output level control to minimum.

Step 9. Slowly increase the output level of the rf signal generator until the ac voltmeter just indicates a level between 0.2 and 0.35 volts (20 to 15 dBq).

#### NOTE

For stations with the optional auto level board, the signal generator output should be increased RAPIDLY. If not, the AGC action may produce erroneous results.

Step 10. If the level indicated on the ac voltmeter does not fall within this range, refer to the repeater squelch sensitivity adjustment paragraph in this section.

#### 5.6 REPEATER DEVIATION MEASUREMENT

Step 1. Connect a deviation meter to transmitter rf output connector J602.

Step 2. Connect an rf signal generator to the receiver rf input connector P501.

Step 3. Turn the station on.

Step 4. Disable (knockdown) repeater operation by depressing the RPTR OFF button on station front panel. (Momentarily push PTT on local/remote or dc remote models to select mode.)

Step 5. On PL models, disable PL by depressing the MONITOR button on station front panel.

Step 6. Set the rf signal generator to the carrier frequency and modulate it with 1000 Hz with  $\pm 3$  kHz deviation.

Step 7. Set the output level of the rf signal generator to 1000 uV. Audio should be present locally and at any remote operating point(s).

Step 8. Measure the voltage at exciter audio P100-6. The reading should be 320 mV  $\pm$  3 dB. If the level indicated on the ac voltmeter does not fall within this range, refer to the repeater deviation adjustment paragraph in this section.

## 5.7 REPEATER DEVIATION ADJUSTMENT

Step 1. Connect an rf signal generator to the receiver rf input connector P501.

Step 2. Turn the station on.

Step 3. Disable (knockdown) repeater operation by depressing the RPTR OFF button on station front panel. (Momentarily push PTT on local/remote or dc remote models to select mode.)

Step 4. On PL models, disable PL by depressing the MONITOR button on station front panel.

Step 5. Set the rf signal generator to the carrier frequency and modulate it with 1000 Hz with  $\pm 3$  kHz deviation.

Step 6. Set the output level of the rf signal generator to 1000  $\mu$ V. Audio should be present locally and at any remote operating point(s).

Step 7. Monitor the voltage at exciter audio P100-6. Adjust AUD POT R7 (refer to Figure 4) for a reading of 320 mV.

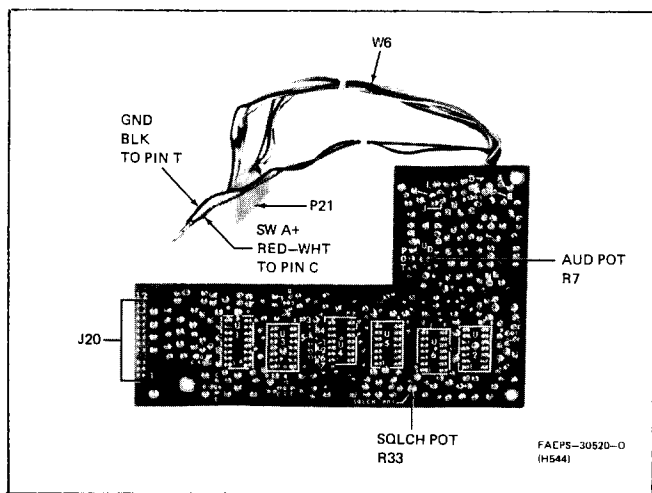


Figure 4. Repeater Control Board Adjustment Locations.

## 5.8 REPEATER SQUELCH SENSITIVITY ADJUSTMENT

Step 1. Connect an ac voltmeter across the speaker; on dc remote models, connect to P4 on dc remote board.

Step 2. Turn the station on.

Step 3. On PL models, disable PL by depressing the MONITOR button on station front panel.

Step 4. Enable (setup) repeater operation by setting the RPTR OFF button to the out position on the station front panel.

Step 5. Turn SQLCH POT R33 on the repeater control board fully counterclockwise (from solder side).

Step 6. Adjust the VOLUME control until a reading of 2 volts is obtained on the ac voltmeter.

Step 7. Connect an rf signal generator to the receiver rf input connector P501.

Step 8. Set the rf signal generator to the carrier frequency, and set the generator output level control to minimum.

Step 9. Slowly increase the output level of the rf signal generator until the ac voltmeter reads 0.2 volts (20 dBq).

### NOTE

For stations with the optional auto level board, the signal generator output should be increased RAPIDLY. If not, the AGC action may produce erroneous results.

Step 10. Slowly adjust SQLCH POT R33 clockwise (from solder side) until voltmeter reading of 0.2 volts abruptly disappears. Then adjust slightly counterclockwise until the voltage level just appears again.

## 6. DUPLEXER ALIGNMENT

### 6.1 GENERAL

Perform the following functional test to verify proper duplexer operation.

### CAUTION

Since the duplexer is a band-reject type (notch-type), mistuning could cause full transmit power output to be applied to the receiver input.

### 6.2 DUPLEXER FUNCTIONAL OPERATION

Step 1. Disconnect P602 (p/o W-12) from the transmitter rf output connector J602.

Step 2. Connect a UHF rated wattmeter, with a nonreactive 50-ohm dummy load capable of dissipating at least 30 watts, to J602.

Step 3. On PL models, disable PL by depressing the MONITOR button on station front panel.

Step 4. Turn the station on.



Step 5. Key the station with either the handset, or the desk microphone or from any remote control point(s). The transmitter should key and the wattmeter indicate a power output level. Note this value.

Step 6. Dekey the station.

Step 7. Reconnect P602 to the transmitter rf output connector J602.

Step 8. Connect the wattmeter, with a nonreactive 50-ohm dummy load capable of dissipating at least 30 watts, to antenna output connector J604.

Step 9. Key the station with either the handset, or the desk microphone or from any remote control point(s). The transmitter should key and the wattmeter indicate a power output level. The value should be no more than 3 dB less than the previously noted value.

Step 10. Disconnect P603 (p/o W-12) from the UHF input connector J603.

Step 11. Connect a rf signal generator to J604.

Step 12. Remeasure the 20 dB quieting level, as was done for the Base 20 dB Quieting Sensitivity Measurement, except with the generator connected to J604 instead of the receiver rf connector P501. The 20 dBq level should not increase by more than 2.1 dB over the level previously noted.

Step 13. If either of these measurements are faulty, refer to the following adjustment paragraphs for the appropriate corrective measures.

### 6.3 RECEIVE FREQUENCY NOTCH ADJUSTMENT

Step 1. Remove the duplexer unit from the repeater housing.

Step 2. Connect test equipment to the duplexer as shown in Figure 5.

#### CAUTION

A minimum separation of one foot is required between cables connecting the Tx and Rx connectors on the duplexer, in order to maintain isolation.

Step 3. Adjust the receiver and rf signal generator for the receive (higher) frequency.

#### CAUTION

Do not overload the limiter current indicator.

Step 4. Set the stepped attenuator for zero loss.

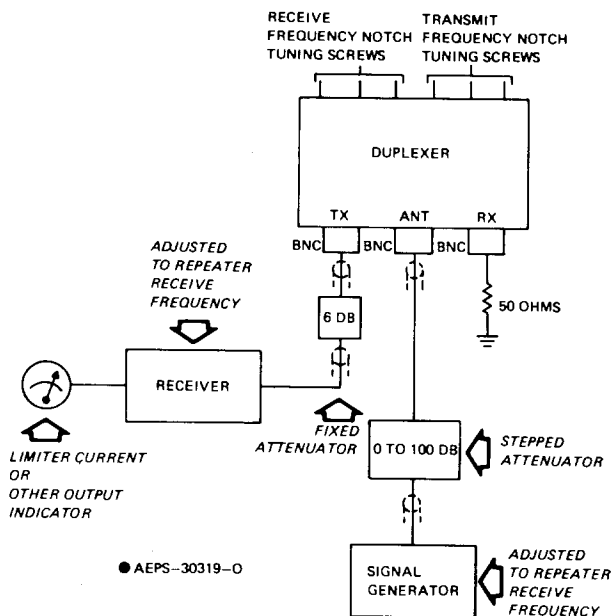


Figure 5. Receive Frequency Notch Adjustment Test Equipment Set-Up

Step 5. Adjust the signal generator output to give a receiver indication.

Step 6. Adjust the receive frequency notch tuning screws for a minimum signal reading from the receiver.

#### NOTE

“Out” adjustment of the screws results in moving the notch up in frequency. “In” adjustment of the screws results in moving the notch down in frequency.

Step 7. Increase the signal generator output for a greater receiver indication.

Step 8. Repeat Steps 6 & 7 until the signal reading from the receiver does not decrease any further. Note this level.

#### NOTE

A hollow shaft nut driver in combination with a long screwdriver will make adjustment and locking of the tuning screws easier.

#### CAUTION

The tuning screws must be locked for proper operation.

Step 9. Adjust the stepped attenuator for maximum attenuation.

Step 10. Disconnect the cable connections to the duplexer Tx and Ant ports.

Step 11. Connect the output of the stepped attenuator to the output of the fixed attenuator (via a low loss BNC-to-BNC connector).

Step 12. Adjust the stepped attenuator for the same receiver signal level indication as previously noted. The stepped attenuator should read 65 dB or greater.

#### 6.4 TRANSMIT FREQUENCY NOTCH ADJUSTMENT

Step 1. Connect test equipment to the duplexer as shown in Figure 6.

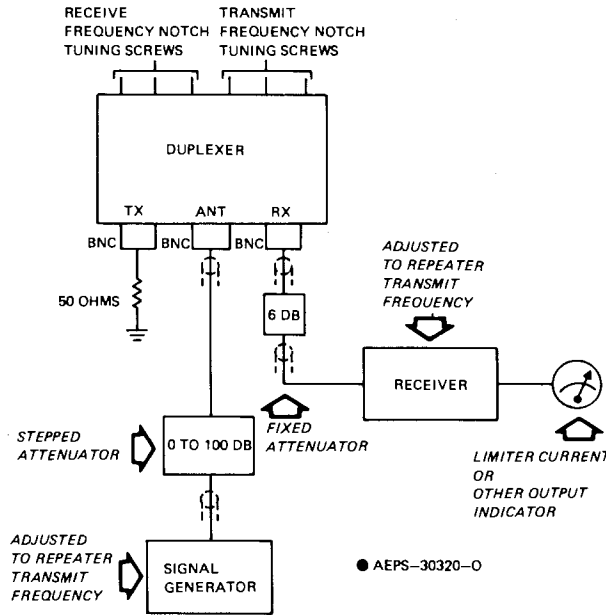


Figure 6. Transmit Frequency Notch Adjustment Test Equipment Set-Up

#### CAUTION

A minimum separation of one foot is required between cables connecting the Tx and Rx connectors on the duplexer, in order to maintain isolation.

Step 2. Adjust the receiver and rf signal generator for the transmit (lower) frequency.

#### CAUTION

Do not overload the limiter current indicator.

Step 3. Set the stepped attenuator for zero loss.

Step 4. Adjust the signal generator output to give a receiver indication.

Step 5. Adjust the transmit frequency notch tuning screws for a minimum signal reading from the receiver.

#### NOTE

“Out” adjustment of the screws results in moving the notch up in frequency. “In” adjustment of the screws results in moving the notch down in frequency.

Step 6. Increase the signal generator output for a greater receiver indication.

Step 7. Repeat Steps 5 & 6 until the signal reading from the receiver does not decrease any further. Note this level.

#### NOTE

A hollow shaft nut driver in combination with a long screwdriver will make adjustment and locking of the tuning screws easier.

#### CAUTION

The tuning screws must be locked for proper operation.

Step 8. Adjust the stepped attenuator for maximum attenuation.

Step 9. Disconnect the cable connections to the duplexer Rx and Ant ports.

Step 10. Connect the output of the stepped attenuator to the output of the fixed attenuator (via a low loss BNC-to-BNC connector).

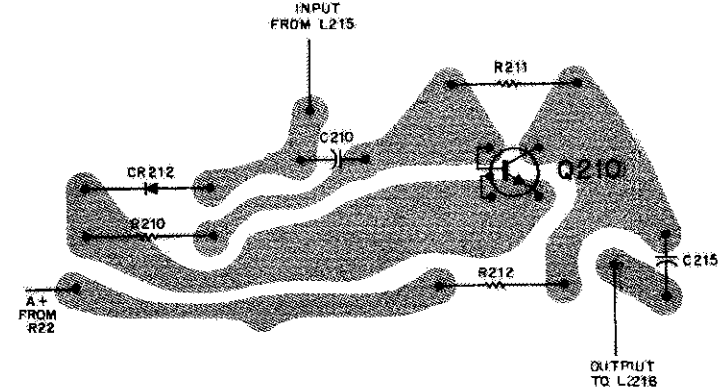
Step 11. Adjust the stepped attenuator for the same receiver signal level indication as previously noted. The stepped attenuator should read 65 dB or greater.





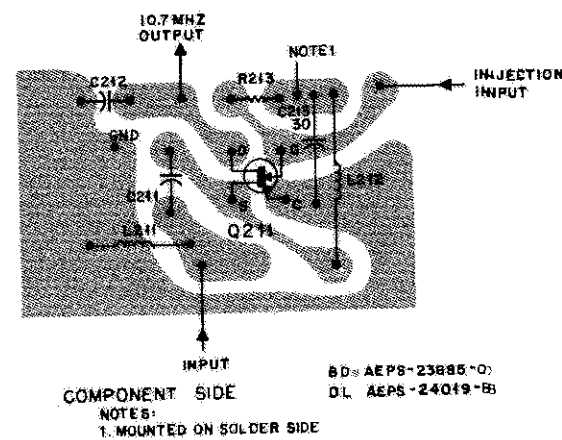
# UHF RECEIVER & EXCITER UNIFIED CHASSIS CIRCUIT BOARD DETAILS

## RF AMPLIFIER



80 AEPS-23687-0  
DL AEPS-23688-0

## MIXER



80 AEPS-23685-0  
DL AEPS-24019-B

COMPONENT SIDE  
NOTES:  
1. MOUNTED ON SOLDER SIDE

### Receiver Unified Board Wiring Chart

Wire Color	FROM No.	TO No.	Function	Remarks
—	1 (C163)	C216 (on Filter Housing)	Tripler Output to Filter	Sleeved Wire
RED	4 (CR311 Anode)	J901-7	SW A +	From Power Supply
ORG-WHT	6 (CR311 Anode)	30 (Q803 Emitter)	SW A +	For Power Control Drive
—	10 (C52)	L221	RCVR Injection	Sleeved Wire
ORG-BLU	19 (R68)	31 (Z2-11)	Controlled Heater Current	—
RED-WHT	27 (R801)	43 (CR311 Anode)	SW A +	—
BLK	28 (C27)	RF Mixer	Mixer GND	—
WHT	29 (R22)	RCVR RF Amplifier	SW A +	—
ORG-WHT	30 (Q803 Emitter)	6 (CR311 Anode)	SW A +	—
ORG-BLU	31 (Z2-11)	19 (R68)	Controlled Heater Current	—
ORG	34 (R147)	J901-14	XMTR or RCVR Meter 3	Metering
YEL	39 (R42)	J901-13	RCVR Meter 2	Metering
BRN	40 (C50)	J901-10	RCVR Meter 1	Metering
BLK	41 (C35)	J901-6	GND	From Power Supply
RED-WHT	43 (CR311 Anode)	27 (R801)	SW A +	—
RED-BLU	45 (C87)	45 (R68 & R69)	RCVR Heater	—
RED-BLU	46 (R68)	45 (C87)	RCVR Heater	—
BRN-YEL	59 (P100-1)	Pin C (Q83 Collector)	Carrier Indicate	—
WHT-VIO	60 (P100-1)	61 (L22)	Audio Enable	—
WHT-VIO	61 (L22)	60 (P100-1)	Audio Enable	—

### Exciter Unified Board Wiring Chart

Wire Color	FROM No.	TO No.	Function	Remarks
—	1 (C163)	C216 (on Filter Housing)	Tripler Output to Filter	Sleeved Wire
YEL-BLU	2 (R156)	5 (CR311 Anode)	SW A +	—
RED	J200-1	3 (CR311 Anode)	SW A +	From Power Supply
RED-WHT	4 (CR311 Anode)	J601-7	SW A +	Metering
YEL-BLU	5 (CR311 Anode)	2 (R156)	SW A +	—
ORG-WHT	6 (CR311 Anode)	30 (Q803 Emitter)	SW A +	For Power Control Drive
BLK	J200-2	7 (P100-15)	GND	From Power Supply
RED-BLK	8 (C168)	C632	Driver Controlled A +	To Final PA via Feedthru
GRY-RED	9 (C168)	56 (Q802 Collector)	Tripler Controlled A +	—
WHT-RED	14 (JU102)	C629	PTT	To Antenna SW via Feedthru
VIO-WHT	18 (Q802 Emitter)	37 (Q803 Base)	Power Control	—
ORG-BLU	19 (R68 & R69)	31 (Z2-11)	Controlled Heater Current	—
WHT-ORG	24 (C801)	C633	Thermal Shutback	To R609 in PA via Feedthru
GRN-YEL	25 (R801)	C630	SW A +	To PA via Feedthru
YEL	26 (R809)	C631	SW A +	To Final PA via Feedthru
RED-WHT	27 (R801)	43 (CR311 Anode)	SW A +	—
ORG-WHT	30 (Q803 Emitter)	6 (CR311 Anode)	SW A +	—
ORG-BLU	31 (Z2-11)	19 (R68 & R69)	Controlled Heater Current	—
GRN-WHT	33 (R162)	J601-11	XMTR Meter 5	Metering
ORG	34 (R147)	J601-14	XMTR or RCVR Meter 3	Metering
GRN	35 (JU102)	J601-8	PTT	Metering
VIO-WHT	37 (Q803 Base)	18 (Q802 Emitter)	Power Control	—
YEL-RED	38 (Q803 Collector)	55 (C168)	Tripler Controlled A +	—
BLK	41 (C35)	J601-5	GND	Metering
VIO	42 (R801)	J601-15	XMTR Meter 7	Metering
RED-WHT	43 (CR311 Anode)	27 (R801)	SW A +	—
RED-BLU	45 (C87)	46 (R68 & R69)	RCVR Heater	—
RED-BLU	46 (R68 & R69)	45 (C87)	RCVR Heater	—
YEL-RED	55 (C168)	38 (Q803 Collector)	Tripler Controlled A +	—
GRY-RED	56 (Q803 Collector)	9 (C168)	Tripler Controlled A +	—
BLU-RED	57 (CR120 Anode)	Pin TD on Tone PL Board	Code Disable	Coded Squelch Only
—	—	Pin CD on DPL Board	Code Disable	Coded Squelch Only
WHT	58 (CR120 Cathode)	59 (P100-10)	Code Disable	Coded Squelch Only
WHT	59 (P100-10)	58 (CR120 Cathode)	Code Disable	Coded Squelch Only

### Exciter Coded Squelch Board Connections Chart

Tone PL (all models) or DPL (all models)		
FROM PL Board	TO Unified Board Pin	PL or DPL Function
RED-WHT	C	SW A + Input
WHT-RED	D	Connected, but not used
YEL-WHT	E	Connected, but not used
YEL-BLU	F	Connected, but not used
GRY	G	Connected, but not used
GRN-BRN	M	PTT Input
GRN-WHT	N	Delayed PTT Output
BRN-ORG	P	Tone or Code Output
BLK	T	GND

### Push Pin Connections for XMIT PL Inhibit (PL Stripping)

Wire Color	Tone PL Board	DPL Board	Function
BLU-RED	"TD"	"CD"	Strips PL tone or code from paging or data transmission, preventing interference.
GRY	JU401 to "HD"	JU302 to "D"	Enables Squelch Switch.

### Exciter Unified Board Jumper Status

Jumper Number	Status
JU1	OUT
JU2	OUT
JU3	OUT
JU4	OUT
JU101	IN
JU102	IN for Carrier Squelch Models; OUT for PL Squelch Models

### Receiver Coded Squelch Board(s) Connections Chart

Tone PL (all models) or DPL (DC Remote Models Only)			
FROM PL Board	TO Unified Board Pin	TO Repeater Control Board Pin	PL or DPL Function
RED-WHT	—	C	SW A + Input
WHT-RED	D	—	Tone or Code Input
YEL-WHT	E	—	Tone Only: High Pass Filter Audio Input
YEL-BLU	F	—	Tone Only: High Pass Filter Audio Output
GRY	—	K	PL Indicate
GRN-BRN	M	—	PTT Input
GRN-WHT	N	—	Delayed PTT Output
BRN-ORG	P	—	Connected, but not used
BLK	—	G	GND

### DPL with High Pass Filter Board (Local & Local/Remote Models Only)

Wires FROM DPL Board TO Unified Board Connected as Follows:

FROM DPL Board	TO Unified Board Pin	TO Repeater Control Board	DPL Function
WHT-RED	D	—	Code Input
GRY	—	K	PL Indicate
GRN-BRN	M	—	PTT Input
GRN-WHT	N	—	Delayed PTT Output
BRN-ORG	P	—	Connected, but not used

Wires FROM DPL Board TO HPF Board Connected as Follows:

FROM DPL Board	TO HPF Board Pin	TO Repeater Control Board Pin	DPL Function
RED-WHT	A +	—	SW A + Input
BLK	GND	—	GND

Wires FROM HPF Board TO Unified Board Connected as Follows:

FROM HPF Board	TO Unified Board Pin	TO Repeater Control Board Pin	HPF Function
RED-WHT	—	C	SW A + Input
YEL-WHT	E	—	Audio Input
YEL-BLU	F	—	Audio Output
BLK	—	G	GND

### Receiver Unified Board Jumper Status

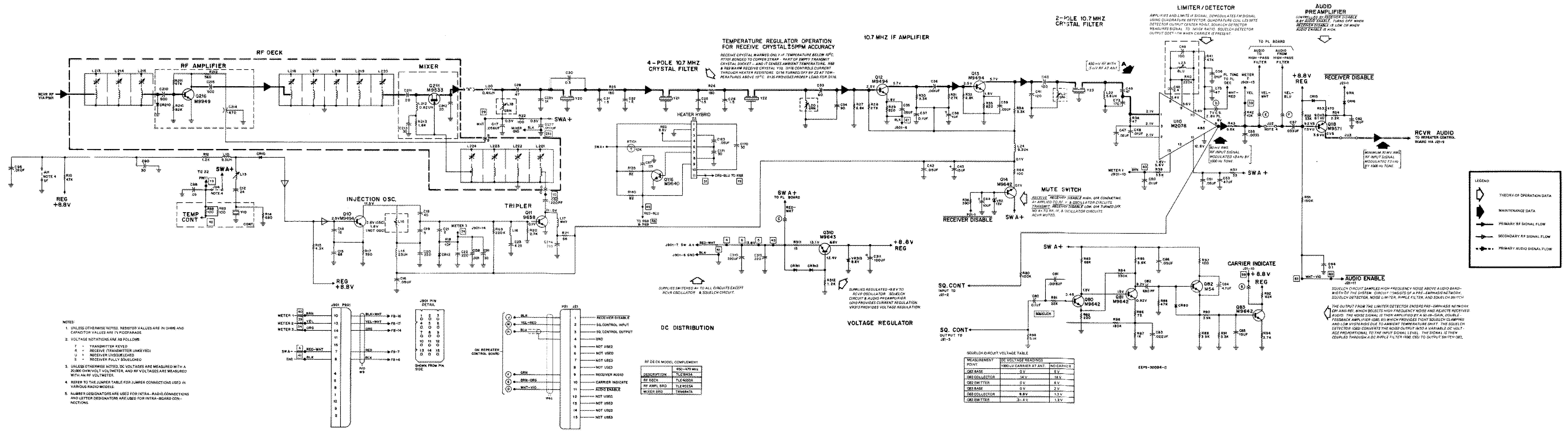
Jumper Number	Status
JU1	IN
JU2	IN for Carrier or DPL (DC Remote only) Squelch Models; Out for Tone PL or DPL (Local & Local/Remote only) Squelch Models
JU3	IN
JU4	IN
JU101	OUT
JU102	IN for Carrier Squelch Models; OUT for PL Squelch Models

# UHF RECEIVER & EXCITER UNIFIED CHASSIS

## RECEIVER RF SECTION

### FUNCTION

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







parts list

TLE4033A Receiver RF Deck PL-6985-O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
L213	1-80748B40	coil rf;
L214	24-8441G01	8 turns; ORG
L215	1-80748B40	8 turns; BLK
L216	1-80748B41	8 turns; RED
L217, 218, 219	24-84641G01	8 turns; BLK
L220	1-80748B41	8 turns; RED
L221	24-84641G2B	8 turns; BLU-BLU
L222, 223	24-84641G01	8 turns; BLK
L224	1-80748B4E	8 turns; BRN
<b>mechanical parts</b>		
3-1465	SCREW, machine; 4.40 x 3/16"; 15 used	
3-83001M02	SCREW, tapping; 2.32 x 1/4"; 25 used	
14-84886A01	INSULATOR, standoff; 2 used	
15-84499K01	COVER, 1/2 deck	
29-5324	LUG, solder; .037" wire hole	
29-134245	LUG, solder; .046" wire hole; 3 used	
2-84773E04	NUT, tension; 12 used	
3-84589G01	SCREW, set; 5.40 x 7/16"; 12 used	
15-84396G01	COVER, 3 cell	
15-84394G01	COVER, 4 cell	
15-84397G01	COVER, 5 cell	
1-80714D30	LUG and WIRE assembly (WHT)	
29-83452L01	TERMINAL	
39-82717M01	CONTACT, receptacle	
1-80714D31	LUG and WIRE assembly (WHT-BRN)	
29-83452L01	TERMINAL	
39-82717M01	CONTACT, receptacle	
1-80717B83	LUG and LEAD assembly (BLU)	
39-83983L01	CONTACT, connector shell	
1-80787B86	LUG and LEAD assembly (WHT-RED)	
39-83983L01	CONTACT, connector shell	
1-80787B91	LUG and LEAD assembly (BRN-VIO)	
39-83983L01	CONTACT, connector shell	
1-80787B93	LUG and LEAD assembly (BLK)	
39-83983L01	CONTACT, connector shell	
1-80788B01	LUG and LEAD assembly (ORG)	
39-83983L01	CONTACT, connector shell	

TRN8616A Hardware Kit (Main Board RCVR) PL-6984-A

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
P501	28-83099K01	connector, plug; male, single contact
Q116	46-869640	transistor; (see note)
W1	1-80722D53 30-83794C01	capn; type M940 includes P501 and; CABLE, coaxial; 9-1/2" used
<b>mechanical parts</b>		
3-134186	SCREW, tapping; 6-32 x 5/16"; 4 used	
3-135506	SCREW, tapping; 8-32 x 1/4"; 2 used	
3-83001M02	SCREW, tapping; 2.56 x 3/16"	
3-83001M02	SCREW, tapping; 2.32 x 1/4"; 2 used	
3-83001M03	SCREW, tapping; 2.32 x 9/32"	
4-84511K01	WASHER, shoulder	
14-83572K01	INSULATOR, transistor	
14-84499K01	INSULATOR, coax cap	
15-84410K01	COVER, mixer	
26-83294K01	SHIELD, cover	
26-83358L01	SHIELD, receiver	
26-84170L01	SHIELD, oscillator cover	
54-865436	LABEL, FCC	
54-84585K01	LABEL	
39-10184A24	CONTACT, 2 used	
3-134212	SCREW, tapping; 4.40 x 5/16"; 5 used	
5-84500B01	EYELET, special; 5 used	
27-83283L03	CHASSIS	
42-84284B02	RETAINER; 5 used	
4-84180C01	WASHER, shield	

TRN6847A Mixer Board PL-6986-O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
C211, 212	21-82877B12	capacitor, fixed; 20 pF ± 7.5%; 75 V
C213	21-864521	30 pF ± 10%; 75 V
L212	24-82723H17	coil, rf; choke, 0.82 uH
Q211	46-869533	transistor; (see note) FET, N-channel; type M9533
R213	6-185B82	resistor, fixed; ohms 1.8k ± 10%; 1/8 W

TLE4023A RF Amplifier Board PL-6988-O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
C210, 215	21-847065	capacitor, fixed; 500 pF ± 100-0%; 25 V
CR210	48-83654H01	diode; (see note) silicon
Q216	46-869642	transistor; (see note) NPN; type M9342
R210	6-185C03	resistor, fixed; ohms ± 10%; 1/8 W; unless otherwise stated
R211	6-185B99	47k
R212	6-185A43	560 ± 5%

TLE4203A Main Receiver Board PL-6984-B

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
C12	21-840845	capacitor, fixed; pF ± 5%; 500 V; unless otherwise stated
C14	21-82133G77	24
C15	21-82610C30	68; 200 V
C16	21-82372C04	.05 uF ± 80-20%; 25 V
C17	21-84008H07	.056 uF ± 10%; 10 V (attached to L16)
C18	21-82610C01	40; 200 V
C19	21-863466	5
C20	21-83596E10	220 ± 20%
C21	21-82450B18	220 ± 20%
C22	21-83596E10	220 ± 20%
C23	21-84499B54	4.25 ± 0.25
C24	21-859996	20
C25, 26	21-82450B51	1.5
C27	21-82428B90	.01 uF ± 70-30%; 100 V
C28	21-82204B60	47; 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	.01 uF ± 80-20%; 25 V
C38	23-84665F04	1 uF ± 100-0%; 50 V
C39	21-82372C04	.05 uF ± 80-20%; 25 V
C40	21-83799B01	EVLET, special; 5 used
C41	21-84848B06	1.3k
C42	21-82372C04	.05 uF ± 80-20%; 25 V
C43	23-84538G04	15 uF ± 20%; 25 V
C44	23-84665F01	10 uF ± 100-0%; 25 V
C45	21-82428B90	47; 100 V
C46	21-82450B14	2.4
C47	21-82428B28	.02 uF ± 80-20%; 200 V
C48	21-82428B59	.01 uF ± 80-20%; 200 V
C49	21-82358G12	100; 100 V (attached to L23)
C50	21-82428B59	.01 uF ± 80-20%; 200 V
C51	21-82372C04	.05 uF ± 80-20%; 25 V
C52	21-83596E10	220 ± 20%
C53	23-84538G06	47 uF ± 20%; 20 V
C55	6-82905G25	.0033 uF ± 10%; 100 V
C56	21-82428B59	.01 uF ± 80-20%; 200 V
C57	6-82905G06	.033 uF ± 10%; 50 V
C73	21-84484B08	170
C75	21-82610C03	47; 200 V
CR80	6-84490C05	0.1 uF ± 20%; 100 V
CR1	21-82187B18	.0015 uF ± 10%; 100 V
CR2	21-865452	680 ± 10%
CR3	8-84496D07	.022 uF ± 10%; 100 V
CR4	23-84538G02	4.7 uF ± 20%; 20 V
CR5	23-84538G04	15 uF ± 20%; 20 V
CR6, 87, 88	21-82372C04	.05 uF ± 80-20%; 25 V
CR9, 91	21-964521	30 ± 10%; 75 V
CR2	23-84538G04	15 uF ± 20%; 20 V
CR9	21-82372C09	0.1 uF ± 80-20%; 25 V
CR5	21-82428B04	.01 uF ± 70-30%; 25 V
C123	21-82372C04	.05 uF ± 80-20%; 25 V
C139	21-82187B20	.001 uF ± 10%; 100 V
L110, 171	21-83406D77	30
C214	21-84706C01	470 ± 20% (feedthru)
C310	23-84665F06	220 uF ± 150-0%; 25 V
C311	23-84665F03	100 uF ± 150-0%; 25 V
C313	21-83596E10	220 ± 20%
J21	26-83441F12	connector, plug; male, 15-contact; WHT
J901	15-83292K01 29-82713M01	includes: HOUSING, connector; 15 contact TERMINAL, contact; 9 used
L10	24-82835G20	coil, rf; choke, 9.3 uH
L13	24-83601K01	18-1/2 turns
L14	24-82723H03	choke; 23 uH
L15	24-84572A01	2-1/2 turns; coded YEL
L16	24-83884G03	1-1/2 turns; coded BRN
L17	24-83884G06	4-1/2 turns; coded WHT
L18	24-84419D03	33-1/2 turns; coded GRN (attached to C17)
L20, 21	24-84419D03	33-1/2 turns; coded GRN
L22	24-82635G41	choke; 5.8 uH
L23	24-84419D04	2-1/2 turns; coded BLU (attached to C49)
L24	24-82835G20	choke; 9.3 uH
L30	24-82723H05	choke; 0.41 uH
Q10	46-869932 or 46-869494	transistor; (see note 1) NPN; type M9532 NPN; type M9494
Q11	46-869658	NPN; type M9558

TLE4213A Main Transmitter Board PL-6989-B

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
Q12, 13	48-869932 or 48-869494	NPN; type M9932 NPN; type M9494
Q14	46-869642	NPN; type M9642
Q15	46-869571	NPN; type M9571
Q81	46-869642	NPN; type M9642
Q82	46-134674	NPN; type M54; coded WHT
Q83	46-869642	NPN; type M9642
Q310	46-869643	PNP; type M9643
R10	6-11009C89	resistor, fixed; ohms ± 5%; 1/4 W; unless otherwise stated
R12	6-11009C51	1.2k
R14	6-11009C45	60k
R15	6-11009C64	4.3k
R17	6-11009C39	390
R18	6-11009C73	10k
R20	6-11009C59	2.7k
R21	6-11009C18	56
R22	6-11009C25	100
R25, 26	6-11009C31	180
R27	6-11009C69	6.8k
R28	21-82372C04	27k
R29	6-11009C47	820
R30	6-11009C81	3.3k
R31	6-11009C83	27k
R32	6-11009C89	6.8k
R33	6-11009C47	820
R34	6-11009C13	3.3k
R38	6-11009C39	390
R37	6-11009C13	33
R38	6-11009C17	47
R39	6-11009C85	33k
R40	6-11009D06	220k
R41	6-11009C89	47k
R42	6-11009C73	10k
R43	6-11009C89	6.8k
R51	6-11009D02	150k
R52	6-11009C85	33k
R53	8-18009C41	470
R54	6-11009C57	2.2k
R63	6-11009D08	220k
R64	6-11009C25	100k
R68, 69	6-125A25	100; 1/2 W
R80	14-84268A01	100k
R81	6-11009C81	22k
R82	6-11009C33	220
R83	6-11009C93	68k
R84	6-11009D10	330k
R85	6-11009C67	5.6k
R86	6-11009C22	7k
R87	6-11009C49	15
R88	6-11009C99	47k
R89, 90	6-11009C83	3.3k
R91	6-11009C101	3.3k
R92	6-11009C92	82k ± 5%
R94	6-11009C59	2.7k
R96	6-11009D04	180k ± 5%
R97	6-11009C25	100
R98	6-11009C86	5.1k
R135, 140	6-125A23	82; 1/2 W
R311	6-11009C05	15
R312	6-11009C51	1.2k
RT101	6-83600K06	thermistor; 10k @ 25°C
U10	51-84320A78	integrated circuit; (see note 1) type M2079
VR2	48-82256C50	voltage regulator; (see note 1) Zener; 13 V
VR313	48-82256C56	Zener; 8.5 V
Y10	—	crystal unit; (see note 1) KXN6122AA
Y20	48-84396K05	10.7 MHz
Y21	48-84574K03	10.7 MHz
Y22	48-84396K02	10.7 MHz
Y23	48-84574K01	10.7 MHz
Z2	1-80796B95	hybrid circuit; temperature regulator; 5 PPM
<b>mechanical parts</b>		
14-84602K01	INSULATOR; 4 used	
9-83487K02	SOCKET, crystal; RCVR	
26-134245	SHIELD, crystal; XMTR	
26-83266F01	SHIELD, 0.738" x 0.738" x 1.05"	
26-84169L01	SHIELD, oscillator	
26-84171L01	SHIELD, I-F	
26-84598A01	SHIELD, coil	
26-84598A02	SHIELD, coil; 3 used	
39-10184A10	CONTACT; 18 used	
39-10184A24	CONTACT	
29-84708E06	TERMINAL, contact crimp; 4 used	
42-10217A02	STRAP TIE; 9 used	
76-83960B01	FERRITE, core	

TLE4213A Main Transmitter Board PL-6989-B

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
1-80791B46	CRYSTAL HEATER assembly includes: R135, R140, and; THERMISTOR & BRACKET assembly includes: CR101, and BRACKET	
1-80789B58	CRYSTAL HEATER assembly includes: CR101, and BRACKET	
7-82587L01	CRYSTAL HEATER assembly includes: CR101, and BRACKET	
TRN4305A Main Transmitter Hardware Kit PL-6990-B		
REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
CE20, 821	23-82801A31	capacitor, fixed; 15 uF ± 150-10%; 25 V (No Power Amplifier)
CE29 thru 633	21-869219	1000 pF ± 100-0%; 50 V (feedthru)
J1	15-83498F22	connector; includes: HOUSING, connector; 15 contact (RED) CONTACT, terminal; 11 used
J100	15-83498F17	connector; includes: HOUSING, contact; 15 contact (WHT) CONTACT, terminal; 6 used
Q116	48-84413L12	transistor; (see note) NPN; type M1312
Q122	46-86988	



## 1. INTRODUCTION

### 1.1 GENERAL

- Step 1. The field modification of a 1 or 2 frequency UHF FLEXAR Base Station to operate as a Base/Repeater Station applies only to those base stations that are 15/30 watt, ac line powered, and operate in the 450-470 MHz frequency range. Modified 2-frequency stations will have T1-R1 operation only. Refer to Table 1.

#### NOTE

In the case of dc remote models, the additional requirement of 2-frequency control capability is necessary for proper system operation.

*Table 1. Model Application Chart For UHF "FLEXAR" Base/Repeater Modification Kits*

FLEXAR Base Station		Repeater Field Modification Kits	
Existing Model		WITH Duplexer/Circulator	WITHOUT Duplexer/Circulator
L34TRK1100	H	TRE1253A	TRE1283A
L34TRK1130	H	TRE1253A	TRE1283A
L34TRK3100	H	TRE1263A	TRE1293A
L34TRK3130	H	TRE1263A	TRE1293A
L34TRK6100	H	TRE1273A	TRE1303A
L34TRK6130	H	TRE1273A	TRE1303A
L44TRK1100	H	TRE1253A	TRE1283A
L44TRK1130	H	TRE1253A	TRE1283A
L44TRK3100	H	TRE1263A	TRE1293A
L44TRK3130	H	TRE1263A	TRE1293A
L44TRK6100	H	TRE1273A	TRE1303A
L44TRK6130	H	TRE1273A	TRE1303A
L34TRK1105		TRE1253A	TRE1283A
L34TRK1135		TRE1253A	TRE1283A
L34TRK3105		TRE1263A	TRE1293A
L34TRK3135		TRE1263A	TRE1293A
L34TRK6105		TRE1273A	TRE1303A
L34TRK6135		TRE1273A	TRE1303A
L44TRK1105		TRE1253A	TRE1283A
L44TRK1135		TRE1253A	TRE1283A
L44TRK3105		TRE1263A	TRE1293A
L44TRK3135		TRE1263A	TRE1293A
L44TRK6105		TRE1273A	TRE1303A
L44TRK6135		TRE1273A	TRE1303A

- Step 2. The field modification kit consists of a repeater housing (containing a receiver and a repeater control logic board), all interconnecting cables, all necessary hardware, and a 2 PPM

transmit stability conversion kit. Certain field modification kits also contain a circulator/duplexer within the repeater housing. Refer to the attached model charts for further information concerning field modification kit contents.

- Step 3. The control cabling attaches to the base station metering connector (J601) and a system metering connector (J801) is provided on the repeater housing. The cabling is 18" standard with optional (L151A series) 10' extension cabling available, as follows:

- TKN8110A Control Cable 10' Extension Kit
- TKN8111A RF Cable 10' Extension Kit

The control cable plugs into the existing 18" filtered control cable, and the rf cable replaces the existing 18" rf cable. The extension cabling is available as a factory installed option or as a field installed modification. The cabling permits wall mounting or remote placement of the repeater housing in space sensitive installations. Four mounting holes are provided in the repeater housing (however, mounting hardware is not provided).

- Step 4. The field modification consists of disabling the existing receiver, installation of new contacts in the "metering" socket, cable kit(s) installation, replacement of the existing front panel escutcheon, and installation of a 2 PPM heater hybrid (if required).
- Step 5. Installation requires the use of the tools listed in Table 2.

*Table 2. Tools Required for Field Modification*

• Flat Blade Screwdriver
• # 2 Phillips Screwdriver
• 7/32" Nut Driver
• 1/4" Nut Driver
• 11/32" Thin Wall Nut Driver
• Long Nose Pliers
• Molex Pin Extractor Tool ST-1145
• 45 W Soldering Iron
• Razor Knife (Xacto™ type)



**MODEL COMPLEMENT CHART  
FOR  
UHF "FLEXAR"  
BASE/REPEATER  
FIELD MODIFICATION KITS**

**CODE:**

= INDICATES QUANTITY OF ONE SUPPLIED

ITEM	DESCRIPTION
KXN6122A	RECEIVER CRYSTAL
TLE4193A	CIRCULATOR (450-470 MHZ)
TRN8810A	DUPLEXER HARDWARE KIT
TRN8811A	NON-DUPLEXER HARDWARE KIT
TRN8813A	RETROFIT HARDWARE KIT
TKN8112A	RF CABLE: 18-INCH
TKN8035A	REPEATER INTERCONNECT CABLE
TRN8817A	FILTER BOARD AND CONTROL CABLE
TRN8815A	REPEATER CONTROL BOARD
KLN6209A	"VIBRASPONDER" RESONANT REED
TRN6005A	CODE PLUG
TRN8833A	-tone "PRIVATE-LINE" ENCODER/DECODER
TRN6207A	"DIGITAL PRIVATE-LINE" ENCODER/DECODER
TUE1603AB	UNIFIED CHASSIS (RCVR. ONLY) 1-FREQ.

OPTION	DESCRIPTION	TYPE OF SQUELCH
TRE1253A	BASE/REPEATER FIELD MODIFICATION W/DUPLEXER	CARRIER
TRE1263A	BASE/REPEATER FIELD MODIFICATION W/DUPLEXER	"PRIVATE-LINE"
TRE1273A	BASE/REPEATER FIELD MODIFICATION W/DUPLEXER	"DIGITAL PRIVATE-LINE"
TRE1283A	BASE/REPEATER FIELD MODIFICATION	CARRIER
TRE1293A	BASE/REPEATER FIELD MODIFICATION	"PRIVATE-LINE"
TRE1303A	BASE/REPEATER FIELD MODIFICATION	"DIGITAL PRIVATE-LINE"

EPS-30341-0

- Step 6. Any remote controller that is used to control the FLEXAR Base/Repeater Station must have 2-frequency (F1/F2) capability, where F1 selection corresponds with repeater setup and F2 selection corresponds with repeater knockdown.

- 28D46—no exchange required,
- 98B95—exchange required, and
- 98B96—exchange required.
- 33G81—exchange required.
- 33G82—exchange required.

Field modification may require the modification of any 1-frequency SERIES-80 Desk Top Controller used in the system. If required, a F1/F2 Switch Kit is available for field installation. Also, the TRN8809A Repeater Button Accessory Kit is then required to change the button legend to read RPTR OFF instead of F2. This latter kit is also required to modify an existing 2-frequency SERIES-80 Desk Top Controller.

**NOTE**

When modifying an existing SERIES-80 Desk Top Controller, have a replacement escutcheon of the proper color and with the correct holes and slots available before removing the existing escutcheon.

**1.2 INSTALLATION**

- Step 1. Remove ac power from base station.
- Step 2. Record the present control line connections made to TB-2. The control line connections will be replaced after completing the field modification.
- Step 3. Disconnect antenna feed line from J602.
- Step 4. Remove base station housing cover by loosening the four captive screws from the bottom of the housing.

**NOTE**

When carrier squelch stations are being field modified, the MONITOR connection on the local control board must be modified. To accomplish this modification, delete JU12 from the local control board.

- Step 5. Examine the component side of the transmitter/receiver unit. Maintain or establish the following jumper status:
  - JU1—OUT (located under RF Shield Cover)
  - JU2—OUT
  - JU3—IN
  - JU4—OUT
  - JU101—IN
  - JU102—IN for carrier squelch;  
OUT for coded squelch.
- Step 6. Locate temperature regulator Z2. Move cabling out of the way and identify part number (last five characters) printed on the back side of the hybrid substrate. These characters will determine if the hybrid should be exchanged for the one that comes with the field modification kit, as follows:

- Step 7. If exchange is required, unplug the existing hybrid and replace it with the new hybrid. Older units may require unsoldering of the existing hybrid. If so, loosen three captive screws and fold the transmitter/receiver unit over, exposing the solder side. Unsolder the existing hybrid and replace it with the new hybrid that comes with the field modification kit.
- Step 8. Remove all crystals from the transmitter/receiver unit except for the T1 transmit crystal. Place the styrofoam crystal cover over the transmit crystal socket. Fasten it in place with the spring clip and the 4-40 x 5/16" Phillips machine screw. The spring clip is mounted on the chassis tab with two screw holes. Use the screw hole farthest away from P100.

**NOTE**

If the unit being modified had a 5 PPM heater, use the styrofoam crystal cover supplied with the field modification kit.

- Step 9. Examine the existing FCC XMTR DATA number on the tag fastened to the rear of the base station housing. Choose a new tag that has the new FCC XMTR DATA number with the same numeric value. Install this new tag in place of the existing tag. The new tag number signifies 2 PPM transmit stability.
- Step 10. Locate Q14 on the unified board. Cut the three transistor leads as close to the board as possible. Remove and discard the transistor. This disables the receiver section of the transmitter/receiver unit (re-identified exciter unified chassis).
- Step 11. Identify station model being field modified.

If station is an "A" version local control model (example: L44TRK-3100AH) with option L169 (local/remote control board), or

If station is an "A" version dc remote control model (example: L44TRK6135A);

Then further modifications must be made to the control board in the station.

- Step 12. Refer to the attached model TRN6796B Local/Remote Control Board instruction section 68P81045E64-O. To modify the local/remote control board, add R58 and C27 and make the required

plating cut as per the circuit board detail. R58 is a 47k ohm  $\pm 10\%$ ; 1/4 W (Motorola part number 6-124C89). C27 is a .05 uF  $\pm 10\%$ ; 25 V (Motorola part number 21-82372C07). R58 is installed between U4-8 and U3-10, on the foil side of the board. C27 is installed between U3-10 and U3-7, on the component side of the board. The plating cut is made on the foil side of the board, underneath U3, to the foil path connecting U3-10 to U4-8.

- Step 13. Refer to the attached model TRN4435A DC Remote Control Board instruction section 68P81045E66-A. To modify the dc remote control board, add R69, C35, a jumper wire, and make two required plating cuts as per the circuit board detail. R69 is a 47k ohm  $\pm 10\%$ ; 1/4 W (Motorola part number 6-124C89). C35 is a .05 uF  $\pm 10\%$ ; 25 V (Motorola part number 21-82372C07). R69 is installed between U3-9 and U2-8, on the foil side of the board. C35 is installed from the anode of VR2 to the anode of CR10, on the foil side of the board. The jumper wire is installed between U3-11 and the foil pad to the right of JU1 (board viewed from the foil side), on the foil side of the board. One plating cut is made on the foil side of the board, underneath U3, to the short pad connecting U3-9 to the main foil path between U2-8 and U3-11. The other plating cut is made on the component side of the board, between the foil pad to the left of JU1 (board viewed from the component side) and the foil pad to which the anode of CR10 is soldered.
- Step 14. Locate the RED-WHT wire connected between J601-7 and point 3 on the unified circuit board near J100.

---

**CAUTION**

Do not confuse this RED-WHT wire with any other RED-WHT wire in the unit. The required wire is a # 24 stranded type.

---

- Step 15. Cut the wire approximately 3 inches from point 3. Then, strip and tin each end of the cut wire.
- Step 16. Disassemble the fuse holder included with the field modification kit. Thread the short half of the fuse holder over one of the wires, then crimp and solder a fuse clip to the tinned end of the wire. Thread the long half of the fuse holder over the other wire, then thread the wire through the compression spring. Finally, crimp and solder a fuse clip to the tinned end of the wire.
- Step 17. Insert the 4 Amp slow blow fuse (identified: F4) into the fuse holder and fasten the holder together.

- Step 18. On local or local/remote control models, unplug the 3-watt audio board from the control board.
- Step 19. Cut the two cable ties which fasten the radio interconnect cable (either TKN8028A or TKN8029A) to the transmitter/receiver unified chassis.
- Step 20. Disconnect the cable from the base station by unplugging J100 (WHT) from the transmitter/receiver unified chassis and unplugging J1 (RED) from the control board.
- Step 21. Unfasten the PL board, by removing four screws, and move it aside.

**NOTE**

When PL or DPL stations are being field modified, the ORG- BLU wire from the encoder/decoder board, attached to point number 60 on the unified circuit board, must be unfastened, removed, and discarded.

Additionally, when DPL stations are being field modified, the DPL high pass filter board must be disconnected and discarded. Then connect the RED-WHT and BLK wires, from the encoder/decoder board, to points C and T, respectively, on the unified circuit board.

- Step 22. Route the new radio interconnect cable (identified W8; Motorola part number: 1-80722D51) as shown in Figure 1. Plug J100 (WHT) into P100 on the unified chassis and plug J1 (RED) into P1 on the control board. Route the lugged ends of the cable back, along the inside edge of the unified chassis, to "metering" socket J601. Fasten W8 to the chassis with two cable ties supplied with the field modification kit. Plug the 3-watt audio board back into the control board.
- Step 23. Using an ST-1145 Molex Pin Extractor Tool, disconnect the BRN Meter 1 wire from J601-10 and the YEL Meter 2 wire from J601-13. Cut both wires off as close as possible to the unified board and discard them.
- Step 24. Refer to Figure 2. Using a flat-tip screwdriver, push up and in on the bottom tab of J601, so that J601 can swing in and up slightly.

---

**CAUTION**

J601 can NOT be completely removed. To attempt to do so will damage the socket.

---

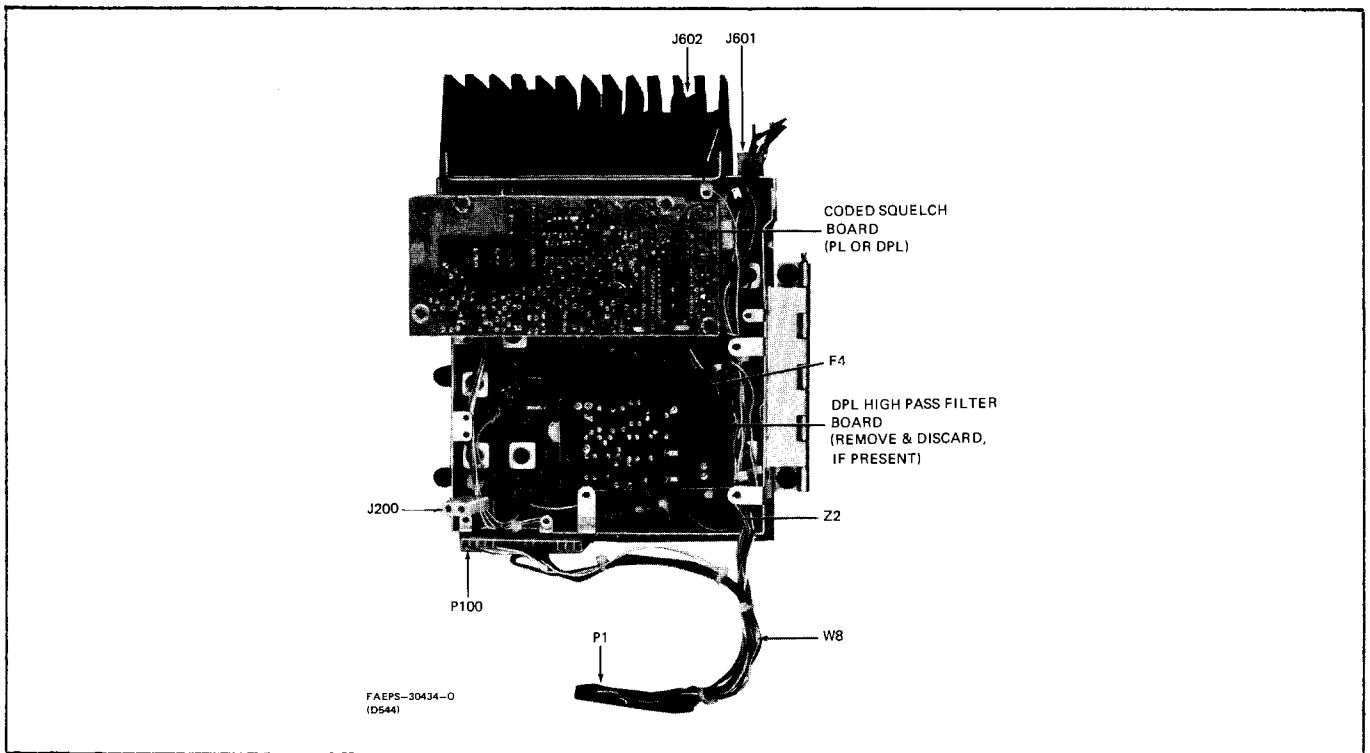


Figure 1. Radio Interconnect Cable W8 Routing

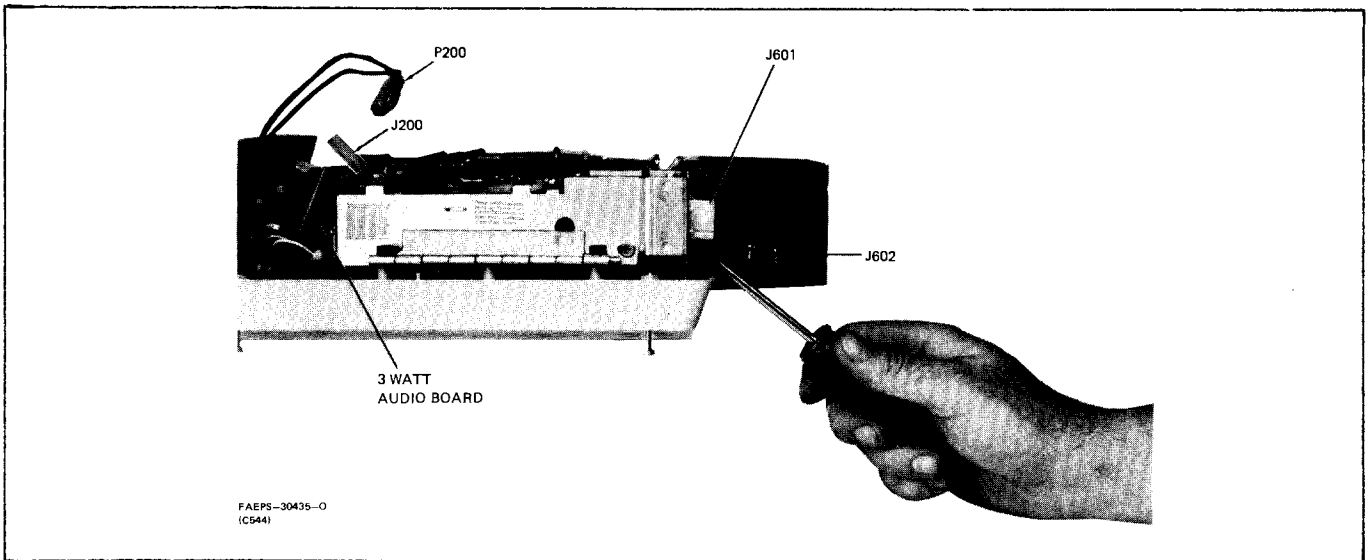


Figure 2. Recommended Method of Loosening J601

- Step 25. Insert the following lugged (connector) ends of W8 into J601.
  - YEL-BLK to J601-13
  - BLU to J601-12
  - YEL to J601-10
  - ORG-BLK to J601-9
  - WHT to J601-5
  - BRN-BLK to J601-4
  - BRN to J601-3
  - RED-BLK to J601-2
  - GRN to J601-1
- Step 26. Snap J601 back into the unified chassis.
- Step 27. Dress W8 along the inside edge of the unified chassis and fasten the PL board back into place with the four loose screws.
- Step 28. Fold the exciter unified chassis over and fasten it down with three captive screws.
- Step 29. Identify the model number of the power supply. If it is TPN1155A or TPN1155B, a ground strap (identified W100) MUST be installed between

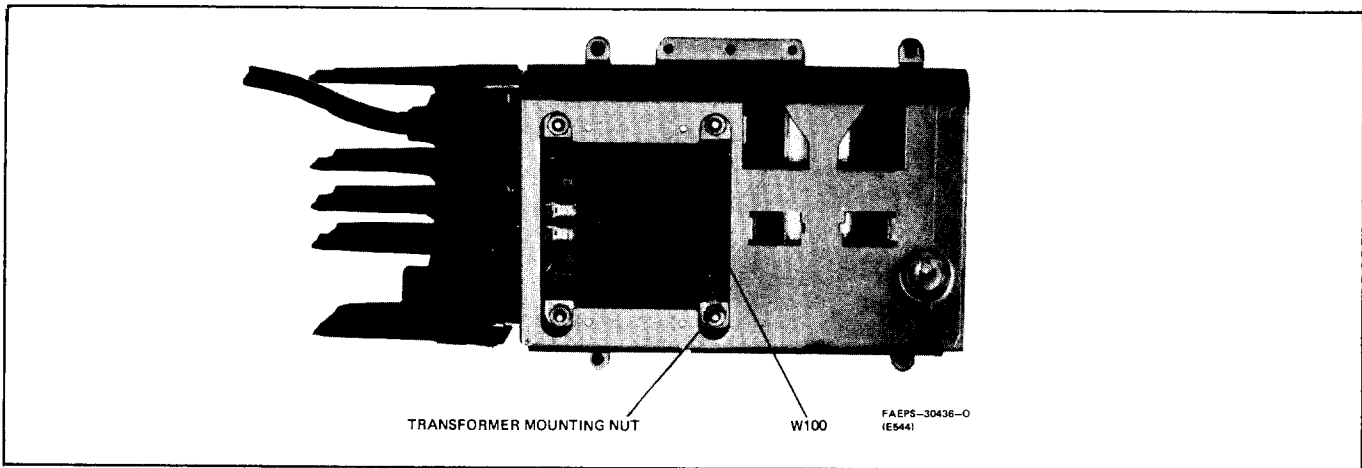


Figure 3. Bottom View of A TPN1155A or TPN1155B Power Supply

the power supply chassis and the negative terminal of capacitor C1.

**NOTE**

W100 not required on TPN1176A Power Supply.

- Step 30. If W100 is to be installed, remove the power supply chassis from the base station housing by loosening four captive screws. On handset equipped models, also remove the handset cradle by removing three mounting screws.
- Step 31. Turn the power supply bottom side up and remove the transformer mounting nut (11/16") next to the power supply regulator board.
- Step 32. Refer to Figure 3. Slip the lug on one end of W100 over the exposed bolt and fasten it in place with the loose nut. Push the free end of W100 between the power transformer and the regulator board.

- Step 33. Refer to Figure 4. Turn the power supply so that the regulator board is up. Remove the C1 negative terminal mounting screw. Route the free end of W100 over to the negative terminal and fasten it in place with the loose mounting screw.
- Step 34. Replace the power supply in the base station housing and fasten it in place by tightening the four captive screws. On handset equipped models, also replace the handset cradle by replacing three mounting screws.

**NOTE**

If field modification is for a 15-watt power amplifier, be sure to install the 15-watt adapter plate (Motorola Part No. 7-84043M01) on the Filter Board Housing before installing the housing.

- Step 35. Locate and identify the TKN8817A Filter Board & Control Cable (identified W7). The plug on the filter board end is identified P601, and the plug on the other end is identified P701.

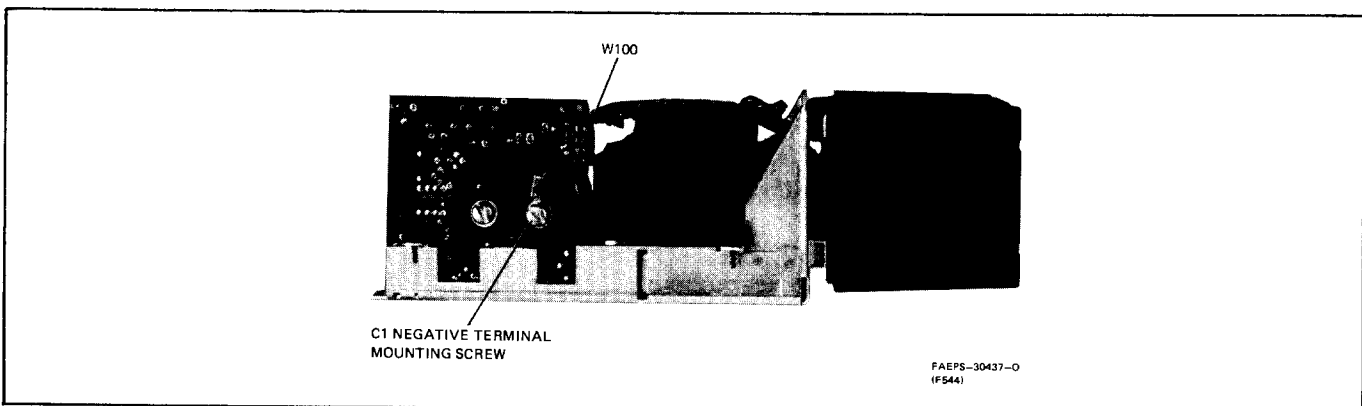


Figure 4. Side View of A TPN1155A or TPN1155B Power Supply

- Step 36. Plug P601 into J601. Slip the supplied filter board cover (black) over the filter board and hook the cable clamp S-hook into the hole in the cover.
- Step 37. Route the free end of the filter board ground strap along the side of the chassis and through the slot in the cover.
- Step 38. Remove the rf deck mounting screw from under the cover mounting slot. Secure the cover and the ground strap to the chassis (ground strap lug outside of the cover) with 6-32 x 3/8" Phillips hex screw.
- Step 39. Push the cover flush to the chassis, and fasten it in place with two 6-32 x 1/4" Phillips hex screws through the top of the cover.

**NOTE**

The two screws do not screw into anything except the cover. They hold the cover in place by butting against the inside edge of the chassis.

- Step 40. Pull the OFF/VOLUME and SQUELCH knobs off of their control shafts from the front of the base station.

**NOTE**

DC remote stations do not have need of either an escutcheon or button exchange.

- Step 41. Using a flat-tipped screwdriver, carefully pry the escutcheon (with attached adhesive) off of the front of the station and discard. Begin to pry the escutcheon off at the volume and squelch holes in the escutcheon.
- Step 42. Peel the protective paper, with the escutcheon outline, from the double sticky adhesive. Place the new escutcheon upon the exposed adhesive surface, assuring all holes and slots are aligned. Using a flat surface, press the escutcheon tightly against the adhesive.

---

**CAUTION**

On stations with clock option, assure red clock window is in place before installing assembly in the following step.

---

- Step 43. Peel the remaining protective paper from the adhesive, and stick the escutcheon and adhesive assembly in place upon the station front panel, assuring all holes and slots are aligned.
- Step 44. Replace all front panel pushbuttons with those supplied.
- Step 45. Connect P701 of W7 to J701 (stamped CONTROL) on the repeater housing.
- Step 46. On non-duplexer stations, the transmit antenna will be connected to transmitter rf output connector J602 (on the base station housing), and the receive antenna will be connected to UHF input connector J603 (stamped INPUT) on the repeater housing.
- Step 47. On duplexer stations, connect the TKN8112A 18" RF Cable (identified W12) between J602 and J603. The antenna will be connected to antenna output connector J604 (stamped OUTPUT) on the repeater housing.

**NOTE**

System metering jack connector J801 (stamped METER) is located on the repeater housing.

- Step 48. Replace the base station housing cover and fasten it in place by tightening the four captive screws from the bottom of the housing.
- Step 49. Proceed to verify proper operation of the base/repeater station, as described in installation and line level adjustment instruction section 68P81045E97.

---

**CAUTION**

Proper operation is dependent upon a correct power supply voltage of 13.8 V on transmit.

---

## parts list

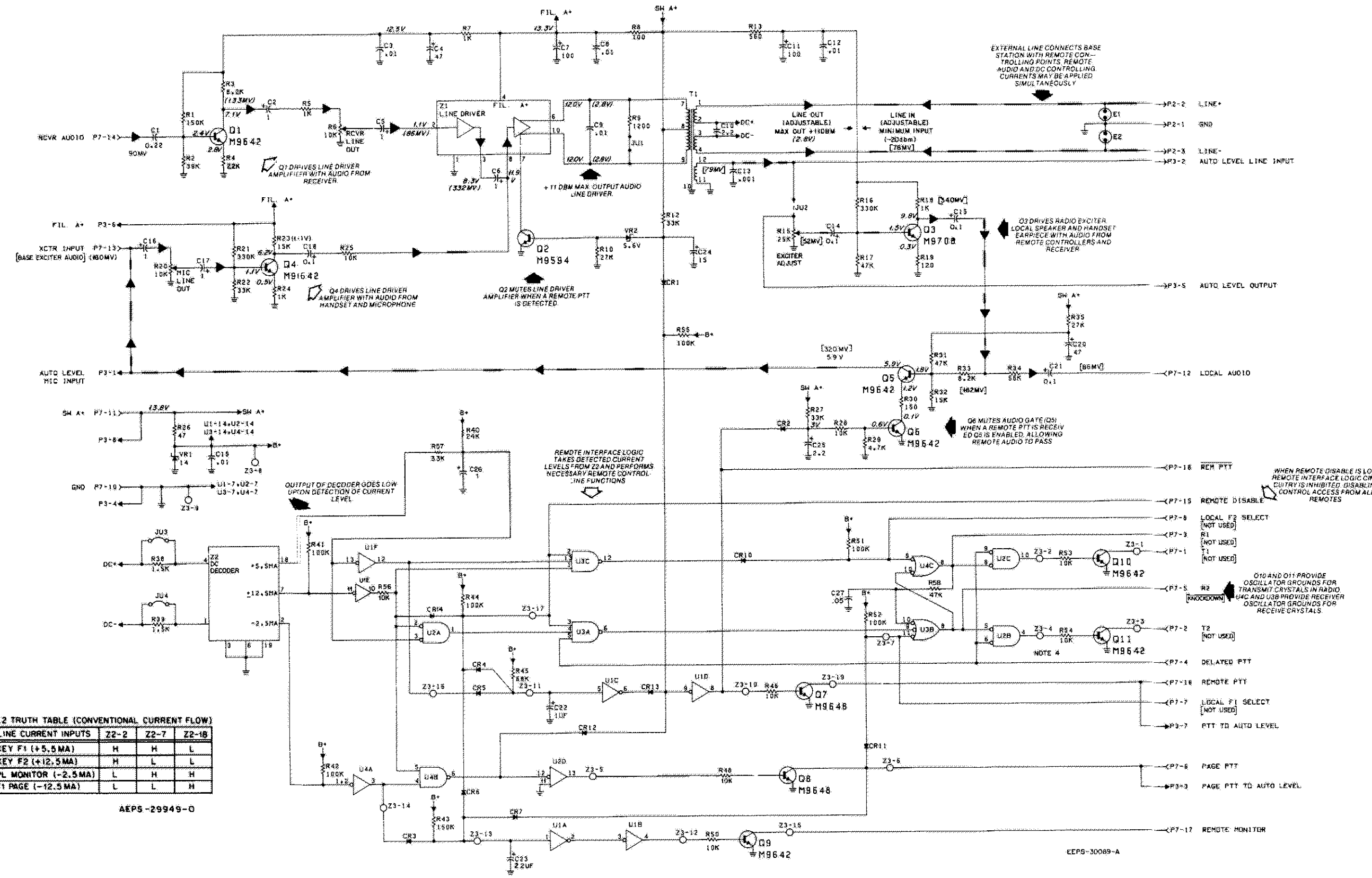
TRN8813A Field Modification Hardware Kit

PL-6983-A

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
C27	21-82372C07	<b>capacitor, fixed:</b> .05 uF ± 10%; 25 V (p/o TRN6796B)
C35	21-82372C07	.05 uF ± 10%; 25 V (p/o TRN4435A)
F4	65-834464	<b>fuse, cartridge:</b> 4A
J1	15-83498F22	<b>connector:</b> includes: HOUSING, connector; 15-contact (RED)
J100	29-83499F01	CONTACT, terminal; 11 used
	15-83498F17	includes: HOUSING, connector; 15-contact (WHT)
	29-83499F01	CONTACT, terminal; 6 used
R58	6-124C89	<b>resistor, fixed:</b> 47k ± 10%; 1/4 W (p/o TRN6796B)
R69	6-124C89	47k ± 10%; 1/4 W (p/o TRN4435A)
W8	1-80722D51	<b>cable assembly:</b> includes J1, J100 and: CONTACT, receptacle; 9 used (for J601)
	29-84706E06	CONTACT, terminal
	39-10184A24	STRAP, tie; 0.091" x 3.62"; 7 used
	42-10217A02	
W100	1-80728D58	includes: LUG, ring tongue; 2 used
	29-859665	
Z2	1-80728D46	<b>hybrid circuit:</b> temperature regulator 2 PPM
<b>non-referenced items</b>		
	1-80795B62	COVER, oven
	3-134212	SCREW, tapping; 4-40 x 5/16"
	3-135506	SCREW, tapping; 6-32 x 1/4"
	3-136138	SCREW, tapping; 6-32 x 3/8"
	7-84043M01	BRACKET; 1" x 1.3" x 0.90" (15 W PA adapter cover)
	13-83280L34	ESCUTCHEON (RPTR, MONITOR, REMOTE)
	13-83280L35	ESCUTCHEON (RPTR, MONITOR, REMOTE, INTERCOM)
	13-83280L36	ESCUTCHEON (RPTR, MONITOR, REMOTE, CLOCK)
	13-83280L37	ESCUTCHEON (RPTR, MONITOR, REMOTE, CLOCK, INTERCOM)
	14-82882A01	FUSEHOLDER BODY
	14-82883A01	CAP, fuseholder
	33-84054M01	NAMEPLATE
	38-83282L02	PUSHBUTTON; 4 used
	41-82885A01	SPRING, fuseholder
	42-10217A02	STRAP, tie; 0.091" x 3.62"; 2 used
	42-82588L01	CLIP, holddown
	42-82884A01	CLIP, fuse; 2 used

# LOCAL/REMOTE CONTROL BOARD

## MODEL TRN6796B

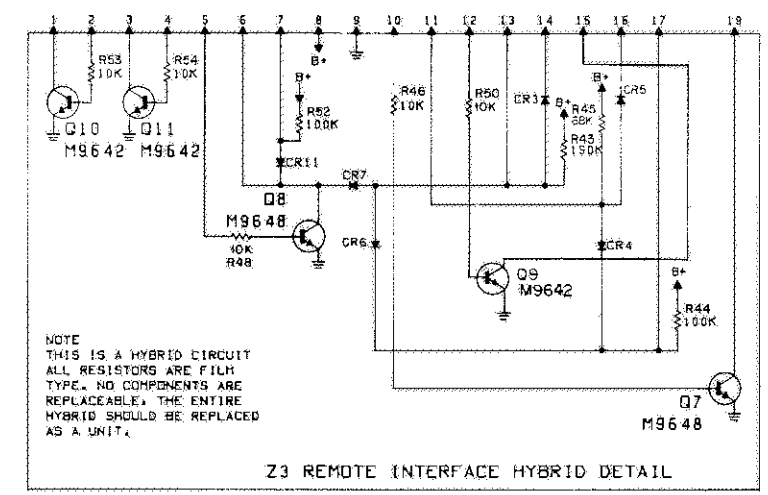


**Z2 TRUTH TABLE (CONVENTIONAL CURRENT FLOW)**

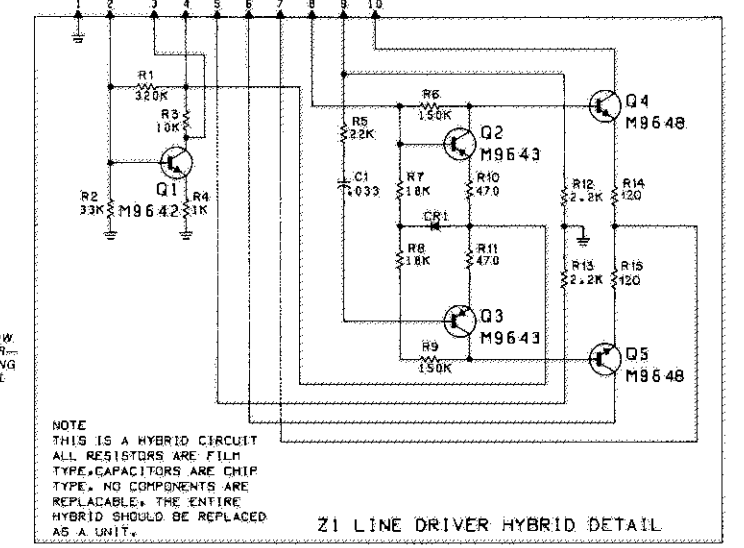
LINE CURRENT INPUTS	Z2-2	Z2-7	Z2-1B
KEY F1 (+5.5 MA)	H	H	L
KEY F2 (+12.5 MA)	H	L	L
PL MONITOR (-2.5 MA)	L	H	H
F1 PAGE (-12.5 MA)	L	L	H

AEPS-29949-0

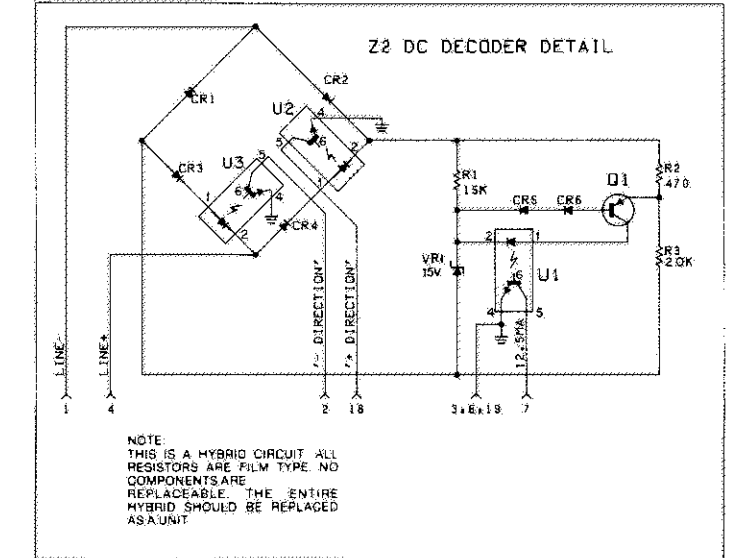
AEPS-30089-A



Z3 REMOTE INTERFACE HYBRID DETAIL



Z1 LINE DRIVER HYBRID DETAIL



Z2 DC DECODER DETAIL

### FUNCTION

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

**JUMPERTABLE**  
 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**
- ALL RESISTORS ARE IN OHMS. CAPACITORS ARE IN UF UNLESS OTHERWISE STATED.
  - ALL DC VOLTAGES ARE MEASURED WITH A 20K VOLT METER.
  - ALL AC VOLTAGES ARE RMS, MEASURED WITH A HIGH IMPEDANCE METER. A 600 OHM LOAD IS ATTACHED ACROSS THE LINE.  
 [ ] = MINIMUM LINE INPUT (-20dbm)  
 [ ] = MAXIMUM LINE OUTPUT (+11dbm)
  - SIGNAL NAMES AND INFORMATION IN BRACKETS [ ] APPLY ONLY TO OPTIONAL REPEATER OPERATION.  
 F1 SELECT IS REPEATER SET UP.  
 F2 SELECT IS REPEATER KNOCKDOWN.

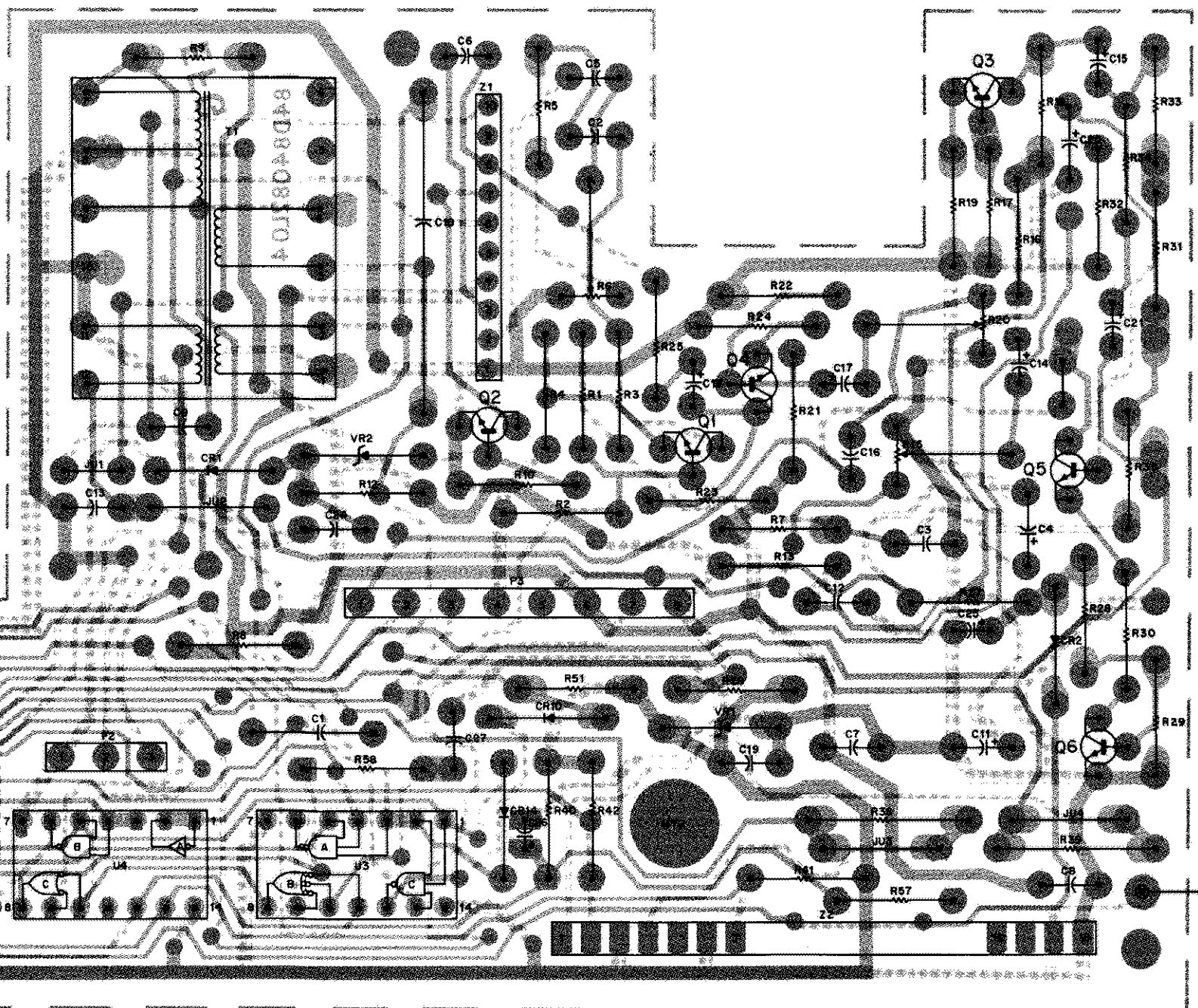
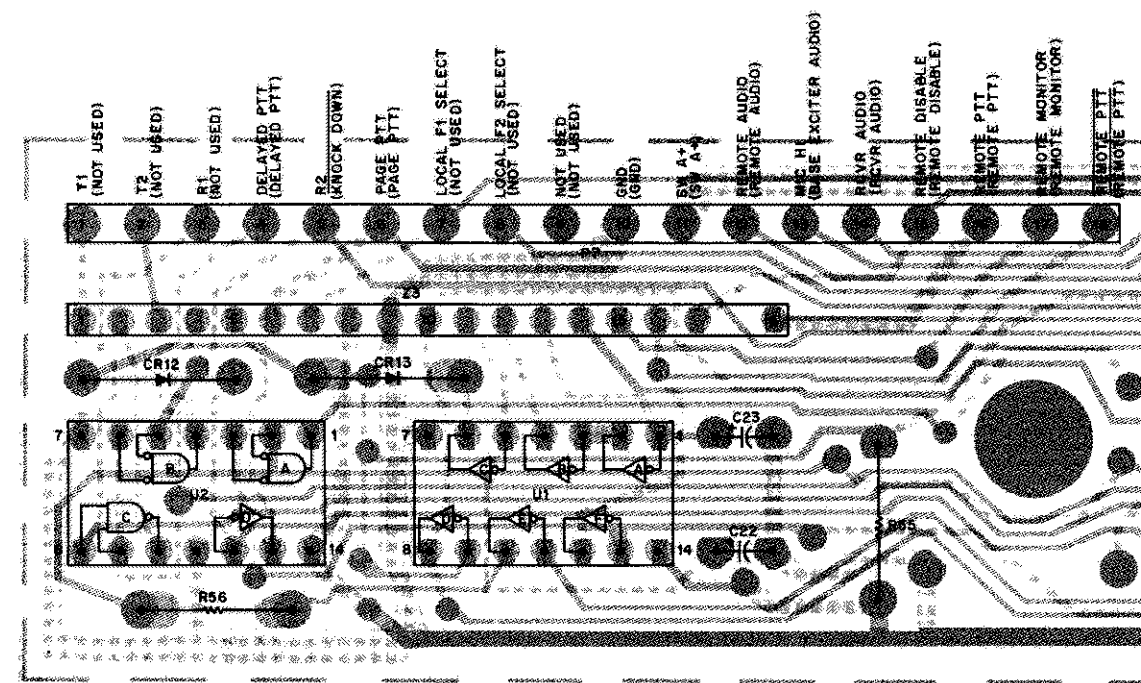
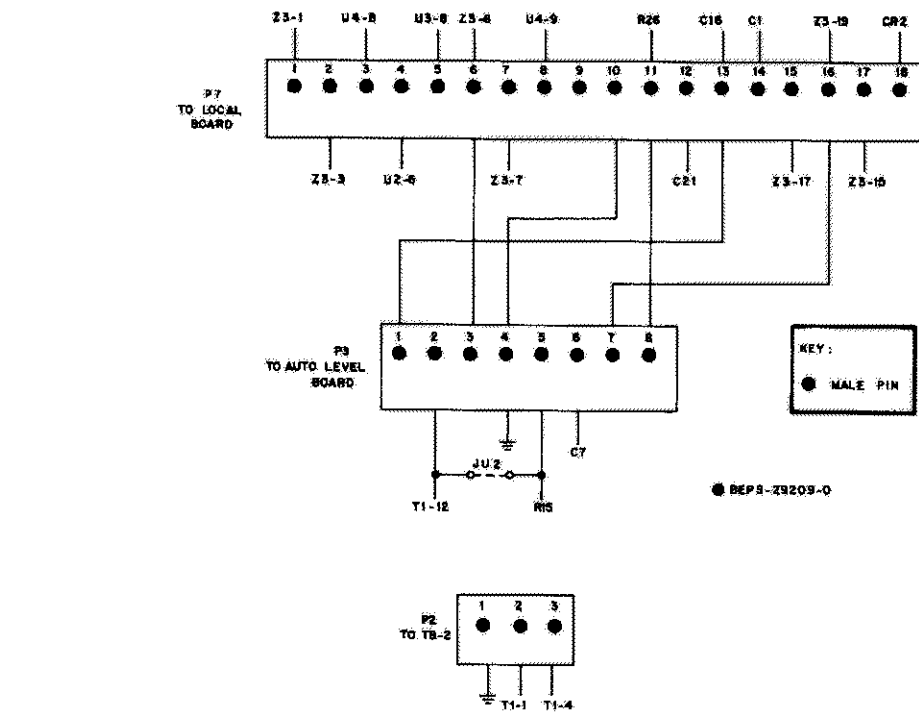
- LEGEND:**
- RECEIVER AUDIO
  - TRANSMIT AUDIO
  - MAINTENANCE NOTE
  - CIRCUIT THEORY
  - Z3-XX Z3 CONNECTION

LOCAL/REMOTE CONTROL



# LOCAL/REMOTE CONTROL BOARD

MODEL TRN6796B



SHOWN FROM COMPONENT SIDE

COMPONENT SIDE © 80-DEPS-32780-0  
 SOLDER SIDE 80-DEPS-32781-0  
 QL-DEPS-31179-B

## parts list

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
C1	8-8205G32	capacitor, fixed: uF: .22 ± 10%; 50 V
C2	23-84538G01	1.0 + 150-0%; 50 V
C3	21-82428B40	.01 + 50-40%; 250 V
C4	23-84538G06	.47 ± 20%; 20 V
C5, 6	23-84685F04	1.0 + 150-0%; 50 V
C7	23-84685F03	100 + 100-0%; 25 V
C8, 9	21-82428B40	.01 + 50-40%; 250 V
C10	8-82086J15	2.2 ± 10%; 250 V
C11	23-84685F03	100 + 100-0%; 25 V
C12	21-82428B40	.01 + 50-40%; 250 V
C13	21-82187B29	.001 ± 10%; 100 V
C14, 15	23-84538G03	0.1 ± 20%; 35 V
C16, 17	23-84685F04	1.0 + 150-0%; 50 V
C18	23-84538G03	0.1 ± 20%; 35 V
C19	21-82428B40	.01 + 50-40%; 250 V
C20	23-84538G06	.47 + 150-0%; 50 V
C21	23-84538G03	0.1 ± 20%; 35 V
C22	23-84685F04	1.0 + 105-0%; 50 V
C23	23-84538G06	2.2 ± 20%; 20 V
C24	23-84538G04	15 ± 20%; 20 V
C25	23-84538G06	2.2 ± 20%; 20 V
C26	23-84538G01	1.0 ± 20%; 20 V
C27	21-82372C07	.05 ± 10%; 25 V
CR1, 2	48-83654H01	diode (see note)
CR10	48-83654H01	silicon
CR12, 13, 14	48-83654H01	silicon
P2	28-83441F18	connector: 3-pin, male, WHT
P3	28-83496F01	8-pin, male, WHT
P7	15-84928L02	18-pin, male, WHT
Q1	48-869642	transistor: (see note)
Q2	48-869594	type M9642; NPN
Q3	48-869706	type M9594; NPN
Q4, 5, 6	48-869642	type M9706; NPN
Q5	48-869642	type M9642; NPN
R1	6-11009D02	resistor, fixed: ± 5%; 1/4 W;
R2	6-11009C07	150k
R3	6-11009C71	8.2k
R4	6-11009C57	2.2k
R5	6-11009C49	1k
R6	18-84944C03	variable: 10k
R7	6-11009C49	1k
R8	6-11009C25	100
R9	6-11009C51	1.2k
R10	6-11009C83	27k
R12	6-11009C85	33k
R13	6-11009C43	560
R16	18-84944C02	variable: 25k
R17	6-11009B10	37k
R18	6-11009C89	400k
R19	6-11009C49	1k
R20	18-84944C03	variable: 10k
R21	6-11009D10	330k
R22	6-11009C85	33k
R23	6-11009C77	15k
R24	6-11009C49	1k
R25	6-11009C73	10k
R26	6-11009C17	47k
R27	6-11009C85	33k
R28	6-11009C73	10k
R29	6-11009C65	4.7k
R30	6-11009C29	150
R31	6-11009C89	47k
R32	6-11009C77	15k
R33	6-11009C71	8.2k
R34	6-11009C81	56k
R35	6-11009C83	27k
R38	6-125A53	1.5k; 1/2 W
R39	6-125C53	1.5k ± 10%; 1/2 W
R40	6-11009C82	24k
R41, 42	6-11009C97	100k
R51	6-11009C87	100k
R55	6-11009C87	100k
R56	6-11009C73	10k
R57	6-11009C81	3.3k
R58	6-11009C89	47k
T1	25-83038L01	transformer: line driver
U1	51-84561L93	integrated circuit: (see note)
U2	51-84561L95	hex inverter
U3	51-8527M19	quad NOR gate
U4	51-8327M17	triple 3-input NAND quad 2-input NAND
VR1	48-82256C14	diode, Zener: (see note)
VR2	48-82256C12	15.0 V; 400 mW
		5.6 V; 400 mW

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
Z1	1-80796B46	hybrid circuit
Z2	1-80796B45	line driver
Z3	1-80705D27	dc decoder remote interface
non-referenced items		
	3-139776	SCREW, tapping; 5-20 x 3/8"; 2 used
	42-84284B01	RETAINER, screw
	1-90705D28	CIRCUIT BOARD ASSEMBLY includes:
	39-10184A10	CONTACT, plug

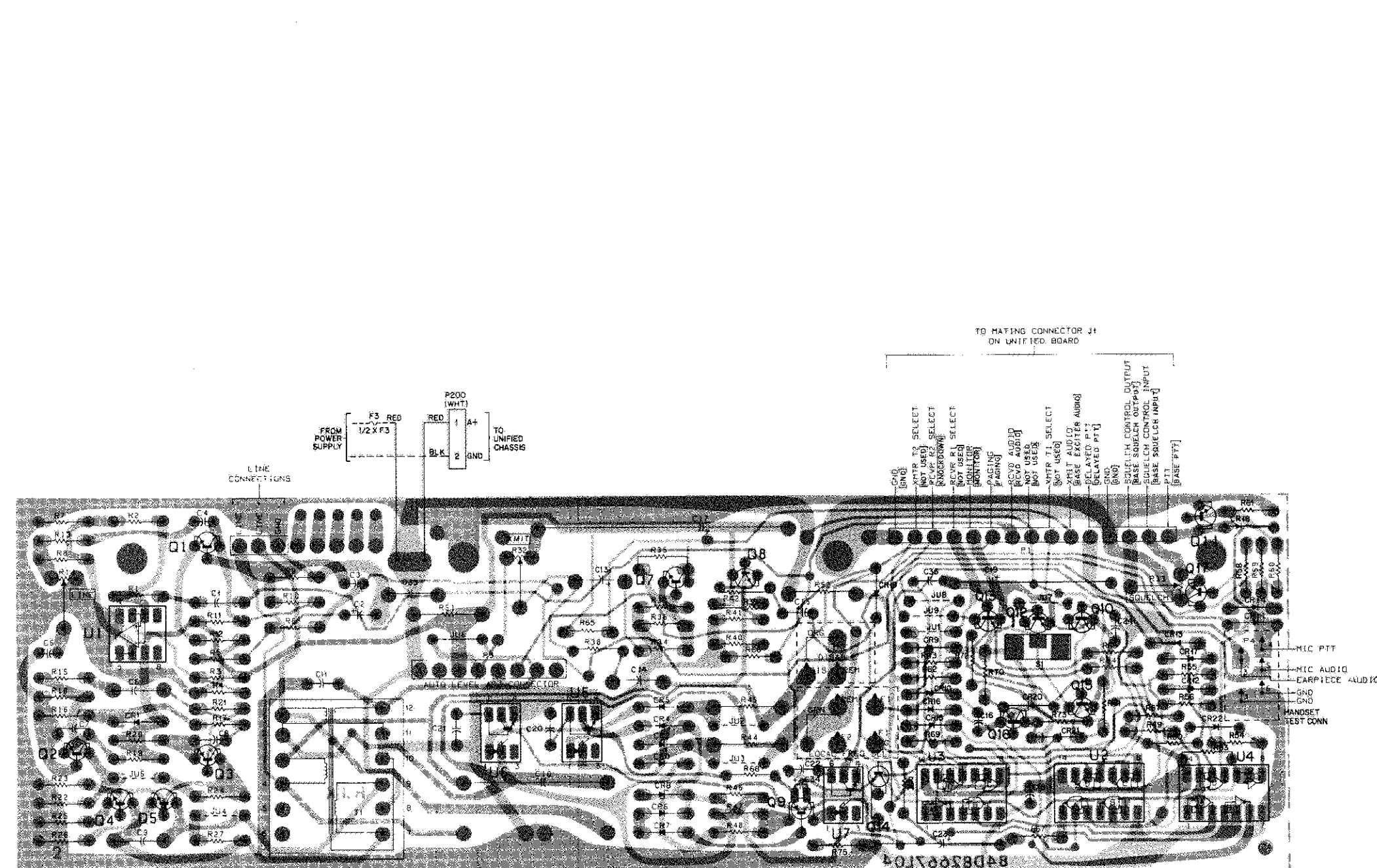
note: For optimum performance, diodes, transistors, and integrated circuits must be ordered by Motorola part numbers.

## revisions

CHASSIS AND SUFFIX NO.	REF. SYMBOL	CHANGE	LOCATION
TRN6796B	U3	WAS 51-82784K05	
	U4	WAS 51-82784K01	
		CIRCUIT BOARD CHANGED FROM 8-84082L03 TO 84-84082L04	
	E1, 2	OMITTED	
	R1, 2	OMITTED	
	U1	WAS 51-82784K16	
	U2	WAS 51-82784K02	

# DC REMOTE CONTROL BOARD MODEL TRN4435A

**FUNCTION**  
Provides remote control interface for radio operation.



SHOWN FROM COMPONENT SIDE

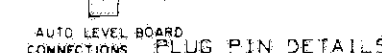
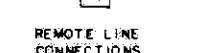
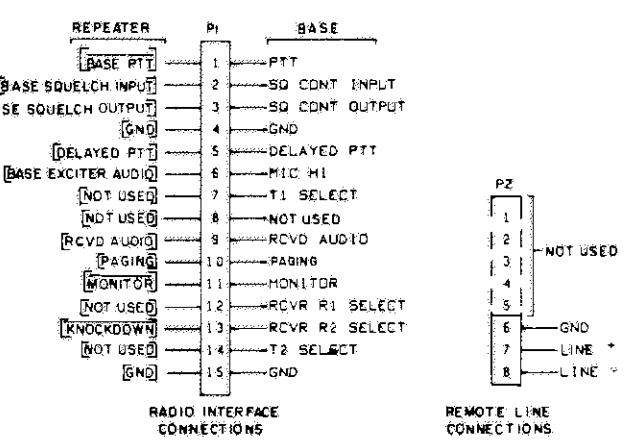
TRANSISTOR LEAD DETAILS

COMPONENT SIDE - BD-DEPS-3249-D  
SOLDER SIDE - BD-DEPS-3242-D  
DL-DEPS-3124-C

DC DECODER CIRCUIT TRUTH TABLE  
(CONVENTIONAL CURRENT FLOW)

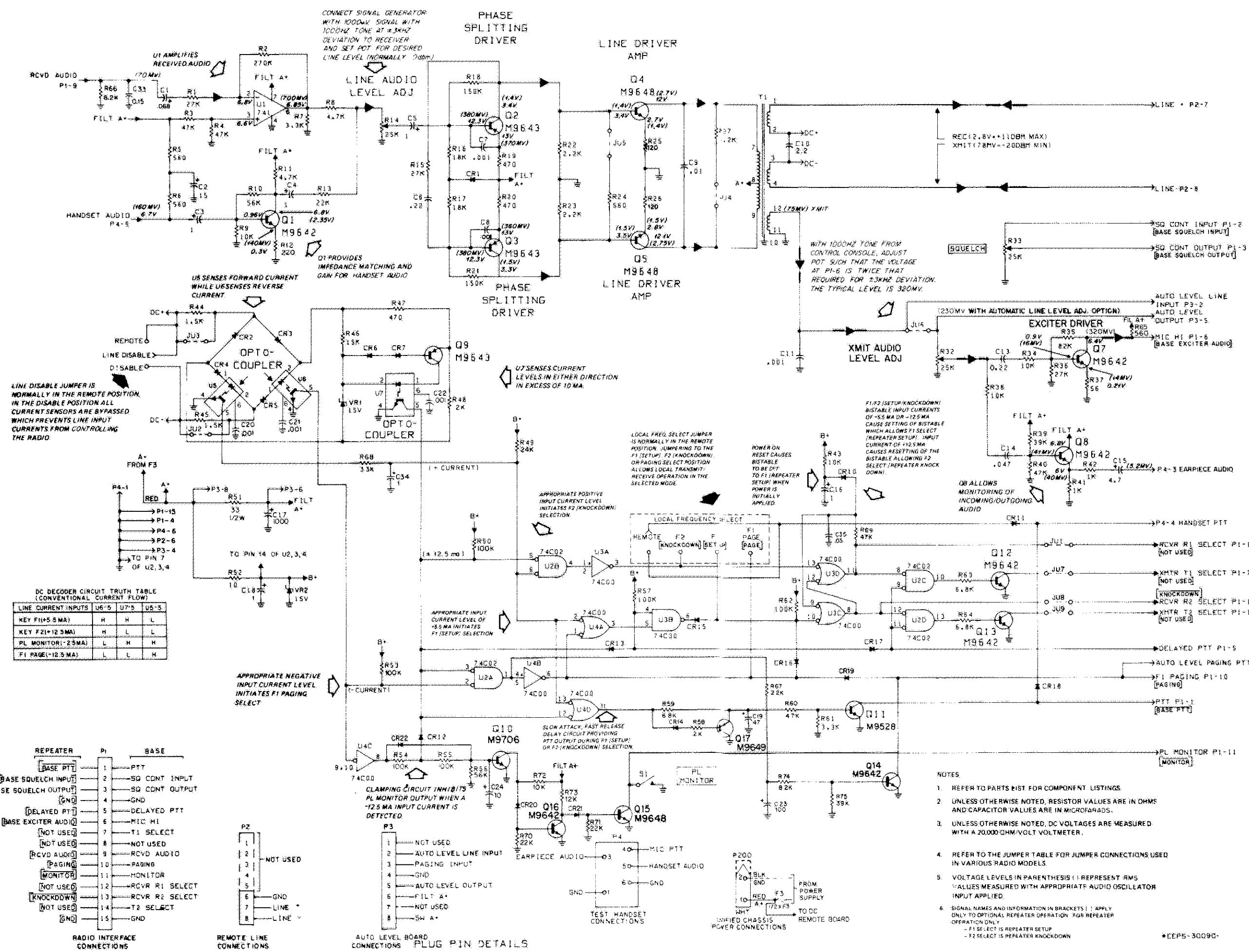
LINE CURRENT INPUTS	U6-5	U7-5	U5-5
KEY F1 (+3.5 MA)	H	H	L
KEY F2 (+12.5 MA)	H	L	L
PL MONITOR (-2.5 MA)	L	H	H
F1 PAGE (-12.5 MA)	L	L	H

• AEP5-29950-0

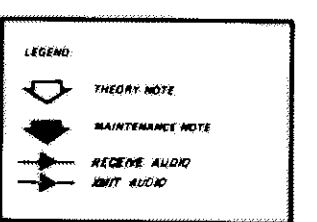


DC DECODER CIRCUIT TRUTH TABLE  
(CONVENTIONAL CURRENT FLOW)

LINE CURRENT INPUTS	U6-5	U7-5	U5-5
KEY F1 (+3.5 MA)	H	H	L
KEY F2 (+12.5 MA)	H	L	L
PL MONITOR (-2.5 MA)	L	H	H
F1 PAGE (-12.5 MA)	L	L	H



- NOTES
- REFER TO PARTS LIST FOR COMPONENT LISTINGS
  - UNLESS OTHERWISE NOTED, RESISTOR VALUES ARE IN OHMS AND CAPACITOR VALUES ARE IN MICROFARADS
  - UNLESS OTHERWISE NOTED, DC VOLTAGES ARE MEASURED WITH A 20000 OHM/VOLT VOLTMETER
  - REFER TO THE JUMPER TABLE FOR JUMPER CONNECTIONS USED IN VARIOUS RADIO MODELS
  - VOLTAGE LEVELS IN PARENTHESIS ( ) REPRESENT RMS VALUES MEASURED WITH APPROPRIATE AUDIO OSCILLATOR INPUT APPLIED
  - SIGNAL NAMES AND INFORMATION IN BRACKETS ( ) APPLY ONLY TO OPTIONAL REPEATER OPERATION. FOR REPEATER OPERATION ONLY:  
- F1 SELECT IS REPEATER SETUP  
- F2 SELECT IS REPEATER KNOCKDOWN



JU1	NORMALLY IN-OUT FOR ONE FREQUENCY RECEIVER
JU2, JU3	NORMALLY OUT, USED FOR SPECIAL APPLICATIONS
JU4	NORMALLY IN - OUT FOR LINE BRIDGING
JU5	NORMALLY OUT - IN GIVES 20 DB ATTEN
JU6	NORMALLY IN - OUT FOR AUTO LINE LEVEL OPTION
JU7	NORMALLY IN-OUT FOR ONE FREQUENCY TRANSMITTER
JU8	NORMALLY IN-OUT FOR ONE FREQUENCY RECEIVER
JU9	NORMALLY IN-OUT FOR ONE FREQUENCY TRANSMITTER

PARTS LIST SHOWN ON BACK

68P8104SE66-E  
7/21/82-PH1

DC REMOTE

# parts list

TRN4435A DC Remote Board

PL-8958-E

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
C1	8-82905G04	capacitor, fixed; uF $\pm$ 10%; 50 V; unless otherwise stated;
C2	23-84538G04	.068
C3, 4, 5	23-84665F04	15 $\pm$ 20%; 20 V
C6	8-82905G11	1 + 150-0%
C7, 8	21-82187B29	0.22
C9	8-82905G01	.001; 100 V
C10	8-82096J15	.01
C11	21-82187B29	2.2; 250 V
C13	8-82905G11	.001; 100 V
C14	8-82905G03	0.22
C15	23-84538G02	.047
C16	23-84665F04	4.7 $\pm$ 20%; 20 V
C17	23-83210A24	1 + 150-0%
C18	23-84665F04	1000 $\pm$ 20%; 20 V
C19	23-82783B37	1 + 150-0%
C20, 21, 22	21-82187B29	47 $\pm$ 20%; 25 V
C23	23-82783B04	.001; 100 V
C24	23-84538G05	100 $\pm$ 20%; 25 V
C33	8-82905G34	10 $\pm$ 20%; 15 V
C34	23-84538G01	0.15 $\pm$ 5%
C35	21-82372CD7	1 $\pm$ 20%; 20 V
		.05; 25 V
CR1 thru 7	48-83654H01	diode; (see note)
CR8, 9		silicon
CR10 thru 22	48-83654H01	NOT USED
		silicon
P1	28-83441F16	connector, plug;
P2	28-83441F18	male; 15 contact
P3	28-83496F01	male; 3 contact
P4	29-84547B04	male; 8 contact
P200		male pin; 5 used
		consists of:
	15-10183B22	HOUSING, connector, 2 contact; WHT
	39-10184A24	CONTACT, chain form, female; 2 used
Q1	48-869642	transistor; (see note)
Q2, 3	48-869643	NPN; type M9642
Q4, 5	48-869648	PNP; type M9643
Q7, 8	48-869642	NPN; type M9648
Q9	48-869643	NPN; type M9642
Q10	48-869706	PNP; type M9643
Q11	48-869528	NPN; type M9706
Q12, 13, 14	48-869642	NPN; type M9528
Q15	48-869648	NPN; type M9642
Q16	48-869642	NPN; type M9648
Q17	48-869649	PNP; type M9642
		PNP; type M9649
R1	6-11009C83	resistor, fixed; $\pm$ 5%; 1/4 W;
R2	6-11009C08	unless otherwise stated
R3, 4	6-11009C89	27k
R5, 6	6-11009C43	270k
R7	6-11009C61	47k
R8	6-11009C65	560
R9	6-11009C73	3.3k
R10	6-11009C91	4.7k
R11	6-11009C65	10k
R12	6-11009C33	56k
R13	6-11009C81	4.7k
R14	18-84944C02	220
R15	6-11009C83	22k
R16, 17	6-11009C79	variable; 25k $\pm$ 20%; 1/8 W
R18	6-11009D02	27k
R19, 20	6-11009C41	18k
R21	6-11009D02	150k
R22, 23	6-11009C57	470
R24	6-11009C43	150k
R25, 26	6-11009C27	470
R27	6-11009C81	150k
R32, 33	18-84944C02	2.2k
R34	6-11009C73	2.2k
R35	6-11009C95	560
R36	6-11009C83	560
R37	6-11009C19	120
R38	6-11009C73	1.2k
R39	6-11009C87	variable; 25k $\pm$ 20%; 1/8 W
R40	6-11009C89	10k
R41, 42	6-11009C49	10k
R43	6-11009C73	27k
R44, 45	6-125A53	27k
R46	6-11009C77	56
R47	6-11009C41	10k
R48	6-11009C56	10k
R49	6-11009C82	39k
R50	8-11009C97	47k
R51	6-125A13	1k
		10k
		1.5k; 1/2 W
		15k
		470
		2k
		24k
		100k
		33; 1/2 W

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
R52	6-125A01	10; 1/2 W
R53, 54, 55	6-11009C97	100k
R56	6-11009C91	56k
R57	6-11009C97	100k
R58	6-11009C56	2k
R59	6-11009C69	6.8k
R60	6-11009C85	4.7k
R61	6-11009C81	3.3k
R62	6-11009C97	100k
R63, 64	6-11009C69	6.8k
R66	6-11009C71	8.2k
R67	6-11009C57	2.2k
R68	6-11009C81	3.3k
R69	6-11009C89	47k $\pm$ 10%
R70, 71	6-11009C81	22k $\pm$ 10%
R72	6-11009C73	10k $\pm$ 10%
R73	6-11009C75	12k $\pm$ 10%
R74	6-11009C71	8.2k
R75	6-185A63	3.9k; 1/8 W
S1	40-83468E01	switch;
		spst
T1	25-83036L01	transformer;
		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.
U1	51-84371K60	integrated circuit; (see note)
U2	51-84561L95	op-amplifier
U3, 4	51-83627M17	quad NOR gate
U5	51-83629M63	quad AND gate
U6	51-83629M64	optical coupler
U7	51-83629M63	optical coupler
VR1, 2	48-82256C14	voltage regulator; (see note)
		15 V Zener
1/2XF3		fuseholder, in-line;
	14-82883A01	includes:
	42-82884A01	CAP
		CLIP
		mechanical parts
	3-139776	SCREW, machine
	9-84151B03	LUG; 2 used
	39-10184A30	CONTACT, plug; 6 used

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

## revisions

MODEL	REF. SYMBOL	CHANGE	LOCATION
TRN4435A	J8	DELETE POWER SUPPLY CONNECTOR	A + FROM POWER SUPPLY
TRN4435A-3	Q15, 16	ADDED	
	R70-73	ADDED	
	CR20, 21	ADDED	
	—	PC BOARD CHANGED FROM 84-82667L02 TO 84-82667L03	
	U3, 4	WERE 51-82764K01	
	R67	WAS 6-124A73, 10k $\pm$ 5%, 1/4 W	
	R74, 75	ADDED	
	Q17	ADDED 48-869649	
	R58	WAS 6-124A43, 560 $\pm$ 5%, 1/4 W	
	—	PC BOARD CHANGED FROM 84-82667L03 TO 84-82667L04	
	E1, 2	REMOVED 80-83029H01 FROM CKT 8D	
	U1	WAS 51-84320A13	
	U2	WAS 51-82764K02	
	U5	WAS 51-84320A05	
	U6	WAS 51-84621K81	
	U7	WAS 51-84320A65	